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Editor

J. C. MURRAY, B.A., B.Sc.

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REMOVAL NOTICE.

The offices of the "Canadian Mining Journal," on and after May 15th, 1912, will be Room 36, Canadian Birkbeck Building, 10 Adelaide Street East.

STUDENTS' COMPETITION

FURTHER ANNOUNCEMENT.

Our issue of April 1st contained the announcement of an offer of one hundred dollars (\$100) as a prize for the best technical essay or descriptive article submitted by a mining student or by a recent mining graduate.

The following conditions must be complied with: Competitors must be regular third or fourth year students whose standing is satisfactory; or mining graduates of the years 1911 or 1912. Students who are taking a partial course will not be eligible.

All manuscripts submitted should be typewritten on suitable paper, and carefully bound and wrapped. No written manuscript will be considered. Drawings, such as plans and diagrams, must be made on tracing paper, or white drawing paper, in black ink. All lettering must be made large enough for reduction to suit these pages. This applies to the drawings themselves, which should be done with a view to clearness in engraving. Where a scale is included it should require no change on reduction. Photographs should have a glossy finish.

No restrictions are suggested as to the subject-matter of the essay, except that it must bear upon Canadian mining or metallurgy. The length of the essay is left to the discretion of the competitors.

Clear grammatical English, devoid of superfluities, will count largely in the award.

All papers should be handed in not later than November 15, 1912.

All manuscripts submitted will become the property of THE CANADIAN MINING JOURNAL, and, with the exception of the winning essay, if published, will be paid for at regular rates.

THE DOMINION DEPARTMENT OF MINES.

For some time the conditions under which the work of the Department of Mines at Ottawa has been carried on have been unsatisfactory. The Department, which includes the Geological Survey Branch and the Mines Branch, was, until April 1st of this year, under the

jurisdiction of the Minister of Inland Revenue. On that day it was transferred to the Department of the Interior, under the direction of the Hon. Mr. Rogers. It is hoped and expected that this will be a change for the better.

The Minister under whom the Rt. Hon. Mr. Borden has placed the Department of Mines has now an opportunity to do great service to the mineral industries of Canada. When he needs advice as to the administration of a department of mines he has but to consult his colleague, the Hon. Mr. Cochrane, whose regime as Minister of Mines of Ontario has left a lasting impress upon that province's extensive mining interests. Whatever differences of opinion may obtain as to the handling of such problems as the Gillies Limit, it is a fact that in this incident, as in others of a like nature, the Hon. Mr. Cochrane's policy was characterized by courage, foresight, and a notable disregard of practical politics. His generous treatment of the Ontario Bureau of Mines made possible the exceedingly satisfactory work accomplished and the high standing attained by that body. In no instance has politics been permitted to interfere with the Ontario Bureau of Mines.

And political interference, especially the appointment of men to the staff on account of party affiliations, is fatal in a technical department. If the Hon. Mr. Rogers is satisfied that he has the proper men as heads of Branches, then he should follow their advice. Only they can advise on the selection of qualified men for the staff, on the advancement or dismissal of others, and on the work to be undertaken.

Undoubtedly some reorganization should be begun at once. There are officers to whom superannuation is due. To prevent friction and overlapping the respective spheres of the Survey Branch and the Mines Branch should be more closely defined.

In Canada the mining industry is now second in importance. Agriculture is the only industry that means more to the country at large. Since fully one-third of Canada offers no possibilities except the opening up of mineral deposits, and since, even in the older provinces, mining is only in its infancy, the Hon. Mr. Rogers has a unique opportunity of benefitting his country by wise administration of a Department that has never yet been properly managed.

May his success be all that mining men hope for and that the country needs!

THE COALS OF CANADA.

Nearly six years ago a thorough investigation of Canadian coals and lignites was begun by the Dominion Government. The Dominion Department of Mines was not then in existence, and the work was placed under the official supervision of the Geological Survey, of which Dr. A. P. Low was then director.

On account of the fact that the Mining Department of McGill University was well equipped, and from the further consideration that the government possessed no suitable laboratories, the work was assigned directly to the University, and Dr. J. Bonsall Porter was requested to make all arrangements necessary for an exhaustive investigation. After the organization of the Mines Branch, the investigation was transferred officially to that sub-department, the whole routine, however, being still arranged from McGill.

The research was conducted with a view to cover the taking of samples in the field, crushing and preparing them; washing, and mechanical purification; coking; steam tests; producer and gas engine tests; chemical work, and miscellaneous investigations. Dr. Porter was assisted by Mr. R. J. Durley, Mr. Theo. C. Denis, Mr. Edgar Stansfield, and a large staff of special assistants.

Carefully taken samples of representative Canadian coals were secured from mines in Nova Scotia, New Brunswick, Saskatchewan, Alberta, British Columbia, and Yukon Territory. The methods employed in testing these samples were ingeniously devoted to reproduce commercial conditions, particularly in the testing of coke.

Dr. Porter's general introduction, in which is outlined the scope of the enquiry, is followed by a comprehensive descriptive review of Canadian coalfields by Mr. Theo. C. Denis. In this section Mr. Denis has condensed a large amount of information gleaned from many sources, and has added thereto much fresh material. To the description of each mine from which samples were taken are affixed the reference numbers of those samples. This chapter is probably the most useful summary of the subject that has yet been published.

Part III., written by Mr. Denis and Mr. Stansfield, describes the precautions observed in taking samples and the manner in which they were taken. Many of the representative lots were over five tons in weight; while a few did not exceed 100 pounds. The essential history of each sample is given.

In Part IV., Dr. Porter outlines the process of sampling in the testing plant and laboratory; and in Part V. he presents a resume of the mechanical preparation of coal, a subject with which he has been long conversant. The results of many laboratory washing tests are appended.

Mr. Stansfield and Dr. Porter are responsible for the concluding section on the manufacture and testing of coke. Coking tests were made in specially contrived iron boxes which were placed in the ovens at the plants of five large Canadian companies. The results obtained throw light upon several important questions, such as the effects on coke of exposure to weather, the effect of time of coking, the effect of compression, and the effect of moisture. All of these results are syste-

matically tabulated. Five large general maps are attached.

This is the first volume of a series of six. The second volume, which will appear presently, is devoted to reports by Messrs. Durley and Stansfield on mechanical and laboratory tests. The remaining volumes are to be confined to tabulated records and details of the work summarized in the first two. The first two volumes, therefore, form a complete history of the investigation. The remaining four give to the technologist full data that will hardly appeal to the public.

Any such voluminous report as the one under consideration is open to criticism both as to plan and as to execution. The technically trained reader will find much that is elementary and much that can be found in trade catalogues. But, on the other hand, the intelligent lay reader will discover little that he cannot readily understand. And it must be borne in mind that the object of Dr. Porter and his associates was so to epitomize the technology of coal cleaning and coke making as to give the untrained reader a clear view of this important branch of industry. Without this epitome the reports of the laboratory tests would have been meaningless to the mass.

The Government's intention was to publish a report that would be alike informing to the engineer and instructive to the laity; and that would comprise all securable facts as to the economic value of Canadian coals. This object has been kept clearly in view. Limited appropriations, and other restricting conditions, tended to modify the scope of the investigation as it progressed. Nevertheless when the six volumes appear there will have been added to official Canadian literature a monumental contribution that will see years of good service and will always remain a sound work of reference.

THE MINING INDUSTRY AND THE T. & N. O. RAILWAY.

As a Government enterprise the Temiskaming and Northern Ontario Railway has played a most important part in the development of the country that it serves. Just how important that part is, cannot be better realized than by a perusal of the annual report of the T. & N. O. R.'s mining engineer, Mr. Arthur A. Cole. Mr. Cole has long been the philosopher, guide, friend, statistician, and general information bureau of Cobalt. His activities not take a wider range, comprising Porcupine and the outlying districts.

The present report, for the calendar year 1911, is noteworthy for its fund of statistics and information, and, incidentally, for several references to the relation of farming to mining. To these we shall refer later. Meanwhile, let us glance over some other salient points.

In the Cobalt district, and this includes Gowganda and South Lorrain, silver to the value of \$16,500,000 was produced in the year 1911. The total production

to date is valued at about \$65,000,000. Thus in eight years Canada, through the mines of Cobalt, has assumed third place in the list of the world's producers.

The largest yearly tonnage of ore shipped was reached in the year 1910, when, roughly, 34,000 tons were transported from the camp. The corresponding figure for 1911 was 24,921.71 tons. The current year will probably witness a further diminution of tonnage. The explanation is, of course, obvious. The operation of more and more concentrators, and the increasing tendency to reduce rich ore to refined bullion, are the factors in the case. Whereas in 1910 only \$501,815.33 was shipped as bullion from the district, during 1911 the bullion shipments amounted to \$2,012,428.95. Formerly, too, low-grade ore was shipped in quantities about twice as great as the shipments of high-grade.

Last year the opposite was the case, 283 cars of high-grade ore (ore containing more than 500 ounces) being shipped as against 140 cars of low-grade. During the year, 381,870.97 tons of ore were milled, the concentration ratios ranging from 18:1, to 108:1. Fifteen mills were in operation, and two are under construction.

In Mr. Cole's opinion, and he is well qualified to judge, Cobalt is on the crest of a wave that will not subside for some years to come. The subsidence, when it begins, will be gradual. Much depends, naturally, upon the condition of the silver market, which market has been favourable for some time. What a good price for silver means to Cobalt may be judged from the fact that a rise of one cent in the market quotation adds to the camp's income at the rate of about \$325,000 per annum.

Dividends paid since the birth of Cobalt reach the grand total of \$31,671,622, to which amount the mines contributed \$8,958,047 in 1911.

Freight rates to Canadian smelters work out at from \$4 per ton to \$10 per ton. To United States smelters the charges are correspondingly higher. From Cobalt to Hamburg, Germany, the seasonal rates range from about \$13.50 per ton to about \$15 per ton.

The smelting situation is practically unchanged. Canadian smelters treated 34.02 per cent. of the ore, all of which was high-grade. United States smelters purchased 65.13 per cent. of the ore, which proportion included the remaining high-grade and all the low-grade. Only a small quantity was shipped to Germany, and none at all to Great Britain.

The advantages of cheap hydraulic and electric power are seen when it is noted that the coal consumption in Cobalt has been cut from 105,416 tons in 1909, to 44,216 tons in 1911.

Mr. Cole makes brief reference to Porcupine, in which he points out the debt owed by that camp to Cobalt. He adds a paragraph on the healthy progress being made in Swastika, Munro, and Larder Lake.

In his concluding remarks Mr. Cole alludes to the fact that Cobalt was opened up by a railroad intended to exploit the farming lands of the north. "If the railroad," he continues, "had been entirely dependent for its tonnage on the agricultural resources of the country, it is quite probable that the train service . . . would consist of a mixed train every alternate day, instead of, as at present, two through passenger trains daily, with sleepers and café-cars and local trains where required. The reason for the difference lies in the fortunate discovery of productive mining camps in the vicinity of the railway."

The prospector "is the true pioneer, . . . his word acts like magic in calling to his side a host of eager followers. Along with these, or closely following, comes the miner. All these men together form an army that is absolutely dependent on outside sources of supply. As such, it forms a strong magnet for a farming population, if only the right kind of land can be found in the vicinity. . . . What greater inducement could be offered to a farmer than rich land in the vicinity of a large cash market, where good prices are paid for a good article supplied. These are the conditions that rule in the Cobalt district." Further to illustrate this point, Mr. Cole adduces figures showing that food supplies to the value of \$485,593 were used at the mines of Cobalt alone during 1911. Since there were 3,020 employees, this implies that the cost per man per day was 44 cents. In addition, the sum spent on the horses used by the mines was \$17,391. It is to be noted that the miners form but a relatively small part of the population, and that there are many other towns and mining camps to be supplied.

In the statements quoted, Mr. Cole is making no special plea; he is merely presenting facts. It is beyond question that Northern Ontario owes its prosperity to the prospector and the mine. Mining is the industrial skeleton of the region. Farming will clothe that skeleton with flesh. Mining has rendered necessary the construction of well-equipped railroads. The farmer will reap the full benefit when, in years to come, his markets expand.

The obvious moral is that the Government can best assist the whole community by making easy the way for the prospector and the miner.

Mr. Cole's report is timely. It should be given wide publicity.

THE TWENTIETH ANNUAL MEETING OF THE MINING SOCIETY OF NOVA SCOTIA.

On the 27th and 28th of March the Twentieth Annual Meeting of the Mining Society of Nova Scotia was held at Halifax. The annual dinner, on the evening of the 27th, was, like its predecessors, a happy and important event. The newly elected president of the Canadian Mining Institute, Dr. A. E. Barlow, and Mr. R. W.

Brock, director of the Geological Survey, were among the guests of honour.

During the dinner several speakers referred to Mr. T. A. Rickard's report on the gold mines of Nova Scotia. The references consisted mainly in veiled allusions and humorous touches. At a previous meeting, also, the matter was brought up and a resolution was passed requesting the Nova Scotia Government to furnish a copy of the report.

Both the dinner and the meetings were well attended. But it is hardly to be expected that more definite results will follow these gatherings than have followed the annual meetings for some years past. The Mining Society and the Nova Scotia Government are waiting for things to happen. It is the duty of both first to clear the atmosphere as to the Rickard incident, and then to get down to the business of developing the mineral deposits of Nova Scotia. The Government appears to be content to receive more than half its revenue from the coal mines of the Province and to let everything concerned with good mining go by the board. The Mining Society enjoys a year-long slumber, waking only at the sound of the dinner bell.

Nova Scotia must help itself before others can do anything for it.

THE STRIKE AFTERMATH.

Utterly impossible as it will always be accurately to estimate the full damage inflicted upon Great Britain by the recent coal strike, yet trade returns, already made public, reveal the magnitude of certain immediate losses. The coke and coal exports from Great Britain for the month of March, 1911, were valued at £3,186,000; while for the month of March, 1912, the exports fell to £1,132,000. For the first time in eight months, also, the total exports of British products showed a falling off,—a falling off small in itself, but significant as occurring during a period of general expansion.

In short, the coal miners have succeeded in securing the concession of a principle at the expense of alienating the whole nation. Fourteen million pounds sterling lost in wages, and depleted Federation funds are other items of loss. The total gains were the minimum wage, and the establishment of District Boards.

The miners have exercised certain prescriptive privileges without considering for a moment any interests but their own. They have lost in prestige and in pocket, and, we sincerely hope, will suffer a curtailment of the political privileges that they have so wantonly abused. We do not doubt that by proper means they could have placed themselves in the long run in a much better position.

That the "general strike" is unnecessary, immoral, and wantonly cruel will be conceded by all who are capable of giving the matter disinterested considera-

tion. The local strike is sufficiently barbarous, and plentifully effectual when the funds of a federation are available for its support. The employer and the employed can fight to a finish without disturbing the equilibrium of a whole nation. But for any one class of workers, many of whom are entirely satisfied with their work and at peace with their employers, to band together to terrorize a nation is anarchy.

As with the British railway men last year, so with the coal miners, the object has been to starve forty or fifty million people so as to bring irresistible pressure to bear upon a limited group of individuals. And by these means "rights" are sought! Surely, if the word has any meaning at all, the consumer, who, after all, pays for everything (including the strike) has "rights" to assert. And the consumer must see to it that those rights are considered.

Through the history of the Eight Hours Act, through the history of the two great strikes, is distinctly traceable the influence of a disastrously weak Government. Political expediency made the Eight Hours Act possible—An Act plausibly sound *per se*, but singularly unadapted for immediate adoption into a sensitively organized industry. The recent strike, in which the Federation leaders disregarded the specific terms of standing agreements, was the fruit of the Eight Hours Act. Once again the British Government failed to vindicate the liberty of the individual workman. Once again political considerations overshadowed all questions of right and wrong.

In the most far-reaching sense, the coal miners of Great Britain are striving to establish a monopoly of a great natural asset. They, not the owner, are the autocrats. They have proved themselves able and willing to strangle the nation. How long is this power to remain theirs?

LEASING.

The gold mines of Nova Scotia, many of the prospects and abandoned mines of Ontario, and numberless mining properties in British Columbia await the advent of the "leaser." We have personal knowledge of several mines that have sufficient ore in sight to yield good net incomes if they were freed from corporation mismanagement. One instance will suffice.

A very promising deposit of a valuable mineral was discovered some years ago. The discoverer sold it outright to a lawyer, who, in turn, raised money to develop and equip the property. Certain complications arose as to marketing the ore. These were overcome. Then the owner ran short of money. He raised sufficient amounts from his friends to tide him over and, meanwhile, organized the enterprise into a joint stock company. To provide for the future he entered into a binding contract with a smelting com-

pany, whereby the mining company was obliged to deliver certain quantities of ore, of a certain tenor, at stated periods. Very soon his stopes were depleted, and, as development had not been pushed beyond immediate requirements, contract deliveries could not be filled. The smelting company promptly took possession of the mine. However, an enterprising third person had meanwhile discovered a technical flaw in the title and had instituted legal proceedings with the object of securing title to the right of mining for one of the metals contained in the ore. The result can be imagined. Endless suits and cross-suits were begun. At last a compromise was arranged between two of the litigants. But by this time the original owner had been completely shut out. At present the mine, which contains a considerable amount of workable ore, is lying idle. An experienced mining man, operating under a working lease, could put the plant in order, unwater the mine, and make money for himself and all concerned. This would, for one thing, put the mine in better shape for selling, and certainly would be a boon to the small community living in the vicinity. As matters stand at present, the mine is held for sale at a price that no sane engineer could approve, and the country is the poorer because of the stupidity and cupidity of a few wrong-headed persons.

This somewhat laboured instance may be taken as typical. Of course there are many prospects and mines that are not worth looking at. But it is often the case that a property is abandoned for reasons that have nothing to do with its merits. The competent, independent operator can, we are confident, find abundant opportunities of making money in Canada by means of the working lease.

PARRAL TANK SLIME AGITATION.

The evolution of slime agitation in cyanide treatment of gold and silver ores has been most marked in the last few years. Until recently, the Pachuca system of air-lift agitation through a series of connected tanks, represented the last word in cyanide practice. Perfection was not attained in the Pachuca, nor has it yet been attained. But in the Parral tank system, described by Mr. Bernard Macdonald in the April Bulletin of the American Institute of Mining Engineers, there are improvements that are worthy of note.

The Pachuca tank is a cylinder 45 feet high and 15 feet in diameter. The bottom is conical. The air-lift tube about one foot and one-quarter in diameter, is fixed in the centre of the tank and extends from near the bottom, to a few inches from the top. Compressed air is fed into the bottom of the air-lift tube, and is supplied also for agitation in the tank bottom. The discharge is placed a few feet from the bottom in tank when the feed is intermittent; and when the tanks are

continuous the discharge is well up on the side. Mr. Macdonald points out some mechanical defects in the Pachuca, particularly in the application of the compressed air.

These defects, Mr. Macdonald claims, have been eliminated in the Parral tank.

The Parral tank is 25 feet in diameter and 42 feet high. It is flat-bottomed and has a capacity three times as great as that of the Pachuca. The compressed air is admitted from four 12-inch pipes set 12 inches from the bottom. Instead of a rubber stocking, the air is admitted through patent nozzles fitted with a ball-valve, which open and close intermittently. Should the compressed air fail, there is no danger of clogging the air valves as they are automatically sealed by the ball. To the top-ends of the transfer pipes are fixed tees, and the pulp is discharged horizontally, setting up a spiral flow which gradually extends to the bottom of the tank.

These are some of the advantages claimed. Space does not permit us to dwell at length upon these. Suffice it to say that Mr. Macdonald asserts that the Parral tank, which by the way is his own child, does away with all the defects and most of the limitations of the Pachuca. A tabulated comparison of the two gives very easy advantage to the Parral. Extraction-curves, plotted from operations in both tanks, give results disadvantageous to the Pachuca in every case.

THE TITANIC.

