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CIRCULATION.

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CONTENTS.

ANNOUNCEMENT.

The Canadian Mining Journal desires to interest the mining student and young mining graduate in the work of building up Canadian mining literature. To this end we make the following offer:—

To the student in the third or fourth year of his course in mining engineering, or in metallurgy, who sends in the best essay on any appropriate technical subject we shall award a prize of one hundred dollars ($100). The judges will be the Editor of the Canadian Mining Journal, and several professors of mining and metallurgy from Canadian colleges.

Fuller details will be given in a later issue. It may be borne in mind, meanwhile, that the offer is open to all students taking mining or metallurgical courses in Canadian institutions. It is understood that the subject matter of the essay must be distinctively Canadian. Manuscripts that do not attain the highest mark, but that are of sufficient interest to be published in these columns, will be paid for at current rates.

MINING ACCIDENTS IN ONTARIO IN 1911.

The Ontario Bureau of Mines has issued a bulletin covering the record of mining accidents throughout the Province during the past year. The bulletin was written and the figures compiled and analyzed by Mr. E. T. Corkill, Chief Inspector of Mines. It is an excellent piece of work, marking a new level of thoroughness, and reflecting credit upon the Bureau and upon the Chief Inspector.

From the exhaustive tables included in the bulletin we observe that 49 fatalities occurred in mines, quarries, and metallurgical works during the year 1911. As the number of persons employed numbered 14,543, the fatal accidents per 1,000 employees work out at 3.37. This is a lower figure than has been reported since the year 1907.

Of the 49 fatal accidents, 36 occurred in connection with mining.

More deaths were due to the careless handling and use of explosives than to any other cause. Almost half of the mining fatalities were traceable to premature explosions, drilling into missed holes, and explosion of dynamite while handling. Thus 16 of the

36 deaths fell into this class. Two persons were killed by falls of ground, eight in shaft accidents, seven in miscellaneous accidents, and two by the blowing up of a thawing house. Mr. Corkill classifies 38.9 per cent. of these fatalities as being "due to fault of the injured persons," while 72.2 per cent. (including, of course, the previous figures) can be placed at the door of managers and the workmen.

There is no statutory definition of the serious accident. For convenience sake Mr. Corkill has placed in the category of "serious" all accidents by which a miner was incapacitated for more than seven days. Of these there were 84 in Ontario mines during the year. Twenty-six of this total were surface accidents. From falls of ground four men were injured. Shaft accidents accounted for nine serious accidents; explosives for 10, and miscellaneous accidents for 37. Here again it is to be noted that nine men suffered for their carelessness in drilling or picking in old holes.

Among the specific acts of negligence on the part of mine managers are the following:—

Failure to erect and maintain approved thawing houses.

Failure to instal safety cross-heads.

Neglect of efficient scaling, of proper ventilation, and of enforcement of regulations as to riding in buckets, blasting missed holes, etc.

Neglect of maintaining auxiliary ladder-ways while sinking shafts.

On the other hand, the workmen sinned in the following respects:—

Careless handling of explosives.
Drilling into missed holes.
Irregular tamping.
Riding in buckets and skips.
Failing to keep shaft guard-rails in position.
Neglect of proper scaling of walls and roof.

As Mr. Corkill points out, the manager shares the responsibility with the careless workman when he fails to report promptly any breach of the provisions of the Mining Act.

The urgent need of means for testing and regulating the character of explosives is strongly emphasized. Careless storage, careless handling, and irregular use of explosives can be controlled to an extent. But it is practically impossible for the Inspector to take steps against the sale of dynamite that is improperly manufactured.

The bulletin contains strong recommendations as to the establishment of mine hospitals, particularly at Porcupine, where already the Dome Mines, Limited, has set a good example.

Accidents in metallurgical establishments, and in quarries are fully tabulated and analyzed.

Bulletin No. 9 is by far the most complete presentation of the year's accidents that has ever been issued in Canada. Its appearance in pamphlet form is a step in the right direction. Particularly to be commended is Mr. Corkill's effort to allocate generally the moral responsibility of each accident.

VERTICAL VERSUS INCLINE SHAFTS.

Mr. J. M. Nicol, writing in the latest bulletin of the Mexican Institute of Mining and Metallurgy, discusses the relative merits of vertical and incline shafts. His remarks are prefaced with the statement that there is in Mexico a general prejudice against the latter type. This holds for Canada as well. It is, therefore, appropriate to follow Mr. Nicol's argument. The metal mining field alone is considered.

Dealing first with prospecting, or exploration, shafts, the advantages of sinking to the dip of the vein are summed up as follows:—

The vein can be followed through every change of direction without the subsequent cross cut. The ore extracted lessens the expense of sinking. The work of sinking is easier owing to the more friable character of the vein matter as compared with the wall rock.

Against these advantages are to be set several disadvantages: First, more water is encountered usually in sinking on the vein, and during the sinking water is harder to handle than after fixed pumping stations have been established.

Second, sinking pumps are given hard duty, are difficult to repair, and may give serious trouble when handling water carrying sharp quartz grit.

Third, variations in the dip imply unfavourable hoisting conditions when sinking on the vein, and may render the shaft useless for later operations.

Fourth, if the ore body in which the shaft is sunk is large and valuable, either pillars of ore must be left or expensive timberings installed.

On the other hand, it is claimed that the vertical shaft can be driven more rapidly, timbered more easily, unwatered with greater facility, and that hoisting can be conducted with greater facility.

After thus summing up the pros and cons, Mr. Nicol proceeds to commend, for first exploration work, an incline shaft driven at a constant angle in the foot wall, only short cross cuts being required to tap the vein. This implies less pumping, and more rapid actual development. Further, stoping operations can be carried on at an early stage without entailing subsequent complications and loss.

For shafts sunk exclusively for drainage purposes, and these are most frequently necessary to unwater old workings, Mr. Nicol suggests the use of the core drill wherever possible, using air-lifts to extract the water.

Touching next on permanent shafts, designed for the handling of the mine output, the advantages of the self-dumping skip, as compared with the cage, are pointed out. Veins that are nearly vertical are, of course, not considered; nor are cases where there is

a series of more or less parallel veins. But where two veins, or series of veins, dip in opposite directions, two incline shafts, the collars side by side, can most economically be sunk, thus avoiding long cross cuts and underground haulage.

Ventilation shafts, where ventilation is the only object, can be sunk cheaply and expeditiously with a large core drill.

Mr. Nicol's paper, though incomplete, is highly suggestive. There are many Canadian mining districts where timely consideration of the suitability of the incline shaft not only would have saved much initial expenditure, but would have reduced later working costs. There are many limiting conditions of topography and geological structure that may force a decision one way or the other. Yet very frequently a choice is open. Too often no thought at all is given to the matter.

UNGAVA.

Ungava is in the air. Several expeditions are being organized to search for the rumoured placers. The infectious rumour of gold has caught the imagination of the prospector. While, very fortunately, there can be no rush, yet several men of means have arranged to send parties off to the north to spy out the land.

Now by a curious twist of fate we ourselves have seen a good deal of Ungava, at least of the shore line that bounds Hudson Bay on the east. Our recollection of the country, refreshed by re-reading voluminous notes taken during two summers, is distinctly discouraging. The geology of the shore line from latitude to latitude is simple. Unmetamorphosed sedimentaries, limestones, and quartzites probably of Cambrian age, overlain by trap, form several long series of islands and, in places, constitute the mainland. For the most part, however, the mainland consists of granite in the form of low-rounded hills, nowhere attaining the dignity of mountains. The topography and the physiography of the country apparently preclude the possibility of placers forming. The rivers are not large. They are, in the main, exceedingly rapid. Nowhere, so far as we know, has nature provided the pre-essentials. Nowhere are conditions favourable for littoral or estuarian concentration. Little known as Ungava is, it is safe to say that all ascertained facts are against the existence of placer gold deposits.

A further drawback is the difficulty of travel unless one has experienced white guides and Eskimo servants. Overland travel is practicable only over certain routes. Water travel is dangerous, especially to persons who do not know the country and the inhabitants.

It is not pleasant to write in seeming disparagement of any part of Canada. Our justification is that there is need of curing what appears to be a delusion. Ungava offers other chances to the hardy prospectors. Those who hope for placers may find an equivalent.

HOLLINGER AGAIN.

Our friend and contemporary, Mines and Minerals, than which no more edifying and careful periodical exists, has for once departed from the strict path of judicial impartiality. In its March issue appears a leading editorial on the Hollinger report. The moral inculcated by the editorial is sound. Unfortunately Mines and Minerals has gone astray in matters of fact.

Its arraignment of the report is based upon a paragraph quoted from the Cobalt Nugget. That paragraph runs thus: "Experience in similar rock formation in "other parts of the world has shown that the veins con- "tinue to depth of 1,000 to 2,000 feet, so that there can "be no doubt as to the conservatism of the estimated "depth of the Hollinger veins, none of which have been "estimated on a greater depth than 300 feet." Now this quotation is a loose paraphrase of a paragraph in Mr. Robbins' report, and does not represent either what he said or what he meant. Here is the text of the original: "It is probable that this vein will continue "to carry values to depths several hundred feet below "our present workings, and it is reasonably certain "that for the purpose of this report an allowance of "300 feet of depth for the entire vein will not lead "to any disappointments. Judged by past experiences "and results obtained in other pre-Cambrian fields in "other parts of the world, we may look for a continu- "ance of values to depths of over a thousand or fifteen "hundred feet, and the concensus of opinion among "engineers who have visited our property is that the "vein and values will persist to some such depths. "Academically this is a reasonable hypothesis, com- "mercially it is speculative and remains to be "proven."

Nothing could well be more cautious and rigidly professional than the language of this last paragraph. Of course, Mines and Minerals intended no injustice. But, as we have pointed out, it got hold of the wrong "dope." This mild correction is offered all the more readily since we are conscious of having committed errors of the same kind in the dim past.

Meanwhile enough has been written of the Hollinger report. The subject is hereafter taboo.

COAL STRIKES.

Strikingly dramatic is the reappearance of Mr. Balfour as leader of the Unionists. Unlike Mr. Roosevelt, Mr. Balfour came back at the urgent request of his successor. His task is to move the rejection of the minimum wage bill. Thus, to the embarrassments already

faced by the British Government is added the opposition of the Unionists led by the most consummate master of debate. With the whole force of the vested interests behind him, Mr. Balfour may succeed in blocking Mr. Asquith, and may, indeed, become the leader of a new Cabinet. But, whatever the issue, it seems probable that industrial peace is farther away than ever.

The British coal strike is slowly paralyzing transportation and manufacturing. The direct loss is incalculable. The indirect loss, even after work shall have become normal, will be enormous. The dislocation of the coal trade will affect the country for years to come. For instance, Great Britain exported to Europe 67,276,846 tons of fuel in 1911. This fuel had an average value of about $2.90 per ton. It can readily be appreciated that the temporary cessation of this export trade is tremendously costly, especially as Germany has built up a competitive export trade of nearly 30,000,000 tons, and is preparing further to command the market.

The serious plight of the British mine owner is obvious. There is little doubt that a minimum wage of some kind will have to be conceded to the men. It is equally true that a tentative measure, a measure that can be tried out for some years, is a necessity. This will give owners and men a chance to realize that in the long run their interests are identical. An overwhelming victory for either side would be a catastrophe. There must be a process of reconciliation and mutual adjustment of grievances.

The rumours of strikes in the United States will mean little if, meanwhile, peace is restored in Great Britain.

THE BRAKPAN SLIMES PLANT.

At the Brakpan mine, South Africa, there has been installed a slime plant that represents the last word in modern equipment. Four slime collectors, 65 feet in diameter by 12 to 17 feet in depth, are followed by six Pachuca tanks, 15 feet in diameter by 45 feet in height. Compressed air keeps the pulp in circulation in the Pachucas for four hours. After transference to the stock tank, the pulp gravitates to Butters vacuum filters. The filter plant is particularly interesting. Two filters of 168 leaves each, the area of each leaf being 80 square feet, present a total filtering surface of 27,000 square feet. Two double-cylinder, geared pumps, produce the vacuum. The solution is discharged into clarifying tanks, thence to storage tanks. The slime cake is dropped into a concrete sump, water is added, and after agitation, it is pumped into the slime dam.

The Brakpan ore, it may be added, carries about $6.75 gold per ton. Reserves of over two million tons were developed last May. Further reserves of about 900,000 tons carried about $2.15 per ton. The mill is equipped with 160 stamps of 2,000 pounds each. The stamp duty exceeds 12 tons per day. The whole plant is driven by electric power.

EDITORIAL NOTES.

The Dome mill at Porcupine was put into commission on March 21st. The visitors who attended the celebration on the 30th will, therefore, have seen a fairly seasoned plant.

La Rose quarterly dividend, increased from 2 to 2½ per cent., was declared on March 20th.

The International Nickel Company on March 19th declared a 7 per cent. quarterly dividend on its common stock, and a dividend of 1½ per cent. on its preferred. There are still symptoms of vitality about the corporation. Dr. David T. Day must revise his prediction of an early demise.

News comes from Gowganda to the effect that on the 250-foot level of the Miller Lake-O'Brien mine 200 feet of very rich ore has been developed. The vein here ranges between one and three inches in thickness, the ore carrying 5,000 ounces of silver to the ton. The mine has been shipping more than $30,000 worth of rich ore every six weeks. Gowganda has to be taken seriously.

The Nova Scotia Steel and Coal Company had a prosperous year in 1911. A slight decline in profits as compared with 1910, yet leaves the handsome sum of $1,019,392.51. Outputs of steel and iron were the largest on record. Coal production fell off slightly. Nearly $100,000 was added to the general reserve fund.

Cobalt is petitioning for a tavern license. At present the town is practically without hotel accommodation. It is believed by the petitioners that no hotel can survive without the sale of liquor. This, we think, is wrong. Legitimatized liquor selling in any mining camp is a mistake. It would be calamitous in Cobalt. On the other hand, a clean, well-managed hotel would undoubtedly succeed in Cobalt without liquor.

Whatever the intention of Prof. H. E. T. Haultain in his remarks before the Canadian Mining Institute, it certainly was not as represented in the newspapers. He had no dispute with anybody as to the depth of Porcupine deposits. His references were confined to a quite different subject.

CORRESPONDENCE

Montreal, March 20th, 1912.

To the Editor THE CANADIAN MINING JOURNAL,

Toronto, Ont.:

Sir,—I have read with attention the leading article in your issue of March 15th, commenting on the recent annual general meeting of the Canadian Mining Institute. The tone of the article may appear to be laudatory; but, it seems to me, that rather than depart from the attitude you have consistently assumed when discussing the affairs and policies of the Institute, you here garnish your dish of praise with the strong spice of criticism, cleverly enough disguised and served up in the sauce of fatherly advice. Criticism is only justified when it has a constructive excuse; mere captiousness is always despicable. I am, however, prepared to give you credit for the higher motive. But since your article may convey to those of our members who were not in attendance a false impression as to the manner in which the meeting was conducted and suggest to them that it was less successful than it actually was, I propose, with your permission, to analyze the suggestions you are pleased to put forward that others may judge whether or not they are so essentially vital.

First, then, you remark that "the paucity of the discussion was marked, although what discussion there was reached a remarkable pitch of interest." In other words, only men who had something to say worth while to say gave expression to their views. I am inclined to think this is a matter for profound congratulation. Time at our meetings is limited and valuable. There is none to waste on that which is not profitable. Discussion, if not to the point, is not profitable. Mr. T. A. Rickard, on page 130 of this issue of The Journal, emphasizes the fact that the discussion was unusually to the point. Since the chairman did his utmost to encourage discussion, the inference is that members having nothing profitable to add to what had been already contributed wisely kept silent. Thus was time conserved for other profitable business.

Your next suggestion is "that certain chosen papers should be printed and distributed to obviate the necessity of reading in extenso and to prime the audience." A good enough idea (if it were only original); but so far as practicable this course has been followed for several years past. It was also this year. Moreover, at the recent meeting not a single paper was read in extenso. Again, not a very vital nor necessary criticism.

Then you suggest that provision should be made for the sectionalization of certain hours of each session, etc., etc. That is a matter of opinion; but I don't believe you will find many to agree with you. The proof of the pudding is in the eating. There was not a session of the last meeting that was not crowded. There was no compulsion on any member to remain in the hall if he were bored with or not interested in the proceedings. Further, as a matter of fact, the papers were grouped according to subject. I refer you to the printed programme, the order of which was followed without deviation, except in one or two unavoidable instances. This also disposes of the criticism requiring "a clearer system of announcing the programme for each day." The programme is printed. Every member is supplied with a copy. In addition, the titles of papers to be presented at each session were duly bulletined. The possible use of a megaphone suggests itself; but, perhaps, you have matured some ingenious scheme, at once subtle and startling, which you will place at the disposal of future Organization Committees.

Your final suggestion to the effect that manufacturers of mining and metallurgical machinery should be encouraged to exhibit new devices or inventions at Institute meetings is at least debatable. But—and it is a big but—with the innovation you would certainly introduce an element of danger. The Institute, as you are aware, has hitherto been careful to discourage any attempt of commercial interests to take advantage of our meetings for the exploitation of their wares. It is a wise policy.

Well, I have discussed your suggestions, I think, with fairness. Is there so very much in them? These omitted, your article would have been more generous, less grudging. The gentlemen who were responsible for the arrangements and conduct of the meeting—I refer, of course, to those serving on the several local committees—are deserving of unstinted thanks, bestowed with both hands. Half-hearted commendation is worse than none. If I have misread your intentions, others will have done so also.

Yours faithfully,

H. MORTIMER-LAMB,
Secretary.

PERSONAL AND GENERAL

An event of interest to the geological fraternity was the marriage on March 2nd of Mr. Cyril W. Knight, assistant geologist of the Ontario Bureau of Mines, to Miss Grace Hewson, daughter of Judge Hewson, Gore Bay, Ont. Mr. and Mrs. Knight are spending their holidays in Bermuda, remote from mining camps and geologic disputes. They will return to Toronto early in April.

Mr. A. B. Willmott, mining engineer, Toronto, is spending some weeks at Killarney, Ont., organizing a stone quarrying business.

Mr. George R. Rogers, manager the Mann Mine, Gowganda, took a shipment of fourteen tons of high grade ore to the Deloro smelter early in March.

Mr. L. S. Arnold, mining engineer, 25 Broadway, Ne York, recently examined a mining property in Eastern Ontario.

Mr. Kehoe, mining engineer, Spokane, Wash., is in Toronto. Mr. Kehoe attended the C. M. I. Annual Meeting and was one of the party that visited Cobalt and Porcupine.

Dr. C. H. Shamol is engaged in a revision of his "Mining, Mineral and Geological Law," which is to appear soon. He requests that any readers who may have discovered errors, or have any suggestions for additional topics, communicate with him in care of his publishers, the McGraw-Hill Book Company, 239 West 39th St., New York.

Mr. E. J. Scovil, gold commissioner for Northeast Kootenay, has resigned after fifteen years of service.

Mr. E. Jacobs, our British Columbia correspondent, is visiting New York, Ottawa, and Montreal. He will return to Victoria early in April.

Mr. J. B. Woodworth, mining engineer, Lyndhurst Avenue, Toronto, has returned from a protracted visit to Arizona.

Mr. Stanley N. Graham, mining engineer, Toronto, has taken charge of the editorial department of the Canadian Mining Journal during the absence of Mr. J. C. Murray. Mr. Murray is on a short holiday trip.

Mr. Alex. Smith, manager of the Surprise mine, in Slocan district, British Columbia, has been spending part of the winter in Toronto.

Mr. H. H. Lavery, who at the beginning of February retired from the superintendency of the Monarch mine, near Field, B.C., was at Houghton, Michigan, lately.

Mr. C. H. Dickie, president of the Portland Canal Mining Company, and Mr. W. J. Elmendorf, its general manager, were in Toronto early in March.

Mr. M. K. Rodgers, of Seattle, Washington, was recently at the Nickel Plate mine, in Hedley camp, Similkameen, B.C., going thence to New York.

Mr. John L. Retallack, well-known as manager and part owner of several mines in Slocan district, British Columbia, is on a visit to England.

Mr. Irving R. Gard, mining engineer on the staff of the Canadian Collieries (Dunsmuir), Limited, has returned to Victoria, B.C., from a trip to the Eastern States.

Mr. J. A. Thompson, managing director of the Mt. Stephen Mining Syndicate, of Vancouver, B.C., has been spending several weeks personally supervising progress at his company's Monarch mine and newly erected concentrating mill near Field.

Mr. A. W. Constans, formerly manager of the Athabasca gold mine, near Nelson, B.C., is now manager of the Second Relief mine and 10-stamp mill, in Erie camp, also in Nelson mining division.

Mr. Thomas Kiddie has returned to Victoria, B.C., from a second visit to his son, John, who fills an important position on the mining engineering staff of the Arizona Copper Company at Morenci, Arizona.

Mr. Herbert Carmichael, Provincial assayer for British Columbia, was a recent visitor to San Francisco, California.

The Arlington mining property, situated in Erie camp, Nelson mining division, British Columbia, which for a number of years has made profits under the management of Mr. Leslie Hill, is being offered for sale.

Mr. Douglas C. Livingston, formerly with the Tyee Copper Company in British Columbia, and afterwards in Mexico for several years, read a paper at a recent meeting in Spokane of the local section of the American Institute of Mining Engineers. Mr. Livingston is now one of the professors in the mining engineering department of the University of Idaho, Moscow, Idaho.

Mr. R. R. Hedley left Toronto on March 17th on his return to Vancouver, B.C. After the close of the annual meeting of the Canadian Mining Institute he paid short visits to Montreal and New York.

Mr. E. Jacobs left Toronto for New York on March 21st, intending to proceed thence to Montreal and Ottawa before returning to Victoria, B.C.

Mr. W. J. Elmendorf, of Victoria, B.C., general manager of the Portland Canal Mining Company, was in Toronto for several days during last month in connection with a proposed amalgamation of several Portland Canal mining properties.

BOOK REVIEWS

Searchlights on Some American Industries—By James Cooke Mills—Illustrated—299 pages—Price $1.50 net—Published by A. C. McClung & Co., Chicago—1911.

An untechnical series of pleasant essays on certain great industries. The author has striven with varying success, but with unqualified assurance, to outline the vital facts necessary to the understanding of eight important branches of human activity. The order is a large one, too large indeed for one man to fill. Mr. Mills has done better than might have been expected. A native of Michigan, he has had an opportunity of studying at first-hand lumbering, salt-making, paper-making, and one or two other industries. These he has written up in a manner that is sometimes convincing, often exceptionally good, and not infrequently weak. In the main, however, his work is clear, conscientiously accurate, and logical. The chapter on graphite is well done, that on salt making also is a creditable performance. But the range of the book is too wide. The result is that one is conscious of much newspaperese.

Petrographic Methods—The authorized English Translation of Part I., Anleitung zum Gebrauch des Polarisationsmikroskops (third revised edition); and Part II., Die Gesteinsbildenden Mineralien (second revised edition)—By Dr. Ernst Weinschenk—Rendered into English by Robert Watson Clark, A.B.—396 pages—Illustrated—Price $3.50 net—Published by the McGraw-Hill Book Company, 239 West 39th St., New York—1912.

Although any addition to our already voluminous literature on petrography might appear superfluous, yet a brief examination of the book before us proves that it will fill its own chink in the library. Part I. of Weinschenk's original text has gone through three editions in Germany; Part II. through two editions. Mr. Clark's transcription into English is not a literal translation. It is a free rendering of the spirit and meaning of the original, and as such is much to be preferred to a servile following of the text.

As pointed out in the introduction, the microscope is not merely an instrument for magnification. Other optical adjustments are much more important. And with a foundation of mineralogical knowledge and full macroscopic data, the microscope becomes a highly efficient device.

The book is divided into two parts. Part I. opens with a description of the microscope. The adjustment of a polarizing microscope; observations in ordinary

light; observations in parallel polarized light; observations in convergent polarized light; and twins and optical anomalies, are the topics of this Part.

Part II. takes up the preparation of material; methods of separation; methods of investigation; development of rock constituents; and closes with a lengthy series of mineral species and determinative tables.

A glance over the pages of this treatise shows that it is modern to a degree. The clear exposition in Part I. and the lucid description in Part II. are outstanding features of the book. There is no evidence of superfluous or extraneous material. The scope is narrowed down to the essential.

It strikes the reviewer that the book is not only a good book to teach from, but is also a good book to read. It does not go into the abstruse mathematical phases of microscopy. But it covers fully the practical use of the microscope.

Observations on the West of England Mining Region —By J. H. Collins, F.G.S.—683 pages—18 folding plates—Printed for the Author by William Brendon & Son, Limited, Plymouth, England—1912.

Although privately printed, this substantial tome forms Vol. XIV. of the Transactions of the Royal Geological Society of Cornwall. Quite appropriately it is dedicated to His Royal Highness Edward, Prince of Wales and Duke of Cornwall. Like the author, we are His Royal Highness's most obedient servant, and we devoutly believe that the young man's whole course in life will be profoundly modified if he wades through the offering that is thus laid at his feet.

The mineral deposits and the economic geology of Cornwall, Devon, and Somerset are the author's subjects. The discussion of ore deposits, "regular fissure veins," "'carbonas," etc., is instructive though diffuse. Everywhere there crops out the quaint terminology of Devon and Cornwall. Elvans, Killas, flucan, prian, peach, are terms with which not all of us are familiar. But the reader also notes how largely the mining world has been supplied with names and variants by Cousin Jack.

Statistical addenda contribute to the value of the book, which is really a substantial, if ponderous, acquisition to our knowledge of English mining fields. The author has displayed enormous industry in collecting facts, and wide erudition in assorting and correlating them.

Symptoms of traditional insularity are not absent.

The Mining Manual for 1912—By Walter R. Skinner —A Record of Information Concerning Mining Companies, etc.—Twenty-sixth year of Publication —Established 1887—Price $5.00 net—London, 1912 —Canadian Mining Journal, Book Department, Toronto.

