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FIFTEENTH YEAR OF PUBLICATION.

THE CANADIAN MINING REVIEW

Established 1882

Vol. XVI.—No. 4 MONTREAL—OTTAWA—HALIFAX. APRIL, 1897.

SCHOOL OF MINING,

KINGSTON, ONTARIO.

The following Courses are Offered

1. *Three Years' Courses for a Diploma in*
   - (A) Mining Engineering.
   - (B) Analytical Chemistry and Assaying.
2. *Four Years' Courses for a Degree in*
   - (A) Mining Engineering (M.E.)
   - (B) Chemistry and Mineralogy B. Sc.)
   - (C) Mineralogy and Geology (B. Sc.)
3. *Post-Graduate Courses for the Degree of*

   Doctor of Science (D. Sc.)
   For further information see the calendar of Queen's University for 1896-97, p. 128.
4. *Prospector's Course.*

   The School offers to Mine Foremen, Assayers, Prospectors and Mining Men generally, Special Courses of Instruction beginning January 6th, 1897, and continuing eight weeks.
5. *Extramural Classes for Prospectors and Mining Men.*

   Lecturers will be sent to Mining Centres to conduct Classes in Elementary Chemistry, Mineralogy and Geology as applied to the discovery and winning of valuable minerals.

The School is provided with well equipped Laboratories for the study of Chemical Analysis, Assaying Blowpiping, Mineralogy, Petrography and Drawing. In the Mining Laboratory recently built the operations of Crushing, Amalgamating, Concentrating, etc., can be studied on a large scale.

The BRUCE CARRUTHERS SCHOLARSHIP (value $200 per annum) will be awarded in May. Its object is to aid one who has had some experience in amalgamating, etc., in acquiring a good education in Mining Engineering. The conditions of the award will be made known on application to the Director or theBursar.

FOR CALENDAR OF THE SCHOOL AND FURTHER INFORMATION APPLY TO

WM. MASON, Bursar,

SCHOOL OF MINING, - KINGSTON, ONTARIO.

PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of chap. 1, Acts of 1802, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor is not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones; five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

MINING LAWS OF ONTARIO.

ANY person may explore Crown Lands for minerals. Mining lands may be taken up as surveyed locations or staked claims.

Locations range from 40 to 320 acres.

Claims range from 10 to 20 acres on vein or lode.

Locations may be acquired in fee or under leasehold.

Price of locations north of French River, $2 to $3 per acre, and south of it, $2 to $1.50, according to distance from railway.

Rent of locations first year 60c. to $1 per acre, and subsequent years 15c. to 25c. per acre.

Rent of claims, $1 per acre each year.

Claims must be worked continuously.

Royalty on ores specified in the Act, 2 per cent. of value at pit's mouth less cost of labor and explosives.

Royalty not charged until seven years from date of patent or lease, nor (as provided in s. 4 (3) of the Mines' Act, 1892), until fifteen years in the case of an original discovery of ore or mineral.

Original discoverer of ore or mineral on claim entitled to stake out a second claim.

Crown Lands sold under provisions of mining laws in force prior to 4th May, 1891, exempt from royalty.

Copies of the Mines Act, 1892, Amendment Act, 1894, may be had on application to

ARCHIBALD BLUE,
Director Bureau of Mines

TORONTO, May 25th, 1894.

15th YEAR OF PUBLICATION.

The Canadian Mining Review

Established 1882

Official Organ of the Mining Society of Nova Scotia; The General Mining Association of the Province of Quebec; The Asbestos Club; and the Representative Exponent of the Mineral Industries of Canada.

B. T. A. BELL, Editor and Proprietor. Published Monthly. OFFICES { Slater Building, Ottawa; Metropole Building, Halifax; Windsor Hotel, Montreal.

VOL. XVI., No. 4. APRIL, 1897. VOL. XVI., No. 4.

The Coming Season.

The attention which Canadian mines are now receiving abroad, is akin, in a minor degree, to that shown the South African fields some eight years ago; and, but for the political disturbances in Europe, would have resulted in much British capital finding its way into the Dominion.

This attention is not confined to one portion alone of the Dominion, although the major part of the promotions have been of British Columbia properties, but Ontario, Quebec and Nova Scotia have shared in the renewed interest.

It is devoutly to be desired that this first real awakening of interest in Canada's mines may prove permanent, and that the bad odor which has heretofore attached to Canadian investments may be permanently dispelled.

The renewed activity in the large low-grade deposits of Nova Scotia promises most excellent and satisfactory results, and not the least favorable feature of this activity is the fact that almost all the capital required is coming either from the province itself or from its sister province of Quebec. Under the business management promised, it is a safe thing to predict that the gold mining industry of Nova Scotia will attain dimensions never seen before, with results more in keeping with its unquestioned natural resources.