Comment at this date from THE CANADIAN MINING JOURNAL upon the ghastly tragedy of April 15 may be considered superfluous. The newspapers of every country have given the fullest publicity to every painful detail. The awful event will serve to make navigation safer. As in mining, public sentiment must be stirred, and, sad to say, wholesale loss of life seems to be the only means of accomplishing that end.

It is appropriate to note here that the mining fraternity paid toll in the person of Mr. E. Sjostedt, well-known as a capable metallurgist and for a long time connected with large Canadian enterprises.

The insane desire for speed and for rapid returns affects every business and industry. The same governmental control that is being striven for as regards mining should obtain in transportation.

CASUALTIES.

Two deaths, one by asphyxiation, the other by inanition, have occurred in Porcupine. The Pearl Lake mine has been shut down, smothered by over-ground expenditure. In the Rea mine (we believe that this is, after all, a case of suspended animation) the sound of the drill is no longer heard.

Each must be diagnosed separately. The Rea mine has not been worked on its merits. In both cases those responsible should be brought to book.

EDITORIAL NOTES.

It is reported that the Granby earnings for the month of March were more than \$100,000.

Mr. J. Thomas Reinhardt, of Porcupine Central fame, has blown up. The detonation was not heard in Canada.

The Dominion Steel Corporation has added largely to its fleet, the Black Diamond Line. Two motor passenger and freight steamers, and five colliers have been acquired. This should supply brisk coal shipments this summer.

The number of stamps dropping in the mills of the Witwatersrand in December, 1911, was 9,585 as compared with 9,135 in December, 1910; 242 tube mills were working, as against 185; and 4,514 rock drills, as against 3,380. The average number of tons of ore crushed per stamp per day increased from 7.43 tons to 7.99 tons. All of which is eminently satisfactory.

Satisfaction will be expressed at the news that Mr. J. B. Tyrrell has been requested by the Ontario government to supervise the task of determining the Ontario-Manitoba boundary between Island Lake and the mouth of the Nelson River. The selection of a strip of land 150 miles long and five miles deep, and the choice of two and one-half square miles of land as a terminal point for the T. & N. O. at Port Nelson, are in themselves responsible duties. To those Canadians who have knowledge of the north, however, Mr. Tyrrell's task assumes a weightier aspect. The Nelson River is one of the largest and most magnificent of our waterways. A future generation may see at the river's mouth a metropolis rivalling Toronto, Montreal, and Winnipeg. History is being made in the making of the new boundary.

THE GOLD FIELDS OF NEW ONTARIO

By Walter Baelz, Assessor of Mines.

(Translated by Dr. T. L. Walker* from Zeitschrift F. Prakt. Geologie, Vol. XIX, Part II., Nov., 1911, Pages 377-385.)

I. In General.

The discovery of gold-bearing quartz veins in the neighbourhood of Porcupine in 1909 is the most important made in Ontario since the discovery of the nickel deposits of Sudbury in 1886 and the silver veins at Cobalt in 1903.

As mining in the new gold belts is only beginning it will be necessary to wait for many years before being able to indicate the full extent of the gold region. At present, however, an examination of the work already done is sufficient to convince one that this gold occurrence deserves more than passing notice. On account of the promise of the Porcupine belt the Government of the Province of Ontario has recently built a railway line almost to the Metagami River and it is proposed later to extend it toward the west.

In comparison with the Porcupine district the earlier discoveries at Swastika and Larder Lake are relatively less important. The following report is in general based upon observations in the Porcupine district.

The most important information regarding the Porcupine gold fields contained in a report by A. G. Burrows entitled "The Porcupine Gold Area" was published by the Ontario Bureau of Mines in 1911. Many other reports have appeared in the technical press, particularly in the Canadian Mining Journal, published in Toronto. In addition to these the Bureau of Mines has already issued a reconnaissance map of the Porcupine district on the scale of one mile to the inch. This map indicates the geology in the vicinity of the Hol-

linger and Dome and is accompanied by a brief geological statement of Prof. W. G. Miller. Naturally, this map is not complete and in the later editions the topography and geology will appear in greater detail. I wish to add that Dr. M. Maclaren† very kindly indicated to me the geological relationships in the Township of Tisdale and further that I have had the benefit of the examination of numerous specimens by the Geological Survey at Berlin.

II. Extent of the Gold-Bearing Region.

It is not possible at present to definitely indicate the geographical boundaries of the region in which the gold-bearing quartz claims occur. Already about 10,000 claims representing an area of about 400,000 acres have been recorded. It must not be taken for granted that gold-bearing quartz veins occur on all of these claims—possibly some of the claims do not show quartz veins of any kind. On the other hand new discoveries continue to be made in districts in which valuable deposits were not previously known.

The most important deposits so far located lie to the east of the Metagami River in the Townships of Tisdale and Whitney, but recently discoveries have been made to the west of the Metagami in the Township of Bristol in the Cripple Creek district.

III. Topography.

The region is generally level or slightly undulating and possesses an average altitude of about 300 metres.

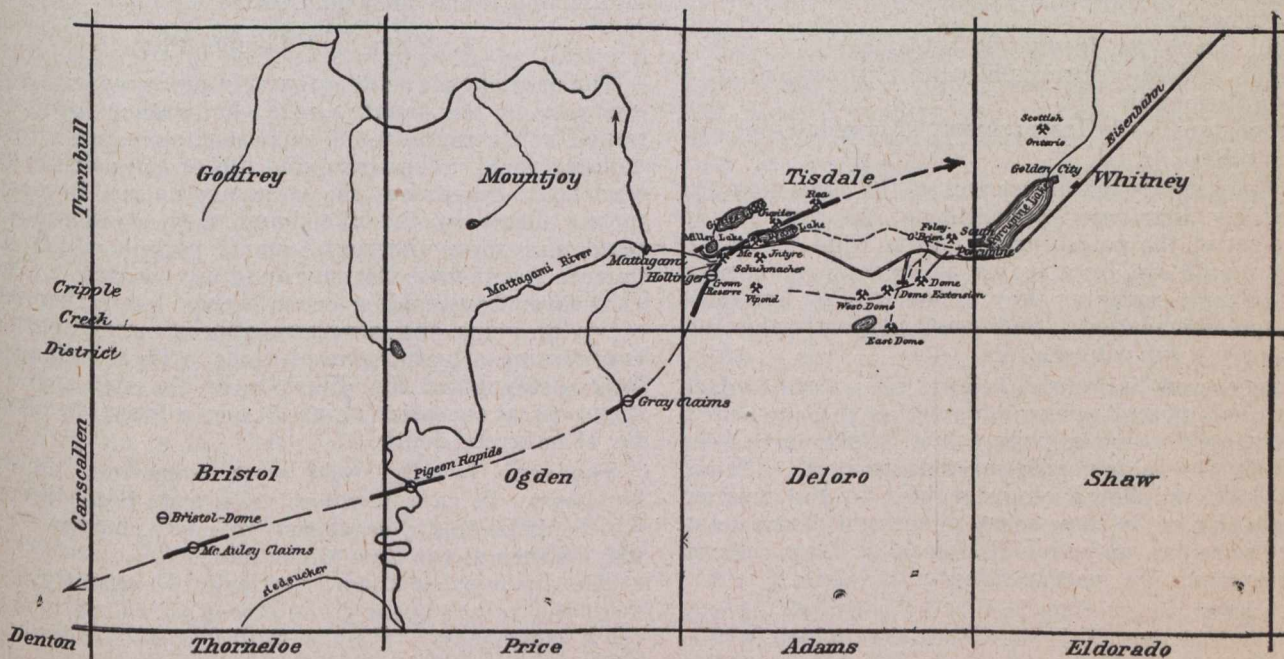


Fig. 2.—Most Important Outcrops in the Porcupine District

(The Townships shewn on this map as well as several adjacent Townships are almost all taken up as mining claims.)

- The broken lines indicate the course of the Hollinger Dome Vein Zone.
- * Chief Shafts of the more important mines.
- Some of the richer gold outcrops on the less developed claims.

*Professor of Mineralogy, University of Toronto.
 †Author of "Gold, Its Geological Occurrence and Geographical Distribution."

The surface is usually covered with glacial boulders, sand and clay. Upon the compact clay a substance resembling turf is formed. The older rocks project through the younger sediments and form ridges which seldom rise more than 20 metres above the plain. In these ridges the quartz veins appear.

The region contains numerous lakes which vary from three to six metres in depth. The Metagami, which is the most important of the rivers, forms a wide sluggish stream when in the region of the recent sediments. Where, however, this stream cuts the altered rocks it forms rapids well suited for the development of electric power.

Until recently the whole district was difficult of access and covered with coniferous forests with thick moss. More recently forest fires have removed much of the vegetable covering and facilitated the work of prospecting in a remarkable degree.

IV. The Ore Bodies.

1. Geological Relationships.

The stratigraphical relationships of the country rock may be indicated as follows.

Quaternary.

E.—Glacial.

Gravel, sand and clay.

Unconformity.

Precambrian (Algonkian).

D.—Post Huronian.

Younger diabase, usually containing olivine.

Slight unconformity.

C.—Huronian.

Lower Huronian slates, graywacke and conglomerate.

Archaean.

B.—Laurentian.

Coarsely crystalline granite and granite gneiss.

A.—Keewatin.

Acid porphyry, frequently schistose.

Older diabase with amphibolite and serpentine.

Iron formation.

Greenstone and Greenschists (Amygdaloidal basalts).

The Keewatin is the oldest and at the same time the most widely distributed formation of the district. In it the most of the gold-bearing quartz veins occur. It has been built up by a series of volcanic outbreaks. These volcanic rocks as they appear to-day are more or less metamorphosed. Sediments played in this formation only a subordinate role.

The greenstone is very abundant. It is light to dark green in colour and occurs schistose as chlorite schist, serpentine schist and sericite schist, which have been formed by the metamorphism of basic lava, tuff and ash. The Canadian geologists refer to the original rock as basalt or, in some cases on account of the cellular structure, as amygdaloidal basalt. The cells in this greenstone are usually filled with calcite.

The basalts are overlain locally by a deposit of iron bearing sediments. This iron formation, which is composed of alternate layers of magnetite and red jasper, occurs principally in the southern part of Whitney. It is regarded as equivalent to the Keewatin iron formation of Lake Superior.

After the deposition of the sediments occurred an eruption of diabase, as may be seen in Whitney Township. This older diabase is frequently altered to amphibolite.

The volcanic activity of the Keewatin came to its close with the extrusion of a mass of porphyry, usually acid. It occurs as felsitic quartz porphyry, but frequently, as in Delora, it appears in the form of coarsely crystalline granite porphyry. In the neighbourhood of Pearl Lake the quartz porphyry has been altered to sericite schist, which may be distinguished from the sericitic greenschist by its lighter colour.

The coarse crystalline Laurentian granite occurs in Porcupine in only a few places. It is very frequent in Swastika, where it frequently forms veins.

Unconformably upon the Archaean rests the sediment of the lower Huronian composed of conglomerate, greywacke and more rarely grey slate. The conglomerate carries numerous boulders, usually of granite. The Huronian represents only a small development because it has been partly worn down by glacial action. In contrast to Cobalt, where the Huronian conglomerate appears in only slightly disturbed arrangement, it is in Porcupine strongly folded and altered frequently into conglomerate schists containing flattened boulders. Before the close of the Precambrian there occurred an extrusion of olivine diabase and of other basic eruptives (Post Huronian), which occurs mostly in veins and are regarded as the equivalent of the similar diabase of the Sudbury region.

A part of the older rocks was carried away by the glaciers in their southward movement. Glacial clay and sand were deposited over wide areas, thus hiding the Archaean and Precambrian formations and the quartz veins which occur within them.

2. Age.

The gold-bearing veins cut through the Keewatin and lower Huronian formations, but are themselves intersected by the younger post-Huronian diabase. They are, therefore, either upper or post-Huronian in age and belong to the older gold formation.

3. Form and Composition.

The ore deposits seldom form simple veins with sharp contacts on the country rock, but rather form compound veins, sending out numerous stringers into the country rock. The strike and dip of the veins is very variable. Sometimes the veins are only a few centimeters across; on the other hand, they occasionally expand and form enormous quartz masses which, like domes, rise above the surrounding country. These vein formations seldom occur singly, but rather form series of veins and stringers approximately parallel, constituting a broad zone of veins. These extend for long distances in the direction of the strike and as they possess considerable width one is forced to assume for them great depth.

The veins usually strike west, southwest to east, northeast. In rare instances veins have been observed which strike south, southeast, to north, northwest, as may be seen at the East Dome mine.

The dip is often almost vertical. Frequently, however, the veins appear to be strongly faulted by later earth movements. Such a fault has been discovered in shaft No. 2 of the McIntyre mine.

The gangue consists for the most part of milky quartz and more or less silicified country rock. This quartz contains gas and liquid inclusions,** as well as feldspar crystals and fine needles of tourmaline. As a result of earth movements the quartz is much fissured and, consequently, easily broken. Along with the quartz, siderite and a brownish mineral with rhombo-

**J. Stanford: Microscopic Examination of Some Typical Specimens of Porcupine Rocks and Vein Matter, Canadian Mining Journal, 1911, p. 109.

hedral cleavage—ankerite ($\text{CaMgFe} \text{CO}_3$)—are fairly prominent. In a vein on the West Dome mine, ankerite is the chief mineral in which the quartz forms only slender stringers running across the vein. The vein body consisted therefore originally solely of carbonates and only after later movements in the old fissure did the introduction of the rising solutions carrying gold and silica become possible. A metasomatic replacement of the carbonate by quartz has been frequently observed. The ankerite sometimes carries a little gold, but this has been derived from the solutions which introduced the quartz. The appearance of ankerite in large proportions is not always a favourable

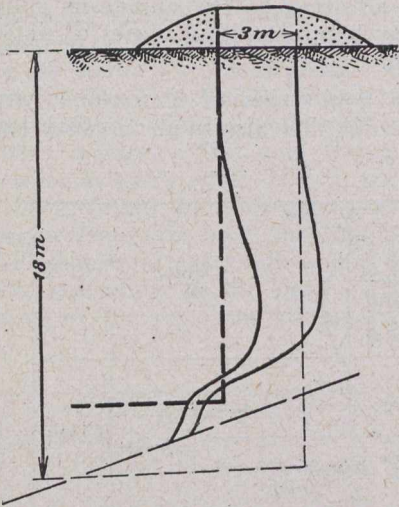


Fig. 3.—Faulting as shewn in Shaft No. 2, McIntyre Mine. sign for the occurrence of gold values evenly distributed through the vein.

The chief metallic minerals are pyrite, marcasite, magnetite, calcopyrite and occasionally a little galena and zinc blende. In the veins in Bristol Township arsenopyrite plays an important role.

More than half of the gold contained in the veins and stringers occurs as native gold. This appears as a rule in the form of fine plates within the quartz, especially along the lines of contact between the quartz and the country rock. The remainder of the gold is combined with the sulphides and arsenides which form large mineralization zones in the country rock.

It is interesting to note that in the northwestern part of Tisdale the native gold occurs in serpentine asbestos, which along with actinolite and calcite is found as veins in serpentine. According to Dr. McLaren, this type of gold occurrence had been previously observed in only one locality—Western Australia.

Gold telluride occurs in small amounts in a quartz ankerite vein to the east of Larder Lake. Up to the present telurides of gold have not been observed in the Porcupine district.

No considerable development of gossan formation is present. The primary zone with milky quartz and undecomposed sulphide reaches almost to the surface. This is due to the fact that the glaciers have removed the oxidation and cementation zone—probably originally present—and that since the glacial period a sufficient time has not elapsed for the formation of extensive secondary zones. Only at the very surface may the decomposition of the sulphides and ankerite be observed. In this rusty mass the gold values are higher. This slight evidence of secondary enrichment is rarely marked at a depth greater than two to three metres.

From this point of view the exposures at the Jupiter

mine are very instructive. Here the milky quartz containing scales of sericite and tourmaline needles is well banded with light and dark bands. It is well exposed from the surface to about fourteen metres below the ground water level, and is of a fairly uniform character. The gold, which is finely divided, may be seen without the aid of a lense, occurs in the native form and is scattered through the fresh quartz in such a manner that, notwithstanding the high values, one may not regard it as the product of secondary enrichment. Similar observations were made at the Hollinger mine which, at present, is the deepest in the district. Its shaft has attained a depth of about 60 metres, while its drilling operations have probably not exceeded 170 metres measured from the surface. It is just possible that this primary gold value may diminish with depth, as has been found to be the case in many mines in Western Australia. Inasmuch as the primary zone extends right to the surface the valuation of these ore bodies is considerably simplified.

It is very hazardous to value and purchase gold properties on the basis of surface observations, as is frequently done in the Porcupine district. It should not be forgotten that even in primary ore bodies bonanzas may occur representing portions of the vein primarily enriched. These bonanzas must be considered along with large amounts of poor ore to be encountered in following the vein either horizontally or vertically. In order to be able to determine whether we are dealing with isolated portions of rich ore accidentally occurring near the surface and of larger or small extent, as much of the vein as possible should be uncovered. Diamond drilling should be undertaken and test pits sunk to the depth of at least 20 to 30 metres.

These explorations should be along the vein as well as across it, and at short intervals.

Such explorations are strongly recommended also on account of the constant variation in the size of the vein.

The distribution of the ore seems to be most uniform when the ore body occurs in strongly disturbed and fissured country rock. This is particularly true in the case of the schistose quartz porphyry. Under such circumstances the rising ore-carrying solutions could penetrate everywhere freely and consequently found numerous points of contact with the country rock. A belt of quartz porphyry of this kind, now largely altered to sericite schist occurs in the vicinity of Pearl Lake (Fig. 4). The quartz porphyry crops out through the glacial formations in the vicinity of Miller Lake and extends eastward on both sides of Pearl Lake to the properties of the Plenaurem and of the Bewick-Moreing syndicates, where, however, unaltered porphyry and greenstone may be observed in place. The metamorphosed porphyries are bounded to the north and to the south by old greenstones. It is a remarkable fact that the veins in the acid porphyry carry considerably higher value in gold than do the veins in the basic greenstones. This may be most readily seen on the northern contact where a vein exposed in the porphyry carried rich ore, but where it intersects the greenstone formations it becomes almost valueless. Here in the metamorphosed quartz porphyries around Pearl Lake the gold ores occur in such richness and in such quantity as is rarely seen in primary deposits in such a small area. Those veins which are not parallel to the schistosity, but which intersect it by a sharp angle, are to be regarded as the chief carriers of rich ore. The influence of the country rock on the gold-bearing values of the veins is more

marked at Pearl Lake than anywhere else in the Porcupine district. On certain other properties, however, such as the Dome, the Dome Extension, the McAuley claims in Bristol, schistose porphyries play an important part.

In reference to the peculiar significance of this acid porphyry it may be well to point out that also in the Keewatin in the Province of Quebec, similar quartz ankerite veins have been observed, without, however, carrying any important amount of the noble metal. M. E. Wilson† considers that this lack of economic proportions of gold should be attributed to the complete absence of intrusions of quartz porphyries with which the occurrences of gold in Northern Ontario is apparently very closely connected. As a matter of fact in Northern Ontario such intrusions of porphyries have been observed to possess great extension, not only in Porcupine, but also at Swastika and Larder Lake

In the Porcupine district the Dome and the Hollinger mines are among the best known. The former deposit is the best representative of the dome vein type, while the latter deposit consists of a mineralized zone containing compound veins. The Great Dome of the Dome mines forms an irregular dome rising above the glacial deposit about seven and one-half meters. It is 180 meters long and 60 meters broad. This great body consists of several masses of milk-white quartz, some of which attain a diameter of 40 meters, and which, along with a net-work of veins and stringers, enclose large mineralized masses of schistose greenstone and of Huronian schist conglomerate. On the surface, in addition to the numerous sulphides, occasionally very handsome thin plates of native gold may be observed.