Not only are references and general information supplied for 3,160 mining companies, but a vast mass of personal and corporate information is also added in Skinner's Mining Manual. The 1912 edition contains over 1,500 pages, not including inserts. The enquirer who wishes to find out the record of the Bewick-Moreing people, the standing of the Consolidated Goldfields, the directors of the City of Cobalt Mining Co., or, in fact, any essential facts touching any mining company of English parentage or affiliations, will have no difficulty in turning up the right page in the Mining Manual.

As Canadian mining enterprises are becoming more and more interesting to English investors, and vice versa, as English capital is becoming more and more interesting to Canadian mining men (perhaps "divestors" is the correct antithetical term for "investors"), The Mining Manual becomes a greater necessity for the engineer, the lawyer, the writer, and the average citizen.

Apart from its value as a directory, The Mining Manual gives in brief the financial history of thousands of mining ventures. It is, therefore, an invaluable fount of facts concerning the economics of mining.

Annually we commend it to our readers. Our commendation is as hearty now as ever.

THE CANADIAN MINING INSTITUTE PORCUPINE TRIP

(Special Correspondence, by E. Jacobs.)

After the close of the fifteenth annual meeting of the Canadian Mining Institute, held in Toronto, Ontario, on March 6-8, a brief visit was paid by a few members of the Council of the Institute and their guests to some of the mines and reduction works in Porcupine and Cobalt districts, respectively. As is well known, these districts are in what is known as New Ontario. Cobalt is distant from Toronto by railway about 330 miles, in a northerly direction, and South Porcupine, the station on the Temiskaming and Northern Ontario Railway from which short trips were made to the Hollinger and Dome mines, is 148 miles farther up the line, this distance including the length of the branch line from Iroquois Falls to South Porcupine.

This excursion was arranged by the Council of the Institute, and it was made under the direction of Mr. H. Mortimer-Lamb, secretary of the Institute, who received much assistance from Mr. Arthur A. Cole, mining engineer to the T. & N. O. Railway Commission. The guests of the Council were: Mr. Theodore Dwight, New York, president of the Mineral Development Company, operating mines in Mexico; Mr. F. Lynwood Garrison, Philadelphia, consulting mining engineer; Mr. H. W. Hardinge, consulting mining engineer; Mr. W. R. Ingalls, New York, editor of The Engineering and Mining Journal; Mr. R. V. Norris, Wilkes-Barre, Pa., consulting engineer; Mr. T. A. Rickard, London, England, editor of The Mining Magazine; Prof. F. H. Sexton, Halifax, director of Technical Education for Nova Scotia; Mr. Henry Kehoe, mining engineer, Spokane, Wash.; Mr. E. Jacobs, Victoria, B.C., secretary of the Western Branch of the Institute, and Mr. Alex. H. Smith, South Porcupine, secretary of the Porcupine Branch. The Council of the Institute was represented by the following: Dr.

Willet G. Miller, Toronto, Provincial Geologist for Ontario, past-president of the Institute; Dr. A. E. Barlow, Montreal, president; Mr. R. W. Brock, Ottawa, director of the Geological Survey of Canada; Mr. Arthur A. Cole, Cobalt; Mr. Theo C. Denis, Quebec, Superintendent of Mines for Quebec; Mr. W. F. Ferrier, Toronto, mining engineer, and Mr. H. Mortimer-Lamb, Montreal, Secretary of the Institute. Colonel A. M. Hay, president, and Mr. Charles A. O'Connell, manager, both of the Trethewey Silver-Cobalt Mine, Ltd., were with the party from Toronto to Cobalt, and Mr. Ben Hughes, of the Toronto Globe, to Porcupine. The party travelled in the Pullman car Twilight, which left Toronto on Saturday night.

Hollinger Mine and Mill.

South Porcupine was reached on Sunday afternoon, a short stay having been made at Englehart en route, to see the contents of the green houses close by that station. The car was taken over the branch line to Timmins, four or five miles beyond South Porcupine, this having been the first time a passenger train was run to that station. The remaining two hours of daylight were spent in examining the incomplete 40-stamp mill and cyanide plant of the Hollinger Gold Mines, Limited, which were being hurried toward completion, the intention being to have these in regular operation as early in the spring as shall be found practicable.

The following is an excerpt from the first annual report of the Hollinger Gold Mines, Limited, dated January 15th, 1912:—

"**The Mill.**—It is obvious that milling costs can be reduced if the tonnage milled is increased, i.e., the standing charges, superintendence, supervision, general items of expense, etc., will be spread over a greater tonnage, and therefore the cost per ton will be reduced. It follows, then, that working upon a large scale it will be possible to mill ore profitably which would be unprofitable if milling were carried on upon a small tonnage basis. Our mill has, therefore, been designed with a view of treating ore from adjoining claims, for by so doing our costs will be reduced and a profit can also be made from milling purchased ore, which will further reduce the expense of the Hollinger.

"The initial mill will have a crushing capacity of 300 tons per day, while the cyanide plant will be capable of treating 500 tons per day. The extra capacity of the cyanide plant has been provided at the outset in order to avoid the complications and heavy costs of making additions later on, the installation of additional stamps being a comparatively simple matter.

"**Process of Treating Ore.**—Our original plan had been to crush and amalgamate and to concentrate the sulphides for future treatment, in a more or less incomplete mill, meanwhile conducting experiments to determine the most suitable methods of completing the process, Mr. A. G. Kirby, of Cobalt, having been retained as consulting metallurgical engineer.

"The fire of May 19, 1911, destroyed the 30-stamp mill then under construction and the impassable condition of the roads, coupled with the effects of the fire that swept the district on July 11, resulted in a complete setback to our work and necessitated a change in plans.

"Owing to the loss in time engendered by the above-mentioned causes, the proposed experimental work had of necessity to be curtailed, and some type of a permanent mill had to be decided upon, in order to take advantage of the remaining months of summer suitable for preparing the mill site. Accordingly a sample of ore was taken from the dumps and shipped to Mr. Kirby at Cobalt for experimental treatment.

"The net result of the tests was to show the necessity for fine grinding and also the advisability of extracting the concentrates for separate treatment.

"The process as decided upon is:—

"Coarse grinding.

"Stamping in cyanide solution.

"Tube milling.

"Concentration followed by amalgamation of concentrates.

"Cyanide treatment of both gangue and concentrate residues.

"The apparatus being installed consists of: A gyratory crusher, a jaw crusher, sampling plant, 40 1,500-lb. stamps, 4 Dorr classifiers, 4 tube mills, 5 ft. diameter by 20 ft. long, Spitzkasten, 40 Deister slimes tables, 4 Dorr pulp thickeners, 4 Trent agitators, 2 Moore filters, 2 Merrill clarifying presses, 2 Merrill precipitation presses, and the usual pumps, amalgamating pans, settlers, etc.

"The mill will be electrically driven throughout.

"When development work is more advanced and we have a more intimate knowledge of the low-grade ores, it is possible that part of the ore can be leached coarse, without the necessity of grinding fine and filtering, but this is a question which will have to be settled by experience.

"The mill being constructed will probably cost about $275,000, and it is hoped that everything will be in running order some time in April."

Underground at the Hollinger.

After supper in the mine boarding house, the visitors were taken underground, the mine maps having been first examined. About two hours were spent in the workings on the 100 and 200-foot levels, and much interest was evinced in the fine showings of ore seen. A very brief summary of the information relative to the mine given by the manager in the anual report follows.

The company owns four claims, and development work has been confined to a limited area on two of these. The mineralized area extends northeast and southwest, and covers practically the whole of three of the company's claims. Geologically, the richly mineralized belt is a shear zone of schist, probably formed from quartz porphyry, with considerable sericite occurring near the veins. The strike of the schist is generally southwest to northeast, while the quartz veins cut across this strike at a small angle more to the north and south. The schist is heavily mineralized with iron pyrite and, generally speaking, pyrite is disseminated throughout the quartz masses, being contained in the cleavages, particularly near the walls. The gold has evidently been deposited contemporaneously with, or a little later than, the pyrite, as occasional instances have been noted where the pyrite is encased in gold. Generally the occurrence of galena portends rich gold value, and to a lesser degree the occurrence of sphalerite is an indication of gold value. Large blocky crystals of pyrite are usually attended by low value in gold, while the finely crystalline pyrite occurs with relatively higher gold value. Scheelite occurs in small quantities. The schist walls of the main vein do not usually contain payable value, except

where contiguous to rich sections of the veins. Generally the southeast wall is the richer. In the quartz masses the occurrence of gold is extremely spotty. The quartz where streaked by fine lines of pyrite in the cleavages is generally more consistent in gold value than the clear masses having occasional spectacular showings of gold. The main vein is remarkable both for its gold content and its continuity. The ore shoot is unbroken for more than 1,000 feet horizontally and, while it varies in width from 2 to 20 feet, the wide lenses are usually the riches. The other veins are lenticular, consisting of chimneys and kidneys of quartz. There is no evidence of surface enrichment; the spectacular specimens found upon the surface are no doubt due to a local enrichment from the concentration of surrounding value. Generally speaking, the surface showings may be taken as indicating what may be expected at depth.

Some of the Veins.—In the manager's report mention is made of 36 veins in all. Some particulars are given of 5 or 6 of these, and the estimated tonnage and gold content of 9 others are stated, but the remainder, being of small size or low gold value, have been ignored for the time. An estimate of the tonnage of ore obtainable from six veins—allowing only for a depth of 300 feet on one, 200 feet on three, and 100 feet on two veins—gives 415,000 tons of ore having a gold content of 9,680,000; for nine other veins a total of 47,000 tons is allowed, of a value of $550,000; total, 462,000 tons, value $10,230,000.

No. 1 is the main Hollinger vein; it is exposed at the surface for about 900 feet and has an average width of 9.4 feet, and average gold value of $32.96 per ton; on the 100-ft. level the ore-body is continuous for more than 1,000 ft., has an average payable width of 8 ft., and an average assay value of $31.54 per ton; at the 200-ft. level, where less development had been done when the annual report was made, the average width was stated as 9.3 ft. and assay value $49.30 per ton.

No. 2 vein has been traced on the surface about 300 feet; its average width is approximately 7 feet, and assay value $7 per ton. It has been cross-cut on both the 100 and 200-ft. levels, and in places shows greater width and gives higher average value. The estimated possible tonnage down to 200 feet depth is 110,000 tons, having a gold value of $1,200,000.

Other veins, tonnage and value are: No. 3, 20,000 tons, $150,000; No. 4, 35,000 tons, $450,000; No. 8, 10,000 tons, $140,000; No. 12, 30,000 tons, $180,000.

The manager says: "To sum up—In the aggregate, the ore-bodies so far discovered will yield, for each 100 feet of depth, approximately 240,000 tons of ore, having a gross gold content of, say, $4,250,000, from which a net profit of $2,750,000 may be expected after allowing for operating costs and metallurgical losses. Vein No. 1 may be counted upon to a depth of 300 feet with certainty. Vein No. 2 promises a greater yield than has been estimated. . . . Veins Nos. 4 and 8 are stronger and richer at 100 feet than upon the surface, and although, in estimating, a depth of but 200 ft. has been allowed, ther is no reason to believe that these veins do not continue to much greater depth. No. 3 vein has spectacular showings which were avoided in sampling and hence may be expected to return a greater yield than that estimated. The other veins, classed as miscellaneous, are practically unknown quantities; they will no doubt exceed the estimate. It therefore seems reasonable to expect net profits amounting to more than $7,500,000 during the next four or five years, and beyond that there is the probability that profits will be continued at an undiminished rate, owing to the persistence of the various veins beyond the arbitrary allowances made in the accompanying estimates."

The total underground work in the Hollinger mine at the end of 1911 was 3,717 feet in the proportion of 575 feet of shafts, winzes and raises; 2,522 feet of drifting and cross-cutting on the 100-foot level, and 620 feet of similar work on the 200-foot level.

The main shaft is 4-compartment—three 4 by 5 ft. hoisting compartments and one 5 by 5 feet ladder and pump way. This shaft is to be sunk to a depth of 400 feet—it already connects with the 100 and 200-foot levels. Of the three other shafts, Nos. 1 and 3 are down to the 100-foot level, and a winze connects the 100 and 200-foot levels.

The Dome Mine and Mill.

The party returned to South Porcupine on Sunday night, after having heartily thanked the general manager of the Hollinger Gold Mines, Ltd. (P. E. Robbins) and his staff for their courtesy and attention. On Monday morning sleighs, provided by the local branch of the Institute, conveyed the visitors to the property of the Dome Mines, Ltd., where, however, only the rich surface showing of gold ore, known as the "Golden Stairway," was seen, the workings underground not having been accessible to the party. The superintendent, C. W. Meek, and several of his assistants showed the party over the 40-stamp mill, which was not so well advanced towards completion as that at the Hollinger mine. While, in some important particulars, the treatment of the ore will be similar in the two mills, in others it differs. For instance, at the Dome mill there will be double amalgamation as against single at the Hollinger, the second amalgamation taking place after the pulp leaves the tube mills.

A Day in Cobalt Camp.

The return trip was commenced at noon of Monday. Cobalt was reached in the evening, and the night was spent there. On Tuesday morning a start was made, in sleighs, to visit several mines and mills.

The first property visited was the Nipissing, where a "pour" of melted silver was witnessed by about half the party, the others having, through a misunderstanding, gone on to Kerr Lake.

Crown Reserve.—At the Crown Reserve, under the guidance of H. J. Stewart, assistant manager, some fine showings of silver were seen, on both the 100 and 200-foot levels, in the Carson and Office veins. On return to the surface it was learned that during four years of operation, to the end of 1911, the company had produced and shipped 12,512,377 ounces of silver of a gross value of $6,581,847.77, and had paid dividends aggregating $3,714,509.40, the net profits for 1911 alone having been $1,279,739.79, of which $1,061,288.40 was distributed in dividends and bonuses, this being at the rate of 60 per cent. on the company's dividend-bearing stock.

In the Annual Report for 1911 the president said, in part: "We are now producing ore of a higher grade than ever before, the actual average of our high-grade ore from the mine for 1911 having been more than 5,000 ounces. We have done more underground work during 1911 than in any previous year, and our total

expenditure shows a reduction in cost of one and three-tenths cents per ounce as compared with that of 1910." Later in the report the president observed: "Our policy for 1912 is to continue on the same careful, conservative lines which have brought us so much success, to maintain our regular monthly dividends and bonuses of 5 per cent., to provide for everything in the shape of expenses, royalties, depreciation, dividends, etc., and again make a substantial addition to our surplus; to continue to give special attention to outside properties, our idea being to gradually roll up a combination of properties, which the Crown Reserve Company will own or control, with the ultimate object of having a large, successful, and money-making company.

"We are still producing silver at the lowest production price of any mine in the world, our average for 1911 being 10.67 cents per ounce and our average over four years 10.34 cents per ounce. On account of the richness of our ore, and our policy of spreading the marketing of our product and taking advantage of the European as well as the Canadian and American markets, we are getting the very highest smelter price for our product and our dividend payments compare favourably with those of the best and richest mines in the world."

British American Power Co.—After leaving the Crown Reserve, a call was made at the power sub-station of the British American Power Co., which has its 8,000 horse-power generating plant on Matabitchouan River, 22 miles from Cobalt. The current is transmitted at a high voltage from the generating to the sub-station where it is reduced by three-phase step-down transformers for distribution. There are here two two-stage-compressors each having a capacity of 5,000 cubic feet of free air per minute, these being electrically driven by 1,000 horse-power induction motors. The compressed air is passed through water and air-blast coolers until all the moisture is condensed and removed, and the air is then sent out cold and dry through the distributing pipes.

Temiskaming.—Here the party was hospitably entertained by the manager, Mr. Norman R. Fisher, who first showed the visitors through the 40-stamp concentrating mill, then gave them an excellent luncheon, and finally took them down to the 400-foot level of the mine to examine the silver-bearing veins in place. In the office large samples of ore were shown, some being from the greatest depth yet reached in Cobalt camp, namely 575 feet. A noteworthy feature at this mine is a steel headframe, described as being the only one of the kind in the camp. Before leaving, Mr. Rickard, at the request of the president of the Institute, proposed a hearty vote of thanks to Mr. Fisher for his kindness and hospitality; this was supported by Dr. Miller and accorded most heartily.

Coniagas.—Most of the party spent an hour underground at the Coniagas mine, while a few looked through the mill. Much interest was evinced in the ore occurrences examined on several levels.

Trethewey.—At the Trethewey some time was spent in looking at a fine display of specimens of ores and concentrates, and much information was readily given by Colonel Hay, president of the company, and Mr. Charles A. O'Connell, manager. Each of the visitors was given several small specimens of silver ore as a souvenir of the visit. Then afternoon tea was served by Mrs. O'Connell in her home, and an enjoyable hour was spent in social chat before going to the railway station to resume the return journey.

The Return to Toronto.

At 7 o'clock p.m. the return journey to Toronto was resumed, and by 9 a.m. of Wednesday that city was reached. Gradually the visitors dispersed, until by midnight few were left at the place of rendezvous. Thus ended what was generally pronounced to have been one of the most enjoyable and markedly successful annual meetings the Canadian Mining Institute has yet held.

MR. HEDLEY ON MINING IN BRITISH COLUMBIA, 1911

In the course of an address, prepared by Mr. Robert R. Hedley, of Vancouver, B.C., for presentation at the annual meeting of the Canadian Mining Institute, held in Toronto on March 6th 7th and 8th, he gave the following information concerning the Consolidated Mining and Smelting Company of Canada, Limited, which has its head offices in Toronto:—

"This company has established at Trail, British Columbia, a great metallurgical industry. Beginning with a small copper-matting plant, it now has complete modern copper-matting, and lead-smelting and refining plants. It is doing a large custom ore smelting business, as well as smelting its own ores and operating as owner the following mine in British Columbia: Centre Star, Iron Mask, Le Roi, War Eagle, and others, at Rossland; Phoenix Amalgamated and No. 7 group, in Boundary district; Molly Gibson, near Nelson; Richmond-Eureka, in Slocan district; and St. Eugene and Sullivan, in East Kootenay. Also, it is exploiting, under option of purchase, the Hudson Bay group and Silver Dollar, near Salmo; and the Tiger and No. 1, in Ainsworth camp. C. P. R. interests also operate coal mines at Hosmer, B.C., and Bankhead, Alberta.

"The Consolidated Company has always had a very efficient staff in mining and metallurgy. Thus, its mines are operated to the best advantage; its St. Eugene concentrator at Moyie is lacking in nothing that conduces to successful working; and its smeltery at Trail is kept up to date if not a little ahead. This company took hold of a crude and imperfect, but effective, process for refining lead by electrolysis and perfected it in every detail, until doubtless it has today the best lead-refining plant in existence. Although a little slow in putting in the Huntington-Heberlein process for roasting and desulphurizing ores, it improved on its accessories when it did instal it, and it has been quick to recognize the advantages of the Dwight-Lloyd roasting and sintering machine, which it is striving to adapt to all its most complex conditions. It is known that the company has for some time been at work on the problem of zinc metallurgy, but I do not know how near success it has got. This is with it a most vital matter, for in addition to the by-product zinc concentrate of so many of the mills, it has in the Sullivan mine large bodies of ore the zinc content of which well-nigh puts it out of the lead-smelting class;

Abstracted by Mr. E. Jacobs from an address prepared for the C. M. I. meeting by Mr. R. R. Hedley, Vancouver, B.C.

also an immeasurably larger quantity of ore quite excluded from that class by reason of its high zinc content.

"The company is now investigating the French process for reduction of mixed zinc-lead sulphides. Mr. A. Gordon French has for some time been experimenting with a small plant at Nelson, B.C., and has proclaimed his success. Whether or not it is accepted as a commercial success, Mr. French is entitled to great credit in that with only crude facilities and the aid of but one man, he has evolved this small plant and brought it to the point of producing electrolytic spelter."

Concerning copper mining and smelting in British Columbia, Mr. Hedley wrote:—

"The large and modern plants of the Granby Consolidated Mining, Smelting, and Power Company, and the British Columbia Copper Company, both in Boundary district, have accomplished great things, both in mining and metallurgy. Each is so admirable in its achievement that it is sufficient to generalize on the chief features. Without handicaps of fuel-shortage such as occurred last year, the total cost of mining and smelting ore and converting matte into blister copper may be safely stated as having been not more than $2.50 per ton of ore. Marketing the copper costs 20 cents more. The ore generally averages about 25 pounds of copper, $1 in gold, and 19 to 20c. in silver per ton. Slag losses under present conditions rarely exceed 4 pounds of copper per ton of ore.

"The British Columbia Copper Company has two blast furnaces 360 by 48 inches and one 240 by 48 inches, while the Granby Company has eight furnaces 266 by 44 inches. The latter company has recently deepened its furnaces to give a column of 11 feet above the tuyeres, which has not only increased the capacity, but has reduced the slag loss, the flue dust, and the coke consumption. The most recent change at the Granby works is in disposal of the slag, which will be elevated by travelling belt from a central pit, into which the granulated slag will first flow.

"It is gratifying to see both these companies extending their operations in the province. The Granby, having developed to its satisfaction the Hidden Creek mine, at Goose Bay, Observatory Inlet, is now proceeding with the erection of a smelting plant, with capacity to treat 2,000 tons of ore daily. At this mine the development is sufficient to estimate as in sight various considerable blocks of ore containing good value in copper. The management, however, thinks it conservative to figure as available 6,000,000 tons of two per cent. copper ore, or if it be demonstrated that 1.65 per cent. copper ore will be profitable, to double that tonnage. The precious metal value will probably be somewhat lower than at its Boundary district mines, but I can see no reason for expecting a higher cost at Hidden Creek than in the Boundary. True, coke will at the former be, for the present, either of inferior quality, or greater cost, but the sulphur content of the ore should permit the company to use but one-quarter of the quantity.

"The British Columbia Copper Company has recently installed a cyanide plant at its Napoleon mine, situated not far south of the International Boundary line. It is now exploiting under option of purchase a large field of silicious low-grade copper ore near Princeton, Similkameen; also a big deposit of low-grade gold ore near Silverton, Slocan Lake. If proven worthy, the former will require the installation of a copper-reduction plant, and the latter a cyanide mill, at the respective properties. The establishment of a smeltery at Princeton would do much to encourage the opening of promising mineral claims in that district."

"In the way of notable development," Mr. Hedley observed further, "we have the well-earned success of the Britannia Mining and Smelting Company in finding much profitable ore after four years of mine development and plant improvement. When the price of copper dropped to the neighbourhood of twelve cents per pound it was found that the then known vast bodies of ore containing 1.75 to 2.5 per cent. copper as chalcopyrite, in a vitreous, silicious gangue, were not profitable. During 1911, however, the Britannia mined and treated more than 100,000 tons of ore containing about 5 per cent. copper, perfected its concentration process until it showed a recovery of about 80 per cent. in its mines, and developed a large tonnage of similar ore. The company is operating one unit of the Elmore Vacuum Process plant with, I am told, marked success, but I can give no authoritative details.

"The Hedley Gold Mining Company has improved its condition materially, but without any marked change of methods or plant, except the addition of a tube mill and slime tables. In 1911 this company paid dividends totalling 25 per cent. on its issued capital of $1,200,000, operating on $12 ore. I am told the tube mill capacity is insufficient, and some sand is treated that leaves the mill containing $1.25 to $1.50 per ton, while the slimes contain but 50 cents per ton. No amalgamation is now practised—simply concentration and cyanidation, recovering 93 to 94 per cent. of the value.

"I expect that within twelve months we shall point with pride to a modern gold mill, operating successfully on the well-developed ore reserves of the Mother-lode mine at Sheep Creek, Nelson mining division, and it is likely that ere many years shall have passed we shall have at least one other gold mill at Sheep Creek.

Outlook for Smelting Iron Ore.

"It is well known that there are in British Columbia large and important bodies of high-class magnetite. Those of which ther eis most knowledge are on Texada Island; Bugaboo Creek and Quinsam, on Vancouver Island; and Louise Island of the Queen Charlotte group. The first-mentioned is the most important, for the reason that its quantity is undoubtedly large, its quality (with the exception of small areas near the contact) is excellent, and its situation such that the ore can be mined and put into bunkers at deep tidewater at an extremely low cost. With crude handling facilities and hand labour for mining, it now has a record of cost of 90 cents per ton.

At Quinsam a crew of men has been kept at work for more than a year developing the ore. Mining engineers have reported quantity and quality at the two other localities mentioned, and there are many others that invite exploitation.

In the past few years there have been many announcements of the intended establishment of iron and steel manufacturing works on the coast of British Columbia, and many differences of opinion may be heard on the question of its justification and feasibility. On the first point, with a tremendous increase in the use of structural steel and reinforced concrete, to say nothing of railway construction and the general

rapid progress of the country, it would seem to me to be worth investigating at least. As to the feasibility —in the last quarter of the past century, the Union Iron Works of San Francisco made the best of pig iron, from Texada Island ores, at Irondale, Washington. Recently, the Western Steel Corporation made pig iron at the same place with improved plant, using Crow's Nest Pass coke, costing $10 per ton. This was abandoned as too expensive, and pig iron was then brought in from China at a cost of $16 per ton, which, with abundant scrap, was manufactured into a high quality of steel at a cost of $18.90 per ton and produced merchant bar at $26.90 per ton. It is claimed that with the addition to the plant of a 50-ton crane, costs can be cut approximately $2 per ton.

"Given a good quality of metallurgical coke at $5 per ton, which is not improbable in the near future, there is no reason why British Columbia pig iron should not take the place of Chinese, and a profitable industry be established on the Canadian side of the International boundary line. We have, also, the assurance that the Western Canada Power Company will make a very low price for power for such purposes.

"Again, I suggest, the question is worthy of careful consideration."

THE DOMES OF NOVA SCOTIA

By T. A. Rickard.

PART I.

General Geology.

The Province of Nova Scotia is remarkable among regions yielding gold, not for the amount of precious metal produced, but for a beautiful lode-structure, the origin of which has provoked the constructive imagination of geologists for 50 years. As this interval of time coincides with the age of modern geology, the theories offered in explanation of local conditions serve admirably to illustrate the development of a science that has only lately achieved obvious economic importance as an aid to world-wide industry.