That Quebec is in the eyes of foreigners is evidenced by the asbestos and mica promotions which have been successfully floated recently in the English market. It can only be a matter of comparatively short time now until her gold fields receive the capital and attention that is their due.

Ontario has already been successful in attracting several wealthy English companies to her new gold fields, and in introducing much American capital. The prospects of establishing a permanent mining industry never were better for Ontario.

Unfortunately for her native capital, however, the non-assessable stock company is still the favorite mode of promotion, despite the experience and example of other countries, and despite the sad experience of many of her sons (and daughters too) in the Rossland stock boom—of which the end is not yet.

The present season will see much of this froth blown away, and the evidence regarding her gold industry and gold fields well sifted and placed upon a reliable basis. There are good reasons for believing that Ontario possesses a large area of free milling gold ores which will constitute the basis for a permanent and productive industry, and there are not wanting men of good repute and experience who believe that ultimately Ontario's yield of gold will rival, if not exceed that of British Columbia.

Coming finally to our western-most province, which certainly possesses a wealth and variety of ores and minerals greater than any other portion of the Dominion, we find a considerable number of English incorporations, a greater number of Canadians, and a large number of American ones. In fact, the greatest danger now threatening British Columbia, is the overwhelming amount of paper capital. The rush to incorporate under British Columbia laws was so great during the time it was expected that its legislature would enact a new Joint Stock Company Law, that over $90,000,000 of paper capital were added in the space of a few weeks. That 10 per cent. of all the paper capital represented by British Columbia corporations will ever be paid up in cash is open to doubt.

The production of lode-mining last year was very gratifying, particularly in the Slocan division, which has gone steadily ahead by leaps and strides since 1892. The rapid opening up of the country at the lower end of the lake will more than maintain this advance during the coming season. The worst thing that can happen to the Slocan, will be an influx of fakirs and promoters from Rossland with their questionable boom methods and fictitious valuations. There are not wanting, however, signs that such gentry find their avocations less and less in demand, and even in their own particular camp their successes are becoming smaller and smaller. Their principal newspaper organ has lost its prestige as a reliable paper and is kept busy answering and equivocating the letters of complaint from innocents who, eight months ago, devoured its pages and invested on the headlines of its astonishing articles.

The press of Slocan is on a distinctly higher plane, it recognizes that the district has stood on its merits since 1892, and that it needs no advertisement and no boom other than its enviable record.

The record in the Trail district for the past year was not so satisfactory, doubtless because its irresponsible press led the public to believe many things were facts, which were but surmises. An increased production of half a million dollars from the only two mines the district yet has is very gratifying, but the failure to add one or more mines to the dividend list, even after the lapse of four months of this year, must emphasize the caution previously advised by this journal.

Some "stupendous results" are predicted from the stamp mill. Tests of Le Roi ore, which predictions we venture to think are premature.

If test-lots of the low-grade ores found in the Virginia, Jumbo, Center Star and Deer Park claims had also been subjected to the

milling tests and had shown equal percentages of value recovered, there might have been a solid foundation for believing that the roar of many stamps will shortly be heard in the valley of the Columbia, and of Sheep Creek. Doubtless such tests will be made, but predictions at present are premature.

It has been known since 1895 that certain claims (Le Roi, Cliff, Evening Star and others) carried ores containg particles of free metallic gold, and to this cause has been ascribed the great irregularity in assays of "grab" samples.

Probably the section which will receive as much attention as any of the newer ones, will be the large division of East Kootenay, on which the Spokane promoter already has his eye. The topography of this division is favorable for rapid development, and rail transportation is an assured fact. Some of the best authorities predict a future for East Kootenay, greater than that of West Kootenay.

From this present notoriety as a mining country, much good should result ultimately to Canada. For fifteen years the REVIEW has been the advocate of legitimate mining in the Dominion, believing that the greatest natural source of wealth the country possesses is in its minerals. It believes now that these resources will receive due recognition and will reward investors, and that only the folly, cupidity and shortsightedness of the class known as promoters will avail to prevent Canada reaching that place amongst mining countries to which its natural wealth entitles it.

An Object Lesson.