Since the gold veins of Porcupine vary, not only in dip and strike, but also in an unusual degree with re-

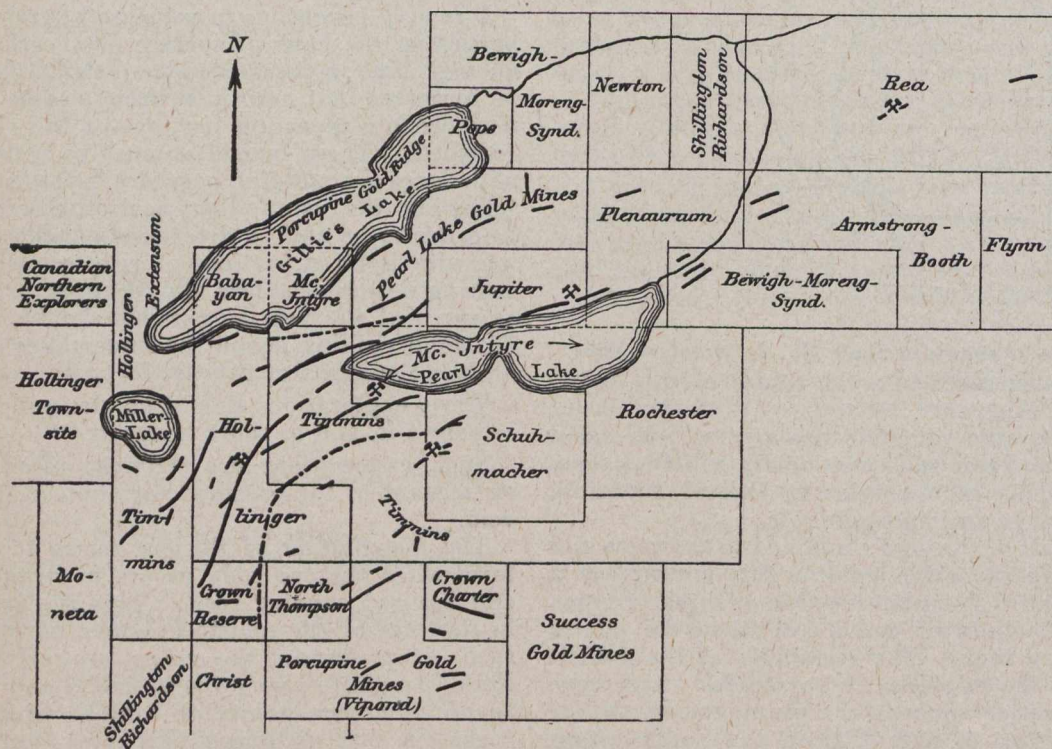


Fig. 4.—Sketch Map of the claims in the vicinity of Pearl Lake.

- — — Direction of the Veins in the mines shewing the greatest development.
- .-.- Contact between the Schistose Quartz Porphyry and the Basalts (Greenstone and Greenschist)—so far as known.

The favourable influence of the acid porphyry on the gold values cannot be of a genetic nature, since it is considerably older than the veins which are late Huronian. On the other hand, the chemical, and particularly the physical properties of this rock, which is easily altered by pressure to the schistose varieties, may be of considerable importance. "The more fissured and schistose the country rock the higher are the ore values" appears to be an important fundamental in estimating the value of these gold deposits. In the ordinary massive greenstone high values are not common, for in this hard and little fissured rock, the ore-bearing solutions were only able to ascend freely where the way was open to them by the steep, smooth walls of relatively wide fissures. Such favourable conditions have been observed only rarely, as for example in the case of the chief vein of the Rea mine.

gard to the thickness of the veins, it is scarcely probable that a mass of such enormous dimensions on the surface as the Great Dome, will be found to preserve such great magnitude with depth. I was not able to obtain definite evidence, however, on this point, since the shaft, which was then 36 meters deep, had been burned and on this account it was impossible to examine the underground workings.‡ According to data contained in Davis Handbook of the Porcupine District (New York, 1911), there is an ore supply of 600,000 tons§ (short tons). This has been determined by sinking shafts and other explorations. This ore contains on an average from 42 to 50 marks per ton in gold, or a total value of twenty-five to thirty million marks. (1 mark=24 cents.)

The Great Dome is part of a vein system which may be followed to the east and northeast past the Dome

†Summary Report of the Geological Survey, 1910, p. 206.
 ‡Permission to make an underground examination of this mine, which is controlled by the International Nickel Company, is under ordinary conditions difficult to obtain.
 §In the following references the ton is understood to be the short ton—2,000lbs.

Extension mine to the Foley-O'Brien and toward the west to beyond the West Dome mine.

From the nature of this deposit as a whole it is apparently best suited for open cut work rather than for underground mining.

The Hollinger mine lies in the region of the Pearl Lake porphyry. The course of the vein at the Hollinger strikes nearly east, as may be observed in Figure 4. On the out-crop these veins have been usually examined by test pits and in this way the gold values determined. Underground explorations of a serious character have been undertaken only in the central and richest of the larger veins. The depth attained in this work does not exceed 60 meters. This chief vein is almost vertical. At the 30-meter level it was followed along its strike for 420 meters. On this level the thickness of the vein varies with a maximum of seven meters and an average thickness of the whole length, of two meters. The vein filling consists of quartz and some country rock. Up to the present ankerite has been found in only one place. Samples carefully taken from the vein throughout the whole length of 420 meters at intervals of one and one-half metres, show, according to the data of Mr. Robbins, superintendent of the mine, an average of 212 marks per ton.||

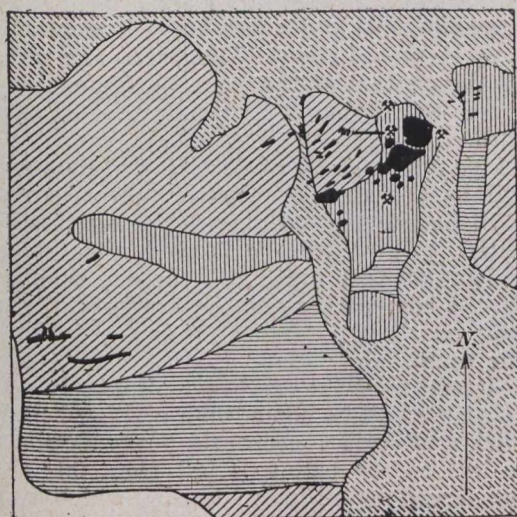







Fig. 5.—Geological Sketch of the Dome Mine

-  Quaternary—mostly glacial sediments,
-  Huronian and Keewatin—Lower Huronian Conglomerates and Schists,
-  Quartz Porphyry—mostly metamorphosed,
-  Greenstone—Amygdaloidal Basalts,
-  Quartz Veins and the Great Dome.

Similar explorations of the 60-meter level, where no great length has been opened up, have given results equally satisfactory. The gold occurs in the form of native gold, or in combination with sulphides. It is distributed throughout the whole body of the vein and does not show so rich in spots as in the case of many other mines. The country rock also carries high values which are greatest in the immediate vicinity of the quartz of the vein mass and stringers. As the whole country rock between the veins is a network of stringers and since this always contains traces of gold wherever there is the least sign of quartz stringer, it

||The other veins appear to be considerably leaner. They carry, however, according to preliminary investigations, frequently from 40 to 80 marks per ton. (1 mark=24 cents)

therefore, appears as if the country rock between the various veins constituted a zone of mineralization. This zone attains a breadth of 420 meters on the properties of the Hollinger and of the closely related Timmins syndicate. Under present conditions ore occurring in large bodies and carrying 20 marks in gold to the ton may be mined with a profit. (1 mark=24 cents.) It seems, therefore, probable that a considerable part of this mineralized zone may be regarded as profitable ore.

Similar relationships are found to the northeast, at the McIntyre and Jupiter mines. Still farther to the northeast (Fig. 2), beyond the schistose porphyry the zone of veins appears to continue in the direction of the Scottish-Ontario mine. In this extension, however, the gold values are not so high.

A southwestern extension of the Hollinger vein zone was observed on the property of the Crown Reserve. Further extension toward the southwest can only be followed with difficulty, as the outcrops of the veins are frequently covered by enormous thickness of glacial material. The vein zone appears to include the free gold exposures of the Gray claims and of several adjacent claims. It then continues farther to the Pigeon Rapids of the Metagami River. A zone of veins has been observed in the midst of these rapids. This zone strikes in a northeasterly direction, has a width of 90 meters and on both sides of the river is hidden by a covering of young sediments. Assays of specimens broken off from under the water gave values in gold varying from two to 120 marks per ton. (One mark=24 cents.)

This exposure in the Metagami River caused many prospectors to seek for the continuation of this zone farther to the west and to the southwest wherever the older rocks were exposed. McAuley Bros. succeeded in June, 1911, in making a discovery in the southwestern part of Bristol Township. The zone of veins appears here in the form of a high ridge rising above the surrounding country and has been exposed partly by stripping and partly by blasting. In this way it has been uncovered for 140 meters in the direction of the strike. It is noteworthy that in this exposure a diabase dyke 12 meters across intersects the quartz vein and strikes in a north-south direction. This dyke of younger olivine diabase apparently occupies a fault fissure. To the west of this dyke the ore body, which is about 20 meters across, includes quartz, a little ankerite and some strongly pressed country rock. To the east of this dyke, however, two veins of similar dimensions are observed about 40 metres apart. The country rock between these veins contains numerous stringers of quartz, but it does not appear to be strongly silicified. The body of the vein exhibits throughout its whole length, exposures of free gold, sulphides, and arsenides of a promising character. Here the conditions do not appear on the whole to be quite so favourable as at Pearl Lake, since the country rock is not quite so schistose and is only in part made up of metamorphosed quartz porphyry. It will be necessary to await the results of assays of samples and underground development before one can judge as to whether this occurrence is really of a superior quality.

Gold has recently been found in a vein which may belong to the same zone, immediately to the south of the McAuley claims.

To the northwest of these claims I examined a quartz dome about 35 metres broad, 50 metres long, and four meters high. On the surface this showed absolutely

no sign of mineralization. In a small pit located on the east side of this dome, where the quartz contains numerous masses of the country rock, I observed some marcasite and arsenopyrite which gave promise of gold and which apparently increased in amount with depth.

The further extension of this gold-bearing belt to the southwest of the McAuley claims is seen in the remarkable arrangement—as indicated on the map of the Cripple Creek district—of all the free gold discoveries hitherto made in the Townships of Carscallen, Denton, and Keefer. All these discoveries are approximately in line with the west southwestward extension of the Hollinger belt.

This Hollinger belt extends in the direction of the strike for at least 50 kilometers. It represents a strongly foliated zone inside of which the gold-bearing solutions were able to find a most convenient way in their ascent. In this belt are found the majority of the promising deposits—the Great Dome, while appearing to lie outside of this zone, may possibly be regarded as an offset. Inside this zone, however, the deposits appear to be particularly rich where this tectonic zone intersects quartz porphyries and their foliated derivatives. I do not wish to be understood to maintain that promising discoveries have not been made in other parts of the district or that they will not be made in the future or that other zones of the same kind may not be established. The Hollinger zone is nevertheless of the greatest significance for the development of this district. That part of the vein which is to-day hidden by the extensive glacial sediments so as to render difficult the work of the miner, will later play a very important part.

I observed at Swastika a tectonic zone almost identical in character and striking in the same direction. In this region several insignificant gold discoveries were made as early as 1907, but systematic prospecting did not occur, however, until 1911. In July and August, of this year, large veins and very rich occurrences of free gold were discovered along the above-mentioned zone. Rich deposits were specially observable where the veins filled in a fissure between the Keewatin rocks on the one side and an arm of Laurentian granite on the other (Lucky-Cross claims). Prospectors surmise that this zone extends in a northeastern direction as far as Larder Lake. My own observations do not permit me to express an opinion in this matter.

4. Genesis.

Professor W. G. Miller is of the opinion that the gold-bearing magma is connected with great granite intrusions which forced their way upward after the lower Huronian period. Not far from Porcupine at the present time masses of such granite outcrop. The occurrence of feldspar, tourmaline, and inclusions of gas are in harmony with this view; moreover, in certain veins specimens have been found possessing the composition of granite and exhibiting free gold.

5. Economic Outlook.

The great forest fire which swept this country last July has set back the development of this gold district for at least several months by the destruction of many structures connected with the mining and winning of the ore values. As a result of this no considerable gold production is to be expected before the beginning of next year.

Keeping in mind all the conditions referred to, it is

difficult to believe that more than a small minority of these mining ventures have any possibility whatever of success. In addition to many gold regions whose development is only in the initial stage there are already six to eight mines, which, judged by present appearance justify in some cases even the very highest hopes. These new gold fields will, therefore, in the course of a few years, play a part in the gold market and in time approach in importance the best American gold regions.

Those in attendance at the next International Geological Congress, which will be held in Toronto in 1913, will certainly have an opportunity to visit this region.

THE NO. 3 MINE, NEAR SUDBURY.

The Canadian Copper Company is developing, in the Sudbury district, another mine known as No. 3. By the existing roundabout wagon-road route, the property is distant about eight miles from the company's smeltery at Copper Cliff, but when the direct railway, in course of construction by the company, shall be completed, the hauling distance between mine and reduction works will be only about four miles.

A shaft is being sunk; it is down about 200 feet, and sinking is to be continued until a depth of 1,000 feet shall be reached. It is a four-compartment shaft, having three skip-ways and a man-way; it is nearly vertical—on an incline of about 77 degrees—and practically parallels the contact of the ore with the country rock. Mining ore will probably be commenced at about 700 feet depth.

The skips will each be of four to five tons capacity; they will be operated by electric power, current for which will be transmitted over a 3-phase line now being erected. Skips will be hoisted up a steel head-frame, about 90 feet high, and the ore dumped over grizzlies, the coarse going to the crushers, there being a separate grizzly and crusher for each skip, thus making three units.

The material from the crushers will first be screened; then the coarse will be passed to a picking belt and the waste rock and some concentrating ore be picked out. The ore left on the belt will fall from this conveyor into bins served by railway cars, in which it will be hauled to the smeltery. It is planned to make the daily output of ore about 2,500 tons. Advance exploration of the mine will be by diamond drilling.

The rock-house is of steel construction. The powerhouse, distant from the shaft about 300 feet, is of brick and steel. A 20-drill compressor is being put in, and foundations for another have been built. A motor-generator set will provide direct current for underground electric haulage. The 3-drum hoist is of 250 h.p.

GOING SOME.

The following is a copy of the body of a letter received by a well-known Canadian mining company. As it appeared to have been written in all seriousness it serves to indicate the profound ignorance of the writer of the conditions under which copper occurs in ores. He wrote: "I presume by your name you are a copper mining company. I am taking an interest in a newly invented machine for cutting blocks of copper in the mine. It will cut up any size of a block in any position. Have you any work of this kind you would let on contract for us to do?"

THE DIAMOND VALE EXPLOSION.

Mr. James Ashworth, to whom we are indebted for the accompanying photograph, has been reported thus on the Diamond Vale disaster. After stating that the force exerted by the explosion in the No. 3 mine of the Diamond Vale Company was less than in any case he had known, Mr. Ashworth proceeds as follows:

"This fact, coupled with the further fact that the flame was of low intensity, shows that although there was undoubtedly an explosion of a mixture of firedamp and coal dust at the originating point of ignition, yet the extension of the flame was due to the inflammation of coal dust as distinguished from an explosion," says Mr. Ashworth. "Thus although the bodies of some of the men were severely burned, yet the flame was insufficient to ignite paper which was found near the bodies. At the point of origin a dinner can hanging on a prop was not unsoldered. The level along which the flame travelled was wet under foot and damp all around. This again is a proof that, as I have always contended, watering a roadway will not control the extension of an explosion.

"This explosion, however, ought to teach a very practical lesson to all officials in charge of coal mines, namely, to be particularly careful where mixed lights are used. In the present case there is not a doubt but that the explosion was consequent upon one or both of



two miners using their open lights in preference to the safety lamps with which they had been supplied. It may not be generally known that a small percentage of firedamp, giving say a half-inch cap, is not an explosive mixture when combined with air, but when it

is intimately mixed with fine coal dust the combination becomes an explosive mixture where an open light is used. Thus a Davy lamp might be used in a current of air having a velocity of six feet per second, and containing only four and a half per cent. of firedamp for a considerable time, but on the addition of a normal quantity of fine coal dust it becomes an explosive mixture and the flame will pass the lamp in about ten seconds. In the Merritt case it is probable that the men tested their chute with the Wolf safety lamps and not finding that the gas would explode in their lamps hung them up at the bottom of the chutes, and proceeded to work with their open lights, thus originating the explosion.

"After an explosion of this character," continued Mr. Ashworth, "there is usually a large production of afterdamp, the most dangerous constituent of which is carbon monoxide, but in this case the men escaping from the other portions of the mine passed through the smoke and dust without any one of them being overcome, and this remark applies also to two of the men who were burned by the flame.

"Although the ventilation fan was thrown out of position and rendered useless for the time being, the natural ventilation was so strong that the explorations were continued without serious difficulty.

"It may be of practical interest to people in general to know that the two-hour rescue apparatus which was quickly brought from the Nicola Valley Coal Company's colliery with a gallant band of rescuers had to be abandoned as being too cumbersome, but a one-half hour apparatus, which is much lighter in weight, rendered a little aid. The rescue was, however, mainly conducted without the use of any rescue apparatus. The lack of this equipment did not add to the death roll.

"This disaster is one more instance of the danger of mixed lights in coal mines and the want of technical knowledge of miners of the increased danger caused by the addition of a small or ordinary percentage of coal dust to a percentage of firedamp in the air and which is not in itself an explosive mixture.

"The extension of this technical knowledge is being attempted by the Nicola Valley Colliery officials, who hold a weekly meeting to discuss matters relating to the safety of mines, and such very desirable meetings must of necessity lead up to the provision of technical mining classes, under Government direction and supervision, in all coal mining camps."

SOME FEATURES OF MINING IN MEXICO*

For several centuries, Mexico has been the greatest silver-producing country of the world. It is one of the richest mineralized areas known, and has rightly been called "The Treasure House of the World" by Baron Von Humboldt in his descriptions of his travels there.

The silver-bearing region follows, in general, the direction of the Sierra Madre Cordillera, from the State of Sonora in the north to Oaxaca in the south. Most of the mines occur in the great central plateau to the east of the Sierra Madres and at an elevation of from five thousand to ten thousand feet.

The greatest silver producing states are Guanajuato, Zacatecas, Durango, Sonora, Chihuahua, Mexico, San Luis Potosi, Hidalgo, Jalisco, Siniloa, and Oaxaca.

The first mine worked by Europeans (Spaniards) was in the town of Taxco in the State of Guerrero. It is said that the ancient Toltecs or Aztecs worked mines in this neighbourhood long before the Spanish Conquest, and that they opened not only placer mines, but underground workings. This is hardly likely, as they had no iron implements, although they did have chisels and hammers of an alloy of copper and tin. Further, the treasure that was delivered to Cortez by Montezuma, the Aztec emperor, has been computed to have been worth over six million dollars.** Of this, five hundred marks, or less than two thousand dollars in value, was of silver, chiefly plate, drinking cups and so on—the greatest part of the treasure being gold. I think that this fact—that the silver was of such a

*Address delivered by C. W. Workman, Mining Engineer, Alfred Street, Kingston, before the students of the Kingston School of Mining.

**Prescott's History of Conquest of Mexico.

minor quantity as compared with the gold—is in itself sufficient evidence to show that they worked only placers.

During the three centuries of Spanish regime—from 1521, the year Mexico City (Tenochitlan) surrendered to Cortez—until 1821—when Mexico won her independence from Spain—over three billion pesos (a billion and a half dollars) of gold and silver were extracted. It is remarkable that nearly one-third of this metal came from one single vein—the “Veta Madre” (mother vein) at the town of Guanajuato.

When Baron Von Humboldt visited the republic, in 1800, about three thousand mines were in operation. I mention this because he has described many of them in his writings about Mexico, and from his descriptions many of the so-called lost and “buried” mines have been reopened and identified.