The gold mining region in question occupies the seaward half of the peninsula of Nova Scotia and is traversed by a series of sedimentary rocks into which granite has intruded. Mining in the granite has not been profitable, all the productive activities of the past having been confined to the sedimentary series, consisting of highly altered beds of quartzite and slate of great geologic antiquity, that is, at least as old as the Cambrian, although, in the absence of trustworthy fossil remains, it is uncertain whether they may not be even pre-Cambrian, namely, Algonkian. These beds of quartzite and slate have a known thickness of 30,000 feet, divided into an upper division of dark slate, with an estimated thickness of 11,500 feet, and a lower division of slate and quartzite about 18,000 feet thick. It is in the lower series that the gold-bearing lodes are found, only one noteworthy mine having been worked in the upper slate, and even this exception occurs close to the line drawn between the two divisions.

The gold mining region has a maximum length, from east to west, of 200 miles, and a width, from north to south, varying from 8 to 50 miles, so that the total area comprised is about 3,000 square miles. (See map.) The heart of the region extends from Caribou to Moose River, the horizontal distance being 10 miles and the vertical thickness of strata 18,000 feet, in one broad monoclinal fold with minor undulations. Across this section quartzite predominates, the slate appearing in beds relatively infrequent and thin. The sand-rock from which the quartzite originated must have contained lime, for calcite is abundant. The fine silt, now changed to slate, has been much hardened, but its true character is not obscured. Of later igneous rocks there is scant evidence, save at Tangier, where dikes or diorite have been noted; but they do not appear to have influenced the distribution of the gold. We have to deal, therefore, with metamorphosed sediments of one series and the granite that has intruded into and through them.

The age of the granite is important, for it bears upon the geologic antiquity of the ore deposits. By reference to maps* it can be seen that the granite has displaced more than a third of the superficial area formerly occupied by the slate and quartzite formation; indeed, it has been suggested that the granite represents these rocks in the last phase of their metamorphism, but this is a deep question, in more senses than one, and need not concern us just now. As we see the granite to-day it is an intrusive rock, and, therefore, younger than the gold-bearing formation into which it has been thrust. How much younger? The evidence on this point is adequate: fragments of detrital granite are found in northern Nova Scotia within Middle Devonian sediments; on the other hand, in the Bear River basin the granite cuts into the Upper Silurian of the Oriskany horizon. Therefore the granite is older than the middle, and younger than the base of the Devonian; it is of early Devonian age. Between the deposition of the sediments now constituting the slate-quartzite series and the irruption of the granite, there stretches the whole of the Silurian period, and a part, if not all, of the Cambrian.

The slate-quartzite series is probably Algonkian; the granite is early Devonian; what, then, is the age of the gold-bearing quartz? The best answer to that is afforded by the fact that the quartz veins in places (as at Forest Hill) follow tongues or apophyses of granite, and gold has been detected in the granite at such places. Moreover, mineralized quartz penetrates the granite at other places (as at Country Harbour). Therefore the quartz is younger than the granite. Finally, a conglomerate known to be of Lower Carboniferous age and composed of the eroded fragments of the slate-quartzite series has been found at Gay's River, and from this conglomerate gold has been won by mining. The deposition of gold in the slate and quartzite must have commenced before the Carboniferous. Thus the gold and the granite do not differ

A paper to be discussed at a meeting of the Institution of Mining and Metallurgy, to be held at the Rooms of the Geological Society, Burlington House, Piccadilly, W., on Thursday, April 18th, 1912, at 8 o'clock p.m., and presented at a meeting of the Canadian Mining Institute at Toronto, on March 6th, 1912.

*I refer to the excellent maps prepared by E. R. Faribault for the Geological Survey of Canada.

widely as regards the time of their introduction, although the limits of one of the older geological divisions, such as the Devonian, include a period of time so vast as to beggar the imagination of a chemist in his laboratory. Nor is it to be assumed that the deposition of the gold, much less its distribution and concentration in the quartz, so as to constitute ore bodies, was confined to any single period. Once brought within reach of the agencies of solution and precipitation lurking in the waters that circulate near the earth's surface, the gold became forever subject to migration, tending to concentrate or to scatter the metal according to changing chemical and physical conditions.

The land now represented by Nova Scotia has passed through successive periods of pressure and uplift, the margin of the aboriginal American continent having been roughly parallel to the longer axis of the Province. The Algonkian beds have undergone tremendous folding. The Silurian and Devonian rocks overlying the gold-bearing series also exhibit plication, but the folds are not so conformable as to warrant the belief that one agency was responsible for all the disturbances recorded by these rocks of different geological ages. It is probable that the Algonkian sediments underwent lateral pressure throughout the Cambrian period and later, especially at the time of the granitic intrusion, for it is apparent that the basal strata from which the slate and quartzite were evolved have suffered long-continued deformation. Besides the main folds, with their axes running east and west, there are cross-folds, the net result of which has been to form domes and troughs. These constitute the characteristic geological feature of the region and largely determine the shape of the ore bodies from which gold is extracted by mining and milling.

The Domes.

The gold is associated with quartz, which in the main follows the bedding of the country-rock; hence it forms sheeted bodies of ore that are sandwiched between the stratification, especially along the thin seams of slate. Since the quartz follows the structural lines of the country-rock, it forms "saddles" where the slate and quartzite have been bent into anticlinal folds; but the most pronounced development of ore—for sometimes the quartz contains enough gold to constitute ore—is on the "domes" formed where folds cross each other.

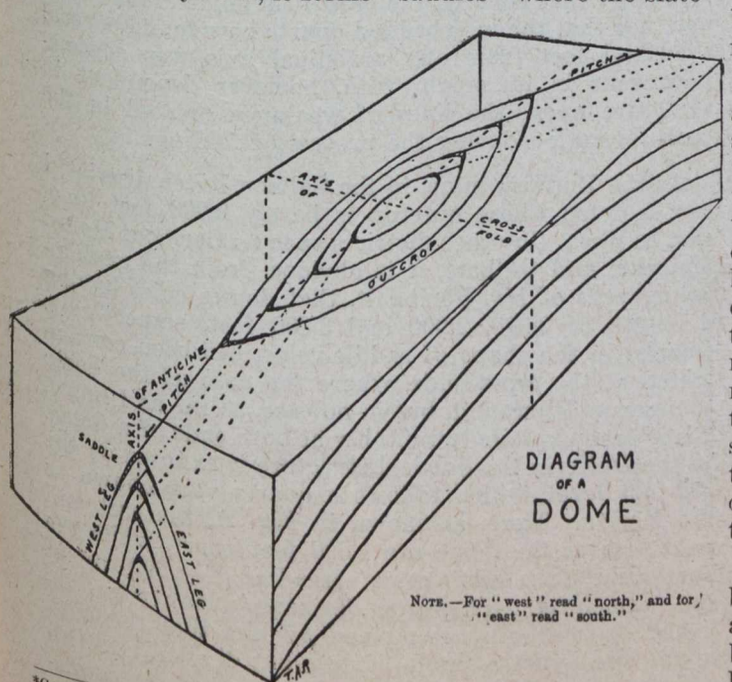


DIAGRAM OF A DOME

NOTE.—For "west" read "north," and for "east" read "south."

This domical structure leads to interesting results. Owing to erosion, the crests of the domes have been degraded to the level of the present surface, on the plane of which the bedding now assumes an elliptical form. Any vein of quartz deposited along a bedding-plane will reproduce this structure. If on a flank of the dome, north or south, it will have a nearly straight strike, but in the approach to the ends, east and west, of the dome, it will curve in accord with the fundamental structure. At the "nose" or extreme end of the longer axis of a dome, the quartz will be curved to a bow. All this is on the plane of the surface. If followed underground such a quartz vein will form a saddle, by being curved with the bedding of the anticlinal fold whose axis runs east and west. Again, owing to the synclinal fold, whose axis runs north and south, the saddle will pitch or slope if exposed at the east or west end of the dome, where the strata plunge in accord with the synclinal curvature of the cross-fold. This description will be made clearer by reference to the accompanying diagram, which, in effect, exhibits the appearance of a model if made in glass. The top of the block represents the geological surface; the elliptical outcrops are evident; at the west end of the curving strata are shown the quartz veins. These in cross-section, as exposed at the left side of the block, constitute "saddles," the pitch of which is indicated.

As regards actual mining, the workings that follow the pitching saddles usually consist of a sloping shaft with curving levels. This is best exemplified by the Richardson mine, a model of which was prepared by E. P. Brown.* At Bendigo, an Australian locality, famous for this type of lode, the "saddle-reef," as it is there called, follows sharp arches in slate and sandstone, but the pitch of the anticlines is flat, because cross-folds are not emphasized; that is, the Bendigo saddle is like a steep ridge with slightly undulating crest. The Nova Scotian dome resembles the upturned bottom of a boat, the keel of which stands for the major anticlinal axis.

While referring to Bendigo as a geological analogy, a further reference may be made to the question of anticlinal pitch. In 1890 and 1891, when I was examining the Bendigo mines, the truly anticlinal structure of the "saddle-reefs" was not recognized; hence the pitch of the anticlines was not considered. As the crests of the folds at Bendigo are not marked by violent changes of slope, especially within the short extent of a single mining property, it is not surprising that this detail of the local geology was neglected. Within recent years, however, it has become generally recognized that the changes of pitch or undulations along the anticlinal axis (there called "lines of reef") constitute an important factor in modifying the distribution of gold-bearing quartz. Thus the Bendigo type of ore deposit finds closer resemblance to the Nova Scotian dome.

Only a small portion, however, of the gold contributed by Nova Scotia has been extracted from quartz at the apex of these domes. Most of it has been broken from interbedded veins associated with the legs or stumps of arched structures whose crests have

*Canadian Mining Journal, August, 1

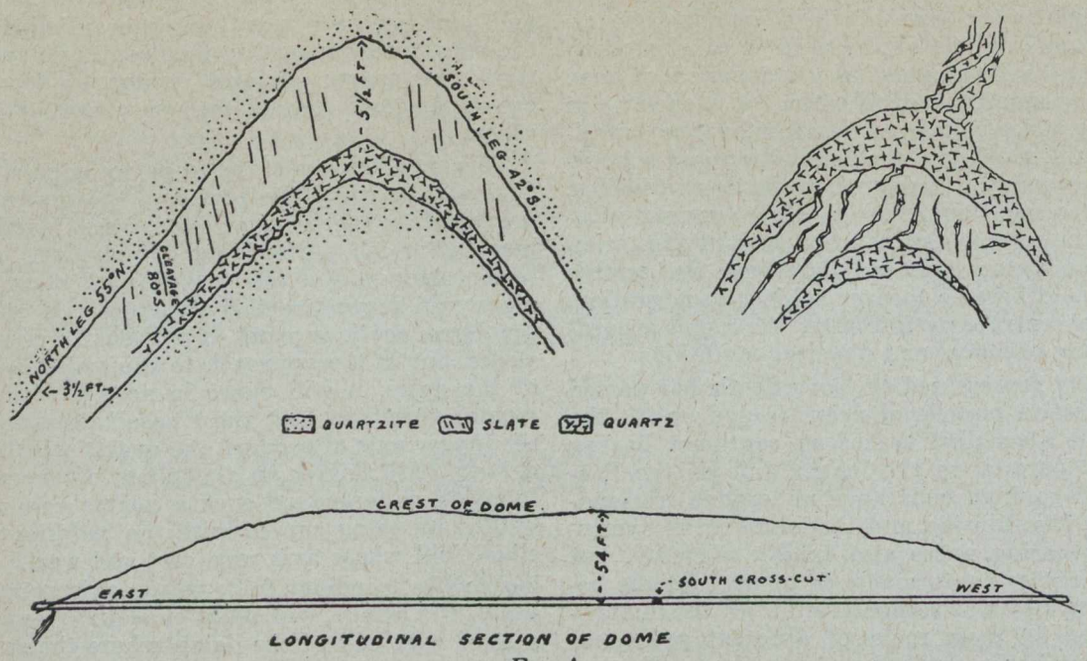


FIG. A.

vanished. It will be understood that the present surface, from which all mining starts, represents a nearly horizontal section that has been cut, by erosion, through the folds at a varying distance from their crests. The bedding-planes, and the quartz veins conforming to them, that are least curved, are simply farthest from the anticlinal crests, since all the beds of slate and quartzite are members of the folded series. The greater the distance from the anticlinal axis the less the curvature, so that many veins following the nearly straight strike and nearly vertical dip of the country appear to be unrelated to quartz deposits on the domes, although structurally they are allied. Such veins follow the lower portion of an arch, the crest of which, at a higher horizon, since denuded, overlapped the dome that survives in the centre of the fold. A distinction must be made, however; it is not necessary to assume, as some writers have done, that every quartz vein at one time extended over an arch of rock that has since been removed. That is another question. Whether the quartz was conterminous with the entire fold of the country-rock before it was reduced by erosion to the level of the present surface is a point on which I shall speak later. At present I am dealing with facts only, not theory. It is advisable to follow the scientific method of proceeding from the known to the unknown. It is not necessary to assume, and I do not believe, that the quartz vein distant from a dome, or an anticlinal arch, is a part of a much more extensive body that covered the crest of a dome eroded long ago, nor that the interbedded quartz now found several thousand feet from any anticlinal axis was contemporaneous in its origin, with, however dependent in structure upon, the lines of weakness created in the rock formation during the process of folding.

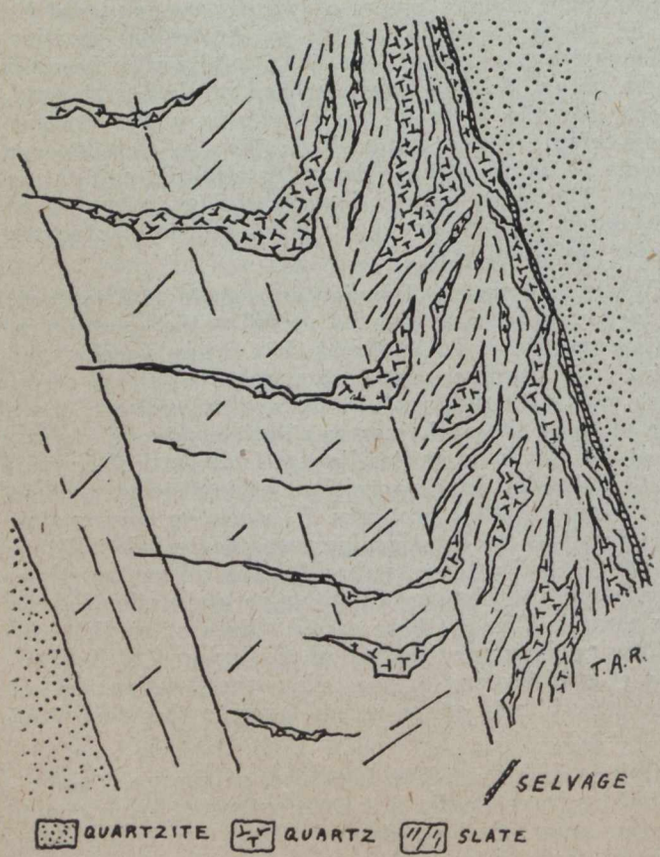


FIG. E.—The Lode at Waverley.

At the Dufferin mine, in the Salmon River district, I saw a dome whose outcrop is barely 2,000 feet long, east to west. In other districts such as Caribou, Mount Uniacke, and Oldham, it is obvious, from the geological surveys of Mr. Faribault, that domes exist having a length of 2,500, 2,000 and 3,000 feet, respectively. Quartz, in the shape of saddle-veins, has been concentrated at the cross-folds, where the nose of the dome plunges underground, but in no case, as far as I know, has it been exploited profitably at both ends of a dome. In the Dufferin the domical structure is exposed on the 300-foot level, which follows a quartz vein known as the No. 1a. Here, as shown in Fig. A, the east and west legs of the dome are 1,300 feet apart, while the north and south legs have a spread of only 200 feet at the same level. Since Mr. Faribault's map was published, it has been ascertained by him that the anticlinal fold is not a single flexure, but divided into two saddles at its crest. Of these, the southern is accom-

panied by a succession of quartz saddles, which have been exploited to a vertical depth of 300 feet and then abandoned as unprofitable. The northern minor flexure has no saddle of quartz, but its northern leg is accompanied by a band of quartz stringers that extend as cross-veins from the apex to the surface and reach in depth to the point where the bedding is turned by the syncline. Stringers of quartz cross the veins that follow the bedding, and it is suggested that the former coincide with fractures due to the cross-fold. In "centre country," that is, at the axis of a fold, even the quartzite exhibits cleavage. As regards the saddles, it is apparent (in Fig. A) that the anticlinal axis is not vertical, but dips south; hence the south leg is flatter than the north. The cleavage is at a high angle southward. The north leg has been more profitably mined than the south, because the latter is terminated abruptly by the synclinal flexure. The corrugation shown under the north leg of the larger saddle near its apex nearly conforms to the pitch of the anticline, which is 2 degrees W. at 125 feet west of the shaft. The saddle shown on the left of Fig. A is a supplementary saddle below the main formation exploited in the Dufferin mine. The quartz is from 8 to 10 inches thick at the apex, and thins going down. The right-hand sketch shows how stringers extend from the saddle across the bedding, but in the line of the anticlinal axis.

From 1881 to 1895 the Dufferin mine yielded 39,130 oz. gold from 93,701 tons, showing an average of 8 dwt. per ton.

Crenulation.

The "saddles" of Nova Scotia are also remarkable for peculiar corrugations or crumplings of quartz, to

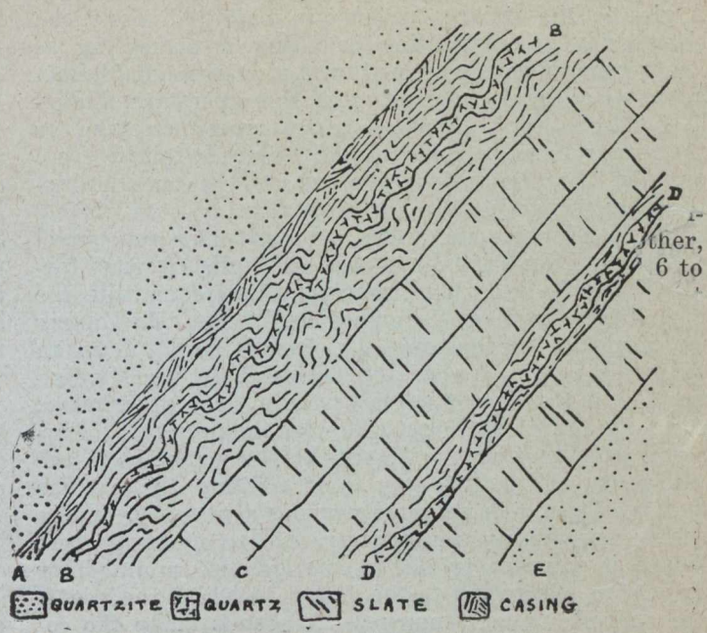


FIG. F.

which the name of "barrel formation" has been accorded, because, when such a corrugated deposit is uncovered, it looks to the miner like the back or top of barrels lying in rows. The accompanying reprints from old woodcuts, appearing in a report by Silliman, will indicate the appearance of such a lode as exposed in a large open-cut on the crest of a hill at Waverley.* I went thither in August, 1905, and saw enough to confirm the general accuracy of these

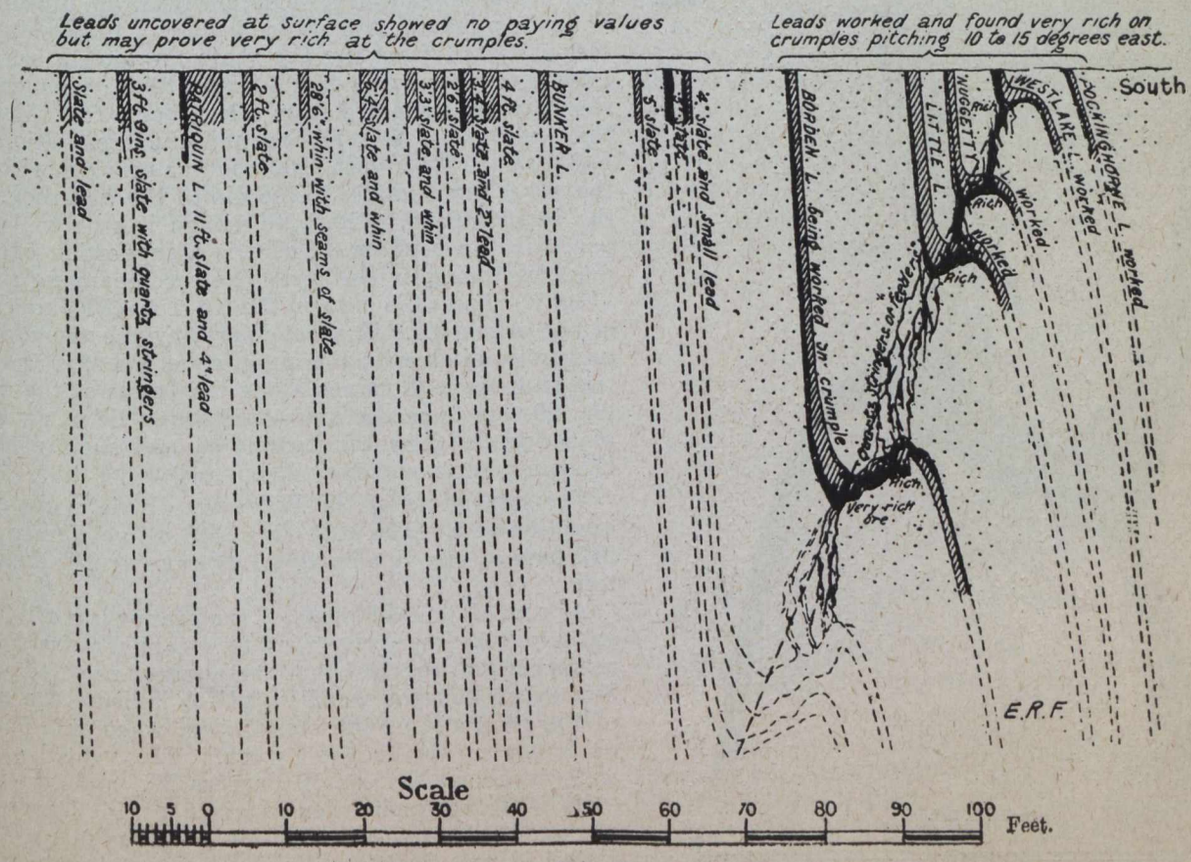


FIG. G.

*It is sometimes spelled Waverly. I have adopted the spelling used by the Canadian Geological Survey.
†This term has been previously used by J. Edmund Woodman, in his paper on the "Geology of Moose River Gold District," Nova Scotian Institute of Science, 1903, vol. XI., part I., pp. 18-88.

angles to the strike; "pitch" is measured along the sketches. The corrugation, crinkling, or crumpling, as it has been variously termed, was most remarkable. As a technical term descriptive of this structure, I suggest "crenation," from crena, a furrow or notch, for the larger barrel structure, and "crenulation,"† from crenula, the diminutive of crena, for the smaller apparently serpentine threads of quartz.

While adopting the Latin derivative for the barrel structure, I deem it best to use the English word, "furrow," for the individual markings that constitute the appearance termed "crenulation." For the larger manifestation of the same structure it might, from an academic point of view, be desirable to use "crenation," but this is not necessary to a clear description, and may, therefore, be set aside for the present. "Furrow" and "crenulation" apply to the markings in the wall-rock, and not to the quartz filling them. The quartz is found in veins of varying continuity, and in shape reproducing the structure of the encasing rock. Hence it appears crinkled, corrugated, crumpled, or serpentine, according to the degree to which the angles are curved. When enlarged, the bends make the so-called "barrels"; when infrequent or individual, and especially when persistent, the "barrel" becomes known as a "roll." Though varying in size and multiplicity, these forms of gold-bearing quartz are the product of similar structural relations.

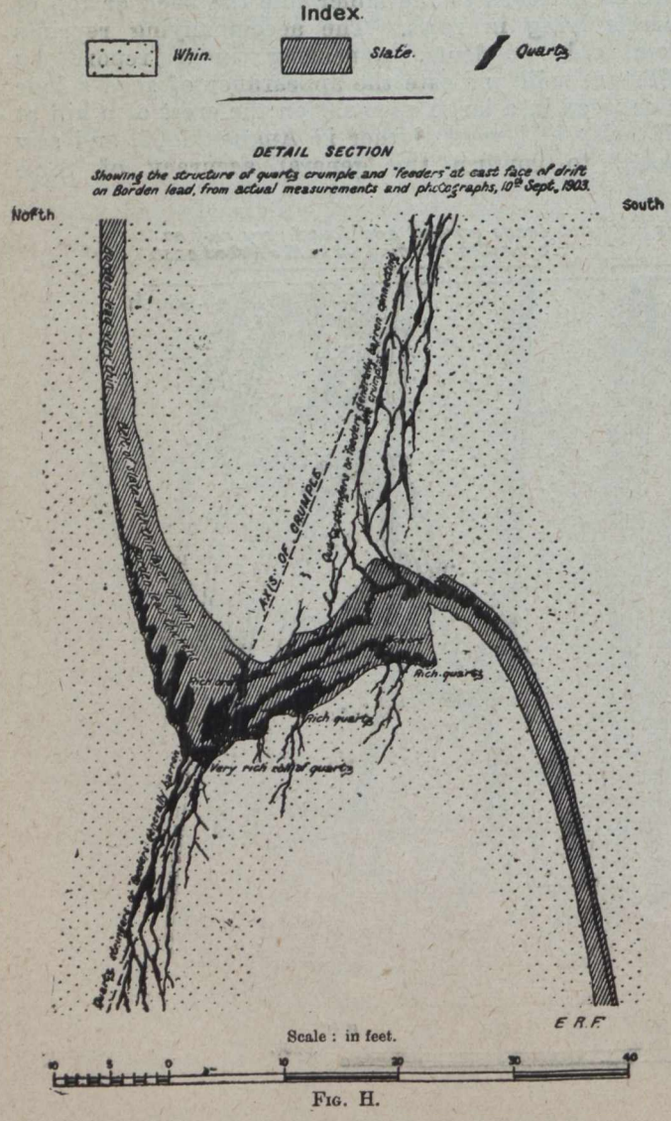


FIG. H.