The receipt of the Annual Report of the Minister of Mines for British Columbia for the year 1896, brings forcibly to mind in comparison the annual reports of the other Provinces in the Dominion in which there is a mining industry. Comparisons may be odious, but they are certainly instructive as well, and afford a very ready means in the case of public documents of judging the energy and fitness of the men directing the departments of which such documents treat. The pamphlet above referred to bears ample evidence of the industry and ability of the staff of the British Columbia Bureau of Mines, and it must be a source of great gratification to the Minister of Mines to feel that the results of the first year's operation of his re-organized Bureau are so patently successful. And it is only justice that he should remember that much the larger portion of this success is due to the man whom he had the wisdom to select as Provincial Mineralogist, Mr. Wm. A. Carlyle, Ma.E., whose merits and conspicuous ability have been no less clearly shown in his "Tables of Production" than they were in the three bulletins issued prior to the appearance of the full Report. In fact it is not going too far to say that the wisdom of placing a thoroughly practical mining engineer on the staff of a provincial bureau of mines was never better exemplified than in the document before us. What has made Mr. Carlyle's bulletins on Alberni, Trail and the Slocan so eagerly sought for has been the recognition, alike by the miner and the capitalist, that they were reading the opinions of a man who knew whereof he spoke, and who was qualified to speak from the standpoint of knowledge and experience.

We have three other provinces in the Dominion which can justly lay claim to attention on account of the mineral wealth they contain, one of which is at present vieing with British Columbia in the endeavor to attract foreign capital. Yet this province which has an enormous area of mineral bearing rocks and has compiled six annual reports upon its mineral industries has no practical man upon its staff, and burdens its Reports with a lot of matter which might admirably suit a book of travels, but is a clog and hindrance to the book as a work of reference for the miner, engineer or capitalist. To this province we commend this British Columbia report as an excellent object lesson.

In another province, the oldest one in point of mineral production, the report of its Department of Mines is merely a collection of tables of statistics with extracts from the diaries of its travelling inspectors, badly written, and containing nothing calculated to awaken interest in the resources of the province, nor anything of value to the mine operator or prospector. Its own constituents for years have been finding fault with the publication, yet its mine owners wonder why this province is passed by by the capitalist. We know of no portion of Canada in which a leaf or two taken from British Columbia's book could be better applied; there's a large opportunity for a competent engineer to prepare monographs on the different industries and districts which would form a most excellent advertisement of the country's resources. That a portion of this programme was carried out 30 years ago is all the stronger an argument for similar and more detailed work to-day.

The rapid strides made in the development of all matters pertaining to mining and metallurgy during the past generation calls for special technical knowledge in the examination of a country's resources. The work of the Dominion Geological Survey is already taxed beyond the appropriations made for it, and something besides a purely geological report is demanded nowadays. The economic side of the question is the one appealing to capitalists, and the one to advance the opening up of a country. And no matter what the formation is, if the evidence presented is such as to lead a practical mining expert or engineer of standing and reputation to advise expenditure of money, the money will be forthcoming.

We commend this Report of the Minister of Mines for British Columbia, to the attention of Ontario, Quebec and Nova Scotia, and say "Go thou and do likewise."

The B. C. Mines Report for 1896.

The REVIEW has been favored with a copy of the "Annual Report of the Minister of Mines for 1896" for British Columbia.

The Report is a substantial phamphlet of 240 pages, with maps, illustrations and a good index, and is the first report since the organization of the Bureau of Mines under the law passed in 1895.

We note in the beginning a most admirable improvement over older reports in the "Tables of Production," which show (a) the total production of the province for all years, (b) the production of metals per district, (c) the production of placer gold for each year since 1858 (d) the production of lode mines for each year since 1887, (e) the production of coal and coke since 1836 and (f) the production of metal mines for 1895 and 1896 in detail and by Districts and Divisions.

This last table (No. VIII) is of particular value at this time when so many preposterous statements are being circulated through prospectuses and newspaper advertisements as to the probable yield of the province for the current year. From it we learn that the yield of the Slocan Division increased from $1,057,677 in 1895 to $2,010,048 in 1896 (90 per cent) that Trail increased irom $702,457 to $1,243,360 (77 per cent.) and that Nelson increased from $63,608 to $545,529 (750 per cent.) while Ainsworth decreased from $388,944 to $189,589. The increase for the whole of West Kootenay was from $2,223,206 to $4,002,735, or a gain of (80 per cent.) in the twelves months. Of the total gain of $1,779,529 the Slocan Division contributed $952,371 or (53½ per cent.) whereas the much boomed Rossland made a total increase of $540,903 and the quiet Division of Nelson added $481,921 almost entirely the production of one mine.

Another statement regarding Rossland is often made, viz. that it is "the greatest gold-copper camp in the world." The figures in the report give the average contents of copper for Rossland ores at 41 lbs. per ton or (2 per cent.). Copper men need not fear any disturbance of the copper market from this source as yet.

The figures for Osoyoos Division of Yale District show a decrease of $10,511 which is apparently due to the non-production of the Fairview camp in 1896 and the stoppage of placer mining, since the production of the Cariboo mine in camp McKinney shows an increase of over $26,000.

The increase from placer mining is not so large as was expected, being $101,600, of which more than half or $54,550 was from the Keahley Creek Division and the product of the Cariboo Hydraulic Mining Co.