Although the mining methods at this time were crude, we must acknowledge that the old Spanish miners were splendid prospectors. We realize this when we consider that there are very few silver or gold veins being exploited in the Republic to-day which were not known to the Spaniards and worked by them. In fact, the new veins can almost be counted on the fingers of the two hands, and these are often veins that have been capped at the surface by a volcanic flow (e.g., the great Dos Estrellas mine El Oro Estado de Mexico).

Of course, prospecting in Mexico was much more easily done than it is in our northern countries. As there has been no glaciation, the outcrops of the veins in most places stand out like great walls, the vein filling being generally harder than containing rocks which have been eroded on either side. In addition to this a large part of the mountainous region is arid and there is consequently but little vegetation. Prospecting in Mexico at the present day is quite different from prospecting here. You may be sitting on a bench at the plaza of a small town, listening to a band concert—for every village has its plaza (park) and band—or watching the crowds of natives pass by, the men with their brilliant serapes (blankets), and the women with their black rebosas, when you are approached by a native, hat in hand, “Senor, Senor!” “Well, what is the matter, friend?” “I have a little sample from a vein my father worked years ago, which is now hidden, and its location is known only to our family. If the Senor wishes I can show it to him”—I might say that you are more liable to be approached by one of the “promoters” if you are wearing what a friend of mine calls his “technical clothes.” The appeal generally ends with a request for a little money in advance. If you accede to this request you will have seen the last of him probably, but, if you are wiser and promise him so much down, when once on the trail, it doubtless will result in a good hard ride the next day, and you will be shown some veins that more than likely are worthless. But, as you know, it takes a good many veins to make a prospect, and a good many prospects to make a mine.

I do not forget one trip I made of one hundred and fifty miles in the saddle—four days’ hard riding—travelling early in the morning and late at night with a rest (in the heat of the day) from ten till two o’clock. At the end of the journey I found that I had been on a wild goose chase. I wish I had time to relate to you some of the incidents that occurred on the way. I may mention that on this trip we passed through a camp where they were using “arrastras” to grind

their ore, the old “patio” process to reduce and amalgamate the silver, and old Spanish reverberatory furnaces to smelt it. There were sixteen “arrastras” run by water power, the water being brought through ditches and flumes from a neighbouring mountain stream. The ore was fed by hand into well-like depressions lined on the bottom and sides with flat flagstones, and over these were dragged huge chunks of rock, chained to wooden sweeps. These last were revolved by horizontal water wheels with inclined paddles. The “arrastras” were set in tiers of fours. The water from the first, or highest, after passing its vanes or paddles, fell upon those of the second, and so on.

Without further digression, I would like to say something about the geology of the silver deposits, with more particular attention to the district in which I was working.

The silver deposits of Mexico are represented by three classes. Firstly, fissure veins in eruptive rocks; e.g., Pachuca and Mines of Jalisco. Secondly, fault fissure veins in metamorphosed rocks; e.g., Guanajuato veins. Thirdly, secondary veins and replacement deposits in cretaceous limestones; e.g., lead silver veins in San Luis Potosi and Coahuila.

The mine where I was employed is in the Etzatlan district, in the State of Jalisco, some fifty miles west of its capital—Guadalajara—a city of a hundred thousand population.

The rocks in this district are andesites—often capped with rhyolitic and trachytic tuffs. The veins are true fissure veins, which is generally true of the silver veins in Mexico except the lead-silver deposits of the northern states, which, as I mentioned before, occur as replacement deposits in limestone.

At the San Juan and Sto. Domingo, in State of Jalisco, the country rock is an augite-andesite, and I believe it is tertiary age. The vein filling is quartz and calcite and is banded in structure. The silver occurs in dark bands of sulphide and antimonides. Argentite and stephanite are common, and native silver as well as the bromides and chlorides of silver is often found in the upper oxidized portion of the vein.

I might say that in this district, oxidized ore is still encountered on the 900-foot level. This is a marked difference from the veins in our northern glaciated country, where we seldom find oxidized ore at a depth below sixty or a hundred feet, or in Ontario within a few feet of the surface.

One vein system in this district is apparently of at least two ages—a system running north and south, and a system running northwest and southeast. These last fault the first system, and the throw is nearly four hundred feet. Both systems are cut by several later faults. The throw of the main one of these is forty feet on the surface and about fifteen feet on the 900 level.

The ore values have been found in the first vein-system and in that portion of the second vein between the faulted ends of the first. Bonanza ore has been encountered almost without exception at the intersection of any vein with the north and south series. The veins are very porous and have a heavy selvage on the walls, which are nearly perpendicular in the oldest. (85 deg. dip).

The veins are full of water, but on account of their porosity drain very rapidly. On tapping a vein by a cross-cut from a winze, work had to be abandoned for a short time on account of the heavy in-rush of water.

On pumping this out it was found that the vein had been drained for several hundred feet on each side.

The veins are continuous and can be traced for a couple of miles. The ore shoot that is being worked is more than 1,500 feet long and varies from 40 feet to 3 feet in width, averaging about 15 feet. That is, it is a series of lenses.

The calcite filling seems to be secondary, or a filling that occurred during a reopening of the vein. Where it is found, it is in the centre of the vein and is full of great long "vugs" or geodes. The calcite carries but little gold or silver value.

It is peculiar, also, that the galena and zinc blende carry little silver values—although from the great masses of these that occur on the walls often run out small stringers of rich silver sulphide.

Oxides and carbonates of manganese (pyrolusite and rhodocrosite) are often found in this district in association with the silver ores.

I will not burden you with a description of the present mining and milling methods used, but would like to say a few words about the methods of the old-time workers—methods which are still employed in many mines in the Republic.

Mexico is a land of contrasts, and in the same way as we see old wooden ploughs working alongside of modern steel ones, or wooden wheeled rawhide-tired carts alongside of automobiles; so we see mines being worked by the old Spanish methods alongside of others fully equipped with the most modern mining and milling machinery.

The mines were formerly worked by either the "partida" or the "buscone" system. (Partir means to divide and buscar to search or look for). The partida system is a leasing or tribute method. The miner is allotted a working place and is given a certain share of the ore he extracts. In the "buscone" system the miners work for the company so many days in the week without pay, then they are given one day when they can mine where they please, within certain limits, and are given a share of what they bring out that day as their wages for the week's work.

Of course, all this tends to very unsystematic methods of working, or "gophering." No attention whatever is paid to the driving of permanent levels, but the ore is followed up or down or across as the value varies, and the workings become as intricate as galleries of an ant-heap. You will see from this that the ore was not brought out of the mine in cars or even in a wheel or hand-barrow, but it was carried out in baskets or in "tanates" (rawhide sacks).

These "tanates" are cut from single rawhides, and are bound together with rawhide straps. They are about three feet high and are ten inches or so in diameter at the bottom, and about a foot and a half in diameter at the top. They are carried on the back with a broad band from the forehead in the same way that our Indians carry their packs with a "tumpline."

A good "tanatero" will pack two hundred pounds up chicken-ladders and inclined passages to the surface. In a shift he can raise, say, three or four tons to a height of a hundred feet.

I have used the term "chicken ladder," and I suppose I ought to explain what is meant by it. A chicken-ladder is a log ten or fifteen feet long and 8 or 10 inches in diameter, with notches sawn or chopped in it and set up as a ladder. On first acquaintance it

is rather difficult to navigate, as you must climb sideways and cross your feet at every step, but once accustomed to it you will find that it is much less fatiguing to climb than the ordinary mine ladder. For the carrying of loads it is much more convenient, especially for the Mexican, who, as he cannot afford to buy boots, wears sandals. The narrow rungs of the American ladder hurt his feet through these thin-soled sandals, while the broad notches of these ladders offer a good support for the whole foot and allows him the full use of his hands, with which to steady himself against the walls.

In the mine where I was employed, there were inclined roads from the surface to the 700-foot level. These were galleries cut at low angles and with stone steps. Sometimes they were in the vein and sometimes in its walls.

In addition to the ore that was carried up in tanates through these roads, there were also ore and water hoisted through shafts. There was a shaft from the surface to the 400-foot level. It was cut in the hanging wall and was "naked"—that is, it had no timbers and no guides. The hoisting was done by a mule whim. The drum of the whim was about 20 feet across and had four sweeps, the ends of which would describe a circle of about 50 feet in diameter. The hoisting rope, about an inch and a half in diameter, was of woven rawhide thongs and about 600 feet long. There must have been hundreds of hides used in making the rope and keeping it in repair. It passed over wooden sheave wheels (of *lignum vitae*), took two or three turns around the whim and either end was fastened to a rawhide bucket.

There was also a winze from the three hundred foot or tunnel level to the seven hundred foot, and here also had been a whim driven by burros. When I went to work there first, there was a boiler and hoist installed underground at this winze, and cable guides were stretched from the top to the bottom to keep the bucket in place. I had *one* ride in this winze. I had been surveying, and was tired, so thought I would enjoy a ride up. I climbed on the cross head with the shift boss, a Texas Mexican, and we started. Our lights soon went out, as the cables swayed a great deal. About half way up Jose began to yell and called upon all the saints in the calendar. I called across to ask what the matter was, and the reply I got was that he wanted to let them know that we were coming. This worried me a little, and I did hope the "them" did not refer to the saints. I found afterwards that the hoistman, although he only wore sandals and loin-cloth, couldn't stand the heat from the boiler and the hoist, so he had the habit of starting his hoist, running out into the tunnel, where it was cooler, and when the bucket should be about due, running back to the hoist again. After that I always walked.

The ore, after it was brought to the surface, was cobbled and sorted and then packed on mules or burros to the "Hacienda de beneficio," or mill.

A trip with one of these mule trains is interesting, it is also musical. You hear the jangling of the bell of the old bell-mare in the lead, the jingling of heavy spurs and saddle trappings, and the songs and shouts of the "arrieros" (muleteers) as they urge the animals along.

I remember an American lady who had no knowledge of Spanish, telling us how she was so impressed by the softness and rhythm of that language, even when coming from the throats of those rough mule-

teers. It seem she had been riding and had overtaken a mule-train which she could not pass on the narrow road, so she trailed in behind them. She said they did not call their animals "mulas" or "burros," but "such and such," and "so and so." Well, what they called them may have sounded musical, and it surely must have had persuasive powers with the mules, for I am certain that no self-respecting mule would stand and listen to it. It would not bear translation into English.

But, coming back again to the treatment of the ore, when it reached the mill it was ground in arrastras as I have already described, then shovelled out and concentrated on "planillas." These "planillas" are floors paved with flagstones. They are about eight or ten feet long by about five or six feet wide, and are slightly elevated at one end. They are also divided one from the other by flagstones set on edge. In front of the lower end runs a stone gutter full of running water. The operator sits in front of this gutter, and, dipping a cow's horn or a half gourd in the gutter, he keeps throwing water on the pile of ground ore at the upper end of the planilla, and thus washes out the sands and slimes, leaving the heavier sulphides on the planilla as concentrates. These were smelted in Spanish reverberatory furnaces.

The tailings from the planillas were carried or scraped into "patios." A "patio" is a large court or yard, also paved with flagstones, and on this the ground ore was piled up until about two feet or so

deep. This spread out ore is called a "torta," which means a cake. Salt is then added (about 5 per cent. by weight), and trampled and mixed with it well by driving teams of horses through it. The horses are fastened in teams of six or eight with a driver on the back of one of them.

In a day or two blue vitriol is added, and this also is mixed by horses and men. In a few days more, quicksilver is added, and the mixing process continued until amalgamation is complete.

The silver sulphides by the action of the salt and copper sulphates are changed to silver chlorides. The silver chlorides are reacted upon by the mercury and form mercury chlorides and free silver. The mercury chlorides are, in turn, broken down by the copper salts and copper chlorides are formed with free mercury, which amalgamates with the silver.

When the process is completed, which often requires three weeks or more, the whole "torta" is cleared off; and the amalgam, which has sunk to the bottom, is swept up from the riffles between the paving stone, collected into stone tanks, and washed. The mercury is squeezed out, distilled off from the amalgam to be re-used, and the resultant metal is smelted with borax and moulded into silver bars, to be shipped to the mints or refineries.

These processes are now, of course, only interesting historically, as they are rapidly falling into disuse and are being replaced with the modern grinding, agitating, and cyaniding processes.

SOME OLD METHODS IN MEXICAN MINING AND METALLURGY

By Stanley N. Graham.*

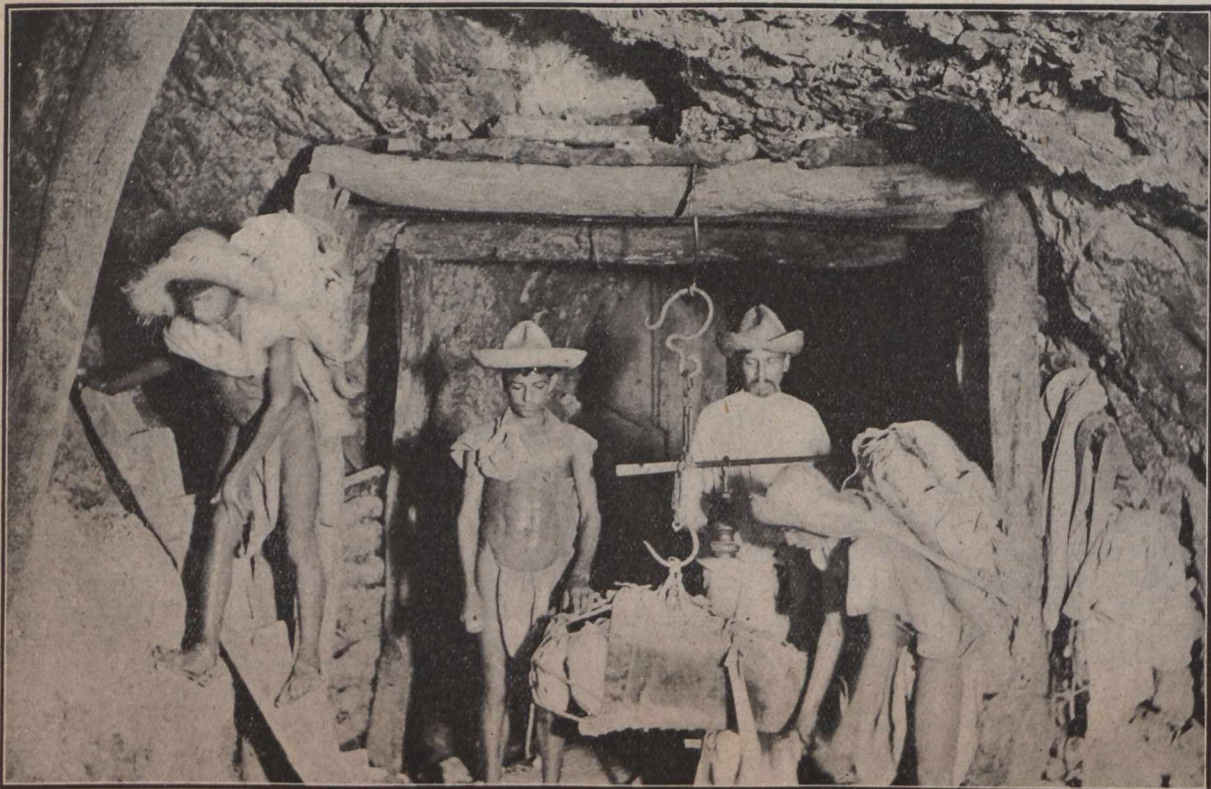


Fig. 2.

*Mining Engineer, Toronto.

The present disturbed conditions in Mexico are attracting a great deal of attention to that country, and, while the political revolution is somewhat doubtful the revolution in mining and metallurgical practice is an accomplished fact. As many of the old methods are now very seldom seen, perhaps the following notes and photographs may be of interest to readers of the Journal.

Photographs Nos. 1 and 2 show "tanateros" packing ore out of a mine. The first is a view on surface as tanateros come out of a prospect shaft, and the second is a flashlight underground.

The ore is carried in rawhide sacks by men and boys travelling up winding inclined roadways and, where necessary, using the "chicken ladder" or notched log. The load varies from 100 to 200 pounds. This work is generally paid per ton (metric ton of 2,204 pounds), or per foot advance of heading. The cost runs about 40 cents per ton per 100 feet vertical.

While much of the ore extracted was carried out of the mine in this manner a great deal was hoisted through vertical shafts by the "malacate" or horse whim. It seems, though, that the primary object of the vertical shafts found in the old mines was that of unwatering the mine. The malacate consists of a drum 10 to 12 feet in diameter, and 6 to 8 feet high with the axis vertical. To this long sweeps were attached and horses or mules used as the motive power. Two raw-hide cables were generally used, working in balance, and to these a raw-hide was hung for a bucket.



Fig. 1.

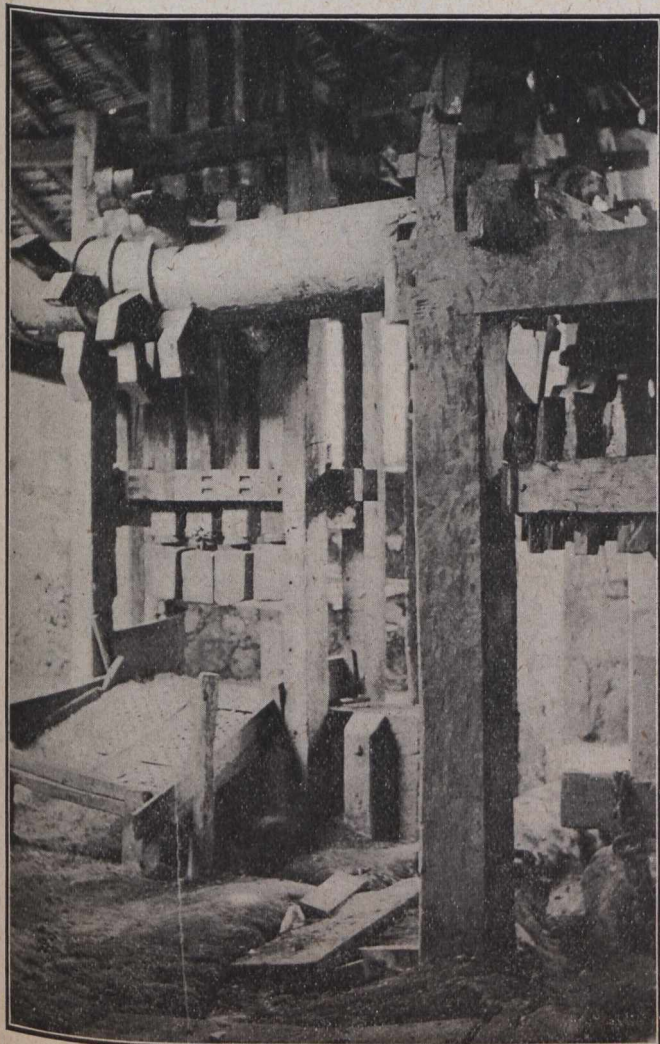


Fig. 3.