The famous ore deposit of Waverley lies at the crest of a low hill, and at the western end of it, where an anticline is crossed by a syncline, so as to cause the folded strata to pitch steeper than the gentle hillslope. The following description is transcribed from my notes made on August 18, 1905. On the crest of the hill the apex of the pitching saddle is uncovered by shallow diggings; the quartz has been removed, but Silliman's sketch indicates how it looked when stripped. In the old excavations, which followed the north and south legs for a few feet, the crenulation on the hanging-wall quartzite can be seen. The furrows are nearly horizontal, or at right angles to the dip of the wall-rock. On descending the incline-shaft of the mine to the third level, the crenulation is found pitching at a strong angle with the dip of the stratification, becoming steeper in the approach to the main anticlinal axis. On this level the slate of the foot-wall shows where the crenulated quartz formerly lay, leaving casts like those left in river mud by logs, of irregular length and width, placed alongside. It is not an undulation; it is a furrow. The quartz remaining averages 8 inches thick, with a maximum width of 12 to 15 inches. The vein crosses from the foot to the hanging-wall of the slate bed within a distance of 20 to 25 feet. The slate is not faulted. Numerous joints cross the fluting and cause it to resemble bamboo. The cleavage and the bedding intersect along the line of the crenulation. On the south side of the anticline the furrows plunge eastward, until on reaching the anticlinal axis (near the Pig shaft) they are parallel to it; here, therefore, they are identified with the dip and at right angles to the strike of the vein and its enclosing wall-rock. As the vein curves at the nose of the dome and is followed around the corner, so to speak, the crenulation begins to exhibit a deviation from the dip until it is again pitching at a decided angle. At a point 125 feet eastward from the Pig shaft the quartz has diminished to a seam only 2 or 3 inches thick; concurrently the slate has dwindled from a bed 7 or 8 feet thick (at the apex) to a few inches, and the crenulation has faded away. When last visible it was nearly horizontal, that is, at right angles to the dip of the wall-rock. On the intermediate level the cleavage is seen to be opposed to the bedding. There is a suggestion of radiated fracturing or fissility. The accompanying sketch (Fig. E) shows the lode on the No. 1 level looking west at the north leg. Thus at Waverley the crenulations or barrels pitch with the anticline at the axis and flatten as distance is gained along the flanks of the dome. At 400 feet from the axis the furrows lie at an angle of 8 degrees from the horizontal, and shortly before becoming horizontal they disappear.

The total yield of the Waverley district (up to the cessation of work in 1898) is 61,308 oz. gold from 122,346 tons of ore, this being an average of 9½ dwt. per ton.

As a persistent advocate of the precise use of technical terms in descriptive writing, I cannot refrain from remarking on the fact that the maps of the Geological Survey employ the word "dip" to indicate the angle of the rolls and of the crenulation, when reference is obviously meant to the "pitch." The "dip" of the slate is given, say, as 52 degrees W., and then the "dip" of the crenulation is given as 15 degrees N., when, of course, the crenulation is on the plane of the slate bed, and therefore dipping the same, but pitching north at a strong angle. "Dip" is measured at right

strike. Again, the use of "whin," to signify quartzite, is bewildering to anyone who is not familiar with the local Nova Scotian usage; for "whin" has heretofore been applied, also locally, in Derbyshire, to an igneous rock. Hardly less objectionable is the local term "belt" for slate, because this is commonly used in another sense in geology. Thus, one author speaks of a "belt" of angulars; one might infer that it was a bed of slate full of cross-veins; and when it is written that "the belt follows the stratification," one concludes—at least I concluded for a moment—that a geologic truism was

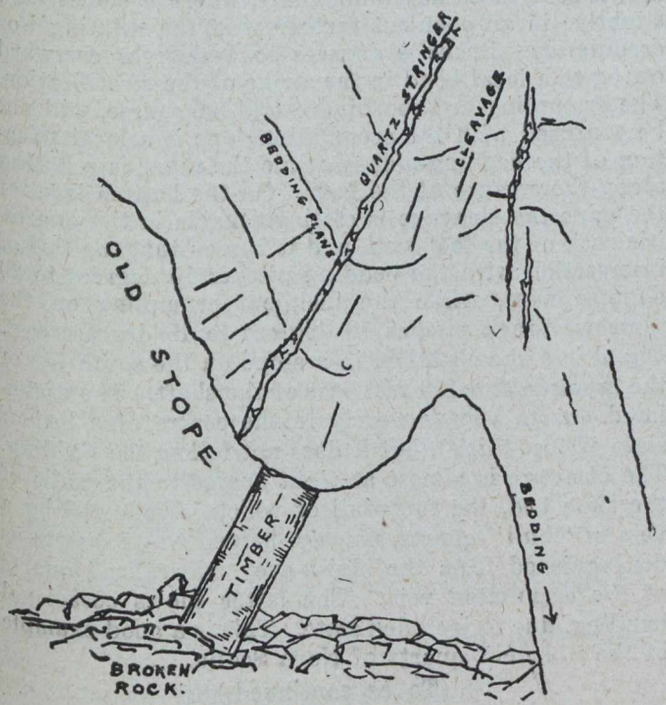


FIG. I.

being stated. Another objectionable localism is "pay-streak" to signify ore-shoot; in mining a "streak" is a thin prolongation of ore, a thread-like or ribbony structure, but in Nova Scotia it refers to an ore body having a definite pitch. While clumsy and unnecessary when employed locally, such terms are undoubtedly confusing when used in writings intended to be read by persons at a distance.

At Oldham more evidence was gathered. Here the mining was at the eastern end of a dome. In an excavation at the side of the road I made the sketch shown in Fig. F. The bedding dips 45 degrees S.; the cleavage is 62 degrees N. The line of intersection pitches clearly at 12 degrees E. The crenulation pitches similarly. In approaching the nose of the dome, or the place where the anticline is crossed by a syncline, it is apparent that the furrows and the quartz associated with them pitch eastward at an increasing angle.

Oldham is celebrated for its "rolls." These I regard as isolated or infrequent furrows of larger amplitude. Thus a "roll' in a quartz vein, following the bedding-plane, represents a persistent enlargement and enrichment along a bend in the foot-wall. A roll is sometimes found where a cross-vein or "angular" meets a vein that follows the bedding. This would appear to mark a displacement at the intersection, just as the normal roll represents a slip where the cleavage crosses the bedding. Angulars are most plentiful at the place of cross-folding, that is, where intensity of movement has induced maximum fracturing.

Oldham has been able to boast some small rich mines. Most of them have yielded gold from recognized rolls, to which the names of their discoverers still cling. One of the most famous is the Hardman roll, named after that veteran engineer, John E. Hardman. This roll is on the Dunbrack vein, which dips 38 degrees S. near the surface and increases (at a depth of 300 feet vertically) to 46 degrees. Two rolls, parallel to each other, have been found. The first, or Ned's roll, carried 6 to 8 inches of quartz in an ellipsoidal body 10 to 15 feet long. The second, or Hardman roll, carried 10 to 15 inches of quartz, increasing rarely to 18 in., and for a length of 18 feet, narrowing at one place to 8 feet, but fairly uniform in size. Both rolls are accompanied by minor fluting of the foot-wall. In going eastward this crenulation, with the rolls, pitches more steeply. Between the rolls the wall-rock exhibits sharp fluting and is accompanied by 4 to 5 inches of quartz. The first roll was struck in the No. 2 shaft at 160 feet and the second at 300 feet on the dip. The No. 1 shaft cut the first at 300 feet and the second at 450 feet on the dip. It appears, therefore, that they maintained an approximate parallelism. Eastward these rolls are cut off by a well-defined fault; they have not been exploited beyond it, although the geological map indicates the position of the vein east of the fault. It is stated that the top roll marks the junction with an angular. These are notes obtained from Messrs. Faribault and Weatherbe, with data given by resident miners. The workings are no longer accessible.

On writing to Mr. Hardman, in Nov., 1905, he stated to me that the rolls are "simply enlargements of the quartz vein-filling, horizontal sections of which have the form of elongated ellipses." The quartz of the Dunbrack vein, he added, had a general assay-value of $3 to $15 (or 3 to 15 dwt.) per ton in free gold, whereas the ore of the roll itself never yielded less than $25, and sometimes as high as $1,600 per ton "for lots of 8 to 10 tons." The high-grade ore was associated with galena and zinc-blende, the poorer quartz carrying from 1½ to 2½ per cent. mispickel, iron pyrite, and pyrrhotite, all of these minerals being found also in the rich ore, but subordinate to the galena and blende. Mr. Hardman says:

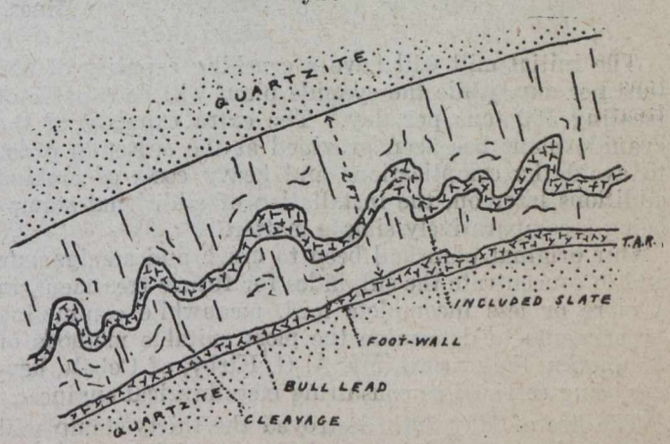


FIG. J.

"The thickness of the Dunbrack vein as a whole (throughout its worked extent of over 2,000 feet) would range from 4 to 5 in.; in places it narrows down to an inch or less, in other places it widens out to about 9 in., but the average width, apart from the rolls, I should put at about 5 in. In the rolls this width is much increased, the average width of the quartz in a

roll being about 17 to 18 inches. The extremes within the roll would run from 8 to 22 inches. Occasionally there came into the vein what are called 'angulars,' which you will recognize under the more general name of 'feeders.' These are small quartz-veins, of very limited length, and comparatively limited width (ranging from ½ in. to 1½ in.); often they are pure quartz, but also often they contain quite an amount of carbonate of iron or siderite. These angulars, when coming into the vein from the quartzite hanging wall had little or no effect on the richness of the ore, but when they came in from the foot-wall side, also through the quartzite, they were decided feeders or enlargers of the quartz above them."

At mount Uniacke, on August 21, 1905, I saw a "crumple" or subordinate fold in the Borden vein. This was described by Mr. Faribault in the summary report of the Canadian Geological Survey for 1903, and is there accompanied by a beautiful explanatory drawing. The evidence obtained in the course of mining indicates that the subordinate fold is echoed by a series of strata, and that the quartz veins following the fold are connected by stringers along the anticlinal axis. The workings visited by me showed that the fold had an amplitude or cross-sectional measurement of 40 feet, and a height or vertical measurement of 15 feet. It had been followed for 340 feet on the pitch, which sloped eastward at 15 degrees. This small fold showed a double crumple in the roof or hanging wall and a single bend in the foot-wall, the divergence into the two clumples being accentuated eastward. Here we have, on a small scale, a maximum of contortion in the bedding, creating highly favourable conditions for the passage of mineral solutions. This locality is 650 feet south of the main anticlinal axis, and at the westward end of a dome.

Fig. G. is a general cross-section, showing the relation of a series of parallel veins, and the subordinate fold as exposed in four successive "leads" or veins. Fig. H is a detailed section on the Borden vein. It will be noted that he marks the cleavage in the slate as being at a high angle northward. Fig. I is a sketch made by me in an old stope. A quartz stringer along the anticlinal axis indicates the system of feeders connecting the successive crumples. The crenulation accompanying the quartz, previously removed by mining, is seen in an adjoining shaft, where it slopes west slightly; in an open-cut farther west the "fluting" or crenulation pitches 4 degrees to 5 degrees eastward owing to a local bend in the strike of the stratification. The crumpling or subordinate fold, of course, will not be confused with the crenulation; one is a local plication of the bedding-planes, while the other is a fluting along the surface of the beds. On the bottom level of the mine the cleavage is distinguishable in the quartzitic rock of the foot-wall, and it is seen that the line of intersection with the bedding pitches 15 degrees to 20 degrees west, while the incipient crumpling on the same wall-rock pitches 10 degrees to 15 degrees east. Fig. J is a sketch taken in a stope on the south leg of the crumple and 150 feet east of the shaft. The crenulated quartz vein is nearly in the centre of a bed of slate (2 feet thick), but it does not follow the bedding. The cleavage is almost at right angles to the walls of the slate bed, the foot-wall of which is followed by a vein of "bull" quartz, namely, barren white quartz as distinguished from the bluish-grey mineralized quartz of the crenulated vein. The latter shows occasional banding, due to included slate. This is a good example of the "barrel" quartz of Nova Scotia.

(To be continued.)

THE HOLLINGER MILL

(From the First Annual Report of the Hollinger Gold Mines, Limited.)

The initial mill will have a crushing capacity of 300 tons per day, while the cyanide plant will be capable of treating 500 tons per day. The extra capacity of the cyanide plant has been provided at the outset in order to avoid the complications and heavy costs of making additions later on, the installation of additional stamps being a comparatively simple matter.

Our original plan had been to crush and amalgamate and to concentrate the sulphides for future treatment, in a more or less incomplete mill, meanwhile conducting experiments to determine the most suitable methods of completing the process, Mr. A. G. Kirby, of Cobalt, having being retained as consulting metallurgical engineer.

The fire of May 19th destroyed the thirty-stamp mill then under construction, and the impassible condition of the roads, coupled with the effects of the fire which swept the district on July 11th, resulted in a complete set-back to our work and necessitated a change in plans.

Owing to the loss in time engendered by the above causes, the proposed experimental work had of necessity to be curtailed, and some type of a permanent mill had to be decided upon, in order to take advantage of the remaining months of summer suitable for preparing the mill site.

Accordingly a sample of ore was taken from the dumps and shipped to Mr. Kirby at Cobalt for experimental treatment. A summary of the test results is as follows:

Tests for extraction were run upon a sample which was crushed to pass 20 mesh. This sample was found to contain 4.86 per cent. of concentrates, and these concentrates contained 82.6 per cent. of the gold contents of the ore. Following concentration the residue was leached with cyanide solutions and after 114 hours of treatment it was found that cyaniding had extracted approximately 60 per cent. of the remaining values.

A screen test made upon the residue from cyanide treatment showed that 61 per cent. of the unrecovered values lay in the sand coarser than 60 mesh.

The combined recovery, as outlined above, amounted to 92.9 per cent of the values contained in the original sample, and as the original value amounted to 2.1 ounces of gold per ton it was evident that the loss was excessive; approximately $3.00 per ton.

Tests were then made to determine the extraction after fine grinding. In these tests the ore was first ground in a tube mill to pass 120 mesh, and then split into two lots.

The first lot was concentrated, the concentrates removed and the impoverished residue agitated by air in cyanide solution. After 34½ hours of treatment the extraction by cyaniding of values contained in residues was found to be 95.1 per cent. and the combined extraction by concentration and cyaniding was 99.56 per cent. of the total original gold contents of the sample.

The second lot of the ore was concentrated, but after pan-amalgamation of the concentrates they were returned to the agitator to be treated with the tailings from the concentrator.

The combined extraction by this method was practically 100 per cent., as the residue after 36 hours of cyanide treatment carried but a trace of gold. In these tests the concentrates amounted to approximately 3.7 per cent. of the total ore treated, and the consumption of cyanide was in the neighbourhood of 2 pounds per ton.

The actual tests were more elaborate than would seem to be shown by the above outline, it being my purpose to merely indicate the steps which were taken to enable us to decide upon a method of treatment.

The net result of the tests was to show the necessity for fine grinding and also the advisability of extracting the concentrates for separate treatment.

The process as decided upon is:
Coarse grinding.
Stamping in cyanide solution.
Tube milling.
Concentration followed by amalgamation of concentrates.
Cyanide treatment of both gangue and concentrate residues.

The apparatus being installed consists of:
One gyratory crusher.
One jaw crusher.
Sampling plant.
Forty 1,500-pound stamps.
Four Dorr classifiers.
Four five-foot diameter by twenty feet long tube mills.
Spitzkasten.
Forty Deister slimes tables.
Four Dorr pulp thickeners.
Forty Trent agitators.
Two Moore filters.
Two Merrill clarifying presses.
Two Merrill precipitation presses, and the usual pumps, amalgamating pans, settlers, etc.

The mill will be electrically driven throughout.

It might be argued that the process as decided upon is too elaborate for the lower grades of the ores which will have to be treated, but it must be borne in mind that most of the ore available for immediate treatment is high in value, and in order to insure a satisfactory recovery of values it has seemed advisable to provide means for overcoming any obstacles which may arise, although up to the present no deleterious minerals have been found in the ore.

When development work is more advanced and we have a more intimate knowledge of the low-grade ores, it is possible that part of the ore can be leached coarse, without the necessity of grinding fine and filtering, but this is a question which will have to be settled by experience.

The mill being constructed will probably cost about $275,000, and it is hoped that everything will be in running order some time in April.

Mill Site.

The selection of the site for the mill has been governed by several factors. It seemed desirable that, if possible, the mill should be located upon Hollinger ground, and after experiencing the fires of May 19th and July 11th it was evident that protection against bush fires was a necessity.

The site chosen is protected upon the west by Miller Lake, upon the north by Gillies Lake, upon the east by Pearl Lake and upon the south by approximately one-half mile of cleared ground. We propose to cultivate the clear ground in the spring as a further protection against fire.

The site is about central in regard to the Hollinger, Miller-Middleton and Dixon ore bodies.

No practical site was available for a "gravity" mill, as the country is too flat to satisfy the requirements of such a mill, and in the mill under construction the pulp will be lifted by means of pumps from the concentrator floor to the cyanide plant.

DESCRIPTION OF EXPLOSION TEST AT THE EXPERIMENTAL MINE OF THE UNITED STATES BUREAU OF MINES, FEBRUARY 24, 1912

BY GEORGE S. RICE
Chief Mining Engineer.

(Printed by permission of the Director, United States Bureau of Mines.)

On the morning of the 24th of February, 1912, there was conducted at the Experimental Mine, near Bruceton, Pa., the 14th and last of the first series of such explosion tests.

The mine consists of a pair of entries in the Pittsburg seam, about 750 feet long from the outcrop opening to the face. These entries are connected by three cross-cuts; in the first of these, from the mine mouth, is a reinforced concrete stopping, the behaviour of which in the explosion was one of the points of interest, since the stopping was built of a known strength, 100 to 150 pounds to the square inch. The second cross-cut had a

15-foot sand-bag stopping supported by a timber frame. The third cross-cut was allowed to remain open so that the ventilating currents could pass through it. The fan was located at the end of an external 120-foot steel gallery leading into a passageway lined with reinforced concrete, which, in turn, entered the air course of the pair of entries above described. The fan at the time of the explosion acted as a blowing-fan, the air entering the air course passing into the last cross-cut, then into the main entry, thence returning on the main entry to the outside. The outer 200 feet of this entry was lined with reinforced concrete. For recording pressures, the velocity of the pressure wave, and the velocity of the flame wave, instruments were placed at stations 100 feet apart. The wiring connecting the stations is intricate, there being some 34 separate wires in the cable which leads from the face of the mine through the different stations to the outside, and thence to the bomb-proof observatory where some of the recording instruments are placed, and which is also the control station.

The entries or passageways are about 7 feet high and 8 to 9 feet wide, which are the usual dimensions in mines in the Pittsburg bed.

While many kinds of tests will be carried on in the Experimental Mine, the principal object at the present time is to determine how and why coal dust explodes, in order that means for prevention and limitation may be suggested from the experiments, and be tried out subsequently. It is for the purpose of understanding the nature of coal-dust explosions and for the comparison of different remedies that the instruments were provided, as without the instruments it would not be known whether the checking or prevention of the dust explosion was a matter of accident or otherwise. In order to obtain consistent results, the coal dust employed in the tests must be of known kind and size, and be distributed evenly. To accomplish such distribution, shelving three inches wide is placed along the walls and the coal dust is placed on these. In the test of February 24, one pound per linear foot of entry was used on the shelving, and one pound per linear foot was placed on the floor of the entry. In the previous public demonstration and explosion on October 31, 1911, one pound per linear foot had been used on shelves, but none on the floor. In other words, in the explosion of February 24, double the quantity was used.

The real consideration in loading is the amount per cubic foot of space, since a limiting influence in any explosion is the quantity of oxygen available for the combustion. If the coal dust is completely burned, only 12-100ths of an ounce is required to use up all the oxygen in a cubic foot of air. As a matter of fact, there is rarely complete combustion; usually there is a considerable amount of fixed carbon not consumed. The gases distilled from the coal are thus chiefly brought into play. When the loading is two pounds per linear foot there is about 64-100ths of an ounce of dust per cubic foot of air, or five times that which is theoretically necessary to use up all of the oxygen.

The coal dust loading in the main entry reached from the mouth to the face. The loading was also continued through the last cross-cut into the air course and out same for 200 feet. At this point there was placed a Taffanel stone dust barrier, which consists of a group of shelves, in this case 13, placed across the passageway about five feet above the track, these shelves being placed about 5 feet apart from centre to centre. Each shelf consisted of 2 1-inch boards, 10 inches wide, making the total width of a shelf 20 inches, on which finely ground stone dust was placed. In this case there was about 2½ cubic feet, or about 200 pounds, of stone dust on each shelf. This style of barrier has been particularly developed by M. Taffanel at the Lievin, France, testing station, where, in an external gallery, it has proven very effectual in arresting coal-dust explosions, and the system has been generally adopted in French coal mines.

Beyond the barrier of coal dust there were 50 feet more of coal-dust loading. Small tufts of loose gun cotton (loose gun-cotton is inflammable, but not explosive), were placed at intervals throughout the mine to determine the extent of the flame, in addition to the flame circuit breakers in the main entry.

The initiation of the explosion was at the face of the main entry, by a single blown-out shot of three pounds of black powder stemmed with 5 inches of fire-clay. In order to insure that the shot would blow out, the hole was cased with 1½-inch pipe. A similar hole was prepared in case of failure of the first, but was not fired. The shot was ignited by an electric detonator connected through the cable with the observatory. The wires of the flame circuit breaker were placed immediately in front of the hole so as to obtain results the moment the flame started from the cannon.

Explosion, and the Results.

After the party of mine inspectors and others interested in mining had inspected the mine, Mining Engineer L. M. Jones and Mine Foreman Howarth connected up the fire lines, no one else being in the mine. Then, having spread some coal dust in front of the holes, they came out of the mine. A locked switch at the outside was cut at the fire lines; from the observatory a generator was thrown in and a similar locked switch in the observatory. All was then ready for pressing the button. The visitors having assembled at vantage points where they would be safe, the boiler plant whistle was blown and three minutes afterward the button was pressed. Two and a half seconds later, as shown by the records, a black cloud of dust shot out of the main entrance accompanied by a tongue of flame and a violent detonation occurred. The smoke from the entrance increased in volume for a few seconds and then a reverse current, caused by a vacuum in the mine, set in and the smoke did not again come out for a number of minutes after the ventilation had been re-established by hanging brattices across the air course and over the conduit. The flame did not come out of the air course, and a later investigation of the tufts of gun-cotton showed that it had not come closer than 60 to 75 feet to the mouth. It seems probable that this effect of the non-appearance of the flame at the mouth of the air course or any extreme violence was due in part at least to the Taffanel stone dust barrier. This was found to be smashed to pieces, as would be expected in opposing so violent an explosion, but this effect is what was desired, as it threw into the explosive wave a large mass of finely divided dust which would be expected to cool the flame. From the point where the explosion originated in the face of the main entry through the cross-cut and through the barrier was a distance of 340 ft., and the explosive force was sufficient to throw down the upper 2 ft. of the sand-bag stopping. The flame evidently penetrated through the barrier. In spite of the considerable violence shown at the Taffanel barrier, there was practically no violence shown beyond it. On the whole, the conclusion is that the test was very favourable to the barrier. It may be well to state here that some previous tests have been made in which the barrier was located closer to the origin of the explosion and in these cases the flame was always extinguished while passing through the barrier.

The Effects of the Explosion in the Main Entry.

The shot which caused the ignition had blown out a small crater in the coal in spite of the pipe linings which had been broken open; except within a few feet of the shot there was little violence for a considerable distance, but there was much evidence of flame in the last cross-cut. At the second cross-cut in which there was the second sand-bag stopping, the upper two feet was thrown down, the first part of the bags towards the air course, and the upper part toward the main entry. Probably the first effect was from the explosion in the main entry and the second effect was due to the explosive wave in the air course, which, with the added length of the last cross-cut, had a longer distance to travel. Going out by the middle cross-cut, the shelving made of 3 x 4 hard-wood timber, in many places was displaced and in places broken. The track ballast in places was lifted, affected evidently by the depressed wave, or vacuum, following the explosive's wave. The violence increased in going out in the neighbourhood of station 150, the concrete arches having been lifted in several places, breaking the face of the concrete and exposing the arched iron reinforcement (¾ths-in. sq. rods). At this station the monometer indicated a pressure of over 150 lbs. per sq. in.; this pressure being measured at right angles to the explosive waves and would therefore be considered static pressure. The pressure at the station fifty feet from the mouth was less than that at station 150. Outside the mine the gates were recessed behind concrete buttresses, and these were carried bodily away. Fifty feet outside the entrance there had been an empty car. This was thrown to the opposite side of the ravine, a distance of 200 feet.