Of the different metals mined in the whole province gold (from quartz) shows an increase of $458,689, silver adds $1,123,460; lead $189,129 and copper $143,234.

From these figures the inference is natural that at present British Columbia is pre-eminently a silver mining country, the production of silver having more than doubled each succeeding year since (including) 1892.

Gold is a good second, and with the discoveries opening up in Lillooet, Yale and East Kootenay may soon take the lead.

The extremely rapid development of lode mining is well shown in table VI. where the total production in 1891 is given at $29,607 which five years later, in 1896, reached the magnificent total of $4,257,179, of which nearly one half was the production of the Slocan Division alone.

The report includes a valuable monograph in the Boundary Creek District by Mr. S. S. Fowler, E. M., and also the three bulletins by Mr. Carlyle on the Alberni, Trail, and Slocan, Nelson, Ainsworth Districts.

The New Legislation for Joint Stock Companies.

The recent session of the Ontario Legislature has been fruitful in the enactment of two Joint Stock Companies' Acts, one for general purposes and one for mining companies. The necessity for an Act for mining companies distinct from other industrial enterprises, may not be readily apparent. There are two classes interested in the latter, and so far in the financial history of the country there is but one class concerned with industrial stocks. The two interests to be satisfied with mining legislation are the brokers and the miners; the Industrial Joint Stock Company interest has not yet descended to the curb-stone to ply the business of exploiting the pockets of the community. For the present, broker and miner make common cause in crying down the par value of stocks of fabulous prospective value, by which the community are enticed to "catch on."

The business has run merrily for a time, but it will soon come to an end. There is flagrant dishonesty in excessive capitalization, and in the nature of things the revelation of the dishonesty will inevitably appear. When it comes, as come it will ere long, the legislation which has favored the designs of fraudulent stock-jobbers and promoters will come in for due reprobation. How deep the curse may bite, how venomous its rabies, may now be seen in the efforts to stir up war with the Transvaal to satisfy the clamor of the ruined gamesters whose losses in "Kaffir" stocks have been estimated at last reports at eighty millions of dollars.

There is a notable difference in the point of view of American and English law-makers respecting Joint Stock Companies' rights which serves to explain why English law, and Canadian law following it, is so crude, and American law in the case of the leading commercial State of New York, and some other States, so clear and concise. Joint Stock companies are merely convenient forms of partnership. Unincorporated companies may be framed and regulated by contract to serve most of the purposes gained by State incorporation. The only benefits conferred by letters patent, or parliamentary incorporation, are the rights to sue and be sued in the corporate name, and the immunity of shareholders against personal liability for more than their unpaid stock in the company. The right to hold and convey property can be managed by unincorporated companies through the medium of trustees without the aid of the legislature. This fact is recognized in New York where men may associate for any lawful business purpose, and upon signing a declaration of their association, obtain a certificate of incorporation. There they cannot sell their stock or bonds for less than par; they may not issue five cent shares or any share less than five dollars; they may not contract debts in excess of their actual paid up capital. In this country it has been the custom to give notice by a long advertisement seen only by lawyers, and a few only of that profession, of intention to petition the Throne, or its representative, for leave to carry on business under a proposed name.

The business of granting charters to companies has been treated in Canada as one of prerogative on the part of the Crown; in the United States as a matter of right belonging to the citizens, subject to such regulations as it may be advisable in the interest of the community to impose. The new Ontario Acts make notice no longer necessary, as indeed it was not under the first Canadian Joint Stock Companies' Act in force thirty years ago. But the Lieutenant Governor in Council pops up on every page, and simple matters of departmental routine are committed to the allowance or disallowance of a Minister of the Provincial Cabinet. Of the ability of any such functionary to discharge the duties fixed by the Act wisely and well there need be no doubt, but upon principle he should not be clothed with any discretionary power whatever in matters of this kind. Every citizen should know his rights as a corporator in any lawful business. It is of the most puerile legislation to place it in the power of any Minister to grant or withhold any power sought by any association of persons for any lawful business purpose. The eighth section of the New Ontario Companies' Act provides "that in every case where any public or private interest is liable to be adversely affected or prejudiced by the granting of letters patent, due notice of the intended application shall be given in three consecutive issues of *The Gazette*, and in any other manner which shall be approved of and be directed by the Provincial Secretary." Now it is quite certain that no Provincial Secretary will ever avail himself of this proviso except from an excess of caution, for the reason that no Lieutenant-Governor-in-Council has any authority to grant, after notice or without notice, power to any company to adversely affect any public or private interest. It would suffice to say to persons desiring to be incorporated for an unlawful purpose that a charter would not be granted. To leave open the inference that the Provincial Secretary by a notice in *The Gazette* can legalize an application for incorporation designed to adversely affect or prejudice public or private interests, is a piece of legislative patch-work not creditable to the Provincial Assembly of Ontario.