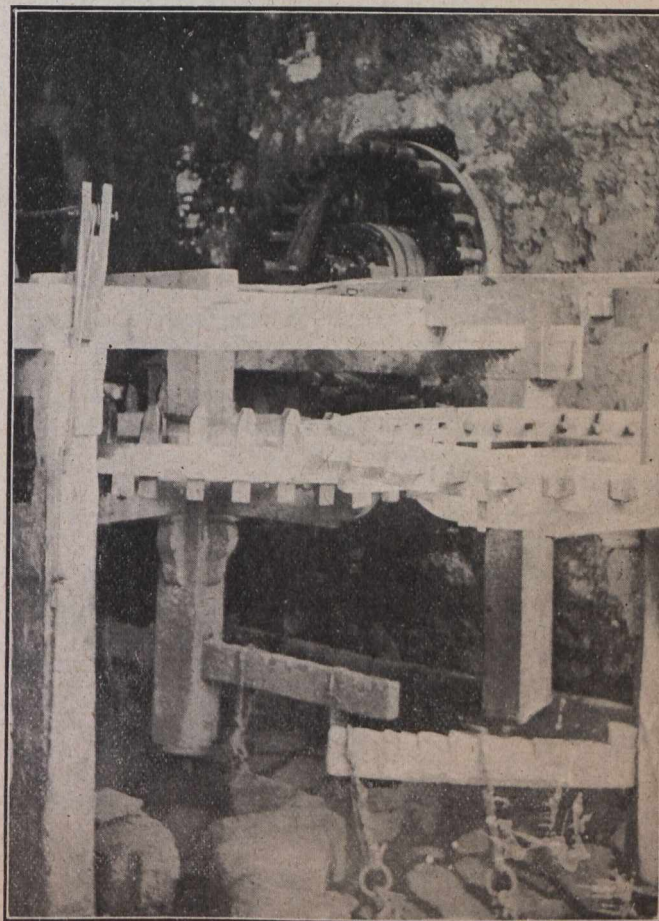


Fig. 4.

In unwatering this skin was landed on a masonry sluiceway, and, collapsing, acted as a self-dumping bucket.

The ore won is carefully hand sorted. The Mexican "peon" is a very expert ore-sorter and the costs for this work are not high. The ore is thus brought up to a value that will enable it to stand the high treatment charges of the crude crushing appliances and of the patio process.

The ore after hand sorting is delivered to the crushers—chilean mills or wooden stamps—in sizes averaging about a 2-inch cube. The chilean mill consisted of a stone centre, 5 to 6 feet diameter, and 10 to 12 inch face with a heavy iron tire. The long axle is extended outwards to form a sweep to which a mule is

drop and order of drop is 1, 2, 3, 4. The stems are made of oak, 6 x 6 inches and 12 feet long. In general usage they are shod with ½-inch strap iron. Crushing is done to about ½ inch and for screens perforated hides, perforated sheet iron or gratings of round iron bars are used.

Ore from the chilean mills or stamps is ground in "arrastras." The illustration shows two of a set of four arrastras driven from one water wheel. The grinding stones are about 18 inches square and the charge is about one ton per day.

From the arrastras the sands are transferred to the "patio," a yard paved with flat stones. It is made up in charges of 30 to 60 tons and spread in "tortas," or

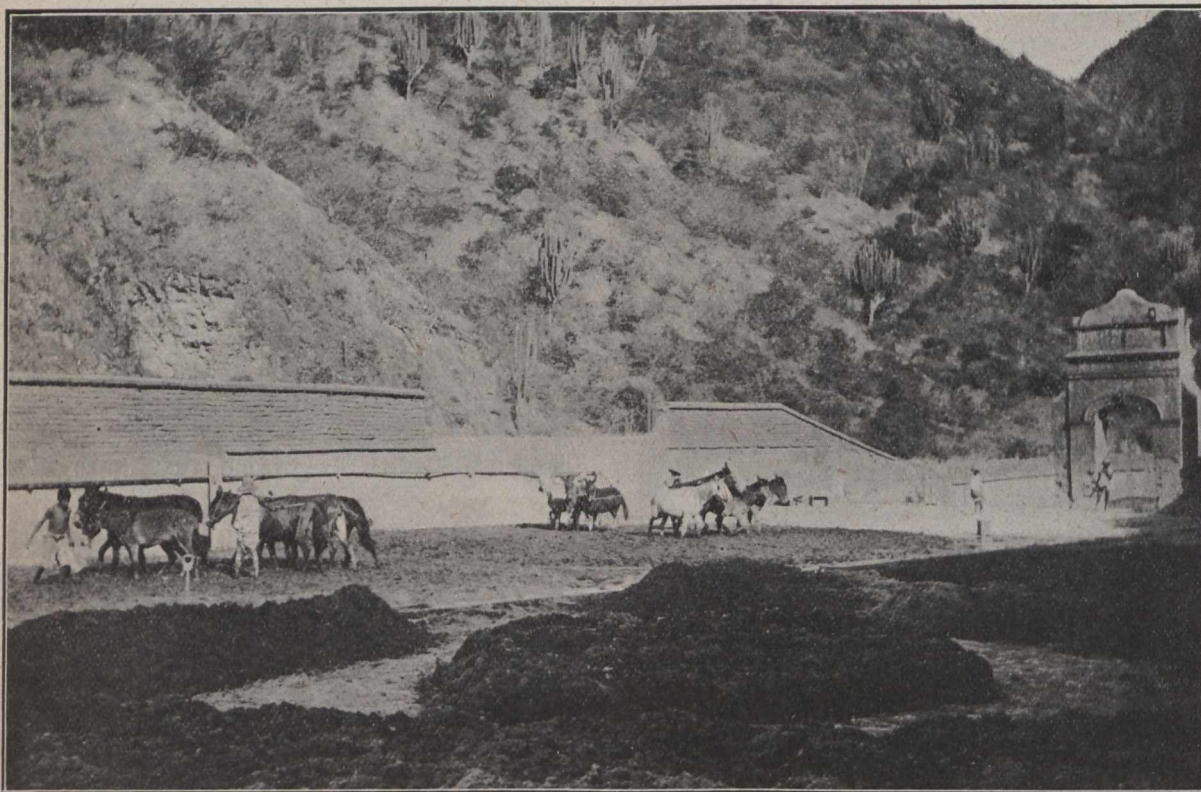


Fig. 5.

hitched. Inwards the axle is attached to a vertical post free to revolve as the mule draws the wheel around. The wheel runs on hard rock or iron track, from the edges of which rise inclined iron gratings. A man follows the wheel shovelling the crushed ore against the grating and pulling the oversize back on the tread. Crushing is done to ½ to ¾ inch.

Wooden stamps are occasionally lifted by men, but are generally run by water wheels. The photo, No. 3, shows a 4-stamp battery which is run by an overshot water wheel, the axle of the wheel being extended to form the cam-shaft. This cam-shaft holds four sets of wooden cams. The stamps are worked with a high

cakes, about one foot thick. Five per cent. salt and one per cent. copper sulphate ("magestral") is added. The charge is turned over and stirred by mules walking through it (photo No. 5). Mercury is added in amounts necessary and tests are made by taking samples and panning. The time required for a charge varies from four to five weeks, after which the amalgam is collected by washing and settling. On argente ores the extraction of silver is 85 to 90 per cent., but only 30 to 40 per cent. of the gold is recovered.

To the decreased relative value of silver to gold, the increased cost of labour and of corn (for mule power) is due the decline of the patio process.

THE DOMES OF NOVA SCOTIA

By T. A. Rickard.

(Continued from last issue.)

PART II.

Introduction.

In 1905 I was engaged by the Government of Nova Scotia to examine and report upon the goldfields of that Province with a view to giving advice concerning

the best method of stimulating a declining industry. After I had completed my investigation of the gold-bearing lodes of the country I turned, as was proper, to the descriptions and explanations published by ear-

lier investigators, and in ransacking the literature of the subject* I found delightful evidence of the growth of geological thought from 1860 to the present day. This evidence can be summarized in the form of a series of quotations, accompanied by my own comment, and it is here proffered as a contribution to the study of economic geology.

Before citing a succession of observers, I shall ask you to remember that the longer axes of the saddles and domes, on which the ore is found, have a strike from east to west, that is, parallel to the backbone of the peninsula of Nova Scotia, with cross-folds extending roughly from north to south. Next it is necessary to explain some of the terms used by earlier writers and sanctioned by local usage: "Lead" is used as a synonym for "lode." The slate is variously called "shale," "clay slate," "argillite," and "belt." The last of these is also a synonym for "bed." The quartz is said to lie in the "belts" of slate. The quartzite is called "sandstone," which is not far wrong, although the rock in question is undoubtedly crystallized by metamorphism. Another local synonym for quartzite is "whin." This, of course, is an old British term applied to the trap-rock forming the base of that horizon in the Carboniferous in which are found the lead deposits of the north of England, notably at Alston Moor. Used thus it is the equivalent of the Cornish "elvan." As applied to the Nova Scotian quartzite it is entirely wrong, and serves merely to perpetuate an early error. Both "belt" and "whin" are localisms of a pernicious character, because any special significance that they may possess is misleading.

Gold was discovered at Waverley† in August, 1861. Earlier discoveries had been made at Tangier, in 1860, but they proved unimportant.

* * * * *

Benjamin Silliman, Jr.

In the following year a famous American geologist, Benjamin Silliman, Jr., offered a description of the Nova Scotian goldfield in a paper published at Newhaven, in February, 1864. He made reference to the strong marks of glaciation and the proofs of extreme denudation. Mention is made of "the universal evidence of a high degree of glacial action, which has so worn down and polished the rocks that their edges everywhere resemble the leaves of a book which has been cut with a dull knife in the binder's press; in a direction at right angles to that of the leaves."

* * * * *

He gives a section and a perspective view of the Waverley deposit, and says:

"Only the corrugations in the open part of the cut are visible; the extension of the vein to the right and left is ideal, the superincumbent mass covering it. I measured, however, the quartzite above, dipping to the right and left at a small angle, and I think no geologist would doubt that the crest of an anticlinal axis here comes to the surface and has escaped the denudation which has removed the top of the crest in most places. The corrugations, or folds, appear to be accounted for on the supposition of a lateral thrust producing the undulations. The annexed perspective view of this interesting locality is taken from a stereoscopic photograph, showing the appearance of the barrel quartz after the surface rock (quartzite) has been removed, and before the miners have broken up the quartz layer for removal."

It is obvious that Silliman made an acute diagnosis of the structure and we shall see that many years passed before any later scientist was able to throw fresh light on the subject.

T. Sterry Hunt.

Four years later, in 1868, a celebrated chemist and geologist, T. Sterry Hunt, made a report for the Geological Survey of Canada. He quotes Campbell as having drawn attention to "the grain or reed-like marking often impressed on the surface of the beds in a direction parallel to the east and west axes of folding, and he points out that the angle of dip, eastward or westward, of these markings on the crown of the great anticlinals enables us to detect the transverse, or north and south, lines of undulation, which have at a subsequent period disturbed the horizontality of the east and west anticlinal folds." It is obvious that for the "angle of dip" we should read "pitch."

Hunt himself proceeds to say:

"The markings in question often appear as rib-like ridges or flutings, which are most conspicuous on the surface of the auriferous quartz layers and the enclosing beds. On the summits of the anticlinal folds they are sometimes so large and so well defined as to give the layers a wrinkled or corrugated form, producing what is designated in the region as 'barrel' quartz, and has by some observers been compared to the ripples on water, and by others, to that parallel arrangement of logs which is seen on what is called a corduroy road."

In explaining the origin of the deposits of gold-bearing quartz, Sterry Hunt says:

"So far as my present observation goes, I think that to describe them otherwise than as interstratified beds would be to give a false notion of their geognostic relations. The laminated structure of many of the lodes, and the intercalation between their layers of thin continuous films or layers of argillite, can hardly be explained in any other way than by supposing these lodes to have been formed by successive deposition at what was, at the time, the surface of the earth. There is, moreover, evidence that these laminae were formed before the lodes were folded and contorted; this is furnished by some remarkable specimens of the so-called barrel quartz which I took from a lode at Upper Stewiacke. . . . It seems not improbable that the corrugated structure of the lodes, which gives rise to the barrel quartz, is due to the difference in texture, and to the greater resistance to lateral pressure offered by the quartz layers than by the enclosing beds of clay and sandstone, which by their consolidation have given rise to the argillites and quartzites."

Thus he supposes the quartz to be an original member of the sedimentary deposit in which it now lies embedded and he imputes the crenulation to subsequent folding. The corrugation of quartz and the corresponding fluting of the rock encasing them are essentially different from ripple-marks, such as, for example, I saw on the foot-wall of the Johnson's Reef mine at Bendigo.‡ The efficacy of lateral pressure alone is negated by the fact that the "barreling" or crenulation is exhibited by veins that cross the stratification.

Henry Y. Hind.

The next observer to write on the subject was Henry Youle Hind, who published a report in 1869. He had an active imagination, for he says: "A very feeble

*In which I was greatly aided by a bibliography placed at my service by Mr. J. Edmund Woodman, then professor of geology in Dalhousie University.
 †Originally it was Waverly, probably from an error in spelling.
 ‡Trans. A.I.M.E., Vol XX., Page 219.

conception can now be formed by superficial observation of the original enormous magnitude of these huge waves of rock which ridged the surface of the Province. Whether denudation took place as fast as the uplift, or whether the undulations attained their maximum altitude, partially or wholly undenuded, it is certain that not less than 9,000 feet, in vertical thickness, belonging to one rock series, have been removed from the present surface of the Waverley gold district."

* * * * *

Hind's idea of simplicity is to ignore facts. However, in his description of the details of lode-structure he exhibits powers of observation better disciplined. He says:

"At Waverley, movement has occurred between the quartz and the whin, or between the quartz and hard slate, or in the bands of slate, and in all cases slickensides, reed-like markings, ripples, and small undulations have been produced. In the barrel quartz no sliding motion is distinguishable, for the corrugations extend far into the overlying whin rock until they assume the form of a series of connected arches 5, 6, and even 7 feet in width. The corrugations are by no means confined to the quartz lead, but spread out, fan-like, into the overlying rock."

He distinguishes between "true" veins, namely, the feeders that cross the stratification, and the "bedded" veins of the domes, thus. "While the gold which the bedded leads contain, in common with other metals, was most probably derived from the oceanic waters from which the quartz was deposited, the gold in the short segregated veins of subsequent origin was transferred from the bedded leads or auriferous interstratified slates." He makes note of the fact that at Montague, Sherbrooke and Laurencetown, the rich quartz or 'gold streak' dips (he means 'pitches') at the same angle as the corrugations. He attributes the occurrence of these richer portions to precipitation by organic matter, saying: "It would be a simple matter to explain the structure of the gold streak on the supposition that organic matter determined the deposition of the metal in belts or zones, for it is easy to conceive accumulations of stranded organisms on subaqueous beaches in a shallow sea in the form of long bands."

This coincidence between the pitch of the rich ore and a large corrugation or "roll" is an important fact, as has been proved by many small but successful mining operations in Nova Scotia. The "stranded organisms" are not confirmed by the evidence of vegetable remains, but it is true that slate is more plentiful at the anticlinal crests.

* * * * *

In describing the mines at Sherbrooke he distinguishes between lodes that are "intercalated, and consequently of later age than the contemporaneous beds." The last two words refer to the interbedded seams of quartz, which he thus distinguishes from the quartz that appeared to him to be unstratified. He goes on to say:

"In broad bands of slate, lodes thicken to the breadth of 10 to 12 inches and thin out to a film of quartz or disappear altogether in the space of a few hundred feet. But before they thin out altogether, another lode begins to appear, separated from the first by a few inches, more or less, of slate and quartzite. This cannot be strictly regarded as a continuation of the lode which has thinned out—although it may thin

out and be in part overlapped by another lode in the strike of the first one which has disappeared. Some lodes of this description appear to belong to the class of intercalated lodes, that is, they are sheets of quartz that have been formed at a later date than the enclosing rock, and were produced by the replacement, particle by particle, of pre-existing beds of some other soluble material. In lodes of this class, which generally occur in slate, the slate itself is found to be auriferous, and the whole mass is frequently worth crushing. The strong persistent lodes generally occur in quartzites, or with quartzites on one side and slate on the other. The intercalated lodes occur in slate, with sometimes thin beds of quartzite, which are also intermittent, that is, 'thin out' and 'take up' again.

Here he recognizes that the quartz assumes the shape of flat discs or lenses, following each other *en echelon*, and he is on the track of the truth in imputing their form to the replacement of soluble sedimentary material. It is strange that he did not take the next mental step, and inquire whether the regular layer-like forms of quartz were not also a replica—in part at least—of rock replaced by silica.

* * * * *

In his description of Waverley, he is off the dangerous domain of theory, and does himself more credit. He says: "The so-called barrel quartz at Waverley is a fair representation of a corrugated lode, occurring on the crown of an anticline. In nearly all the gold districts the same form of quartz beds may be seen, and in similar relative positions. The corrugated structure is not confined to the quartz, but spreads fan-like into the overlying rocks, and appears to be, in part, the result of unequal pressure during the folding of the strata."

Warrington W. Smyth.

At the meeting of the Society of Arts, in London, before which this paper was read, the chairman was Sir Warrington W. Smyth. He was the only person present who cared to criticize Hind's theory, and he did it, as we should expect, in an effective manner. Smyth asked:

"If the gold has been deposited contemporaneously with the quartz by the sea-water, why was not all the gold deposited at the bottom of the sediment, by reason of its greater specific gravity? But by another part of the paper it appeared that the gold ran only in streaks, and that it seemed to be accumulated near certain crossings of these beds by other lines of quartz, which looked more like true veins. At present, therefore, he could not help saying he thought there was a good deal more to be made out. He had on former occasions visited certain localities, though not in Nova Scotia, where it was said that minerals occurred throughout a stratified mass, but he had usually found such a statement to be the result of a deficient observation. In a certain part of the stratified-looking mass there had been a dissemination of mineral matter, but very frequently this apparently stratified mass was nothing else but a mass of stratified material, ground and rubbed together, and existing between two walls resembling those of a regular vein; or, again, the mineral matter had been most decidedly intercalated at a period long subsequent to the original formation of the beds. He could not help thinking that this would prove to be the real explanation of the occurrence of the gold in a great part of these Nova Scotia deposits."

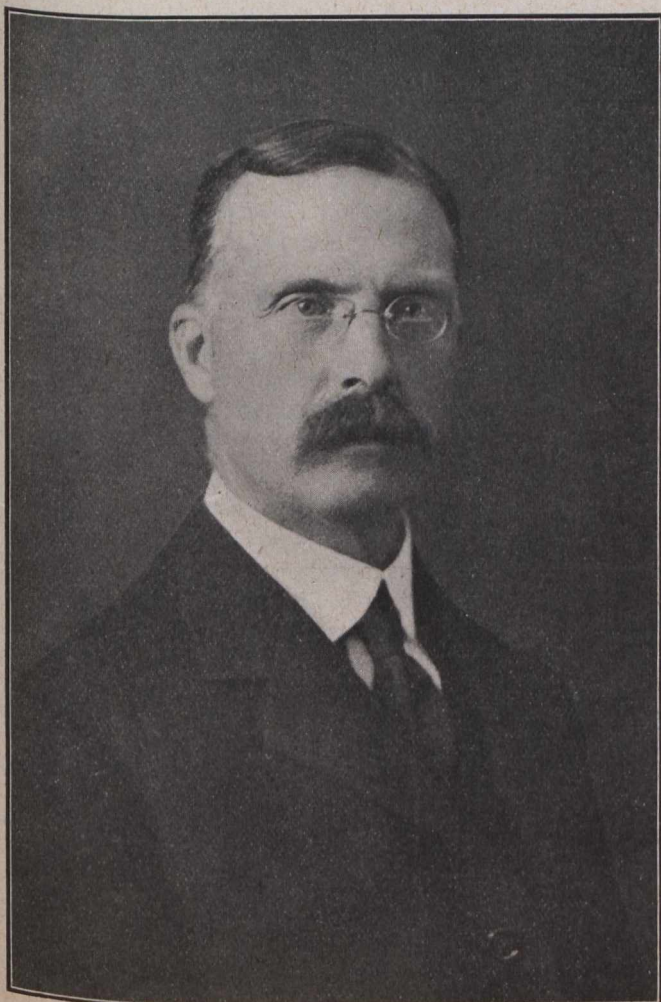
Thus Smyth placed his wide general experience against Hind's local knowledge. The reference to "streaks" requires explanation, that being the word used in Nova Scotia for the richer portions of the quartz, that is, ore-shoots. It is a misleading term, for the "streak" is not a line or thread of rich ore but a band that may be many feet wide, pitching at a strong angle, as determined by the "rolls," to which

(To be Continued.)