The pressure circuit breakers and the flame circuit breakers indicated that the explosion travelled quite slowly at first, but rapidly increased in velocity going outward, showing a speed of over 2,083 ft. per second obtained between stations 450 and 350, and also between stations 350 and 250. Beyond this the circuit breakers failed to work. An interesting fact in connection with the recording of the velocities of the pressure wave and the flame was that the flame, while much behind the pressure wave at the start, caught up rapidly with it as the entrance was reached.

Conclusions.

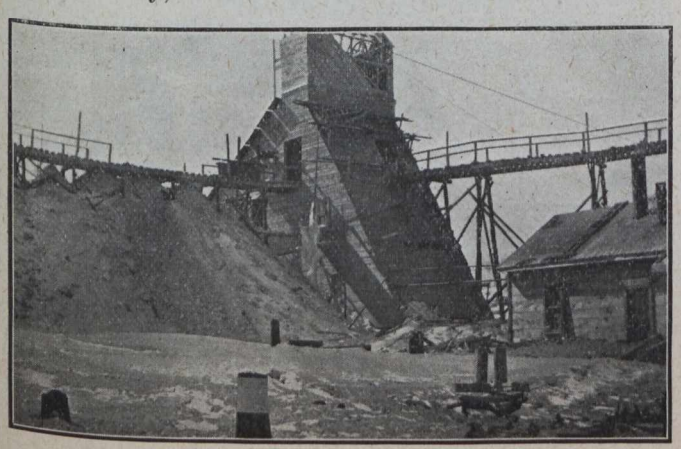
As a demonstration the experiment was less spectacular than that of October 31, 1911, as on that occasion the flames burst from all the openings; whereas in the experiment of February 24, the flame appeared only at the main entrance. However, it did not spread so widely as in the previous demonstration. There was a quick flash projected through the centre of the cloud of dust. In the explosion of October 31, 1911, the manometers did not have springs strong enough to indicate the pressures, which difficulty had been removed on February 24, so that a pressure of over 150 pounds was shown by the manometer at station 150. The records of the maximum pressure gauges placed at various stations along the entrance had not been determined. The detailed information obtained from the various readings will appear in a publication of the bureau on the work of the Experimental Mine.

As regards the efficiency of the Taffanel barrier the evidence is inconclusive. The flame was not immediately extinguished by the barrier, but about 200 feet further on; nevertheless, without the barrier, it is probable that, the large amount of dust being carried from the loading farther in, the flame would have gone to the entrance. This is the more probable since the violence shown by the smashing of the barrier indicates that the explosion had attained considerable violence at this stage. It is intended to make systematic tests of such barriers by the next series of tests.

THE McINTYRE MINE AND MILL, PORCUPINE

(Written for The Canadian Mining Journal
by S. N. Graham.*)

On March 1st the stamp mill of the McIntyre-Porcupine Mines, Limited, was started. This is the first plant to start regular milling operations since the fire last July, and as such deserves comment. Work on this mill had been quietly but energetically pushed and its early working was a surprise to many.

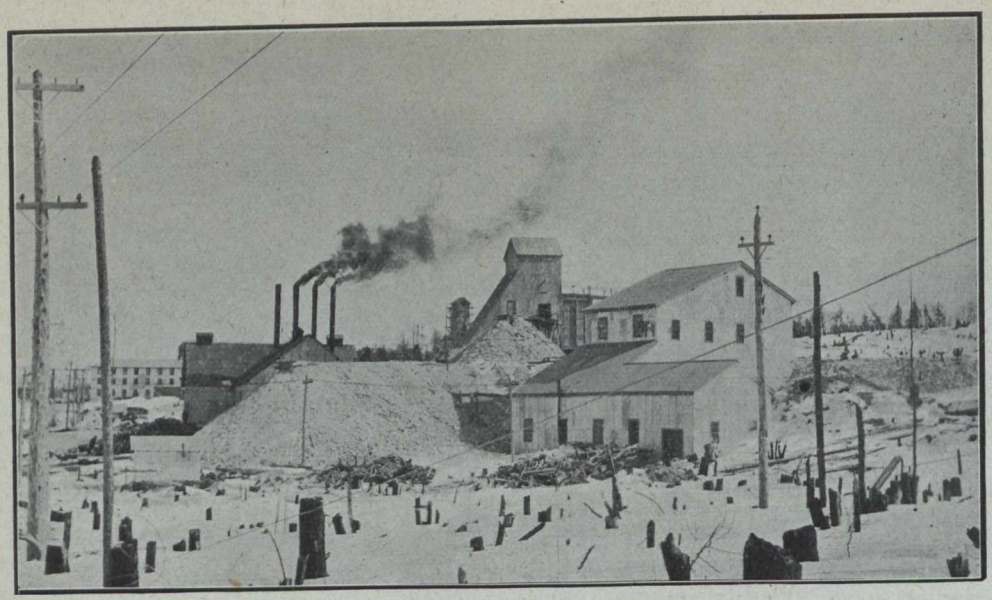


McIntyre Mine, No. 4 Shaft

The treatment is amalgamation followed by concentration and as the metallurgical problem seems to be not difficult the flow sheet of the mill is very simple. However, the ores of a new district always require study and often changes of the first system of treatment proposed, and the information gained in the working of this mill can be used to advantage in the larger plant which is planned for the future.

From the two 200-ton ore bins at the shaft the ore is trammed to a Blake crusher, 10 inches by 20 inches, which gives a product passing through a 2-inch ring. It is then elevated by a bucket conveyor to the mill ore bins having a capacity of 60 tons. From here it is fed by suspended feeders to ten 1,250-lb. stamps by Chalmers & Williams. The ore is crushed through 20-mesh 24-gauge wire screens, the stamps dropping 6 inches and 104 times a minute. Amalgamating is done on plates, three 48 x 60 inch plates to each five stamps. The plates are set at a slope of 1¾ inches

*Mining Engineer, Toronto, Ont.



McIntyre Mill, Power Plant and No. 1 Shaft

to a foot with a drop of one inch between plates. Below the plates are amalgam traps of the Homestake pattern. The pulp is then classified in hydraulic classifiers, the sands being concentrated on two No. 2 Deister tables and the slimes through three Callow cones on three No. 3 Deister slime tables.

The ore proves to be very free milling, the extraction on the plates being about 75 per cent., so far as can be figured from the data now on hand. The concentration is about 40 to 1, and the concentrates are very clean and free from sand. I am informed that the tailings run very low in value.

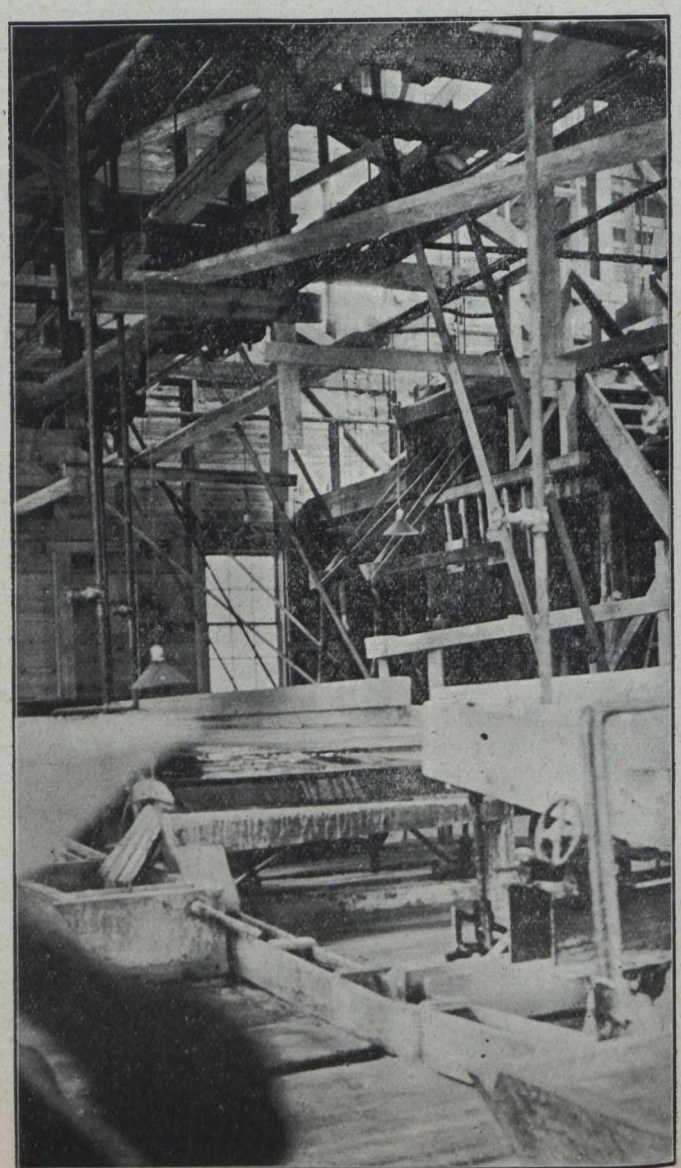
It is expected that the capacity of the plant will be 50 tons per 24 hours. Power is supplied from the Sandy Falls plant of the Porcupine Power Co. The mill is supplied with a 50 H.-P. motor for crusher and stamps and a 5 H.-P. for the tables.

Mining work is at present confined to the McIntyre claim on Pearl Lake and the area under Pearl Lake owned by the company. This are is in the zone of quartz porphyry schist running north-east from the Hollinger, through the Dixon and McIntyre claims and under and surrounding Pearl Lake, continuing past the Jupiter on the north-east end of the lake. The ore is composed of quartz and mineralized schist included in the quartz veins. In places the schist of the walls carries milling values.

In the ground north of Pearl Lake three veins are known, and which are developed by two prospecting shafts on the vein. Situated between these two is shaft No. 5, a vertical working shaft 200 feet deep. At present a new head frame is being erected here.

Shaft No. 1 is about 1,000 feet south of No. 5 and on the opposite side of the lake. This is at present the principal extraction shaft and about it are grouped the office, assay office, blacksmith shop, power plant and mill buildings. It is a vertical two compartment shaft 200 feet deep. From this shaft two veins are under development on both the 100-foot and 200-foot levels with cross-cuts to north and south from the lower level. The 200-foot level is connected with the surface by a raise and stopes are being opened up.

About 800 feet east of No. 1 shaft is No. 4, also vertical and 200 feet deep. From it development work is being done on two veins. The boarding house is situated near this shaft.



McIntyre Mill, Interior View of Gables and Classifiers

It is proposed to deepen shafts Nos. 1, 4, and 5 to the 500-foot level. From shafts Nos. 1 and 5 cross-cuts are now being driven from the 200-foot level, cross-cutting the schist underlying the lake. Here it is hoped to cut the many veins known to exist in the Dixon ground and striking into the south-west end of the lake. On the north-east end of the lake are found veins striking under the lake from the Jupiter and Plenaurum ground.

As mentioned previously, power is supplied from the Sandy Falls plant, but the mine power house is equipped with an auxiliary steam plant, consisting of two 50 H.-P. and two 60 H.-P. boilers. The 12-drill Rand compressor installed can be operated by either steam or electric power.

Mr. F. P. Swindler is manager and Mr. W. D. Cooper is mine superintendent. The mill was designed by Mr. A. G. Kirby and constructed and operated by the superintendent, Mr. R. J. Ennis.

CANADIAN MINING INSTITUTE—*WESTERN BRANCH*

(Continued from last issue.)

Brief Session of Members Only.

Early in the afternoon a brief session of members only was held for the transaction of business.

The minutes of the last general meeting of the branch, held at New Denver, Slocan Lake, were read and approved.

Included in the correspondence was a letter from the Compressed Gas Company, Limited, stating that it is including in its operations generating and compressing oxygen for mine-rescue purposes, which should be of assistance to mines in this territory, since this company has the only generating plant on the Pacific coast erected and equipped for that purpose. An offer was made to supply, free of charge, any oxygen that should be required for demonstration purposes during the meeting of the branch, and an invitation to visit the company's plant in Vancouver was cordially extended. Mr. Thos. Graham and others spoke of the benefit and convenience of having available so near to the coal-mining districts an available supply of oxygen instead of having to send to distant places for it. The secretary was instructed to acknowledge receipt of the letter and thank the manager of the company for having brought to the attention of the meeting the fact that oxygen is being generated and can be obtained in the City of Vancouver.

The courtesy of the Vancouver Mining Exchange in offering the use of its rooms for future meetings of the branch in Vancouver was also acknowledged with thanks.

The meeting was informed that the Branch Council is in favour of a resolution being adopted by the Branch to the effect that it is desirable a copy of minutes of meetings of the Council of the Institute, such as is sent to all members of the Council not present at its meetings, shall be similarly supplied to the chairman and secretary, of the Branch, respectively, so that the Branch may be kept informed concerning business coming before the Council of the Institute. After a brief discussion it was unanimously resolved that the meeting hereby approves the resolution of the Branch Council and authorizes the chairman and secretary to submit the wish of the members of the Branch in this respect to the Council of the Institute when they shall be in Toronto at the annual meeting in March.

It was resolved to authorize the appropriation of a sum of money for defraying out-of-pocket expenses of the chairman and secretary (additional to the travelling and hotel charges the parent Institute will pay) in connection with their attendance at the Annual Meeting of the Institute in Toronto.

The recommendation of the branch secretary that the next general meeting of the branch be held at Ainsworth and Kaslo—a daylight visit to some mines in Ainsworth camp and a night meeting at Kaslo for reading and discussion of papers, etc.—was approved, such meeting to be held about the middle of May next.

Proceedings at Afternoon Session.

At the afternoon session the attendance was good. An address by Mr. E. W. Parker, of the United States Geological Survey, on "The Coal Fields of the United States," was first on the programme. In this Mr. Parker stated that the coal fields of the United States are scattered over thirty different states and territories. The total area of the known fields aggregates approximately 310,000 square miles. In addition to these known areas there are about 160,000 square miles of which little is known, but which may contain workable coal, and about 32,000 square miles where coal probably exists, but under such heavy cover that it is not considered available as a present resource. The chief coal mining districts were then dealt with successively and their locality pointed out on a wall map. After much other interesting information had been given, Mr. Parker concluded with the following: "Mr. S. A. Taylor, in his presidential address before the Coal Mining Institute of America, at Pittsburg, in December, gave some estimates of the present coal supplies of the world. Those of the United States, exclusive of Alaska, amount to something over 3,000,000,000,000 tons. So little is known of Alaska that it is hazardous to make any estimate of its fuel supplies, but they can be put down certainly as 150,000,000,000 tons, making the total for the United States about 3,200,000,000,000 tons. According to estimates of the Royal Commission on Coal Supplies, Great Britain has a little over 160,000,000,000 tons. Including brown coals and lignites, Germany has 145,000,000,000 tons; Austria-Hungary, France, and Belgium, each has from 16,000,000,000 to 17,000,000,000 tons, and Russia about 20,000,000,000 tons. Canada's supplies are placed at 100,000,000,000 tons. The total supplies of all of Europe, according to the above estimates, are 375,000,000,000 tons, or about one-eighth of that of the United States." Mr. Parker then exhibited about thirty lantern slide views, which added greatly to the interest his important subject aroused in his hearers. The discussion that followed was participated in by Messrs. Sutton, Brewer, Sharp, and others.

Professor Daniels followed with a paper full of information relative to the "Roslyn Coal Field, in Kittitas County, Washington." This was also illustrated

by numerous lantern slide views, and gave much useful data and descriptive information relative to that comparatively small but productive field.

Two short papers were read by the secretary. The first of these gave cost data in connection with mining, milling, etc., of a small vein of free-milling ore, which information had been contributed by Mr. A. H. Gracey, mining engineer, of Nelson, B.C., with the expectation that it might prove of interest and value because frequently similar deposits are brought to the attention of mining men or representatives of capital, as prospects or partly developed mines. After detailing the conditions, etc., under which the work was done, the following was given as the cost of handling 13,958 tons of ore:

Mining—	Per ton.	
Stoping	$3.46	
Mucking	0.64	
Timbering	0.43	
Total labour	$4.53	
Supplies	0.51	
		$5.04
Milling		0.925
Cyaniding		0.725
Aerial tramming		0.16
Marketing product (concentrates and bullion)		0.135
Management, general expenses, insurance and taxes		0.675
Maintenance of plant		0.23
Total per ton		$7.92

The mining cost does not include the development cost of driving the main levels and connecting raises, which amounted to $1.90 per ton of ore extracted, but does include the cost of intermediate prospecting such as drifts and raises, and considerable of this work was necessary. Neither are there included interest on capital and depreciation charges. The maintenance of plant includes all repairs and additions necessary to keep the plant in an efficient condition.

Mr. Hedley commented appreciatively upon the results achieved in this connection by Mr. Gracey, under conditions which he knew to have been the reverse of favourable to such economic operation.

The second paper was "A Brief Description of the Electrolytic Lead Refining Plant of the Consolidated Mining and Smelting Company of Canada, Limited, at Trail, B.C.," of which refinery the writer, Mr. J. Miller, is superintendent. A few lantern slide views were shown, including one of the long tank room with its 240 refining tanks. This paper, too, was listened to with great attention, and was a welcome contribution to the day's proceedings.

Thursday Evening Session.

The evening session attracted a large audience. It was opened by Professor Roberts, who took as his subject, "Mining and Metallurgy on the Pacific Coast," and in dealing with this gave information concerning numerous mining fields. The free use of lantern slide views added greatly to the interest of this address, especially those showing gold dredgers at Natoma, California.

Mr. H. M. Wolflin contributed notes on "Some Work of the United States Bureau of Mines—Field Investigations, Mine Safety, and First Aid Work." After greeting the assembled members of the Canadian Mining Institute most cordially, as from the United States Bureau of Mines, Mr. Wolflin gave earnest assurance that it is the desire of the Bureau to co-operate with their friends in British Columbia in every way practicable, especially in mine-rescue work, the instructions received being that in emergencies the existence of a Boundary line between the United States and Canada is to be disregarded as far as possible. This address was also illustrated by lantern slide views, showing examples of much of the work of the Bureau in which Mr. Wolflin and his staff are engaged.

Mr. F. Napier Denison, who, at its Nanaimo meeting last year, gave the Branch much information concerning his investigations into the question of the possible relation of earthquakes, strains and stresses to coal mine disasters, added more notes on this subject, these being largely the concluions he had come to following the observations of another year. He again had the assistance of lantern slides to illustrate his address, and made mention of the Dominion Government having granted an appropriation to enable him to extend his investigations in connection with the subject he dealt with.

Hearty votes of thanks were passed to the several visitors from the United States, and to Mr. Denison, for their respective contributions to the proceedings of the meeting.

Friday Morning Session.

On Friday morning the session was opened by Mr. W. M. Brewer's address on the Marble Bay mine, Texada Island, and the Britannia mine, Howe Sound, two copper mines situated within easy reach of Vancouver. He narrated the history of each, outlined their later development, and pointed out that now they are profitable producing mines—the Marble Bay on a comparatively small scale and the Britannia in very much larger degree. These were instances of the success attending persistence in exploring the ore bodies occurring in the respective localities under notice, and object lessons in metalliferous mining in the Coast district.

Dr. McTavish spoke on the work of the St. John Ambulance Association, and commended it to mine-owners and others interested in mining as being well worthy of their active co-operation and support. Comments on this subject were made by Messrs. James Ashworth, Charles Graham, Thos. Graham, and W. F. Robertson. The meeting accorded Dr. McTavish a vote of thanks for having attended and given his address on this important matter.

The Groundhog Coal Basin.—A paper entitled "Notes on the Groundhog Coal Basin," prepared by Mr. G. S. Malloch, of the Geological Survey of Canada, and (with the kind permission of the director), sent from Ottawa for presentation at this meeting, was read by the secretary. The following is a short abstract:

"So far as known the coal measures extend northwest in a long strip, for at least 70 miles. The width of this strip at its southern end is about 30 miles, but it may not be so wide farther north.

"The coal measures have a thickness of upward of 3,000 feet, but contain coal in commercial quantities near the top and bottom only, though there are a few

thin seams in the intermediate beds. The lower horizon contains at least three seams of from four to six feet in thickness, and the thickness of the upper seams, seven in number, varies from two to six feet. So far as is known, the upper horizon is limited to an area of not much more than 20 square miles, but the lower extends over most of the above-mentioned strip.

"The coal is anthracite in character, but some of the available analyses show very high percentages of ash. Some of the seams have been so crushed that the coal shows numerous cleavage faces and powders badly when handled. In all the seams seen, veinlets of quartz or calcite traverse the coal in different directions. These veinlets are usually between a quarter and an eighth of an inch in thickness, and the foreign material almost invariably sticks to one or other of the pieces when the coal is broken. The number of points at which the coal has been opened are too few to permit of an estimate being made of the amount of the foreign material present, and it is quite possible some localities may be found where the coal is entirely free from it."

As regards transportation, Mr. Malloch showed that in order to obtain a market for coal from this field a railway will have to be constructed. He outlined three feasible routes. The shortest would be from Stewart, at the head of Portland Canal, from which place a railway has already been built twelve miles in the direction of this field. An extension of this short line would reach the broad valley of Naas River at 22 miles from the present terminus. The total distance from Stewart to the coal field would be about 90 miles. Another route from tidewater would be up the Nass River, but this would be 80 miles longer, though there would be much less rock work and an easier grade would be secured. A third route is from the Grand Trunk Pacific Railway at Hazelton, situated about 150 miles southward by a railway route. Then there is a distance of more than 150 miles from Hazelton to Prince Rupert, the Grand Trunk Pacific terminus, or a distance in excess of 300 miles from the coal field to that shipping port.

Mr. Malloch's paper was of particular interest, for the reason that the Groundhog coal field is receiving much attention in the Coast cities of British Columbia and elsewhere.

Development of Coal Areas in Alberta.—Mr. D. B. Dowling, also of the Geological Survey of Canada (with the permission of the Director) contributed some "Notes on the Progress of Development Work on Coal Areas in Alberta and Saskatchewan," which paper was read by the secretary. This gave information concerning progress made in the development of coal areas along the Grand Trunk Pacific Railway, chiefly at Jasper Park; in the coal horizon underlying and west of the City of Edmonton; on the eastern outcrop of the Edmonton coal formation; along the Grand Trunk Pacific Railway east from Edmonton; in the area west of Brazeau Range; on the continuation of the coal measures of the Cascade Basin southward on Kananaskis River, and on Luck Creek; at various places in Alberta reached by branches of the Canadian Pacific Railway, and others in Saskatchewan. To Mr. Dowling's notes Mr. Jacobs added some information he obtained late last year, giving a few particulars of progress made at the Jasper Park collieries, from which shipment of coal had been commenced.

Notes on Coal Mining in Western Canada.—As time was short, the notes he had prepared relative to the coal resources and development of coal mines in British Columbia and Alberta, were briefly summarized by Mr. E. Jacobs, who exhibited a number of lantern slides showing coal shipping docks, mine bankheads, views of general layout of surface works at coal mines, mine-rescue apparatus, etc.

Quoting from Mr. D. B. Dowling's paper on the "Undeveloped Coal Resources of Canada," read at the 1911 annual meeting of the Canadian Mining Institute, the following estimate was given: Area of coal fields, 1,351 square miles. Coal content: Anthracite, 61 million tons; bituminous, 39,674 million tons; lignite, 490 million tons; total approximate coal content, 40,225 million tons. Of this the greater part is in the Elk River field, East Kootenay, British Columbia, as follows: Elk River (Crow's Nest), 230 square miles, 22,600 million tons; Elk River north, 140 square miles, 14,000 million tons; total for Elk River district, 370 square miles, and 36,600 million tons.

Vancouver Island.—Western Fuel Company—Production in 1911, 580,000 tons, which is the largest quantity produced by this colliery in any year. Opening a new mine by shaft, at about four miles from Nanaimo; this will be developed to a producing capacity of 1,200 to 1,500 tons a day, and production may be expected to be commenced next autumn. Canadian Collieries (Dunsmuir), Limited.—Production in 1911 probably about 900,000 tons. Opening in Comox district a new shaft mine to be 1,000 feet deep and be ready for production in 1913; developing hydro-electric power, 11,000 h.p., chiefly for use of Union colliery mines, near Cumberland. Much other development and additions to plant and equipment. Pacific Coast Coal Mines, Limited.—Increased output capacity to 20,000 tons a month. Vancouver-Nanaimo Coal Company.—Adding to shipping facilities and plant.

Nicola Valley.—Nicola Valley Coal and Coke Company.—Increased its output from 41,000 tons in 1910 to more than 200,000 tons in 1911. Put in new tipple, capacity 1,000 tons a day; also much new plant. Important underground development work done; also found, with diamond drill, extensions of coal deposits into ground previously regarded as probably barren. Several other coal properties in Nicola Valley being developed.

Similkameen.—Princeton Coal and Land Company.—Put in additional coal-handling appliances, capacity 500 tons a day; also new machinery and plant. Did development work to provide for making enlarged output. Increased production in 1911 nearly 50 per cent. as compared with 1910. Columbia Coal and Coke Company.—Drove long crosscut tunnel which reached the coal. Railway transportation facilities provided; putting in plant for shipping coal.

Crow's Nest District.—Crow's Nest Pass Coal Company.—Opened three or four practically new seams at Coal Creek colliery; quantity and quality of coal both satisfactory. Reason to hope for success in efforts to provide for making output from company's Carbonado colliery mines. Had trouble at Michel colliery, but recent reports are that output there has been 1,000 tons a day, while Coal Creek mines have produced more than 4,000 tons a day. Hosmer Mines, Limited.—Opened seams at higher level, 500 feet above present main entry; connected new openings, by means of sur-

face tramway around contour of mountain side, with main tramway to shipping tipple and coke ovens; main incline recently double-tracked. Corbin Coal and Coke Company.—Beside mining coal underground from large deposit, up to 300 feet in width, opened enormous surface deposit at 800 to 1,200 feet above level of main entry, and at distance back of about 6,000 feet. Preparing to quarry out this surface coal.

Coal in Alberta.