The quality of crudeness which here and there appears in the Ontario Companies' Act comes from following the Imperial Joint Stock Companies' Act. The basis of a company is, of all things a broker at the ear of a facile legislator would mention, "A Memorandum." Since gerunds in di-do-dum were first conjugated, nothing so vacuous has been required by legislation, as the foundation upon which the structure of an incorporated partnership shall be raised, as this "Memorandum." Business men entering into partnership settle the

scope and conditions of their association by an agreement. The same course of business should be required of those uniting in a Joint Stock Company. The Imperial Act puts in a schedule the form of a code of by-laws which companies may adopt or modify, and styles them Articles of Agreement. Some of these rules should be statutory enactments not variable at the pleasure of the corporation, for the simple reason that they have been framed for the protection of stockholders. Rules which may be modified for the sake of convenience should be left to the directors to frame subject to the assent of their constituency.

The Imperial Joint Stock Companies' Act places no limit on the amount of shares, and requires no other stock subscription than that the applicants for subscription shall each take at least one share. The moral distance between the Stock Corporation Law of a State, which, like Massachusetts, requires all the stock to be paid up before business may be undertaken, and that of Great Britain where only seven shares are required to be taken (not paid) by seven applicants, is immeasurable. There are those who believe that there is no place in the world where a company swindle may be so successfully launched as in London. Is it intended that Canada shall copy Imperial legislation for the creation of similar facilities?

Some new enactments in the Ontario law manifestly designed to protect stockholders, support the claim that the legislature do not intend to allow the law to be made a tool for fraud. For example, it is provided that where stock has been paid for by the transfer of property before incorporation the "Provincial Secretary may require such evidence as shall be satisfactory to him of said transfer," "and of the value of the property." But against the purchase after incorporation of property which stockholders may fraudulently be induced to allow, there is not the least protection.

The absence of preventive legislation in the Act is somewhat compensated by the provisions for a thorough examination of the affairs of a company. It is provided that "upon an application by one or more shareholders or creditors of the company, the judge may, if he deems it necessary, appoint an inspector, to investigate the affairs and management of the company who shall report thereon to the judge, and the expense of such investigation shall, in the discretion of the judge, be defrayed by the company, and partly by the applicants as he shall order." Then the Lieutenant-Governor's prerogative as Visitor of Corporations, is preserved, by giving him power to appoint an inspector, "who shall report to him thereon." And the report is made evidence of the opinion of the inspector.

The Mining Companies' Act makes large provisions for a great variety of powers, businesses, transactions, acts, matters and things. Some part of it reads like an ancient resurrected mining lease. "If the Letters Patent permit" the company may "construct, maintain, alter, make, work and operate on the property of the company, or on property controlled by the company, tramways, telegraph or telephone lines, reservoirs, dams, flumes, race and other ways, water powers, aqueducts, wells, roads, piers, wharves, buildings, shops, stamping mills, and other works and machinery, plant, and electrical and other appliances of every description, and to buy, sell, manufacture and deal in all kinds of goods, stores, implements, provisions, chattels and effects required by the company or its workmen or servants."

The provisions of this Act respecting liability for false statements exempts directors, promoters and others from responsibility for any false or misleading statement made by any engineer or expert unless it is proved that the director or promoter had no reasonable ground to believe that the person making the statement, report or valuation was competent to make it. This is but a re-enactment of the law as it has been heretofore. The question has been time and again raised, how is the ordinary business man to know the attainments of the professed expert, or his qualifications for reporting upon or valuing a property? Will the Mining Institutes thrash out this question to a solution? Meanwhile the Companies Acts will doutless receive attention from the Committee on the subject, appointed at the meeting of the Federated Institute in February last.

The Bounty on Steel Billets.

Some interesting correspondence is made public in the Auditor General's report just issued with respect to the interpretation of the Order-in-Council under date of 22nd June, 1895, providing for the payment of a bounty of $2.00 per ton on all steel billets manufactured in Canada from pig iron (made in Canada from Canadian ore). The Auditor-General took exception to a payment to the Nova Scotia Steel Company, claiming that no deduction had been made for the proportion of foreign pig iron used, to which the Commissioner of Customs contended that no deduction was made because the Order-in-Council provided that not more than 50 per cent. of the total weight "may consist of ferro-manganese, spiegeleisen, ferro-silicon, scrap iron or scrap steel and such other ingredients and in such proportions as are necessary and usual in the manufacture of steel billets." The Auditor-General then submitted the matter for an opinion to the Department of Justice and to Mr. Z. A Lash, Q.C., Toronto, pointing out the uncertain factor in the claim of the Nova Scotia Steel Company—the manner in which the claim should be affected by the presence of foreign pig iron in the charge. While admitting that foreign pig iron might be used as a part of the other ingredients he raised the point "but having been imported as pig iron and not as ore, should the bounty accrue on the whole weight of billets produced or should a deduction be made for that proportionate weight of the ingredients as if the ingredient had been in the ore, or should it not? The following correspondence elucidates the matter and justifies the Commissioner of Customs in the position he took in paying the bounty to the Nova Scotia Steel Company.