THE ONTARIO-MANITOBA BOUNDARY

Mr. J. B. Tyrrell, whose name is familiar to all of our readers, at the request of the Ontario Government, has accepted a position as leader of the expedition that is to choose and survey the five-mile strip of land running from the eastern boundary of the new part of Manitoba to the mouth of the Nelson River on the west shore of Hudson Bay.

No Canadian is better fitted to explore such country as that lying between Manitoba and Port Nelson. Not only has Mr. Tyrrell led several expeditions in northern Canada, but he has also made a profound study of all extant literature bearing on Hudson Bay and the whole Canadian north. As editor of the "Journal of Samuel Hearne's Journey, 1769-72," published by the Champlain Society, Mr. Tyrrell is responsible for one of the most important contributions to the literature



Mr. J. B. Tyrrell

reference had been made, and by feeders or cross-veins that do not conform to the bedding of the country-rock and therefore penetrate the walls of the normal anticlinal sheets of quartz. Undoubtedly Smyth was right in placing his finger on this significant fact, a fact that suggested so obviously that the deposition of the gold could not be due to sedimentation.

of Canadian exploration. Part of Hearne's route, between Fort Churchill and the mouth of the Coppermine River, Mr. Tyrrell travelled himself. Many of Hearne's observations on topography, ethnology, etc., Mr. Tyrrell was able to check. Hence his editing was of a peculiarly valuable quality.

It may be added that the Province of Ontario is entitled to a strip of land five miles wide, extending from the eastern boundary of the new part of the Province of Manitoba, as established by an Act passed by the Dominion Parliament last session, to some point on the Nelson River, which the Province of Ontario may choose. The whole of this strip from end to end throughout its length of about 150 miles must be not farther than 50 miles from the shore of Hudson Bay. In addition to the strip five miles wide, Ontario is to receive a further area extending up or down the Nelson River for a distance of five miles and half a mile back from the river, giving the Province a continuous frontage on the river of ten miles.

The Nelson River, including its tributaries, the Saskatchewan and Red Rivers, is one of the largest streams on the continent, and it is not impossible that with the growth of the northwest territories and the extension of navigation to Hudson Bay one of the large cities of the world may grow up at its mouth. The importance of careful location of Ontario's share of the country near the mouth of the river may thus be appreciated.

Mr. Tyrrell plans to return south through the new district of Patricia. It is hoped that from this journey much matter bearing upon the mineral resources of the district will be obtained.

PERSONAL AND PERSONAL.

Mr. D. L. H. Forbes, mining engineer, Manning Chambers, Toronto, has been appointed consulting engineer for the Trethewey Silver-Cobalt Mining Company, Limited.

Mr. J. C. Murray, editor of the Canadian Mining Journal, has returned to Toronto after an absence of five weeks.

Mr. D. A. Brebner, managing director of the Manufacturers Corundum Company, sailed for England on April 23rd.

Mr. C. H. Macnutt, general manager of the Poderosa Mining Company, Limited, Antofagasta, Chile, is due in London, England, late in May.

Mr. Clifford Smith, mining engineer, Brockville, Ont., and Miss Beatrice Elaine Rimer, daughter of Mayor Rimer, of Bryson, P.Q., were married at Hull on April 24th. Mr. Smith has many friends in Toronto, where he often makes his headquarters, and in Co-

balt, where for some years he was engaged in professional work. This is but one case of a serious epidemic that broke out early in the year. Other cases are pending.

Mr. J. B. Tyrrell, mining engineer, Room 534, Confederation Life Building, has made arrangements to have his professional business attended to during his absence.

Mr. T. A. Wood, of Buffalo, who is associated with Mr. John O. Adsit, of Hornell, N.Y., in the South Bay Mining Company, of Gowganda, was in Toronto on April 18th. Mr. Wood had with him some very rich specimens of silver ore from the mine.

Mr. Elias Rogers, of Toronto, president of the Crow's Nest Pass Coal Company, has gone to England on a business trip.

Mr. G. O. Buchanan, Dominion Supervisor of Lead Bounty, has returned to Kaslo, B.C., after an absence of several months.

Dr. Cairnes, of the Geological Survey of Canada, was to leave Ottawa late in April for Yukon Territory, where he will be engaged in geological investigations during the ensuing field-work season.

Mr. P. W. Lover, late superintendent of the New Dominion Copper Company's Rawhide mine, near Phoenix, British Columbia, died recently in that province.

Mr. E. Jacobs visited the Canadian Copper Company's big smelting works at Copper Cliff before returning to Victoria, B.C. He left Sudbury for the West on April 15th.

The Western Branch of the Canadian Mining Institute purposes holding one of its periodical meetings at Ainsworth and Kaslo, B.C., some time during the latter half of May.

The first volume of "An Investigation of the Coals of Canada, with Reference to their Economic Qualities," as conducted at McGill University, Montreal, under the authority of the Dominion Government, has been issued by the Mines Branch of the Dominion Department of Mines. The report, which will be in six volumes, is by J. B. Porter, E.M., D.Sc., and R. J. Durlley, M.E., assisted by Theophile C. Denis, B.Sc., Edgar Stansfield, M.Sc., and a staff of special assistants.

Col. Carson has returned from a trip to Europe. He stated in regard to Crown Reserve affairs that large contracts had been made for ore on the Continent, while they succeeded in selling all the mine's bullion for a year ahead in London.

Mr. R. G. Drinnan, mining engineer, Vancouver, B.C., visited Toronto last week and returned to the Coast on April 25th.

Mr. Arthur H. Sancton has been appointed Canadian manager for Fraser & Chalmers, Limited. Mr. Sancton was formerly mining engineer for the same firm.

THE CANADIAN OIL SHALES AND THEIR COMPARISON WITH SOME ELSEWHERE

By Arthur Lakes.*

The existence of enormous and inexhaustible bodies of bituminous and oil shale as reported by the government survey is likely to be a source of considerable wealth to the country where petroleum oil is not otherwise a marked feature of production. It would seem at present that the natural oil resources of Canada are confined to a few wells and limited oil areas of New Brunswick and Ontario, whilst there would appear favourable signs of a possible oil field in Alberta. It was the absence of oil in Scotland and at that time in Europe generally, that led the thrifty Scots whose attention had been drawn by certain geologists to the oil bearing properties of areas of bituminous shales to the establishment of their oil shale industry and digesting works which for a long time were so successful until the discoveries of oil at Baku, Russia, and the oil fields of America affected the market. Extensive oil shale works have long been carried on successfully in New Zealand, where, as in Scotland, there appear to be no natural flowing oil fields such as we have in the United States, and petroleum has to be imported. It was not oil only that was digested and extracted from these shales, but an immense number of equally valuable by-products including ammonia, naphtha, paraffin wax candles, etc. Analyses by the survey show the Canadian shales to be capable of between 30 and 40 gals. of crude oil per ton, with from 40 to 65 pounds of sulphate of ammonia. The New Brunswick shales vary in colour from gray to brownish and black and some are thin and known as "paper shales," and contain fish remains; others are in massive bodies of black or brownish tough elastic shale, rich in ammonia-gas and

crude oil. The beds underlie the lower carboniferous formation, and are often of great thickness and extent. Some beds are 1,000 feet thick. "In these," says the Survey, Canada possesses a source of mineral wealth, the great value of which if properly developed can be scarcely overestimated."

In the Quebec region in the Gaspé Basin the oil shales are of a distinctive character from those in New Brunswick and Nova Scotia. They belong to the upper Devonian area, the nature of greyish sandstones, shaly in places; fossil plants are abundant in the formation.

Colorado Bituminous Shale.

The description of these bituminous shales and their prospective importance and value calls to mind the fact that in certain parts of Colorado similar shales abound in enormous quantities, and over very wide areas offering an inexhaustible supply of the material to which so far no attention whatever has been paid, so far as we know even an analysis. The area where these shales out-crop most conspicuously is in the Great Book-Cliff Plateau of North Western Colorado. This remarkable plateau, upwards of 2,000 feet high, extends for several hundred of miles east and west from the Grand River in Colorado into Utah and from south to north a hundred miles and more into the southern border of Wyoming.

It is composed principally of shales and sandstones of the Tertiary period including the Wansatch and Green River Tertiary groups, which rest at the base in Laramie cretaceous coal formations.

The plateau abounds in hydrocarbons such as oil

*Superintendent the Ymir-Wilcox Development Co., Ltd., Ymir, B.C.

springs, oil-seepages, fissures filled with asphaltum and porous rocks more or less saturated with oil.

The shales occur in thick bands. They vary from light coloured thin so-called "paper-shales" to darker and more massive bodies of blackish or chocolate coloured shales, some of a leathery elastic character. The shales are exposed on the sides of the steep cliffs of the plateau 2,000 feet in height and appear also up some of the canyons intersecting it. The shales are easily ignited by a match, their inflammable character was discovered at an early date by hunters, who were surprised to find their wood fire of the night before still burning in the morning, due to the rocks being on fire. It was the habit of the campers after this discovery, to bank their fires at night with these shales which insured a good blaze in the morning.

We have seen near Rifle Creek conglomerate underlying these shales dripping with black asphaltum or hydrocarbonaceous matter no doubt derived in some way from the shales above.

Nothing, as stated, has ever been done to test or develop or manufacture these shales into hydrocarbon producers; few probably know of their existence. They are quite accessible from points along the Rio Grande and Moffat railways.

The origin of the shales and plateau in which they are found is clearly fresh water as shown by fossil shells, insects, water plants, fishes, and mammalian remains.

The plateau represents the deposits of a vast series of fresh water seas or inland lakes accumulating fine deposits throughout the aeons. The bituminous shales would appear to be either the source of the hydrocarbons found at various points in the plateau or to be the recipients of hydrocarbons from surrounding sources. There are no igneous rocks in the plateau and apart from its being gently folded into a synclinal or saddle shape, the strata are undisturbed and show no evidence of faulting hydrocarbons such as asphaltum, oil, etc., ascending through natural joint fissures in the strata.

INDUSTRIAL NOTES.

SULLIVAN MACHINERY COMPANY.

The March number of "Mine and Quarry," a quarterly bulletin published by the advertising department of the Sullivan Machinery Company, has just been received. While issued as an advertisement to show the application of Sullivan machinery to different classes of work, it contains much information of general interest to miners and quarrymen.

The recent issue contains a description of an exhaustive test of a Sullivan compressor; of the plant of a Lake Superior mine; as well as notes on the use of channelling machines, air lifts and stoping drills in tunnel work.

THE RENOLD SILENT CHAIN.

An attractive little catalogue has been issued describing the Renold Silent Chains. In the descriptive matter given, perhaps not the least interesting is that showing the growth of the firm. It was founded in 1879, employing one man, and has increased till the employees now exceed 1,000.

The advantages claimed for this drive are silence, smooth-running, efficiency and reduction of vibration. The range of applicability is from the drive of a motor truck to that of a motor driven mine hoist.

THE GOLDSCHMIDT THERMIT COMPANY.

"Reactions" is the name of a quarterly published by the above company, and devoted to the science of aluminothermics.

In the March issue are given descriptions of repairs to machinery and rail-welding by the Thermit process. The range of applicability is very wide and its use is extended to many different parts of the world.

SPECIAL CORRESPONDENCE

ONTARIO.

Porcupine and Swastika.

There are to-day in the Porcupine camp 50 stamps treating on an average 300 tons of ore per day. These two mills are the Dome, forty stamps, and the McIntyre, ten stamps. The next addition to the capacity of the camp will be the Vipond mill, with a maximum of 125 tons per day. It should be ready early in May, as excellent progress is now being made with construction. It is possible that the Hollinger mill may be in operation by the middle of May, but it is more likely to be the first of June in spite of the very satisfactory progress that is being made. At the McIntyre ground has just been broken for a new forty-stamp mill. It is probable that at first only twenty more stamps will be set up, but room in the building will be left for a duplication of the plant at any time. The five stamps at the Little Pet should be dropping by the end of this month. As soon as returns from the test mill run at the Kingston School of Mines have been received, plans will be drawn up and work commenced on a ten-stamp mill at the Dome Lake property, where marked progress has been made since the first of January.

To date, the production from the camp in 1912 consists of four gold bars from the McIntyre ten-stamp mill.

So excellent has been the saving on the plates at the McIn-

tyre and the Dome that it is probable that Porcupine plants yet to be constructed will be designed with a much simpler flow sheet than those adopted at the Dome and the Hollinger. It is reported that the Dome tailings before cyanidation run very low, and at the McIntyre after amalgamation and concentration there is only a loss of between 50 and 60 cents.

Work has been resumed at Waiwaiten Falls, where A. E. Wallberg & Co. commenced to erect a power plant last November. Early this year money could not be provided for the conclusion of the work, and progress has been checked for at least three months. Now work has been resumed. It is understood at date of writing that the scheme has been re-financed by Mr. D. Lorne McGibbon, president of the La Rose and owner of many other water powers, but it has not yet been confirmed. There is no doubt, however, that the work will now proceed. The Porcupine power plant at Sandy Falls is already loaded to capacity, and further power must be provided for the camp as it develops. The Waiwaiten Falls project should be completed by the end of the summer.

Within the past month excellent progress has been made with the underground development of the Vipond. The shaft is down to 320 feet and a station is being cut at the 300 foot level and preparations made for cross-cutting for the veins at once. At the 100 and 200 foot levels the main or Godfrey vein

is opening up very nicely. At the 100 foot there is now a continuous ore shoot for 528 feet, and 180 feet from the shaft a raise has been put through to the surface, all in ore. On the 200 foot level of the same vein there is pay ore for a distance of 420 feet. The No. 3 vein is showing a good width at the 200 foot level, but values run slightly lower, or between \$8 and \$12. Cross-cutting to the north from the Godfrey vein at the 100 foot level a two foot vein of quartz has just been intersected. At the time of writing this new ore body had not been sampled, but it has all the characteristics of other pay ore veins on the mine. There is now on the dump about 5,000 tons ready for the mill.

Quite a number of prospectors have gone into the Bell River District in Northern Quebec, where good discoveries are reported. The route lies along the Transcontinental east of Cochrane to the end of steel and then 90 miles along the grade to the Bell River, where most of the parties are encamped until the ice clears from the river and it is possible to get north.

Plans are complete for the ten stamp mill which is to be erected at the Swastika mill very shortly. At the 300 foot level of the mine a hundred feet of pay ore has now been opened up in a drift on the main vein, and the shaft is down almost to the 400 foot level, where it is intended to open up another level with all speed. Finds in Lebel and Eby Township on the Tough and other claims have awakened considerable interest in claims, and several transfers of property are reported.

In Burt Township, at Swastika, the report of the discovery of native silver has led to a revival of prospecting and staking. Round Kirkland Lake there is also some activity.

It is stated that Daniel O'Connor, well known to all visitors at Temagami in recent years, has made a discovery of nickel near Connaught or the Frederickhouse Lake station of the Porcupine branch of the T. & N. O. It is thought that this is a continuation of the ore body at the Alexo mine near Kelso.

Three companies holding Porcupine properties have recently been incorporated. These are the Canada Veterans Gold Mines, capital \$1,000,000, Toronto; Porcupine Gold Leaf Mining Company, capital \$1,000,000; and the Porcupine Christ Mines, capital \$1,500,000, head office, Toronto.

Cobalt, South Lorrain, Elk Lake, and Gowganda.

The shipments in bullion for the month of March far exceeded any previous month in the history of the Cobalt camp. There was a grand total of 441,000 ounces. Of this amount the Nipissing alone shipped 43,705 ounces.

The Beaver Consolidated annual report shows that the production of the mine during the year amounted to 750,950 ounces, and cost of production was \$149,066, an average of 19.85 cents per ounce. The profit and loss account shows the net earnings of the mine in 1911 were \$223,097, out of which amount \$169,125 was distributed in the form of dividends, and, after allowing depreciation, the balance carried over to surplus, which now amounts to \$178,184. No estimate is made in the report of the ore reserves, and the veins are extremely erratic both in values and width.

The Lumsden mine on Beaver Lake is now working at the 300 foot level, where a crosscut is being driven from J. L. shaft to pick up two veins which were located upon the Rochester.

The Nipissing production in March was \$225,058 net. The shipments during the month amounted to \$257,706, of which amount \$230,305 was bullion from the high grade mill, where 189 tons were treated during the month. Excellent results were obtained in development at the Meyer No. 100, and 64, but 122 is still disappointing.

The annual report of the Nipissing mine, as revealed in the statement by Mr. R. B. Watson, shows that net earnings were

over \$2,000,000. Notwithstanding that only a third of the annual prospecting was done in 1911, high grade ore reserves at the beginning of the year exceeded in value those of the previous year by more than \$275,000. The reserves of the mine were increased during the year by \$1,300,000, to a total of \$4,572,000. The report shows that there remains 270 acres or about one-third of the total area still unprospected. The shipment of high grade ore amounted during the year to a value of \$881,133. The total tons of ore shipped was 2,838,344, containing 2,512,950 ounces. Including bullion, the grand total output was \$2,381,712, or 4,678,074 ounces, produced at a cost of 14 cents per ounce.

It is stated that the La Rose annual report will show that 3,691,797 ounces were produced during the year, the net value of which was \$1,810,476. The cost of production averaged 19.20 cents per ounce, and the ore reserves were placed at 4,250,861 ounces, of an estimated value of \$1,643,938, while the combined surplus amounts to \$1,551,421 after paying dividends to the amount of \$599,491.

The shaft at the Silver Cliff mine is now being dewatered with a view to opening up again at an early date. The property has been closed down now for almost a year after the mill had been in operation for only a very short time.

By a fire which broke out on the morning of April 11th, the sampling plant and refinery at the high-grade mill on the Nipissing property were destroyed. The damage is estimated at \$5,000,000. Repairs were at once taken in hand and a new building has now almost been completed.

The Kerr Lake Mining Company has just declared a dividend of 5 per cent., payable on June 15th. With this disbursement the Kerr Lake will have paid 134 per cent., or a grand total of \$4,020,000, in dividends.

ALBERTA.

The following notes, relating to only a few of the coal mining properties of Alberta, have been received from a correspondent of The Journal:

St. Albert Collieries.

On the property of the St. Albert collieries, situated eight miles northwest of Edmonton, along the Canadian Northern Railway, a reinforced concrete shaft is being put down through quicksand. This is stated to be the first mine shaft of this kind constructed in Canada. It is in the form of an open steel caisson supported by reinforced concrete. The shaft is being sunk with the object of cutting two seams of coal, of 8 and 6 ft. thickness respectively, and it is thought it will have to be put down to a depth of 320 ft. It is expected the first seam of coal will be reached by the end of May. This property is in what has been designated in Geological Survey reports as the Clover Bar coal horizon.

Pacific Pass Coalfields, Ltd.

The mines of the Pacific Pass Coalfields, Ltd., will be afforded railway transportation facilities by a branch line being constructed from Bikerdike, on the Grand Trunk Pacific Railway, 136 miles west of Edmonton. The branch line will be 156 miles in length, and it is thought it will be completed by the end of June. About 500 tons of coal a day could be shipped now if there were available the requisite facilities. A plant is to be put in to have a daily capacity of 2,000 tons, and it is planned to later make it equal to handling about double that quantity daily.

Lethbridge Collieries, Ltd.

The new and modern steel bankhead for the coal mine of the Lethbridge Collieries, Ltd., at Kipp, six miles west of Lethbridge, has been completed. This plant has a capacity for handling 1,800 tons of coal a day, but the mine is not yet opened on a sufficiently large scale to admit of a daily output of more than 500 tons being made. There will, however, be a

gradual enlargement of its producing capacity until it shall be practicable to put out coal, if required, to the full capacity of the bankhead equipment, which is to a large extent a duplicate of that at the Alberta Railway and Irrigation Company's Galt Collieries No. 6 mine. Two shafts have been sunk. The hoisting shaft is 17 ft. 6 in. by 22 ft.; it is divided into three compartments—two for hoisting and one for pipes and ropes. The cages are in balance and each carries two cars tandem. The air and material shaft is 10 ft. by 20 ft., divided into three compartments—two for air and one for material. Two main haulage ways have been driven below ground, one for full and the other for empty cars. Entries are driven off at right angles to the haulage ways. Horses were used for hauling during opening of mine, but endless rope or other suitable haulage will be substituted for them.