Mr. Dowling's Estimate.—Coal area in Alberta, 29,608 square miles. Estimate coal: Anthracite, 400 million tons; bituminous, 30,250 million tons; sub-bituminous, 79,000 million tons; total, 109,650 million tons. Production in 1910: Coal, 3,036,757 tons; (less used in making coke, 196,249 tons); coke, 121,578 tons; briquettes, 108,996 tons; deaths by accidents, 61. Approximate production of coal in 1911, 1,600,000 to 1,700,000 tons (decrease was result of miners' strike for nearly eight months); deaths from accidents, 7.

Lantern slides showed views of various surface works at mines, Belgian ovens at Lille, and new bankheads at A. R. and I. Company's Nos. 5 and 6 mines; Lethbridge Collieries Company's new mine at Kipp; Chinook Coal Company's mine near Lethbridge, and others. Some of these modern steel bankheads and fine machinery equipments of power houses were briefly described, and information was also given concerning the chief collieries in Crow's Nest and Calgary districts the latter including Bankhead (Banff) and Canmore.

After some observations by Messrs. E. W. Parker, R. J. Drinnan, and James Ashworth, Mr. Jacobs drew attention to the better position British Columbia has reached in regard to loss of life in coal mines. Published statistical tables for the 10-year period, 1901-1910, show British Columbia average of persons killed to have been 9.21 per 1,000 employed, which was the highest in comparison with 20 of the United States and with Nova Scotia. For the 10-year period, 1902-1911, the proportion will be less than 7 killed per 1,000 employed, while for the 5-year period, 1907-1911, it will probably be found to have been less than 3 killed per 1,000 employed. This distinct change for the better should, he thought, be given as much publicity as possible, in justice to the officials of the Provincial Department of Mines, who have, during recent years particularly, done their utmost to ensure the safety of coal-mine employees.

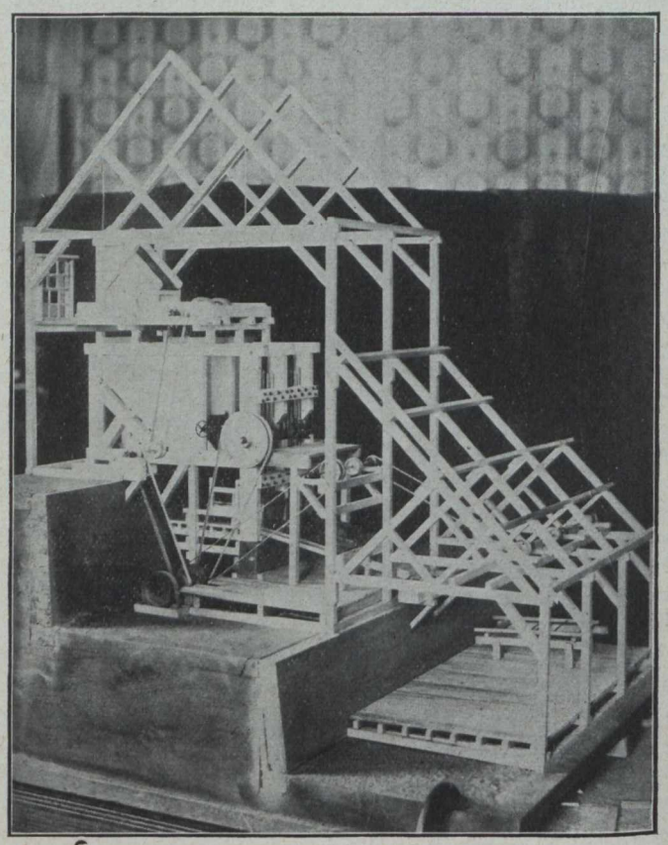
Votes of thanks to the Press of Vancouver, for having gratuitously given much publicity to the meeting of the Branch, and to the chairman and secretary for services rendered, brought to a close a successful and instructive meeting.

A STAMP MILL MODEL.

To Mr. J. W. Evans, Belleville, Ont., The Journal is indebted for the photograph reproduced herewith.

The model stands about 30 inches high. It is a complete and exact replica of a standard 10-stamp mill. The stamps are shod with chrome steel. Even the tiny screens are worked out to scale. The miniature concentrating tables, hardly a foot long, have been so carefully built that they are working smoothly and efficiently. The model will probably be moved to the Victoria Museum, Ottawa.

It will be remembered that Mr. Evans exhibited at Quebec, last year, the model of the Evans-Stansfield electric smelting plant. Both models display remarkable ingenuity.



DIAMOND DRILL RESULTS AT PEARL LAKE PORCUPINE, ONTARIO.

By G. W. Thomson, A.O.S.M.*

We have recently completed some diamond drilling on the property of The Pearl Lake Gold Mines, Ltd., the assay results, and the method I have used to average, present some new features, which I have thought to be of sufficient interest to lay before your readers.

The Ore.

The ore bodies on the surface consist of bands of quartz stringers in a mineralized schist.

The values are obtained only in the presence of quartz, this quartz varying from distinct stringers, widening and combining in places to lenses several feet thick, down to merely a silicification of the schist.

The chief mineral is iron pyrites in a very fine grained state.

Coarse visible gold can sometimes be seen in these quartz stringers, but it is irregularly distributed, as shown by sampling results, which are erratic.

*Mining Engineer, General Manager, The Pearl Lake Gold Mines, Limited.

The mineralized schist between the stringers contains gold, also, differing from the stringers, however, in that the metal is more uniform and constant. It is exceedingly rare to see any gold in the schist.

Indications point to these ore zones having been originally fracture or shear-zones, forming channels of loose country through which the silicious and mineral bearing solutions were able to rise.

The gold, as a rule, appears to be secondary to the quartz.

The schist in these fracture zones is much contorted and of a talcy nature, merging off gradually into the regular schist on both sides.

The planes of schistosity are almost vertical, while the dip of the zones is 65 degrees to 68 degrees.

The drilling points to these structural conditions persisting in depth.

In one place where the ore body was silicified I was able to get the core almost intact, with little loss from abrasion, while in others where the ore body must have been composed of quartz stringers, 1 inch to 4 inches wide, in a soft schist, only short pieces of quartz were obtained, measuring, perhaps 8 inches over all, from 4 feet to 5 feet of ground gone through. When this happened the quantity of sludge obtained was from eight to ten times the usual quantity.

On these occasions the quartz pieces obtained in the core barrel were much rounded, resembling pebbles from a pebble mill.

Attached to some of these quartz pebbles in recesses or crevices were small pieces of the schist and from the feel and general appearance of these I judge that it was of a talcose nature. The schist could be easily picked out with a knife point.

The sludge was collected for each 5 feet all the way down, core samples were taken wherever the core looked promising, and if values were found, consecutive samples were assayed till values ceased.

The feature that I noticed particularly in regard to these samples was that the values in the sludges did not correspond with the richer sections of the core, but appeared to drag, or only show up, 5 feet to 10 feet (depending on the depth of the hole) past where the core was rich. This "drag", however, was more particularly noticeable after we had passed the ore, as indicated by the core samples; and it appeared to extend farther past the ore the deeper the point at which the gold bearing ore was cut.

"Drag."

This "drag" may be explained partly on the ground of particles being suspended in the water, but chiefly, I think, by the time it takes for the uprising current to raise the particles to the surface, the agitation caused by the rods does not permit the thought of much balancing or suspension of particles.

We had not an overabundant supply of water. The speed of the uprising current, I estimate was rarely more than 6 inches to 8 inches a second.

The sludge formed would, of course, vary greatly in size, from the smallest particles which would rise almost as quickly as the water which was carrying them, to other particles whose rate of dropping through water would be almost the same as the speed of the uprising water. These latter would take a long time to rise to the surface.

Particles which were too large to be lifted by the water would remain at, or near, the bottom until broken up.

Take a supposititious case of a hole 1,200 feet deep and of a particle whose rate of dropping through water is 5 inches a second with an uprising current of water at 6 inches a second. Under ideal conditions this particle would rise 1 inch a second and would take about 4 hours to rise to the surface. When going through ore, the drill frequently blocked and the rods had to be raised. The shortest run we had was half an hour; the usual number of times the rods were raised when in ore was from three to five times a shift of nine hours.

From the above it will be seen that most of the heavier particles, containing values, could not possibly have reached the surface when the rods had to be raised. Naturally, these fell back and had to start over again on re-entry of the rods, thus forming the "drag."

The gradual falling away in value of the sludge samples after productive core was passed, as seen from the tables later, appears to confirm this explanation.

This explanation is open to the criticism that possibly pieces from the softer section already gone through might have dropped down. This is possible, but we had remarkably little trouble from caves-in. As a matter of fact we were informed at once of any cave-in by our machines stopping.

I think, however, that the regular extension of this "drag", which, as I show later, varies directly with the depth of the hole, points to the fact that caves-in had not much to do with it.

Having recognized the existence of a drag, a method suggested itself, of arriving at an idea of the value of the ground passed through, especially in those cases when the core was almost entirely ground away.

The following are the core sample results on the occasion when practically all of the core was obtained:—

Table 1.

Depth in hole.	Length. Inches	Assay.	Dollar—inches.
324 ft.—326 ft.	24	$3.20	76.80
326 ft.—327 ft.	12	10.00	120.00
327 ft.—330 ft.	36	8.00	288.00
330 ft.—330 ft. 6 in.	6	2.40	14.40
330 ft. 6 in.—331 ft.	6	1.60	9.60
331 ft.—332 ft.	12	21.60	259.20
332 ft.—332 ft. 10 in.	10	14.40	144.00
332 ft. 10 in.—334 ft.	14	5.20	72.80
334 ft.—335 ft.	12	0.20	
335 ft.—336 ft.	12	Trace	
336 ft.—338 ft.	24	Trace	
Totals	120		984.80

The average, between 324 feet and 334 feet, where the values lie, is $8.20 per ton.

Table 1a.

The following are the sludge samples from the same locality in the hole.

Depth in hole.	Assay.	
320 ft.—325 ft.	Trace	
325 ft.—330 ft.	$4.40	$4.40
330 ft.—335 ft.	3.20	3.20
335 ft.—340 ft.	3.60	3.60
340 ft.—345 ft.	3.60	3.60
345 ft.—350 ft.	2.20	2.20
350 ft.—355 ft.	0.80	
355 ft.—360 ft.	2.20	
360 ft.—365 ft.	....	
370 ft.—375 ft.	0.60	
Totals 25 ft. (5 sections)		$17.00

I have discarded the samples from 350 feet to 375 feet as being possibly the result of a cave-in.

Referring to Table 1, it is evident that no values continue after 334 feet, and, yet, the Table 1a, of sludge samples, shows them to 350 feet at least.

I assume, therefore, that the values from 335 feet to 350 feet belong to the first ten feet and instead of dividing $17.00 by 5, to get the average, I have divided by 2, which gives a figure of $8.50.

This appears to be a fairly close check on the result by the orthodox method in Table 1.

The "drag" is here approximately 15 feet.

Table 2.

This table illustrates a case of where the core ground badly and the few harder, short, pieces that we did get showed practically no values, the sludge, however, carrying them.

Depth of Ground.	Length. Inches.	Actual Length. Inches.	—Assays— Core.	Sludge.
705 ft.—710 ft.	60	60		$1.20
707 ft.—708 ft.	12	12	Trace	
718 ft.—712 ft.	48	8	$1.20	
710 ft.—715 ft.	60	60		5.80
712 ft.—713 ft. 6 in.	18	No record (18)	2.00	
713 ft. 6 in.—718 ft. 6 in.	60	12	2.10	
715 ft.—720 ft.	60	60		5.80
718 ft. 6 in.—720 ft.	18	6	Trace	
720 ft.—724 ft.	48	12	0.80	
725 ft.—730 ft.	60	60		4.70
724 ft.—728 ft.	48	12	Trace	
728 ft.—732 ft.	48	18	Trace	
730 ft.—735 ft.	60	60		4.70
732 ft.—736 ft.	48	24	Trace	
735 ft.—740 ft.	60	60		5.80
736 ft.—740 ft.	48	10	Trace	
740 ft.—745 ft.	60	60		4.80
740 ft.—744 ft.	48	4	0.60	
745 ft.—750 ft.	60	60		5.20
744 ft.—748 ft.	48	48	Trace	
748 ft.—752 ft.	48	48	Trace	
750 ft.—755 ft.	60	60		5.80
752 ft.—754 ft.	24	24	Trace	
756 ft.—758 ft.	24	24	Trace	
755 ft.—760 ft.	60	60		5.20
758 ft. 8 in.—760 ft.	16	16	1.20	
760 ft.—762 ft.	24	24	Trace	
760 ft.—765 ft.	60	60		5.20
765 ft.—768 ft.	36	36		3.80

On examining carefully the above Table 2, and noticing where the core is obtained in its entirety an idea can be obtained of the approximate length of ore in the hole.

Core-sample 707—708 feet is whole, and assays a trace, previous core-samples to this were the same.

Core-sample 708—712 feet, really 48 inches of ground gives only 8 inches of broken core and assays $1.20.

Sludge-sample 705—710 feet assays $1.20 and sludge-sample 710—715 feet assays $5.80.

From these I judge that the ore began at about 710 feet.

The core-samples from this point to 744 feet were badly broken up (see table).

At 744 feet and on, the cores were obtained in their entirety. I judge therefore, that the ore is approximately from 710 feet to 745 feet, being 35 feet along the hole.

The sludge samples continued to contain values to the bottom at 768 feet.

The hole was stopped at this point on account of the barrenness of the core, which was intact, from 744 feet down.

Table 2a.

This table shows the method used to arrive at an idea of the average value of this section, viz., 710 feet to 745 feet.

Depth.	Length. Feet.	Assay.	Dollar-feet.
710 ft.—715 ft.	5	$5.80	29.00
715 ft.—720 ft.	5	5.80	29.00
720 ft.—725 ft.	5	3.80	19.00
725 ft.—730 ft.	5	4.70	23.50
730 ft.—735 ft.	5	4.70	23.50
735 ft.—740 ft.	5	5.80	29.00
740 ft.—745 ft.	5	4.80	24.00
745 ft.—750 ft.	5	5.20	26.00
750 ft.—755 ft.	5	5.80	29.00
755 ft.—760 ft.	5	5.20	26.00
760 ft.—765 ft.	5	5.20	26.00
765 ft.—768 ft.	3	3.80	11.40
Totals	58		295.40

Dividing the dollar-feet by 35, the length of the productive ground, as shown by the core samples, the value is $8.44.

The "drag" in this case amounts to at least 25 feet.

Table 3.

This is an occasion where the core showed some higher values, in this particular case, however, the results were obtained before I had realized the presence of the "drag." Thus I had not kept correct records of the actual length of the core assayed, although the records show that the core was badly broken up.

Depth in Hole.	Ground passed through.	Core Assay.	Sludge Assay.
644 ft.—647 ft. 6 in.	3 ft. 6 in.	.20	
653 ft.—653 ft. 6 in.	0 ft. 6 in.	.40	
655 ft.—660 ft.	5 ft. 0 in.		$3.20
656 ft. 6 in.—657 ft.	0 ft. 6 in.	.40	
657 ft.—657 ft. 3 in.	0 ft. 3 in.	$5.20	
657 ft. 6 in.—658 ft. 4 in.	0 ft. 10 in.	10.20	
659 ft. 0 in.—659 ft. 2 in.	0 ft. 2 in.	58.40	
660 ft.—661 ft.	1 ft. 0 in.	.40	
661 ft.—661 ft. 6 in.	0 ft. 6 in.	2.00	
661 ft. 9 in.—663 ft.	1 ft. 3 in.	.20	
663 ft.—664 ft.	1 ft. 0 in.	6.00	
664 ft. 6 in.—665 ft. 1 in.	0 ft. 7 in.	.20	
660 ft.—665 ft.			8.80
665 ft.—670 ft.			6.40
670 ft.—675 ft.			4.40
674 ft. 6 in.—675 ft. 6 in.	1 ft. 0 in.	1.20	
676 ft.—676 ft. 10 in.		.40	
675 ft.—680 ft.			2.40
676 ft. 10 in.—678 ft.	1 ft. 2 in.	.20	
679 ft. 3 in. 680 ft.	0 ft. 9 in.	.20	
680 ft.—680 ft. 6 in.	0 ft. 6 in.	.20	
680 ft. 6 in.—681 ft.	0 ft. 6 in.	.20	
680 ft.—685 ft.			Trace

The core apparently began to be productive at about 655 feet and continued to about 664 feet.

There is a section between 674 feet—6 inches and 675 feet 6 inches which assayed $1.20. This can, however, be neglected on account of its low value which could hardly affect the sludge samples very materially.

Table 3a.

The sludges, it will be seen, contained values from 655 feet to 680 feet, while the core showed values from 655 feet to 665 feet 1 inch, approximately 10 feet.

SLUDGES.

655 ft.—660 ft.	$3.20
660 ft.—665 ft.	8.80
665 ft.—670 ft.	6.40
670 ft.—675 ft.	4.40
675 ft.—680 ft.	2.40
	$25.20

As the core only shows values for about 10 feet, divide the $25.20 by 2 instead of 5, and the result is $12.60 per ton for 10 feet of the hole.

The drag is 15 feet only.

Table 4.

This is an ore zone at quite considerable depth. There were no other mineralized valuable zones above this.

Depth.	Length of sample. Feet.	Actual length sample. Feet.	Core assay.	Sludge sample.
1150 ft.—1155 ft.	60	..		Trace
1155 ft.—1160 ft.	60	..		$4.50
1154 ft.—1156 ft.	24	5	Trace	
1158 ft.—1159 ft.	12	6	$0.40	
1160 ft.—1165 ft.	60	..		4.40
1160 ft.—1162 ft.	24	9	0.40	
1164 ft.—1166 ft.	24	24	6.00	
1165 ft.—1170 ft.	60	..		Trace
1168 ft.—1169 ft.	12	12	9.20	
1170 ft.—1172 ft.	24	4	0.40	
1170 ft.—1175 ft.	60	..		4.00
1172 ft.—1174 ft.	24	20	2.20	
1175 ft.—1180 ft.	60	—		8.40
1176 ft.—1176 ft. 2 in.	2	2	21.60	
1176 ft. 2 in.—1178 ft.	22	20	4.20	
1180 ft.—1185 ft.	60	..		8.00
1180 ft.—1182 ft.	24	22	1.20	
1185 ft.—1190 ft.	60	..		6.20
1184 ft.—1187 ft.	36	12	0.20	
1190 ft.—1195 ft.	60	..		3.60
1195 ft.—1200 ft.	60	..		3.60
1200 ft.—1205 ft.	60	..		2.40
1205 ft.—1210 ft.	60	..		2.00
1210 ft.—1218 ft. 6 in.	102	..		2.20

On examination of the above table 4 it will be seen that the values come in at 1,155 feet and cease at 1,182 feet.

The core-sample 1,180—1,182 feet was nearly intact and for the remainder of the hole to 1,218 feet 6 inches the core was very good, practically the whole of it being obtained.

The hole was stopped on account of the barrenness of the core below 1182 feet.

The values extended over 27 feet of the hole apparently.

Table 4a.

The value of this section was calculated from the sludge samples as follows: —

Depth in hole.	Length of sample.	Value.	Dollar—feet.
1155 ft.—1160 ft.	5 ft. 0 in.	$4.50	22.50
1160 ft.—1165 ft.	5 ft. 0 in.	4.40	22.00
1165 ft.—1170 ft.	5 ft. 0 in.	Trace (.10)	.50
1170 ft.—1175 ft.	5 ft. 0 in.	4.00	20.00
1175 ft.—1180 ft.	5 ft. 0 in.	8.40	42.00
1180 ft.—1185 ft.	5 ft. 0 in.	8.00	40.00
1185 ft.—1190 ft.	5 ft. 0 in.	6.20	31.00
1190 ft.—1195 ft.	5 ft. 0 in.	3.60	18.00
1195 ft.—1200 ft.	5 ft. 0 in.	3.60	18.00
1200 ft.—1205 ft.	5 ft. 0 in.	2.40	12.00
1205 ft.—1210 ft.	5 ft. 0 in.	2.00	10.00
1210 ft.—12.18 ft. 6 in.	8 ft. 6 in.	2.20	18.70
Total	63 ft. 6 in.		254.70

As the values, as seen from the core-samples, extended over 27 feet the above works out to an average of $9.43 per ton.

The "drag" in this case appears to be at least 35 feet, it would, no doubt, have been slightly longer if the hole had been continued, but owing to the barrenness of the core from 1182 feet down, it was stopped.

Summary of the Holes.

Table.	Depth.	Length of Drag.	Angle of Hole.
1	320 ft.	15 ft.	Inclined at 76 degrees.
2	705 ft.	25 ft.	Inclined at 76 degrees.
3	655 ft.	15 ft.	Vertical hole.
4	1155 ft.	35 ft.	Vertical hole.

Tables 1 and 2 give proportionately slightly longer drags than Nos. 3 and 4, due, no doubt, to the fact that these were from an inclined hole.

General Remarks.

No claim is made that this method of averaging gives accurate results, but I do think that it gives a fairly close approximation, the best that can be obtained under the circumstances.

At first glance it is certainly startling to see an average value, greater than any of the values from which it itself has been calculated.

The outcrops of these ore bodies, indicated in the bore holes, are on a neighbouring property, and I have not accurate sampling results of them there.

A few samples, taken by permission, have, however, yielded results from $2.00 to $56.00.

For further drilling for ore bodies of this nature I would have very close records kept, of the actual length of core obtained for the ground gone through, and the weight and volume of the sludge samples carefully taken; from this information a more accurate idea of the value of the ground gone through could, perhaps, be worked out.

INTERNATIONAL GEOLOGICAL CONGRESS.

The fact that the International Geological Congress, whose 12th annual is to be held in Toronto, meeting in Canada for the first time in its history, does not mean that Canada has been backward in its support of this important organization. On the contrary, Canadians were in the forefront of its inauguration, which was inspired during the 1876 Philadelphia Exposition. At a scientific meeting held at the end of this exhibition a committee was appointed to meet in Buffalo and arrange for an International meeting of geologists to be held in France at the forthcoming Paris Exhibition in 1878.

This committee was called the Comite Fondateur, and the proposed organization named the Congres Geologique International. The Comite Fondateur was replaced by the Comite d'Organization, composed of French geologists, to whom the arrangements for the first meeting were entrusted. This pioneer Comite Fondateur was composed of eleven members, of whom Mr. James Hall, of Albany, U.S.A., was president, and Mr. T. Sterry Hunt, of Montreal, Canada, was secretary. Mr. J. W. Dawson, of Montreal, afterwards knighted for his eminent scientific services, was also a member of the committee.

Those responsible for the Paris Exhibition of 1878, did not confine their scientific interests to geology, and the first meeting of the International Geological Congress was really one of a number of international scientific meetings.

The first meeting of the Congress, held in Paris in 1878, was one of a series of international meetings on scientific and technical subjects, and was an unqualified success. It was international in actuality as well as in name. Twenty-three countries sent representatives, those of Canada being Messrs. Selwyn, F.R.S., Director, and T. Sterry Hunt, member of the Geological Survey, with M. Paul de Caze, the Canadian Government's official representative at the Exposition.

The objects of this first congress were chiefly to make rules for a uniform system of mapping, and the nomenclature and classifications used in geology, and to discuss geological topics of international interest. Since then other objects have been added, but all with a single eye to the one principal of making the geologist's work in one country not only intelligible, but also of the greatest possible use and interest to his fellow-geologists in every other country of the world.

REPORT OF DEPARTMENT OF MINES OF NOVA SCOTIA FOR 1911

(Continued from last issue.)

Gold Mining.

The gold production for the year is the smallest since 1862. The direct cause for the small production may be attributed to the closing down of the Richardson mine at Goldboro and the Oldham-Stirling mine at Oldham.

In all, 18,320 tons of gold-bearing rock was mined and crushed, producing 8,389 ounces, 12 dwts. and 4 grs. of gold. This is valued at $159,411 (at $19.00 an ounce), being an average yield of $8.70.

Operations were carried on on 21 properties in 18 districts. In very few cases, however, were operations carried on during the whole year. Much of the work was done by tributors.

The report contains detailed description of work being done on the different properties.

Tungsten.

Prospecting for the tungsten-bearing ore, scheelite, has been carried on at a number of places in the Province with promising results, notably at Waverly, Halifax County; Fifteen-Mile Brook, Queen's County, and New Ross, Lunenburg County.

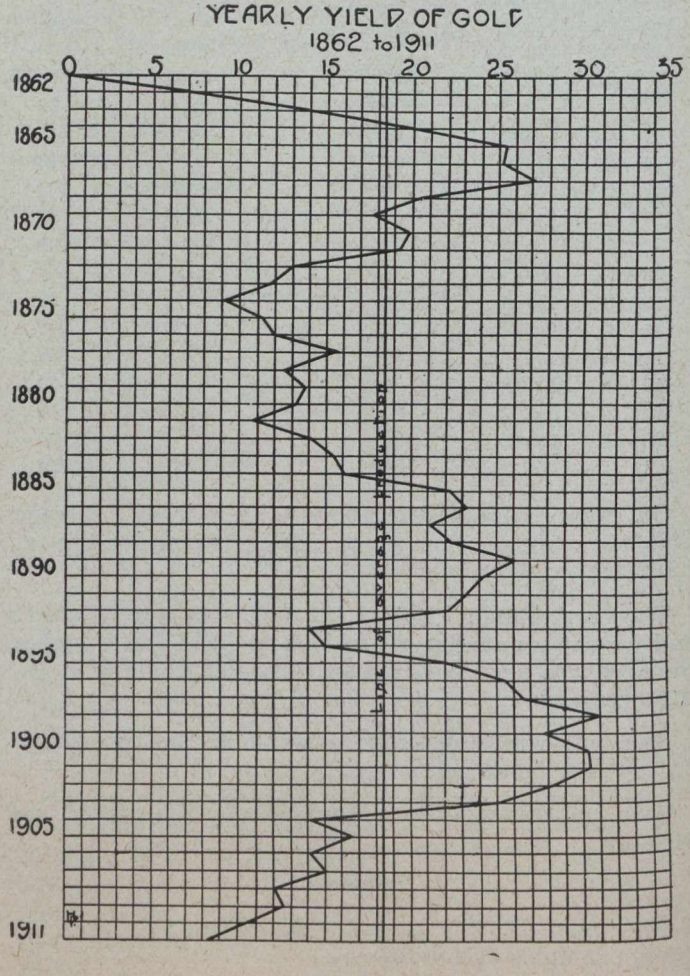
At Fifteen-Mile Brook, Mr. E. R. Faribault, while engaged in field work, discovered scheelite in a quartz vein a short distance north of where numerous pieces of drift had been previously found by Mr. W. H. Prest.