DEPARTMENT OF JUSTICE, OTTAWA, 4TH JULY, 1896.

SIR,—I have the honor to acknowledge the receipt of your letter of 30th ultimo, No. 17,539, in which you ask for an opinion as to the interpretation to be placed upon the regulations for the payment of bounty upon steel billets.

In reply, I am directed by the Minister of Justice to state as follows:

(1) In the opinion of the Minister of Justice foreign pig iron, which is a necessary and usual ingredient in steel billets manufactured from pig iron, (made in Canada from Canadian ore) cannot be excluded in computing the bounty under these regulations, unless it is a foreign ore within the meaning of the regulations. It is not an ore in any ordinary sense of that term, and, such being the case, and, in view of the fact that in the schedule to the regulations, foreign pig iron and foreign ore are treated as separate and distinct classes of ingredients, the Minister thinks that foreign pig iron cannot be held to be foreign ore within the meaning of the first clause of the regulations.

(2) The Minister is of opinion that the bounty is payable only upon billets in which the "other ingredients" constitute not more than fifty per cent. of the total actual weight of such billets when manufactured.

I am, Sir, your obedient servant,

(Signed) A. POWER, A.I.M.J.

TORONTO, FEBRUARY 11TH, 1897.

THE COMMISSIONER OF CUSTOMS.

SIR,—Replying to your letter of the 8th inst., submitting case for opinion, I beg to say:

(1) By 57-58 Victoria, Cap. 9, the Governor-in-Council may authorize the payment of "a bounty of two dollars per ton on all steel billets manufactured in Canada from pig iron (made in Canada from Canadian ore) and such other ingredients as are necessary and usual in the manufacture of such steel billets, the proportion of such ingredients to be regulated by order of

the Governor-in-Council, provided that in computing the bounty no payment shall be made with respect to foreign ores used in the products herein mentioned.

(2) By Order-in-Council approved on 22nd June, 1895, provision was made for the payment of a bounty of two dollars per ton on steel billets, the order in this respect following the words of the statute quoted. The proportion of the other ingredients to be used in the manufacture is thus stated: "not more than fifty per cent. of the total weight, and may consist of ferro-mangense, spiegel, ferro-silicon, scrap iron or scrap steel, and such other ingredients, and in such proportions as are necessary and usual in the manufacture of steel billets."

(3) The Nova Scotia Steel Company, Limited, manufactured steel billets, and from the papers sent I gather that in such manufacture a certain quantity of foreign pig iron was necessary and usual, and was used. The question asked is whether (under the proviso in the Statute, that in computing the bounty no payment shall be made with respect to foreign ores used in the products) a deduction should be made from the total weight of the billets to represent the foreign pig iron which was used, or whether the whole weight of the billets as manufactured should be regarded as computing the bounty. I gather from the papers that more than fifty per cent. of the total weight resulted from the use of pig iron made in Canada from Canadian ore.

(4) I am of opinion that, under the Statute and Order-in-Council, the bounty is payable upon the total weight of the steel billets, unless foreign ores have been used in their manufacture. If foreign ores have been so used, a deduction must be made with respect to them. In other words, the weight of the other ingredients (except foreign ores), which are necessary and usual in the manufacture of the billets, must be computed.

(5) I am of opinion that foreign pig iron cannot be considered as foreign ore within the meaning of the Statute or Order-in-Council. There is nothing in the context to extend the meaning of the word "Ore" beyond its ordinary common meaning, and this meaning does not, I think, include pig iron made from it. If it were necessary to deduct anything for foreign pig iron because it was made from foreign ore, it would be equally necessary to make a deduction for such scrap iron, scrap steel, or other like ingredients used in the manufacture of the billets as may have been made from foreign ore. Therefore, as more than fifty per cent. of the total weight of the billets resulted from the use of pig iron made in Canada from Canadian ore, and as the other ingredients used were authorized by Order-in-Council, and as foreign ore was not used, I am of opinion that in computing the bounty upon the billets manufactured by the Nova Scotia Steel Company, the total weight of those billets must be taken.

I return the papers sent, and have the honour to be,

Your obedient servant,

(Signed) Z. A. LASH.

Knows All About it.

It takes the Spokane man to know it all; here is a choice sample of dynamic geology as evolved from the brain of a writer in "*North Western Facts.*"

For lucidity of expression, originality of ideas and a truly "Scientific Description" of Rossland's formation, we commend it to the learned.