Western Coal and Coke Company.

It is expected that the Western Coal and Coke Company, which has opened a coal mine on Beaver Creek, in Pincher Creek District, Southern Alberta, will shortly be in a position to proceed with the installation of plant and machinery requisite for handling and shipping coal from this mine, at which true openings have been made in the same seams, preparatory to mining coal. The construction of a branch railway, about 13 miles in length, from the Canadian Pacific Railway Company's Crow's Nest line to the mine at Beaver Creek, commencing at a point between one and two miles west of Pincher station, has been in continuous progress since last summer, and the completion of this work before the close of April was looked for. Machinery will be sent in with as little delay as practicable, and the work of putting it in place be proceeded with expeditiously. An eventual output capacity of 2,000 tons of coal per diem is to be provided for. Meanwhile shipment on a smaller scale will be undertaken as soon as the requisite shipping facilities shall be available.

BRITISH COLUMBIA.

As the spring season comes on, conditions generally are less unfavourable to mining than during the winter. Frost and snow at the higher altitudes, and rain and bad roads at the lower, retard operations during the several winter months, so that in most districts the output of ore is smaller and operating costs are greater than when better climatic conditions prevail.

Higher prices for some of the metals are also having an encouraging effect on mining, especially where the chief product is copper. This metal is the most important marketable constituent of Boundary District ores, and of those mined by the Britannia Mining and Smelting Company on its large group of mineral claims situated on Britannia Mountain, Howe Sound. In less degree owners of Rossland mines are also interested in the price of copper, but the ores of the bigger mines of that camp contain much more gold than do those of Boundary and Coast district mines.

From gold mines, both placer and lode, an increase in production in 1912 is expected. Placer gold mines in both Cariboo and Atlin Districts are well equipped for washing a large yardage of gold-bearing gravel, so it only remains for a sufficient supply of water to be obtained to ensure a total recovery of gold this year larger than that of last. The lode gold mines of Sheep Creek and other parts of Nelson Mining Division, and the Nickel Plate group in Hedley Camp, Similgameen, are expected to make a bigger output of gold than in 1911. The Hedley Gold Mining Company has already paid one 5 per cent. dividend this year, and it is not doubted that it will in 1912 equal its total of 25 per cent. (\$300,000) paid in 1911.

Production of silver, lead, and zinc is largely from mines in

the Kootenay Division—in Fort Steele Division of East Kootenay and Ainsworth and Slocan in West Kootenay. The St. Eugene mine in East Kootenay has been closed, its known payable ore bodies having been exhausted. The Sullivan group mine is, in part, taking the place of the St. Eugene. Last year there seemed to be good reason to hope that a fairly large output of lead ore would be made in 1912 by claims about Salmo, Nelson Division, but development of these has been somewhat disappointing, the ore found underground not having maintained the promise given by comparatively large showings near the surface. Notes on several Slocan mining properties follow:

Slocan.—The recent payment of a dividend by the Standard Silver-Lead Mining Company, owning and operating the Standard mine and concentrating mill in Four-mile Camp, near Silverton, marks what it is confidently expected will prove a new era in the history of mining in Slocan District—new as regards a resumption of dividend-paying, which it is reasonable to think will ere long be also practicable to other companies mining in the district. The development of the Standard mine has been extended over a number of years, during a part of which working expenses have been paid out of proceeds of ore mined and sold. A description of this mine, together with an outline of its history, was published in the Canadian Mining Journal of December 1st, 1911. The mine came into public notice more particularly in 1910, late in which year somewhat sensational statements relative to it were sent out from Spokane, Washington. Fortunately, though, control of the company organized shortly afterwards to acquire and operate the mine, was retained by Messrs. John A. Finch, of Spokane, and Geo. H. Ayland, of New Denver, who persistently discouraged the publication of such gross exaggerations as were printed at that time in Spokane newspapers and later sent out from Nelson, B.C. Much silver-lead ore of good grade has been found in this mine, not only on No. 5 level, where there was an unusual width of clean galena, but as well on an intermediate level above, and on No. 6 level at about 190 ft. vertical depth below. Now that the winter is practically over at the lower altitudes of Slocan, an appreciably large increase in production of ore will most likely be made. Other operating mines in the vicinity of the Standard are those of the Van-Roi Mining Company and the Silverton Mines, Ltd., the latter known as the Hewitt-Lorna Doone group.

Lately newspaper despatches have been published to the effect that owing to the softness of the wagon road from the Rambler-Cariboo mine to the Canadian Pacific Railway at Three Forks, hauling ore has been temporarily discontinued. There is a large quantity of ore accessible on several levels of this mine—on the 1,200 and other levels above it, so that whenever conditions shall be favourable to its shipment, a considerable tonnage can be produced. Later, after completion of construction of the railway spur, now being built from Three Forks past the Rambler-Cariboo to the Lucky Jim mine, and of the aerial tramway from the former mine down to its concentration mill close to the new track, there will not exist obstacles to uninterrupted shipment of ore as at present.

During the winter exploration work in the Deep mine of the Whitewater group was discontinued, but the further development of the outcrop mine was undertaken by Retallack & Co., which syndicate is also mining sufficient ore to pay mining expenses. The outlook is favourable for an improvement in the transportation situation, and the owners of this mine, and others also interested in mining in this part of the district, are hopeful that before the close of the current year they will again be provided with railway facilities for shipping out ore and getting in supplies, both at lower cost than is now possible. The position is somewhat similar in regard to the Lucky Jim mine.

GENERAL MINING NEWS

NOVA SCOTIA.

Westville.—The Maple Leaf Mine, Joggins Mines, which has been operated by John D. Betts for the last year, closed down last Wednesday. The manager of this mine has had some difficulty owing to the chief coal inspector of the I. R. C. condemning coal which was supplied them.

Inverness.—Inverness colliery is to have a briquette plant in the very near future for using up the slack coal, much of which has gone to waste in the past. The pitch for these plants is a bye-product of the Sydney steel plant. It is heated by dry steam and mixed with washed slack and after cooling we have the briquette, which is about the size and shape of a cake of tar soap.

Inverness.—Mackenzie & Mann, owners of the Inverness colliery and railway, are negotiating now for the purchase of the St. Rose mine near Cheticamp, and if they are successful in securing it they will begin developments on a large scale. Mackenzie & Mann own quite an extent of coal areas in that vicinity, but require a block of areas held by Hon. Wm. Roche, of Halifax, before they can begin operations. The Senator, it is said, will only sell at what Mackenzie & Mann regard as an exorbitant figure, and the Canadian Northern twins are taking the matter up with the local government in an effort to purchase the block at a fair valuation.

ONTARIO.

Cobalt.—Vein 146 of the Nipissing is reported to have been cut on the Gould Consolidated at the 100-foot level. The vein appeared after about ninety feet of cross-cutting, and assays, it is claimed, much higher than anything yet found on the Gould. Development is to be pushed on this discovery. The lowering of Cart Lake by the town of Coleman this winter has added a large amount of dry land to the Gould area, enabling considerable surface prospecting the coming season, hitherto impracticable from the presence of surface water.

Cobalt.—During the past month development of vein 73 at the Nipissing continued favourable. This vein is still the main source of production at the Nipissing. During March it produced silver valued at \$117,753. Development on veins 100 and 80 between the first and second levels is turning out well.

Cobalt.—Instructions have been received for the dewatering of the Silver Cliff mine at Cobalt, and the pumps are now at work pumping out the shaft and workings. This work will take some time, as there is a considerable amount of drifting done at the mine. The owners of the property are expected in Cobalt shortly, when they will inspect the mine and decide in what direction the development work should be continued. The Silver Cliff has been a producing mine since 1908, and was closed down last year after working for about three months, during which period 92.30 tons of ore were shipped and 2,363 ounces of bullion. The intention of re-opening the mine is of considerable interest to the section of the camp lying west of Cross Lake, and developments at the Silver Cliff will be watched closely.

Cobalt.—Mining interests have advanced greatly in Cobalt in the past three years. In 1908 the concentration of ore amounted to 42,424 tons, last year it amounted to 381,870 tons. The number of mills has been doubled, whereas in 1908 there were only seven mills, last year there were fifteen, thirteen of these being water concentrating mills and two cyanide mills. The increased concentration of the old mills is shown in the following table:

	1908	1911
	Tons.	Tons.
Buffalo	10,200	43,930
Coniagas	13,605	53,150
King Edward	1,043	13,066
McKinley-Darragh	450	46,497
Nipissing Production	2,110	14,766

In the newer mines the concentrating output was: La Rose, 36,264; Temiskaming, 34,720; and Trthewey, 30,925.

Elk Lake.—Great activity prevails in the Elk Lake and Gowganda districts now that the Government has actually started the construction of the new railroad, and several properties have resumed work. In the Elk Lake section, the Regal, Donaldson, Willett-Cobalt, Bateese, Beacon, and Hitchcock are now being developed actively, and the Otisse, a property known to several, is preparing to again take up work. The shaft is full of water, but a pump is being put in to remove it. The owners of the MacDuff claims have added one more to their holdings and are bidding for two more that are adjacent to their property.

A car of ore carrying gold and silver values was recently shipped from the Mann property in Gowganda and excellent returns came from the consignment. The gross receipts were \$38,000, and it cost \$6,000 to get the ore to the steel and from there to its destination. The silver ran in the neighbourhood of 5,000 ounces and the gold values were \$32 to the ton.

Elk Lake.—The plant of the Big Six has been purchased by the Regal, which will begin operations immediately under the able supervision of N. R. Morrison. The Regal adjoins the Donaldson, which has a large quantity of silver showing below the 100-foot level, and the same vein, which contains the silver on the latter property, runs directly into the Regal. The Donaldson machinery is being installed as rapidly as possible and the work will likely be completed in about two weeks. The plant recently installed in the Hitchcock is all ready to work, with the exception of the water supply, which is not quite ready. As soon as a supply is obtained for the boilers, operations will be begun putting down a shaft on this property.

Porcupine.—The Bewick-Moreing summer residence, on the east bank of Pearl Lake, the famous "club house," has been leased by Dr. H. H. Moore, who will conduct a general hospital for the camp. This action was taken as the result of the move on the part of the mine men for a miners' hospital in the western section.

The building is well suited for hospital purposes. Twenty large rooms, besides kitchen, dining-room, and store houses, and a large verandah that reaches around the west and south sides of the structure, afford every convenience for a sanitarium. The altitude is above that at South Porcupine, while pure springs of water run into Pearl Lake.

Porcupine.—The Porcupine Lake Gold Mines are continuing their diamond drilling on the Hunter-Dwyer claims, the work being done now from stages on the ice. It is intended to put down six more holes, and the work will be continued from the ice as long as possible and afterwards by aid of cribs. Indications are still very satisfactory and the extra holes are being put down with the object of charting the part of the property of the company that lies under the lake. With the completion of this chart it will be possible to ascertain the most advantageous point for sinking the shaft from which a cross-cut will be run under the lake. It is expected that the work of sinking the shaft will be commenced in the near future and the property under the lake thoroughly prospected by drifting on the veins that have been located by the aid of the diamond drill.

Porcupine.—The last of the machinery for the Crown Chartered's new power plant has arrived and the work of placing the boilers and hoist will now be pushed with vigour. The management figures that steam should be turned on from the new plant within a few weeks.

Sinking in the main shaft is now down to the 190-foot depth and the 200-foot level will be reached before the week is out. Cross-cutting will go on at the 200-foot level also, while the sinking of the shaft to the 300-foot is also under way. Another level will be cut at the 300-foot depth. Work in the up-rises and drifting on the lead at the 100-foot depth are pursued vigorously. Three levels are to be driven during the summer.

Porcupine.—The Hollinger is to have a new 15-drill compressor in addition to the large one now working. The new machinery will be installed at once.

With the additional power for drilling the Hollinger will be able to run 15 drills besides the 15 now in operation.

A total of from 750 to 800 feet in the underground a month is being made, and with the additional 15 drills this amount of development will be practically doubled each month.

Porcupine.—It is announced that work on the Wallberg power dam at Waiwaitin Falls is to begin at once, following a long suspension of activity on account of financial difficulties, and that all back cheques are being taken up. Forty carloads of material for use at the plant have been shipped to Timmins siding, and more sidings are being laid to accommodate other cars which are expected to arrive this week with large consignments for use at the Falls.

Winter roads are now thawed out, and all the machinery will have to be shipped by scow up the Mattagami River from Timmins Landing. Fifty teams of horses were taken from the Waiwaitin camps last week at the last moment, when they could be gotten out over the roads.

At the Falls the power plant is about half completed, the tubes all laid, and the sand hauled for the cement work on the dam.

Porcupine.—While the ten-stamp mill at the Dome Lake Mining Company has been decided upon, the process to be adopted will not be singled out until results are obtained from the test run at Kingston, although it is probable that it will follow the pattern of the McIntyre mill. The management claims that they have enough ore in sight to pay for the mill, and if the property then makes a mine they will know exactly what ore they have got and what profit they can make with further work.

Sudbury.—The streams are open and the lake ice not safe for travel. Some prospectors have just arrived in town, tired and foot-sore, but with courage still up to the fighting point.

The Mond Nickel Company's dryhouse at the Frood was totally destroyed by fire.

Smith & Durkee have started two drills on the International Nickel Company's property at the Frood.

BRITISH COLUMBIA.

Nelson.—The management of the Mother Lode mine hopes to commence crushing ore at the new mill by May 1.

Men are already at work in the mine and at the mill preparing for the commencement of the season's operations. At present the air pipes are being given their final test.

Rossland.—The Consolidated Company has purchased the Virginia mine, adjoining the Centre Star group, for \$3,500. This was the highest bid received, although it was advertised as far east as Toronto. The Virginia was one of the live properties of the early days, when George Ofunder was superintendent. The company was capitalized for \$500,000. The \$3,500 will just about cover the accumulated debts.

Phoenix.—R. Gosse, representing the Canadian Consolidated

Company, arrived in town recently and has been engaged for some days in removing and shipping the large 400 horse-power motor from the Snowshoe mine, the lease of which was thrown up some months ago. With the exception of one-half section of the compressor, the property of the Consolidated, which is still standing, all the machinery of value has now been removed. The motor was shipped to Trail.

Vancouver.—Details of extensions and improvements at the mines of the Canadian Collieries (Dunsmuir), Ltd., in the Cumberland field on Vancouver Island, involving an expenditure of nearly \$2,000,000, was discussed at a conference held here recently between A. D. McRae, managing director; William Murray, a director; W. L. Coulson, of Victoria, general manager, and F. Perry, of Montreal, Canadian representative of Labard Bros., a Parisian banking house which is heavily interested in the enterprise.

Mr. Coulson stated that at least 1,000 additional men will be employed in connection with the various improvements within the next thirty days. A contract for the extension of the standard gauge railway line to the new No. 8 mine in the Cumberland field, a distance of six and one-half miles, has just been awarded to Clarence Hoard, of Victoria. The shaft is down 70 feet, and it will be extended to a depth of 1,000 feet to tap the coal seams proven up by diamond drills, three of which are still engaged exploring the field. The coal output a year hence, it is expected, will nearly be doubled and brought up to 5,000 tons daily. The company will build 200 new miners' dwellings at the No. 8 mine this summer, and 75 at the old mines at Cumberland, where 25 cottages were built last year. The hydro-electric plant on the Pundledge River will be completed next fall and will provide an electrical energy for operating all the mining plants in the field. It will furnish six thousand horse power, the capacity of which will be doubled later as requirements justify. The fans will also be operated by electricity, following the system in vogue at the Extension field near Ladysmith, where a new generator was installed in February.

It is not proposed to increase at present the coal output in the Extension field, which now produces 1,200 tons daily. The coal bunkers and wharf capacity at Ladysmith and Comox are also being enlarged.

Vancouver.—The prospect of the early establishment of direct railway communication with Vancouver via the Hope Mountain route, is stimulating mining development in the Similkameen district, according to Ernest Waterman, of Princeton, general manager of the Princeton Coal & Land Company, who, with A. Hickling, advisory director, of London, England, is at the Hotel Vancouver. His company, owning three square miles of coal lands at Princeton, lately installed a plant capable of handling an output of 500 tons daily, mostly supplied to the home market, but arrangements have been made to ship 300 tons daily to Spokane over the Great Northern Railway. The import duty is 45 cents per long ton.

Vancouver.—A deal for the consolidation of the principal copper-gold groups, embracing over fourteen claims in White Horse camp, Yukon district, has been completed by Robert Lower, of White Horse, who has spent the past winter in this city. It involves the payments at various periods within the next two years, the first payments in some instances maturing within twelve months. The various groups have been transferred to the New Atlas Mining Company, of Chicago, which has already been financed.

Forty-five miners will leave Seattle April 17th for White Horse, to start development work, which it is proposed to carry out on a very extensive scale. Within a few weeks regular shipments will be made to the Tacoma smelter. This result will be made possible by the general reduction in freight rates over the White Horse & Yukon Railway between White Horse and tidewater at Skagway. The rate on copper ore has been

fixed at \$2 per ton, a figure these comparatively low grade ores, it is expected, will be able to stand without any handicap, as a low rate transportation by water for the remainder of the haul has been secured.

Mr. Greenough will be the general manager of the new company, with John Mocine, of Seattle, as superintendent. Mr. Greenough will take in a large amount of drills and other machinery, as it is the intention to make a thorough examination of several of the properties which show less development than other members of the various groups.

Vancouver.—R. P. Rithet and the Drexel estate, of San Francisco, have just sold the property of the Ward Horsefly Gold Mining Co., Ltd., an hydraulic proposition on Horsefly River, Caribou district, to S. P. Dunlevy and Robert T. Ward, of San Francisco. The new owners intend to operate the plant this season, and a big gang of men is now on the ground getting matters in shape.

The property comprises a lease of the riverbed, a discovery claim and benches embracing 360 acres. Testing the ground with keystone drills during the past winter, Messrs. Dunlevy and Ward, it is said, proved it to average 75 cents per cubic yard, which is considered exceptionally good. Two years ago 100,000 cubic yards were sluiced, the gold production being \$182,000, and the return of the last two weeks' run was \$11,500. The equipment comprises three miles of 30-inch steel pipe with a flow of 3,500 miners' inches, exerting 300 pounds pressure to the square inch, and monitors as well as an electric lighting plant. The water supply is derived from Moffett Creek, which is a large stream all the year round. The new company will be a close corporation. It is styled the Horsefly River Gold Dredging & Mining Company, Ltd.

Prince Rupert, April 16.—The large freighting on the railway will be largely increased this spring by the immense amount of mining machinery that will be required in the Hazelton and Omineca districts. Several companies are talking of installing hoisting and compressor plants in order to get out sufficient ore to make regular shipments as soon as the railway reaches them, while the old placer mines of Omineca are this summer to be worked on a great scale and by simi-

lar hydraulic methods as those put into successful operation by the Guggenheims in the Yukon.

There are two large companies in the Omineca who will operate on a large scale this summer, one of which is backed by Toronto capital and on which Mr. Beaudette spent last summer and the summer before, and when he left Rupert last fall reported that his company would operate as soon as the frost was out of the ground this year. Mr. Beaudette is expected back in a few days to start these operations, the principal holdings of the company being on Manson Creek.

The other company, the Royal Standard of Vancouver, will be represented this season by R. D. Featherstonhaugh, who from 1906 to last year was the engineer and manager of the North Columbia Gold Mining Co., of Atlin. In addition to installing an hydraulic plant on the property of the Standard on Germanson Creek, near its junction with the Omineca River, he will have with him an expert on dredging, the proposition being to work the gravels by steam dredges, as is now being done so successfully in Yukon and also in California and Colorado.