At Scheelite, Moose River, Halifax County, the Scheelite Mines, Ltd., has engaged in mine development and construction of surface equipment and concentrating facilities. Their concentrating mill is now almost completed and they expect to have it in operation by the first of January, 1912. [Editor's note.—The mill has been operating irregularly since the middle of January.] The mill has a capacity of 30 tons per 24 hours. The report gives a description of mill practice as well as a description of the mine and plant.

Barytes.

At Scotsville, East Lake, Ainslie, Inverness County, the Byrites, Limited, is operating on a 9½-foot vein of barytes. The mine is well developed and timbered and yields an excellent grade of sulphate of barium, an analysis of crude ore giving 98.25 per cent.

A plant for grinding and washing is being installed. The capacity of the plant is said to be one ton of finished product per hour.



Gypsum.

Ten miles east of Eastern Harbour, Inverness County, the Great Northern Mining and Railway Company, Ltd., has a mill and two quarries in operation. The description of the property includes notes on quarries, equipment, mill and shipping facilities. (See page 6a.)

Iron.

The amount of iron mined during the year was 53,995 tons, a slight increase over the output of 1910. The Canada Iron Corporation, at Torbrook, was the only operator, all the ore used by the Nova Scotia Steel and Coal Co. and the Dominion Iron and Steel Co., being imported. This amounted to 853,904 tons, of which 831,660 tons came from Newfoundland, 15,734 from the United States, and 6,509 from Europe.

Of the ore mined at Torbrook, 200 tons were shipped, 357 tons sent to concentrator, and the remainder put on stock pile at the mine. The total amount of ore on hand at Torbrook and Port Wade is now in round figures 110,000 tons.

A modern concentrating plant is being erected by this company at Nictaux.

Auriferous Antimony.

The West Gore Antimony Company at West Gore, did not operate its mine during the year and the production of 191 tons of concentrates made and shipped was from the milling of 2,004 tons from dump.

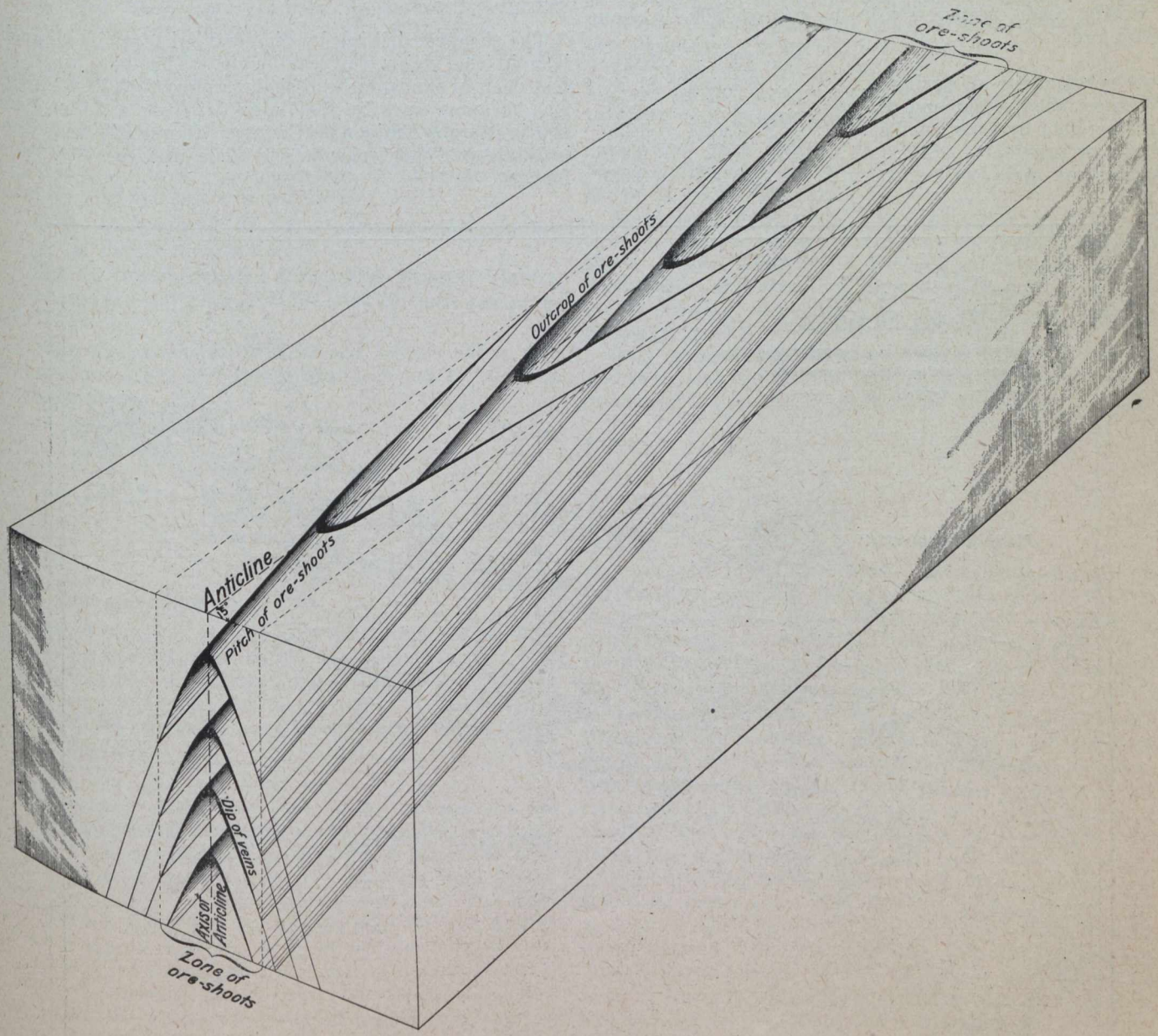
This company has for the past two or three years been engaged in litigation with respect to titles. It is stated that a settlement has been reached and that mining operations are to be resumed during the coming year.

Manganese.

But one company was engaged in connection with the mining of this mineral, namely, the Nova Scotia Manganese Company at New Ross.

This company has been actively engaged in mine development, and in the erection of surface buildings and placing equipment.

High grade pyrolusite, such as the product of this mine, is used by glassmakers, paintmakers, steelmakers, electrical equipment makers, and manufacturing chemists. The poor grades or run-of-mine product being taken by the steelmakers, and the highest grade, or what is known as air-float product, being taken by the manufacturing chemists.



Ideal Projection of Scheelite Measure

As yet no ore other than for test purposes has been shipped. The operators state that reports so far received are most satisfactory.

Tin.

Prospecting for this mineral at the New Ross District, carried on by A. L. McCallum, et al., during the summer of 1910, was continued during the spring and early summer. Additional prospect shafts were sunk and considerable surface trenching done. Tin ore in economic quantities was not met, and the work has been discontinued.

Government Drills.

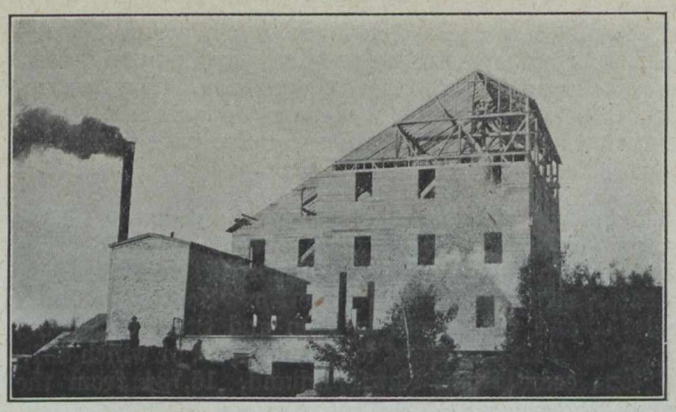
There were 14 holes put down, making the total number of feet bored 4,618 feet 8 inches, a decrease of 1 hole and 602 feet 11 inches when compared with the boring of the previous year. Of the holes put down 10, or 3,134 feet 4 inches bored, were by diamond drills, and four or 1,484 feet 4 inches bored, were by Calyx drills.

Several holes had to be abandoned on account of caving, but no holes were lost, and the holes abandoned were in very badly faulted structure.

The average cost per foot for all boring was $1.28, an increase of $0.29 over the average cost of last year.

Boring costs, compared with the cost of 1909-10, show as follows:

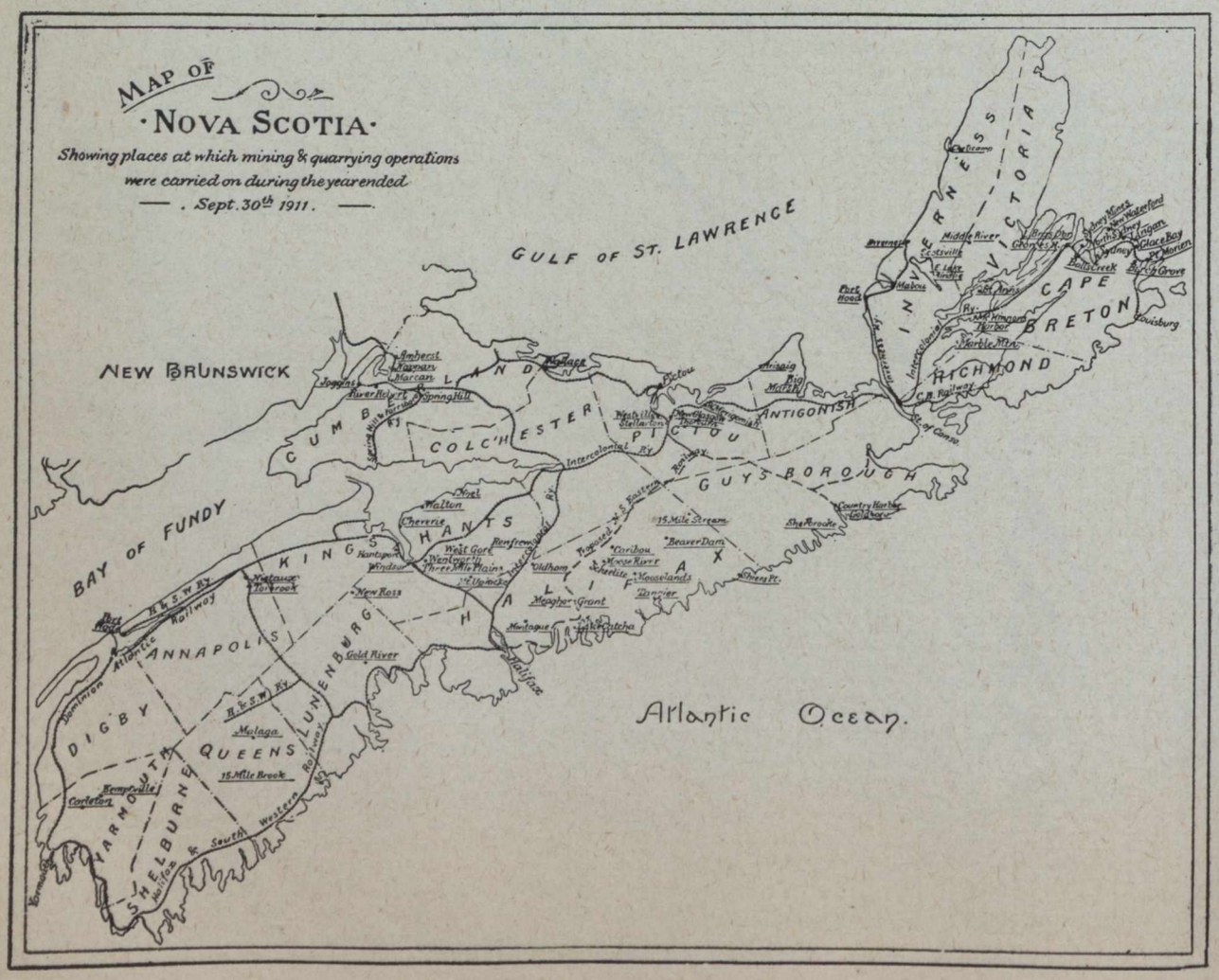
	1910.	1911.
Cost per foot for all boring	$0.99	$1.28
Cost per foot by diamond drills	0.93	1.30
Cost per foot by Calyx drills	1.44	1.25
Shot cost per foot	0.02	0.046
Carbon cost per foot	0.067	0.096



New Ross Manganese Mill

The cost of diamond drilling was increased by the work done in faulted and caving ground at the Moose River Gold mines. Here 41 feet 8 inches of hole drilled cost $6.20 per foot. At Stellarton, delay in getting casing increased the cost of a 284-foot hole, and $3.26 per foot.

The cheapest drilling by diamond drill was in a 2-inch hole in the vicinity of Stellarton. This hole was 705 feet deep in sandstone and shale, and cost $0.70 per foot. The cheapest work by the Calyx drill was a 6-inch hole at Big March, Antigonish County. It was 827 feet deep in sandstone, conglomerate and shale, and cost $1.07 per foot.



TAXATION AFFECTING MINING IN BRITISH COLUMBIA.

From the report of the provincial commission on taxation in British Columbia, which sat last autumn in various parts of the province, and the report of which was presented to the Legislative Assembly on January 22nd, the following information directly affecting the mining industry, as printed in the Victoria Colonist, has been obtained:

"**Coal Land Tax.**—One per cent. on assessed value on worked mines, two per cent. on unworked mines.

"Many witnesses directed the attention of the commissioners toward the disparity between the cost of coal at the mine-head and the price paid by the consumer.

"Appeals to be relieved from the tax on coke were also urged.

"The commissioners refer the evidence regarding the cost of coal to the consideration of the Government. They recommend that the tax on coke be reduced from 15 cents to 10 cents a ton.

"**Mineral Tax.**—Two per cent. on assessed value of ore. Revenue for the year 1910-1911, $91,038.43.

"The report describes the system in vogue in the province of taxing minerals, and draws attention to the present market value of copper.

"Complaints of witnesses were generally directed towards the inequality of the tax as between high-grade and low-grade ores. A suspension, or alternatively, a reduction, of the tax was asked for.

"The commissioners do not recommend any change in the tax imposed on minerals.

"**Tax on Crown-granted Unworked Mineral Claims.**—Revenue for the year 1910-1911, at 25 cents per acre, $42,020.84.

"Upon the evidence as adduced before them, the commissioners are of opinion that this tax is fair and reasonable.

"**Revenue (or Poll) Tax.**—Revenue for the year 1910-1911, $313,338.

"After consideration of this tax from historic and economic points of view, the report proceeds to show that the evidence for and against it was varied and voluminous, and the commissioners have set forth at length their reasons after considerable deliberation, for recommending the abolition of this tax.

(Note.—The Poll Tax affects workers in mines in common with all other "male persons over eighteen" in the province.)

ONE EXCURSION.

The last member of a party of American mining engineers who went to Mongolia two years ago has just returned to New York, their enterprise having been abandoned after almost a million dollars was sunk in it by Russian and French capitalists.

The engineers were employed to investigate reports that certain parts of Mongolia were rich in gold. The site of the operations was in the highest region of the country, at the confluence of two rivers with systems of affluents, all of which were conjectured to be rich in deposits of gold dust and nuggets washed down from the mountains during millions of years.

The engineers, 37 in number, took with them machinery of the latest type, including dredges built in this city and barges built in Pittsburg.

On their way inland, they were attacked by Chinese bandits, and in a pitched battle the party's rifles killed 47 of the robbers.

Eighteen others were taken prisoners and turned over to the nearest mandarin who promptly beheaded them. James Dietrich, a Pittsburg engineer, has an interesting collection of photographs, taken at this point, showing, in succession, each one of the eighteen prisoners as the sword was about to fall.

Only small quantities of gold were found by the expedition, and the cost of mining this was about $5 an ounce more than the market value of the refined gold.

SPECIAL CORRESPONDENCE

ONTARIO.

Cobalt, Gowganda and South Lorrain.

[Editor's Note.—In our last issue the discovery in the Keewatin at the Coniagas mine, Cobalt, was reported to have been made without the mine captain's knowledge. We are assured by the management that this is a mistake. Captain Martin was responsible for this find and deserves credit for following into the Keewatin.]

The extension of the No. 9 vein of the Coniagas into the Keewatin, the striking of rich ore on the Casey Cobalt and the cutting of lead carrying high-grade silver at the Silver Leaf promise to arouse more interest in exploration work in the Cobalt camp and its vicinity than for years past. The drift along vein No. 9, half way up the stope from the 75-foot level in the Coniagas, is still in good ore at 160 feet from the contact. It is estimated that there is already in sight a carload of ore from the extension of the vein in the Keewatin and the returns from this will be devoted to discovering if this enrichment of the vein in an unexpected quarter is a freak or if it may be looked for at other levels. So far no raising or sinking has been attempted and so no information is to hand as to the depth of this streak of ore. The drift will be run beyond the contact on the 150-foot level, and if good values exist there too, it will give the possibility of unsuspected ore reserves for the companies operating along the West Ridge.

At Kerr Lake, after the Crown Reserve has operated the Silver Leaf for two years and a half, definite and promising results are reported from the 475-foot levels. It is stated that twenty feet from the Crown Reserve boundary a rich stringer has been cut and that another and a larger but leaner streak of ore has been also cut. This find also will once more raise hopes of discovering ore in some of the abandoned mines.

Until Mr. John Redington took charge of the Townsite and the Casey Cobalt mines two years ago, the former had been entirely unproductive, although mining had been going on steadily for six years. Since he left the property has been shipping a considerable tonnage and has been more than paying its way. It is now reported that at the bottom level some remarkably rich ore has been found and it is possible that operations may extend to other portions of Casey Township or to a few

spots where the rock outcrops. In the general Cobalt boom the Casey was staked because it was conglomerate rock and the shaft was put down on a smaltite vein not very rich in silver. The company is controlled in England and the news of the discovery was known there long before it was allowed to be published abroad in Canada.

The Nova Scotia mill has shut down until such time as a radical alteration can be made in the flow-sheet. The process was designed to treat silver as it occurs in the diabase in the Cobalt district for the most part as leaf silver distributed in the wall rock. When the Nova Scotia's own ore was exhausted, contracts were made with the Kerr Lake and the Crown Reserve, and about 120 tons per day have been treated every day from the dump heaps of these two mines. It has now been found that at the present contract rates the operation was not remunerative and the mill is being thoroughly overhauled and adapted to meet conditions as they exist in the more complex ores to be found in the Keewatin and conglomerate. It is a remarkable tribute to the continued productivity of the Cobalt camp that there is not a single stamp idle and but one mill, that at the Silver Cliff where rolls are used for crushing.

Fifteen tons of very rich ore have been shipped out of the Mann mine at Gowganda. The ore was taken from an old open cut on this property, which up till a few months ago had been shut down a year and a half, or since the Gowganda boom. It is a peculiar fact that native gold, not in commercial quantities, has been found in the silver vein.

Tenders for contracts on the Elk Lake branch of the T. & N. O. Railway are to be submitted on March 30th, and construction will be commenced at once. In the meantime there is considerable stir at Elk Lake again and the Donaldson and other companies have ordered plants. The Donaldson is reported to be mining good ore.

In February, the Nipissing production was $226,419 net, while the shipments reached $545,559. This is the largest amount that the Nipissing has ever shipped out in one month and certainly the most that any Cobalt mining company has despatched in the same period. There were favourable developments on the Meyer and No. 100 veins, 57 feet being added to the stoping length of the Meyer and a considerable block of additional ore being actually put in sight at No. 100 vein. Excellent progress is being made with the new mill.

It is stated that development in the conglomerate formation at the 300-foot level of the Cobalt Provincial is getting very good results. The vein being drifted upon is about two inches wide of high-grade ore and four other veins with possibilities have been cut.

The shipments of bullion from the Cobalt camp up to the end of February reached 1,052,935 ounces, of a total value of $619,820. To this total the Nipissing has contributed about two-thirds. It is stated that the Ophir Cobalt will pump out the shaft and recommence operations this month. Some of the unissued stock has been sold and another attempt will be made to make a mine of the property. It has been shut down since last August.

With the dividend of 5 per cent. paid on March 15th. the Crown Reserve has now returned to original stock holders 220 per cent. on capitalization, or $3,959,821. The new find on the Silver Leaf lease is being vigorously explored and some good ore is being taken out.

Porcupine, Swastika and Other Gold Districts.

There is as yet no whisper of the new district that has year by year drawn and maintained the interest of the prospector in Northern Ontario. The Hurricane failed to enthuse anyone. There is little doubt that one or two ships will leave Newfoundland this winter for the rumoured placer field on or near Ungava Bay. The Donaldson expedition turned back after penetrating but twenty-three or twenty-four miles north of the Trancontinental Railway, and it is but crediting them with ordinary common bush sense to believe that they had some less arduous objective than the Ungava wilds. It is certain that they were outfitted rather for a permanent camp than a wild rush across 900 miles of country, breaking their own trail as they went. Dane, also, is scarcely the spot that adventurers in the far north would have chosen to leave their base of supplies. It is probable that the first man to prospect the ground where it is once more rumoured that placer has been found, will be Mr. Robert Flaherty, who is already on the ground and will, when the snow goes, strike east, probably along Leaf River and Minto Lake to Ungava Bay. He will thus have a formidable start over all competitors. Meanwhile the Porcupine camp is definitely getting down to business. The McIntyre mill had hardly commenced to drop stamps (they had but run 174 hours) when the Porcupine Power Company cut off the power from all but their contract customers, and the milling operations were perforce stopped for some time. But at the Dome the 400-stamp mill is gradually getting into tune and during the third week in January, stamps were dropped for the first time, not to crush ore, but as an experiment. There is no question but that the mill will be ready and running by March 30th, when the big demonstration is planned. To visitors it will be an added inducement that the underground workings of the Dome will be exposed to the public eye for the first time through the hours of nine till one in the forenoon. This should be considered a privilege since the same advantage was denied two weeks earlier to one of the most representative groups of American and Canadian engineers.

The low water on the Mattagami River and the consequent failure to deliver power from the Porcupine Power Company at Sandy Falls will be a very disturbing factor to progress in the Pearl Lake section as long as it continues. For one day all the mines supplied were without power, now some half-dozen are affected, so that while they can still keep the mines dry, little progress can be made. The companies most affected are the Plenaurum, the Jupiter, the Moneta and the McIntyre. The Hollinger, the Vipond and the Pearl Lake, being contract customers, are being supplied with current and the former have either returned to the steam plant they were using originally or are renting air from a neighbour. The Dome has sufficient steam power to meet all its present needs, but will certainly obtain power from some source at the earliest moment. The Porcupine Power Company has already sold most of the current it can deliver at high water, and the necessity for the completion of the Waiwaitan Falls plant is being felt. As soon as Mr. A. E. Wallberg can get clear of his financial difficulties and can deliver power he will find plenty of customers.

The first annual report of the Northern Ontario Exploration Company, of which Bewick-Moreing Company are general managers, shows that operations in Porcupine and elsewhere gave a net profit of $357,405. The directors have written off $200,000 from the cost price of the shares. The report indicates that the company is likely to divert its energies from Porcupine, where its success was but moderate to Alaska.

A distinguished party of mining engineers and writers on mining affairs visited the Porcupine and Cobalt camps last week, as guests of the Canadian Mining Institute. They were T. A. Rickard, editor of the Mining Magazine, of London, and owner of the Mining and Scientific Press, of San Francisco; Theodore Dwight, of New York; J. L. Garrison, consulting engineer of Philadelphia; N. V. Noris, coal mining expert of Wilkesbarre, Penn.; W. R. Ingalls, editor of the Engineering and Mining Journal, of New York; H. W. Hardinge, inventor of the Hardinge mill; Harry Kehoe, Spokane; Prof. F. H. Sexton, Halifax, director of the Technical College of Nova Scotia,

and E. Jacobs, secretary of the Western Branch of the Canadian Mining Institute. The party, accompanied by eminent Canadian engineers and geologists in the capacity of guides, came direct to Porcupine where they examined the Hollinger and the Dome. At Cobalt they had more time and went through the Coniagas mine and mill, the Temiskaming mine and mill, the Trethewey mine and mill, and the Nipissing mill.

After a protracted search the No. 3 vein of the Vipond has been cut and is now being drifted upon. This is at the 200-foot level. The vein was reported cut some time ago, but it was discovered that a mineralized zone of no great value had been encountered. The vein, as it now shows in the drift, is from four to five feet wide and appears to be of much the same grade of ore as at the 100-foot level, where it ran over $11.

Before the power was cut off the McIntyre mill, the first to drop stamps in the camp since the fire, had run about 200 hours on lean ore. It first commenced to crush on March 1st and since then the 10-stamp plant has been making about $500 per day from the plates and another $50 in the concentrates. The process is merely experimental, being simply amalgamation and concentration of the tailing. The tails are at present only running about 50 cents to the ton. A clean-up house is now being built and before the end of the month the first gold bar should be shipped.

Prospectors who have wintered in the south are beginning to come back and are going out on their claims to do the work. Several good surface finds are reported from Swastika.

Crosscutting for the vein at the 400-foot level of the Rea has been in progress for some time, but so far the ore body has not been picked up. The work of sinking the shaft was carried out very expeditiously and the mine has been thoroughly resampled at all its levels and in all its workings.