THE GEOLOGICAL FORMATION.

Result of the Antics of Dame Nature in the Long Ago—Scientific Description of the Mineral Formation in and Around Rossland—Expert Testimony From the Highest Source in the Province—Rock that Breaks the Best Steel Drills.

To the ordinary reader who may be unfamiliar with the technical terms of geology, the formation about Rossland is perhaps best described by comparing it to some huge molten mass, which, becoming superheated, threw up to the surface gigantic bubbles, which, reaching the air, became quickly cooled in the form of mountains, while the seething mass of rock and mineral was still bubbling and boiling beneath them.

Gradually more and more of this melted matter clung to the inside of the bubbles, standing like hollow pyramids, which, in cooling, left great and small cracks into which more and more of the molten minerals clung until the great fires dying down, the whole mass became cool, and cracking internally the cracks in turn becoming the repositories of the remaining flowing metals.

In cutting tunnels into the mountains these cracks, called veins, are found filled with metal, while the sides of the cracks, the walls, are composed of a mass of rock so hard as to almost turn the edge of the drills."

The New Tariff—Free Mining Machinery—Iron Bounties Increased.

The last form of the REVIEW was made up before the new tariff was submitted to Parliament, and we are, therefore, only able in this issue to indicate the items as they effect our constituency, reserving for a future issue a more extended notice. The items are:

535. Machinery of a class exclusively used and required for mining, smelting or refining purposes, add all materials for the construction of such machinery in Canada to be free for that purpose, the whole to be subject to regulations to be made by the Controller of Customs.

174. Coal, bituminous, sixty cents per ton of 2000 lbs.

175. Coal (bituminous) dust imported without admixture with larger coals than will pass between parallel bars half an inch apart, twenty per cent. *ad valorem.*

396. Blasting and mining powder, two cents per pound.

398. Nitro-Glycerine, giant powder, nitro and other explosives, three cents per pound.

259. Wire rope, twenty-five per cent. *ad valorem.*

216. Iron or steel, scrap, wrought or refuse, including punching, cuttings or clippings of iron or steel plates or sheets having been in actual use, crop ends of tinplate bars, blooms and rails, the same not having been in actual use, $1.50 per ton. Old rate, $4 per ton.

Nothing shall be deemed scrap iron or scrap steel except waste or steel fit only to be manufactured in rolling mills.

217. Iron in pigs, iron kentledge and scrap iron, $2.50 per ton. Old rate, $4 per ton.

218. Ferro-silicon, ferro-manganese and spiegeleisen, 5 per cent. *ad valorem.* Unchanged.

219. Iron or steel ingots, cogged ingots, blooms and slabs, billets unfinished, measuring in size not less than ten united inches in circumference, puddled bars, loops or other forms less finished than iron or steel bars, but more advanced than pig iron, except castings, $4 per ton. Old rate, $5 per ton.

220. Rolled iron or steel angles, tees, beams, channels, girders and other rolled shapes or sections, weighing less than thirty-five pounds per lineal yard, not punched, drilled or further manufactured than rolled, n.o.s., $7 per ton. Old rate, 12½ per cent.

221. Rolled iron or steel angles, tees, beams, channels, joists, girders, stars or other rolled shapes or trough, bridge, building or structural rolled sections or shapes, not punched, drilled or further manufactured than rolled, n.e.s., and flat eye bar blanks not punched or drilled, 15 per cent. *ad valorem.* Old rate, $10 a ton.

222. Bar iron or steel rolled or hammered whether in coils, rods, bars or bundles, comprising rounds, ovals and squares, and flats number sixteen gauge and thicker, n.o.p., and rolled iron or steel hoops, bands, scroll or strips eight inches or less in width, number sixteen gauge and thicker, n.e.s., $7 per ton. Old rate, $10 per ton.

223. Universal mill or rolled edge bridge plates of steel, when imported by manufacturers of bridges, 15 per cent. *ad valorem.* Old rate, 12½ per cent.

224. Rolled iron or steel plates not less than thirty inches in width and not less than one-quarter of an inch in thickness, n.o.p., 15 per cent. *ad valorem.* Old rate, 12½ per cent.

225. Rolled iron or steel sheets or plates, sheared or unsheared, and skelp iron or steel, sheared or rolled in grooves, n.e.s., $7 per ton. Old rate, $10 per ton.

226. Skelp iron or steel, sheared or rolled in grooves, when imported by manufacturers of wrought iron or steel pipe, for use only in the manufacture of wrought iron or steel pipe in their own factories, 5 per cent. *ad valorem.*

227. Rolled iron or steel sheets, thinner than number seventeen gauge, n.o.p., Canada plates, Russia iron, flat or corrugated galvanized iron or steel sheet terne plate and rolled sheets of iron or steel coated with zinc, spelter or other metals of all widths or thicknesses, n.o.p., and rolled

iron or steel hoops, bands, scroll or strips thinner than number sixteen gauge, n.e.s., 5 per cent. *ad valorem*. Unchanged.