Those two propositions alone mean the transportation of many carloads of machinery and supplies, and the employment of a large number of miners.

Nanaimo, April 10.—Superintendent W. A. Wilson, of the Canadian Explosives Company, was killed and a labourer named W. Woods was seriously injured in an explosion at the works at Northfield this morning about 10 o'clock. Other deaths were probably averted through the fact that a warning blast was given.

It is believed that Superintendent Wilson was not killed instantly, dying after the explosion. He was one of the most efficient men that has ever held the position here, and was about 40 years of age. He leaves a family.

Little is known of the labourer.

The explosion was caused by overheating of the nitrate mixer. When the employees found that this condition existed they left the building and summoned the superintendent from the office. Mr. Wilson was 200 feet from the building and approaching it when the powder went off. He was disembowelled.

COMPANY NOTES

ROBERTSON ASBESTOS COMPANY.

Asbestos propositions seem to have fallen on evil days. A short time ago Amalgamated Asbestos defaulted on its bond interest and had to be reorganized. Then the Black Lake Asbestos Company had a somewhat similar experience. Now the Robertson Asbestos Company is being sold by the trustees for the benefit of the bondholders. The company had mines in the neighbourhood of Thetford, P.Q. But, like all other asbestos mines in the neighbourhood, it felt the pinch of competition and lower prices. The asbestos market shows signs of reviving, but the improvement has come too late to help the existing companies.

PEARL LAKE GOLD MINES, LIMITED.

The Pearl Lake Gold Mines, Limited, head office in Toronto, and a considerable amount of stock in Montreal, has assigned. The following circular letter to shareholders has been mailed by B. E. Cartwright, the president:

"I regret to have to report to you that the company has been obliged to make an assignment for the general benefit of its creditors. The company still has in its treasury 251,000

shares of its stock, but during the last few months the market has been such that it has been impossible to sell treasury stock to meet current liabilities.

"Several creditors have commenced proceedings against the company to recover their claims, and it seemed to be best that the assets of the company should be placed in the assignee's hands to protect both the creditors and the shareholders.

"A complete plant with a capacity of twelve drills is installed on the property and a three compartment shaft has been sunk to the four hundred foot level. From this shaft a crosscut has been started to tap the valuable and extensive ore bodies located by diamond drill operations.

"I have every confidence that within a very few weeks I will be in a position to pay off all claims against the company and obtain a re-conveyance of the company's assets from the assignee to the company.

"I feel it my duty to advise and urge all shareholders not to sacrifice their holdings, but to retain their stock until arrangements are completed as above and mining operations resumed."

Mr. Cartwright has not been a model of discretion or of unselfishness in his management of affairs.

REA.

Underground work has been stopped at the Rea and temporarily, at least, the vein will be shut down. For the next two weeks at least the only development that will be done at the property will be diamond drilling.

The closing of the underground work is said to be only temporary, pending the annual meeting of the company, which will be held in Montreal. It is understood that complete reports of the results achieved at the property will be made known at that time.

THE WETTLAUFER LORRAIN COMPANY.

A summary of the report which accompanies the dividend cheques of the Wettlaufer Lorrain Company indicates that during the past quarter there were produced 264,683 ounces of silver at a cost of production of 19½¢ per ounce, resulting in a net profit of \$102,206. There was expended on property acquired and options \$22,348. Prospecting is in progress and the main winze is to be carried down 100 feet below the fifth level. In several cases where stoping was carried on in the original blocks of ore estimated, the pay ore did not maintain its width and values throughout. This was given full weight in making up the estimate of ore reserves as of December 31st.

The Keeley property, which was held under option and on which some work was done, has been relinquished as the results were discouraging. At the Silver Eagle property good results have been obtained. High grade ore was encountered on the fourth level, and an up-raise has been driven for 30 feet, and still continues in excellent ore, running several thousand ounces to the ton and showing a vein from one to four inches wide.

Since the report was written a shipment of 15 tons was made, showing contents to be 4,702 ounces of silver per ton. Word has also been received to the effect that a decided improvement has been made in one of the stopes now being worked in the mine, bunches of high-grade ore appearing, having a width from 3 to 6 inches and assaying 3,000 ounces of silver per ton, where only milling ore was anticipated.

CONIAGAS DIVIDEND.

The directors of the Coniagas mines omitted their three per cent. bonus from their dividend for the second quarter of 1912, and instead of the 6 and 3 per cent. dividend, declared six per cent, payable on May 1. The dividend calls for a disbursement of \$240,000, and is a total disbursement of \$3,440,000, or 86 per cent. of the total capitalization. Coniagas directors went on a 36 per cent. basis the first of last year, and have been distributing the dividends in nine per cent. quarterly payments since that time. Although the extra bonus was earned by the company during the past three months, they have decided to omit it for this quarter in the dividend checks. The Coniagas dividend record reads:

1907.....	9	\$ 360,000
1908.....	11	440,000
1909.....	9	300,000
1910.....	6	240,000
1911.....	36	1,440,000
1912, Feb. 1.....	9	360,000
May 1.....	6	240,000
	86	\$3,440,000

LA ROSE STATEMENT FOR 1911.

The La Rose Consolidated Mines Co. reports for the year ended December 31, 1911, as follows:

Dividends received	\$627,000
Administration expenses, etc.	33,319
Dividends paid	599,451
Deficit	5,770
Previous surplus	13,361
Profit and loss surplus	7,591

The combined income account of the La Rose Mines, Limited, and University Mines, Limited, for the year ended December 31, 1911, follows:—

Gross value of ore	\$1,977,765
Other income	30,362
Total income	2,008,126
Cost of mining and other expenses	739,041
Profit	269,086
Dividends	627,000
Surplus	642,086
Reserve deduction	16,497
Previous surplus	904,367
Combined profit and loss	1,529,956

For the seven months ended December 31, 1910, the operating companies showed a surplus after dividends of \$596,408.

NIPISSING REPORT FOR 1911.

The Nipissing Mines Company has issued its report for the year ended December 31, 1911. The income account of the Nipissing Mining Company, Limited, the operating company, compares as follows:

	1911.	1910.	1909
*Output	\$2,820,257	\$2,984,084	\$2,462,037
Other income	47,168	52,669	40,320
Total income	2,867,425	3,036,753	2,502,359
Operating costs	772,184	869,649	857,491
Net profit	2,095,251	2,167,103	1,644,869
Prev. surp.	952,799	913,195	803,326
Dividends	1,843,297	2,127,500	1,535,000
P. & L. surplus	1,204,743	952,799	913,195

*Including value of ore on hand, in transit, and in process of refining.

The income account of the Nipissing Mines Company for the year ended December 31, 1911, compares as follows:

	1911.	1910.	1909
Div. on Nip. min. stock ..	\$1,843,297	\$2,127,500	\$1,535,000
Interest	22	199	301
Income	1,843,319	2,127,699	1,535,301
Dividends	1,800,000	2,100,000	1,500,000
Admin. ex.	51,290	41,289	22,018
Deduct.	1,851,290	2,141,289	1,522,018
Deficit	7,971	13,500	*13,282
Prev. surp.	8,381	21,971	8,688
P. & L. surp.	410	8,381	21,971

***Surplus.**

President E. P. Earle says: The results obtained from the operation of your properties last year were very gratifying.

The cost of producing silver, including every item of expense, was under fourteen cents per ounce.

Because our hydraulic plant was not delivered in time for operation last year, only about one-third the usual amount of prospecting was done. Notwithstanding this the high grade ore reserves on January 1, 1912, exceeded in value those of the previous year by over \$275,000. Including the accumulated low grade ore on the dumps (but not considering the large amount of this class of ore in the mines) the reserves were increased during the year by \$1,300,000 to a total of \$4,572,000. This is the largest ore reserve ever shown by the company.

The experience gained from the treatment of high-grade ores, having shown that our low-grade ore can also be treated profitably, a 200-ton mill is now being erected for that pur-

pose. It is expected that this will be in operation late this year, and it is certain that the milling of these ores will add largely to the company's income.

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

The following table shows the Cobalt ore shipments for the week ending April 13th, and for the year to date:

	Week.	Year to date.
Beaver	60,000	183,988
Buffalo		710,532
Can. Gowganda		15,967
Casey Cobalt		549,000
Chambers-Ferland		192,000
City of Cobalt		226,293
Cobalt Lake		270,680
Cobalt Townsite	111,000	646,744
Colonial		40,000
Coniagas	230,319	1,228,776
Crown Reserve		298,569
Drummond		604,000
Hudson Bay	61,086	437,830
Kerr Lake	108,469	493,282
La Rose	126,200	1,886,682
Mann (Gowganda)		40,000
McKinley	61,900	1,568,498
Millerette		126,000
Miller Lake O'Brien	50,000	146,500
Nipissing	80,400	1,189,222
O'Brien		398,970
Provincial		44,440
Right-of-Way		220,296
Temiskaming	76,800	564,539
Trethewey	56,165	272,635
Wettlaufer	56,000	216,470
Total	1,022,239	12,649,577

The fire at the Nipissing this week interfered to some extent with their bullion shipments and the total for the week is consequently lower than usual. The Nipissing made only one shipment early in the week to New York and the Trethewey also figured among the shippers with a small shipment to London. The shipments for the week are as follows:

	Ounces.	Value.
Nipissing	39,411.00	\$23,006
Trethewey	1,696.18	990
Totals	41,107.18	\$23,996

The following table shows the Cobalt ore shipments for the week ending April 20th, and for the year to date:

	Week.	Year to date.
Beaver		188,988
Buffalo	56,340	766,872
Can. Gowganda		15,967
Casey Cobalt		549,000
Chambers-Ferland	67,200	259,200
City of Cobalt	65,419	291,712
Cobalt Lake		270,680
Cobalt Townsite		646,744
Colonial		40,000
Coniagas		1,228,776
Crown Reserve	40,900	399,469
Drummond		604,000
Hudson Bay	62,967	500,797

	Week	Year to date
Kerr Lake		493,282
La Rose	232,440	2,119,122
Mann (Gowganda)		40,000
McKinley	137,094	1,705,592
Millerette	30,000	156,000
Miller Lake O'Brien		146,500
Nipissing		1,189,222
O'Brien		398,970
Provincial		44,440
Right-of-Way		220,296
Temiskaming		361,539
Trethewey		272,635
Wettlaufer		216,470

Totals 692,360 13,311,937

The shipments of bullion for the week are as follows:

	Ounces.	Value.
Buffalo	6,168.00	\$3,654.54
Kerr Lake	2,244.50	1,329.57
O'Brien	20,662.00	11,983.00
La Rose	20,636.00	11,801.53
Temiskaming	2,322.50	1,358.00
Drummond	1,198.70	709.81
Totals	53,231.70	\$30,836.45

The bullion shipments for the year to date are as follows:

	Ounces.	Value.
Nipissing	1,124,500.52	\$647,584.30
Crown Reserve	201,143.00	112,678.85
Temiskaming	56,833.00	33,804.96
O'Brien	72,834.47	40,176.85
Nova Scotia	49,010.00	31,800.00
Buffalo	31,438.00	18,214.54
McKinley-Darragh	2,528.00	1,390.37
Kerr Lake	4,566.25	2,678.67
Trethewey	5,703.66	3,238.00
City of Cobalt	1,618.40	1,000.00
Miscellaneous	7,869.64	4,511.81
Totals	1,558,044.94	\$897,078.35

BRITISH COLUMBIA ORE SHIPMENTS.

Consolidated Company's Receipts.

The production and shipments to the Consolidated for the week ending April 6th were:

	Week.	Year to date.
Rossland—		
Centre Star	2,986	42,003
Le Roi	1,464	12,723
Le Roi No. 2	571	6,028
East Kootenay—		
Sullivan	585	7,023
St. Eugene		401
Society Girl		21
Ainsworth—		
Utica		132
No. 1		311

	Week.	Year to date.
Slocan—		
Standard	172	2,569
Van Roi		1,110
Hewitt	31	90
Ottawa		59
Eastmount		57
Fidelity		61
Apex		36
Richmond-Eureka		443
Rambler-Cariboo		411
Reco		24
Lone Bachelor		31
Ruth		259
Middleton		24
Other mines		228
Nelson—		
Canadian King		54
Arlington		670
Nugget		44
Granite-Poorman	30	100
Queen		110
Emerald		833
Vancouver		17
Devlin		11
Molly Gibson	191	335
Silver Cup (Lardo)		86
Monarch (Field)		114
Foreign—		
Knob Hill	110	1,176
Hope		20
Northport		34
Bonanza		80
Totals	6,140	76,391

	Week.	Year to date.
Queens		110
Emerald		833
Vancouver		17
Devlin		11
Molly Gibson	72	407
Silver Cup (Lardo)		86
Monarch (Field)	29	143
Foreign—		
Knob Hill	74	1,250
Northport		20
Hope		34
Bonanza		80
Totals	6,132	82,523

BOUNDARY ORE TONNAGES.

Following are the returns of the output of the mines and smelters of the Boundary District for the week ending April 5th, and year to date:

Granby	24,502	315,166
Mother Lode	7,805	108,938
Rawhide	5,854	38,856
Jack Pot	378	8,188
Others	241	3,106

Smelter Tonnages.

Granby	24,140	361,127
B. C. Copper Co.	12,120	157,613

For the week ending April 12th, and year to date:

Granby	24,666	339,832
Mother Lode	7,524	116,462
Rawhide	3,682	42,538
Jack Pot		8,188
Others	191	3,297

Smelter Tonnages.

Granby	23,655	384,782
B. C. Copper Co.	13,141	170,754

B. C. SMELTING.

In the past year the smelters of the Kootenay and Boundary districts smelted 1,362,244 tons of ore and concentrates. Of this tonnage the Granby smelter at Grand Forks treated 599,855 tons, and the B. C. Copper Company's smelter at Greenwood, 431,708 tons. The smelter of the Consolidated Mining & Smelting Co. of Canada at Trail treated 330,681. Ores and concentrates treated from the Boundary district totalled 1,065,687 tons; from Rossland district, 239,520 tons; from East Kootenay, 33,110 tons; from the Slocan district, 8,863 tons; from the Ainsworth district, 606 tons; from the Nelson district, 7,412 tons; from the Lardeau district, 782 tons. Five properties in the State of Washington shipped 6,237 tons to Trail smelter.

COBALT BULLION SHIPMENTS FOR MARCH.

The summary of the bullion shipments from Cobalt for March shows that the camp sent out 441,451.20 ounces, valued at \$257,597.81, an immense advance on the average monthly shipment of last year, which was 314,410 ounces, valued at \$167,702.80. With the March shipments Cobalt reached a record for bullion shipments.

NIPISSING PRODUCTION FOR THE QUARTER.

The Nipissing for the first quarter of this year shipped \$916,912 net in ore from a production of 1,179,470 ounces. The figures for last month were: shipped, \$257,000; of which \$203,305 was bullion, and produced 386,978 ounces; net value, \$225,058.

The production and shipments to the Consolidated for the week ending April 13th, were:

	Week.	Year to date.
Rossland—		
Centre Star	2,911	41,914
Le Roi	1,708	14,431
Le Roi No. 2	355	6,383
Bluebird		57
East Kootenay—		
Sullivan	736	7,759
St. Eugene		401
Society Girl		21
Ainsworth—		
Utica		132
No. 1	19	330
Slocan—		
Standard	168	2,737
Van Roi	30	1,140
Hewitt		90
Ottawa		28
Eastmont		51
Fidelity		61
Apex		36
Richmond-Eureka	30	473
Rambler-Cariboo		411
Reco		24
Lone Bachelor		31
Ruth		259
Middleton		24
Nelson—		
Canadian King		54
Arlington		670
Nugget		44
Granite-Poorman		100

SHARE MARKET.

(Courtesy of J. P. Bickell & Co.)

April 25th, 1912.

Cobalt Stocks.

	Asked.	Bid.
Bailey . . . . .	.02½	.02
Beaver Consolidated . . . . .	.45	.43½
Buffalo	1.75	1.50
Chambers-Ferland . . . . .	.15½	.14½
City of Cobalt . . . . .	.16½	.15½
Cobalt Lake . . . . .	.27	.26
Coniagas	7.20	6.90
Crown Reserve	3.30	3.20
Great Northern . . . . .	.11	.09
Gould . . . . .	.03¾	.03
Gifford . . . . .	.04½	.03½
Green-Meehan . . . . .	.01¾	.01½
Hargraves . . . . .	.08½	.07½
Kerr Lake	2.95	2.85
La Rose . . . . .	.75	.68
McKinley-Darragh	1.70	1.66
Nipissing	8.10	8.00
Nova Scotia . . . . .	.04½	.03
Ophir . . . . .	.10	.08½
Otisse . . . . .	.02	.01¾
Peterson Lake . . . . .	.09	.08
Rochester . . . . .	.03	.02¾
Right of Way . . . . .	.12½	.11
Temiskaming . . . . .	.45	.44
Trethewey . . . . .	.60	.56
Wetlaufer . . . . .	.64	.63

Porcupine Stocks.

	Asked.	Bid.
Apex . . . . .	.04	.03½
Dobie . . . . .	.75	.50
Crown Chartered . . . . .	.29½	.29
Dome Extension . . . . .	.54½	.53½
Eldorado . . . . .	.08½	.06
Foley-O'Brien . . . . .	.25	.22½
Hollinger	11.55	11.50
Jupiter . . . . .	.40	.38½
Moneta . . . . .	.15	.13
Pearl Lake . . . . .	.14	.11
Porcupine Imperial . . . . .	.04¾	.04
Porcupine Tisdale . . . . .	.05	.04½
Preston East Dome . . . . .	.06½	.06
Rea . . . . .	.60	.51
Standard . . . . .	.04¼	.04
Swastika . . . . .	.23	.22½
Vipond . . . . .	.39	.37½
United . . . . .	.03	.02
West Dome . . . . .	.20	.25 ¼
Big Dome . . . . .	.28	.30

Sundry

	Asked.	Bid.
Island Smelters . . . . .	.09½	.10
Canadian Marconi . . . . .	.07½	.08

New York Curb.

	Asked.	Bid.
Braden	5	5¼
B. C. Copper	5¼	5¾
Butte Coal	22¾	23¼

	Asked.	Bid.
Giroux	5¾	6¾
Green-Cananea	9	9¼
Inspiration	19½	19¾
Yukon Gold	3½	3¾
Nevada Hills	2¼	2½
United Copper	1½	1¾

TORONTO MARKETS.

April 24—(Quotations from Canada Metal Co., Toronto)—

- Spelter, 6.85 cents per lb.
- Lead, 4.50 cents per lb.
- Antimony, 8 to 9 cents per lb.
- Tin, 46 cents per lb.
- Copper, casting, 16.50 cents per lb.
- Electrolytic, 16.50 cents per lb.
- Ingot Brass, 7 to 12 cents per lb.

April 24—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.

- April 22—Connellsville coke (f.o.b. ovens).
- Furnace coke, prompt, \$2.65 to \$2.75 per ton.
- Foundry coke, prompt, \$2.75 to \$3.00 per ton.

April 22—Tin, Straits, 44.70 cents.

- Copper, Prime Lake, 15.95 cents.
- Electrolytic copper, 15.80 cents.
- Copper wire, 17.00 cents.
- Lead, 4.20 cents.
- Spelter, 6.90 cents.
- Shet zinc (f.o.b. smelter), 8.65 cents.
- Antimony, Cookson's, 8.00 cents.
- Aluminium, 19.50 to 20.00 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, \$41.00 per 75-lb. flask.

SILVER PRICES.

	New York.	London.
	cents.	pence.
April 9	58¾	26¾
April 10	58¾	26¾
April 11	58¾	27
April 12	58½	26½
April 13	58¾	27
April 15	58¾	26¾
April 16	58½	26½
April 17	58¾	27½
April 18	59¼	27½
April 19	59¾	27¾
April 20	59¾	27¾
April 22	59¾	27½