Work on the Dome Lake property is making good progress. Two shafts, both on the vein, have been sunk to the 50-foot level and assays running over $20 per ton have been taken from the bottom of both shafts. Drifts are now being run from both shafts to connect up the two workings. Two diamond drills are operating on the property.

GENERAL MINING NEWS

QUEBEC.

Montreal, March 20.—At the adjourned annual meeting of the Amalgamated Asbestos Company this afternoon, the old directors, with the addition of Messrs. Doucet and Cook, were re-elected until March 31, when the Royal Trust Company will take over the concern, to reorganize it for the benefit of the bondholders, for whom it is acting as a trustee. The terms have been previously announced.

ONTARIO.

The Elk Lake branch of the Temiskaming & Northern Ontario Railway which was promised by the Provincial Government during the recent campaign, is to be placed under construction at once. The line is to run from Earlton to Elk Lake, thirty miles, and the successful tenderers are Messrs. McCaffery and McQuigge, of Toronto. Their tender, $180,000, was the lowest of twelve received, some of which, it is understood, were from foreign contractors. "The gradient of the new road," said Commissioner J. L. Englehart, "will be better than that of our main line, six-tenths of one per cent. being the maximum grade. The contract calls for the construction only of the roadbed, for ties and rails will be laid by the Commission. Work will be begun as soon as the contractors can start the contract calling for the completion of the work by September 1st. It is expected that the line will be in operation this year."

Elk Lake, March 15.—The syndicate which purchased the Hitchcock property has lost no time in getting to work. The buildings are now ready for occupation and the machinery is being put in place ready for work. The option agreement provides for an expenditure of about $40,000 in development on this property and will insure steady work for a year to complete the requirements.

South Porcupine, March 17.—Within the past two days the Vipond has cut its No. 3 vein at the 200-foot level. At about 80 feet from the crosscut the vein extends right across the face of the drift, and has every appearance of making as good ore as on the 100-foot level, where it ran over $11. It was reported that No. E 3 vein had been cut some time ago, but this was afterwards found to be a mineralized zone, giving low assays, and not directly related to the main vein.

Six hundred and fifteen tons of ore have been shipped from the McKinley-Darragh mine since January 1st. The two new veins, discovered under the swamp in the unexplored section of these holdings, average about three inches in width, and have been giving values of 2,500 ounces to the ton. Another important vein has been discovered in the second swamp at the 150-foot level, and this mine is proving itself to a considerable degree.

Cobalt, March 21.—The new plant has been installed on the property of the West Coleman Silver Mines. This plant was rushed in before the spring break-up of the snow roads, and considerable yet remains to be done before actual development can proceed. Camp buildings for the accommodation of a considerable force of men are being erected on the Porcupine Kendall property in Deloro Township, Porcupine. As soon as they are completed diamond drilling will be commenced to determine the values existing at depth on the property. Good surface assays have been obtained where other bodies have been stripped. The underground work at the Dominion Silver property has been temporarily suspended. Sinking will be commenced on the surface showing, and the shaft will probably be driven to the 200-foot level, the policy of deep mining having proved to be the best in that zone, which includes the Beaver and the Temiskaming.

Porcupine, March 24.—The last camp of the Bewick-Moreing Company in Porcupine was shut down yesterday, and the plant is for sale. Last summer the English company had three camps on the various claims, sold to them by the Timmins syndicate, but all have been closed down for some time, with the exception of No. 1, where work was suspended last week.

In the Mann mine, Gowganda, native silver, lately produced, is assaying 998 fine.

The interest being taken in the Ungava and Labrador gold fields, which are being reported as fabulously rich, has assumed significant proportions. Already some fourteen expeditions are equipping to leave for the far north this spring. One expedition is to sail from St. John's, Newfoundland, the latter part of May, reaching the gold fields about the end of June. The expedition is composed of ten men, who have had long experience in placer mining in Alaska, and are thoroughly versed in all the ramifications of this kind of mining.

BRITISH COLUMBIA.

Kaslo.—In response to a call eminating from C. F. Caldwell, of the Utica mine, and issued in the form of printed dodgers, a large number of citizens from every walk of life met in the council chamber to take the initial steps to form a mining men's club. The large number present was a surprise to many and the chamber, not affording sitting room, many stood in the hall and either listened to or took part in the discussion as it progressed. Mayor Garland occupied the chair. Mr. Caldwell set forth the object of the meeting and explained the aims of the club and told what a vast amount of good similar organizations had done for the capital of the inland empire. A committee of five with John Keen as chairman was appointed by the chair to provide ways and means to bring to fruition the plans which were submitted during the evening, and to report on Tuesday. It is proposed to secure apartments for the club in which to transact its business and entertain any who may seek its assistance in any of those matters on which it will be its peculiar function to afford help. An accurate record will be in possession of the club of every mineral claim of the country where it is, what work has been done on it and all other information which will enable a man who is interested to get possession of reliable facts connected with it. Maps will be kept, showing not only the mines and undeveloped claims, but also the trails and other means of reaching it. Mineral exhibits will also be on view. Information regarding the land, the lime, timber, fish and other sources of the country's wealth will also be classified and made available to the interested enquirer, whether he be miner, tourist or prospective settler.

Rossland, March 13.—Smelting 25,156 tons of ore during last week, the Granby smelter not only exceeded the amount of any previous week since the resumption of operations, but created a new record for a week's smelting tonnage at the reduction works. During the week 430,000 pounds of blister copper were shipped, bringing the total for the year to date up to 3,973,000 pounds.

Grand Forks, March 15.—The mines and smelters of the Boundary are making new records in the shipment of ore and in the smelting of the same. During last week 38,796 tons of ore were sent out by the shipping mines of the district. The total shipments from Boundary mines for the year to date are 323,619 tons. At the Granby smelter in this city a new record was established last week, 25,156 tons of ore being run through the eight furnaces in seven days, giving the Granby a total smelter treatment of 213,020 tons for the year to date.

The B. C. Copper Company's smelter at Greenwood treated 14,000 tons of ore during last week, bringing the total for that reduction works for the year to 106,039 tons, and giving the two Boundary smelters a combined treatment for the year of 319,059 tons.

The blister copper shipments from the Granby during the week amounted to 430,000 pounds, bringing the total copper shipments for the year so far up to 3,973,000 pounds.

GENERAL.

Fort Smith, Ark., March 20.—Mine No. 2 of the San Bois Coal Company, at McCurtain, Okla., was wrecked to-day by an explosion of gas in the ninth level, and fire and smoke have thus far prevented any effective work of rescue. One body has been brought out, and it was so badly burned that experienced miners believe there is little hope that any of the 85 men composing the day shift at the mine at the time will escape alive.

McCurtain, Okla., March 21.—Thirty-five men entombed in the San Bois mine, where an explosion occurred yesterday morning, had not been accounted for early to-night. Twenty-six men had been rescued during the day, and 55 bodies had been brought to the surface. Rescue parties still are at work to-night harbouring the faint hope that possibly more may be found alive. Fifteen men rescued to-day were found huddled in a room on the thirteenth level. They rushed there when they heard the explosion, and kept themselves alive with an air-pump. Searching parties were directed to the room by tappings on the air-pipes. The condition of two of the men is serious, but the others seem none the worse for their experience.

Venezuelan Ore Lands Venture.—According to Mr. F. G. Jones, who recently returned from a visit to the property of the Canadian Venezuelan Company, there are 150 men at work and most of the machinery necessary for the equipment of the mines is on the ground. The "Alabama" has left for Philadelphia with the first cargo of ore and from now on regular shipments will be made, although these may not reach any large amount until mid-summer or early fall. The difficulties in connection with the construction work were many, but these are being gradually overcome. The ore is of the best quality and will average 64 per cent. iron, with low phosphorous and is an ore which can be easily reduced. The quantity has been demonstrated to be amply sufficient to justify all expenditures the company is making.

COMPANY NOTES

HEDLEY GOLD MINING COMPANY.

A published summary of the annual report of the Hedley Gold Mining Company, owning and operating the Nickel Plate and Sunnyside mines, in Hedley camp, Similkameen district, British Columbia, gives the following brief information:

The company's 40-stamp mill, with cyanide plant, was operated continuously during the calendar year 1911. The quantity of ore crushed and treated was 57,815 tons, of an average value of $11.99 per ton, from which an extraction of 94 per cent. of the gold was made. A reserve of approximately 10,000 tons of broken ore in the stopes has been maintained throughout the year. The estimated total tonnage of ore in sight is now fully as large as when the property was purchased by the present owners. The development work done during the year consisted of drifting, 655 feet; sinking, 425 feet; and raising, 235 feet; total 1,315 feet. Diamond drilling totalled 3,160 feet.

The statement of accounts shows that a net profit of $318,152 was made, and that, out of this, a total of $300,000 was paid to shareholders, this being at the rate of 25 per cent. on the issued capital of $1,200,000. The balance of net undivided profit at credit of the company at the close of the year, after payment of dividends, was $200,861, and this, after charging to operating expenses all expenditures of every kind made in 1911.

NORTHERN ONTARIO EXPLORATION.

The pamphlet report of the Northern Ontario Exploration Co. as of December 31st last, has been distributed to Canadian shareholders. It shows that the company made a profit through

the purchase and sales of other shares amounting in all to £81,481. The company still held shares in other companies at a cost of £100,941, but had written down this cost to £60,941, using £40,000 of the profits for this purpose. In addition to these holdings, the company had in cash or loans £98,790 against a capital stock issue of £119,425.

LA ROSE DIVIDEND.

The directors of the La Rose Mines Company met in New York on March 20 and declared a quarterly dividend of 2½ per cent., increasing the annual rate from eight to ten per cent. Two new directors were elected to the vacancies created by recent resignations of Messrs. Earle and Greene. The new directors are Canadians of prominence, who will undoubtedly add strength to the board. They are Messrs. Edwin Hanson, of Montreal, and William Dobell, of Quebec.

The reports of the treasurer and general manager of the operating company and the report of the treasurer of the holding company for the fiscal year ending December 31st, 1911, will be submitted at the annual meeting of the company to be held at Augusta, Maine, April 29th. Advance copies of these reports will be mailed to every shareholder in the early part of April.

The report of the president, Mr. D. Lorne McGibbon, says in part: "The production of silver for the year amounted to 3,691,797 ounces, the net value of which was $1,810,470. The cost of production was 19.20 cents per ounce, and the average selling price 53.55 cents per ounce. The ore reserves on December 31st, 1911, amounted to 4,250,861 ounces, of an estimated net value of $1,643,938 and the combined surplus of the operating and holding companies amounted to $1,551,420.70 after payment of dividends of $599,450.80.

"Your directors have had under consideration for some time the disposition of this large cash surplus. Three courses have been suggested: to distribute the surplus in the form of largely increased dividends or bonuses, to invest in other mining enterprises, or to keep the surplus intact until the value of the properties now owned by the company have been fully demonstrated. After giving the matter very earnest consideration your board has come to the conclusion that the best interests of the shareholders would be served by adopting a middle course, namely, to increase the dividends to 10 per cent. per annum, payable quarterly, and, in view of the fact that the company has still a large undeveloped area to continue the vigorous policy of development which has produced such satisfactory results during the past two years, and, as opportunity presents, to acquire interests in other mining enterprises which, after thorough examination and the reports of the most competent and reliable engineers, are considered proper investments for the company's funds. This policy conservatively followed should make your company a permanent organization for the profitable development of mining properties."

Herewith is a comparison of statistics for 1910 and 1911:—

	1911.	1910.
Cost of production (cents)	19.20	19.11
Selling price (cents)	53.55	53.95
Ore reserves (ounces)	4,250,861	5,556,248
Est. net value ($)	1,643,938	2,034,686
Combined surplus ($)	1,551,420	917,728
Dividend paid ($)	599,450	475,000

TEMISKAMING DIVIDEND.

The Temiskaming Mining Company has declared a 3 per cent. distribution of profits. This is the first distribution in upwards of a year. The directors stopped dividends shortly after they bought the North Dome.

The dividend cheques will go out on April 18th, and with them will go a ballot by which shareholders may express their opinion regarding the proposed sale of the North Dome property.

The last dividend on the Temiskaming was paid October 17th. The dividend record to date is:

1908	9	$200,156.25
1909	12	300,000.00
1910	11	275,000.00
1911—April 10th	3	75,000.00
July 12th	3	75,000.00
October 17th	3	75,000.00
Totals	41	$1,009,156.25

NIPISSING QUARTERLY.

Contrary to the predictions in some quarters, the Nipissing Mines Company has declared the regular quarterly dividend of 5 per cent., and the usual quarterly extra dividend of 2½ per cent., payable April 20th. Books close March 30th and reopen April 18th.

The financial statement presented at the meeting to-day shows cash on hand, ore in transit to smelters, and at the mines amounting to $1,468,000.

The statement of the Nipissing operating companies as of March 16th shows cash in hand, ore in transit to smelters, and ore sacked at mines ready for shipment amounting to $1,468,000.

This is the best figure ever recorded in the history of the company.

COBALT LAKE.

President Pellatt's report read at the annual meeting of Cobalt Lake shareholders, showed a reduction in the capitalization of the company during the year of 625,115 shares, the outstanding capital thus being reduced from $3,929,166 to $3,304,051. Since the report was compiled it is understood there has been a further reduction of about another 100,000 shares.

The financial statement was equally satisfactory, a debit balance of $209,005 at the end of 1910 having been paid off and replaced by a credit balance of $80,847 at the end of 1911. In addition the company during the year erected a concentrator at a cost of $64,216.

Net returns from ore for 1911 were $323,793. Engineer Gordon estimates ore reserve at 2,851,180 ounces of a gross value of $1,425,590.

YUKON GOLD COMPANY.

In the calendar year 1911 the Yukon Gold Company reports an increase of $4,233 in surplus, bringing the total profit and loss surplus to $386,654. There was charged off for depreciation $434,108, an increase of $145,309. Dredge and hydraulicking produced a total of $3,116,227, which compares with 3,847,108 in 1910, a increase of $269,119. The gross hydraulic production was $444,382, which compares with $693,375 in 1910. This decrease it is explained in the report "was due to the fact that mechanical elevators were not operated during the season of 1911, as the dredges were found to do the work at much less cost." The dredge operations produced $2,671,845 gross gold, which compares with $2,150,733 in 1910, the increase being $521,112.

During the year the total yardage was increased 1,930,000 cubic yards, the company acquiring a number of creek claims by purchase or working agreement. The dredging equipment

was increased two dredges, making nine in all. The dredge operations were commenced three weeks earlier than in 1910, handling 4,159,249 cubic yards of an average value of 64.35 cents, which compares with 3,249,788 yards of an average of 66.18 cents in 1910. The cost increased from 31.09 cents a yard to 35.43 cents, the net yield being 28.92 cents, against 35.09 cents.

Hydraulicking operations disposed of 2,125,551 cubic yards, an increase of 19 per cent. Hydraulicking was handicapped by extremely low water in the latter part of the season, but despite the handicap the recovery was made with a cost of 15.5 cents a cubic yard, the lowest in the history of the company.

BEAVER DIVIDENDS.

The Beaver of Cobalt, which has just declared a 3 per cent. dividend, has this dividend record:

	P. C.	Amount.
1911—May 15	2½	$45,000
August 21	3	60,000
December 15	3	60,000
1912—April 20	3	60,000
	11½	$225,000

ORE CONCENTRATION COMPANY (1905), LIMITED.

During the month of January the Elmore vacuum plant at the mines of the Sulitelma Company, Norway, produced 720 tons of copper concentrates.

CROW'S NEST PASS COAL.

At the conclusion of the annual meeting of the Crow's Nest Pass Coal Company, Mr. Elias Rogers, president, said: "The board has decided to issue no financial statement for publication. In view of the fact that a strike among the miners was in progress most of last year, there is very little that we could say, in any event. But, while that is the fact, conditions are now on a normal basis, and we purpose reaching out for new avenues of trade to meet the restrictions placed upon the volume of our output in certain directions. We have lost business through the glut of American coal in the western market, and as a result of railways in the Western States adopting oil as a motive power, but we hope to bring our output up to its former level by seeking purchasers farther east than we have done in the past."

STATISTICS AND RETURNS

BRITISH COLUMBIA ORE SHIPMENTS.

The Consolidated Mining & Smelting Company of Canada ore receipts at the Trail smelter for the week ending March 15th, and year to date, in tons, were:—

	Week.	Year to date.
Centre Star	2,680	32,790
Le Roi	1,413	9,447
Sullivan	643	4,715
St. Eugene	.....	401
No. 1	.....	262
Richmond-Eureka	32	384
Molly Gibson	47	131
Other mines	1,190	10,386
Totals	6,005	58,536

Boundary District.

Following are the returns of the output of the mines and smelters of the Boundary district for the week ending March 14th, and year to date:

	Week.	Year to date.
Granby	25,112	243,003
Mother Lode	8,740	85,785
Rawhide	4,786	22,704
Jack Pot	152	3,669
Athelston	...	340
Emma	436	4,901
Other mines	220	2,633

Smelter Tonnages.

Granby	25,112	288,672
B. C. Copper Co.	13,955	119,994

The ore production for the week ending March 9th and year to date is:

Rossland.

	Week.	Year to date.
Centre Star	3,124	30,110
Le Roi	441	4,249
Le Roi No. 2	384	4,249
Bluebird	....	57

East Kootenay.

Sullivan	459	4,072
St. Eugene	....	401
Society Girl	21	21

Ainsworth.

Utica	....	132
No. 1	27	262

Slocan.

Standard	163	1,788
Van Roi	125	923
Hewitt	....	25
Ottawa	....	28
Eastmount	....	30
Fidelity	....	51
Apex	....	36
Richmond-Eureka	53	352
Rambler-Cariboo	31	319
Reco	....	24
Lone Batchelor	....	31
Ruth	36	215
Middleton	....	24
Other mines	....	228

Nelson.

Canadian King	....	54
Arlington	68	637
Nugget	....	22
Granite-Poorman	....	70
Queen	....	70
Emerald	72	670

	Week	Year to Date
Monarch (Field)	....	28
Silver Cup (Lardo)	....	86
Molly Gibson	84	84
Bonanza	....	45
Foreign.		
Knob Hill	118	861
Hope	....	20
Northport	....	34
Totals	5,282	52,531
Granby	23,479	76,051
B. C. Copper Company.		
Mother Lode	8,740	17,918
Rawhide	5,574	17,918
Emma	....	4,465
Athelstan	....	340
Jackpot	327	3,414
Unnamed	476	1,468
Totals	15,117	103,656

COBALT ORE SHIPMENTS.

Shipments for the week ending March 9 and year to date, in tons, are as follows:—

	Week.	Total.
La Rose	72.70	576.76
Coniagas	29.15	313.20
O'Brien	....	128.98
Right-of-Way	....	66.57
Chambers-Ferland	....	64.00
McKinley-Darragh	30.32	477.61
Nipissing	....	297.09
Hudson Bay	31.17	155.70
Buffalo	29.34	176.36
Crown Reserve	19.89	109.99
Cobalt Townsite	29.00	153.81
City of Cobalt	....	87.33
Trethewey	20.48	92.91
Colonial	....	115.98
Kerr Lake	65.72	103.26
Drummond	....	300.32
Temiskaming	42.44	151.29
Beaver	....	71.99
Wettlaufer	32.57	62.59
Provincial	....	22.22
Casey Cobalt	....	24.50
Totals	435.71	3,765.62

The bullion shipments for the week amounted to $30,750.69, as follows:—

	Ounces.	Value.
Nipissing	22,687.90	$13,215.69
O'Brien	10,262.00	5,747.00
Trethewey	2,024.00	1,093.00
Crown Reserve	18,390.00	10,695.00
Totals	53,363.90	$30,750.69

The following table shows the Cobalt ore shipments for the week ending March 23 and for the year to date:

	Week.	Year to date.
Beaver	.....	123,988
Buffalo	60,610	594,961
Canadian Gowganda	.....	15,967
Casey Cobalt	.....	549,000
Chambers - Ferland	.....	128,000
City of Cobalt	.....	174,673
Cobalt Lake	.....	206,530
Cobalt Townsite	.....	457,744
Colonial	.....	40,000
Coniagas	41,789	814,057
Crown Reserve	36,119	256,139
Drummond	.....	604,000
Hudson Bay	.....	312,412
Kerr Lake	.....	324,008
La Rose	276,198	1,552,831
Mann (Gowganda)	.....	40,000
McKinley	62,933	1,283,652
Millerette	40,000	126,000
Miller Lake-O'Brien	.....	96,500
Nipissing	206,570	1,040,710
O'Brien	.....	334,923
Provincial	.....	44,440
Right-of-Way	87,450	220,296
Temiskaming	.....	432,805
Trethewey	.....	185,823
Wettlaufer	.....	120,087
Totals	811,669	10,092,551

Bullion Shipments.

	Ounces.	Value.
Nipissing	96,906	$56,601
Buffalo	7,679	4,500
Crown Reserve	18,791	10,898
O'Brien	9,618	5,530
Totals	132,985	$77,537

The following table shows the Cobalt ore shipments for the week ending March 16, and for the year to date:—

	Week.	Year to date.
Beaver	.....	123,988
Buffalo	58,678	474,784
Buffalo	59,567	534,351
Canadian Gowganda	.....	15,967
Casey Cobalt	.....	549,000
Chambers - Ferland	.....	128,000
City of Cobalt	.....	174,673
Cobalt Lake	.....	206,530
Cobalt Townsite	84,000	457,744
Colonial	.....	40,000
Coniagas	.....	772,268
Crown Reserve	.....	220,020
Drummond	.....	604,000
Hudson Bay	.....	312,412
Kerr Lake	41,543	324,008
La Rose	143,119	1,276,633
Mann (Gowganda)	40,000	40,000
McKinley	276,052	1,220,719
Millerette	.....	86,000
Miller Lake O'Brien	.....	96,500
O'Brien	77,568	334,923
Nipissing	.....	837,140
Provincial	.....	44,440
Right of Way	.....	132,846
Temiskaming	86,450	432,805
Trethewey	.....	185,823
Wettlaufer	.....	120,087
Totals	808,299	9,280,882

TORONTO MARKETS.

March 21—(Quotations from Canada Metal Co., Toronto).
Spelter, 6.85 cents per lb.
Lead, 4.25 cents per lb.
Antimony, 7 to 9 cents per lb.
Tin, 45 cents per lb.
Copper, casting, 14.95 cents per lb.
Electrolytic, 14.95 cents per lb.
Ingot brass, 7 to 12 cents per lb.

March 21—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).
Summerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Midland No. 1, $19.00 (f.o.b. Toronto).
Midland No. 2, $18.50 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

March 19—Connellsville coke, f.o.b. ovens).
Furnace coke, prompt, $2.10 per ton.
Foundry coke, prompt, $2.75 to $3.00 per ton.
Tin, Straits, 42.40 cents.
Copper, Prime Lake, 14.70 cents.
Electrolytic copper, 14.60 cents.
Copper wire, 15.00 cents.
Lead, 4.00 cents.
Spelter, 6.90 cents.
Sheet zinc (f.o.b. smelter), 8.50 cents.
Antimony, Cookson's, 7.62½ cents.
Aluminium, 18.50 to 19.00 cents.
Nickel, 39.00 to 40.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $48.50 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $44.00 per 75-lb. flask.

SILVER PRICES.

	New York cents.	London pence.
March 8	58¼	26 13/16
" 9	58¼	26 13/16
" 12	58⅝	27
" 11	58½	26 15/16
" 13	58½	26 15/16
" 14	58½	26 15/16
" 15	58⅜	26⅞
" 16	58¼	26 13/16
" 18	58⅜	26⅞
" 19	58½	26 15/16

SHARE MARKET.

(Courtesy of A. E. Bryant & Co.)

New York Curb.

	Bid	Ask
Braden	5¼	5⅜
B. C. Copper	4½	4⅝
Butte Coal	...	...
Giroux	4⅜	4½
Greene-Cananea	8⅜	8½
Inspiration	19	19⅛
Yukon Gold	3⅜	3½
Goldfields Con.	...	...
Nevada Hills	2⅜	2½
Miami	24	24½
Tonopah	7⅞	8
Ray Cons.	17⅜	17¾
Chino	26¼	26⅞
United Copper	1¼	1½

Cobalt Stocks.

	Sales. Low	High
Bailey	.02*	...
Beaver Consolidated	.47	.48
Buffalo	1.25*	...
Chambers-Ferland	....	**.15
City of Cobalt	.16½	...
Cobalt Lake	.27½	...
Coniagas	7.70*	...
Crown Reserve	3.20	...
Great Northern	.13	.13½
Gould	...	**.03
Gifford	.02*	...
Green-Meehan	.01¼	...
Hargraves	.08	.09
Kerr Lake	...	**2.87½
La Rose	4.00	...
McKinley-Darragh	1.69	1.70
Nipissing	8.40	8.50
Nova Scotia	.04½	...
Ophir	.09½	.10
Otisse	...	...
Peterson Lake	.08½	.09½
Rochester	.02⅛	.02¼
Right of Way	.07	...
Silver Leaf	.05¼	.05½
Temiskaming	.41	.41½
Trethewey	.66¼	...
Wettlaufer	.77	...

Porcupine Stocks.

	Sales. Low	High
Apex	.06½	.07
Dobie	.65	...
Crown Charter	.27	.29
Dome Extension	.55	.56
Eldorado	...	...
Foley-O'Brien	.36	...
Hollinger	12.90	13.25
Jupiter	.48½	.49½
Moneta	.17	.17½
N. Ont. Exp.	4.75	4.85
Pearl Lake	...	...
Porcupine Central	4.25	4.30
Porcupine Imperial	.06½	.07
Porcupine Northern	1.42	1.45
Porcupine Tisdale	.02¾	...
Porcupine Southern	1.75	1.78
Preston East Dome	.11¼	11½
Rea	.80	...
Standard	.20	...
Swastika	.22	...
Vipond	.48	...
United	.02¼	...
West Dome	...	**.55
Big Dome	30.00	30.30

Sundry.

	Low	High
Island Smelters	.09	.09½
Canadian Marconi	7.25	7.45

*Bid. **Offered.