228. Chrome steel, 15 per cent. *ad valorem*.

229. Steel, rolled or hammered, in bars, bands, hoops, scrolls or strips, sheets or plates, of any size, thickness or width, when of greater value than four cents per pound, n.o.p., 15 per cent. *ad valorem*. Old rate, $10 per ton.

230. Swedish rolled iron and Swedish rolled steel nail rods, under half an inch in diameter, for the manufacture of horseshoe nails, 15 per cent. *ad valorem*. Unchanged.

231. Iron or steel railway bars or rails of any form, punched or not punched, n.e.s., for railways, which term for the purposes of this item shall include all kinds of railways, street railways and tramways, even although the same are used for private purposes only, and even although they are not used or intended to be used in connection with the business of common carrying of goods or passengers, 30 per cent. *ad valorem*. Unchanged.

232. Railway fish plates and tin plates, $8 per ton. Old rate, $10 per ton.

233. Switches, frogs, crossings and intersections for railways, 30 per cent. *ad valorem*. Unchanged.

234. Locomotives for railways, n.e.s., 35 per cent. *ad valorem*. Unchanged.

235. Iron or steel bridges, or parts thereof, iron or steel structural work, columns, shapes of sections, drilled, punched or in any further stage of manufacture than as rolled or cast, n.e.s., 30 per cent. *ad valorem*. Unchanged.

236. Forgings of iron or steel of whatever shape or size or in whatever stage of manufacture, n.e.s., 30 per cent. *ad valorem*. Old rate, 35 per cent.

237. Iron or steel castings, in the rough, n.e.s., 25 per cent. *ad valorem*.

238. Stove plates, stoves of all kinds, for oil, gas, coal or wood, or parts thereof, and of smoothing, hatters and tailors irons, plated wholly or in part, or not 25 per cent. *ad valorem*. Old rate, 27½ per cent.

239. Springs, axles, axle bars and axle blanks, and parts thereof of iron or steel, for railways or tramway vehicles, 35 per cent. *ad valorem*. Old duty, $20 per ton.

240. Springs, axles, axle bars and axle blanks, and parts thereof, of iron or steel, including cart or waggon skeins or boxes, n.e.s., 30 per cent. *ad valorem*. Old duty one cent per pound, and 20 per cent.

241. Cast iron pipes of every description, n.e.s., $8 per ton. Old duty, $10 per ton.

242. Wrought iron or steel boiler tubes, including flues and corrugated tubes for marine boilers, 5 per cent. *ad valorem*. Former rate, 7½ per cent.

243. Tubes of rolled steel, not joined or welded, not more than one and one half inches in diameter, and seamless tubes for bicycles, 15 per cent. *ad valorem*. Unchanged.

344. Wrought iron or steel tubing, plain or galvanized, threaded and coupled or not, over two inches in diameter, n.e.s., 15 per cent. Unchanged.

IRON BOUNTIES.

1. That it is expedient to repeal chapter nine of 57-58 Victoria, being "an act to provide for the payment of bounties on iron and steel manufactured from Canadian ore," and all regulations thereunder made by order of the Governor-in-council.

2. That it is expedient to provide that the Governor-in-council may authorize the payment of the following bounties on steel ingots, puddled iron bars and pig iron made in Canada, that is to say:

   On steel ingots, manufactured from ingredients of which not less than fifty per cent. of the weight thereof consists of pig iron made in Canada, a bounty of $3 per ton.

   On puddled iron bars manufactured from pig iron made in Canada, $3 per ton.

   On pig iron manufactured from ore, a bounty of $3 per ton on the proportion produced from Canadian ore, and $2 per ton on the proportion produced from foreign ore.

3. That it is expedient to provide that the Governor-in-council may make regulations in relations to the bounties hereinbefore mentioned in order to carry out the intention of these resolutions.

4. That it is expedient to provide that the said bounties shall only be applicable to steel ingots, puddled iron, bars and pig iron made in Canada, prior to the 23rd day of April, 1902.

5. That it is expedient to provide that the foregoing bounties shall be payable only on iron and steel for consumption in Canada, and that the Governor-in-council may at any time by proclamation impose export duties on such iron and steel if the same shall be exported from Canada, such duties to be not greater than the amount of the bounty payable on such iron and steel.

EN PASSANT.

In referring to the Engledue deal last month we incidentally remarked that the Ontario Bureau of Mines required remodelling, but it was not our intention in that connection to reflect in any way upon the administrative capacity of the present officers, Mr. Blue the Director, and Mr. Gibson his assistant. Both of these gentlemen are hard working, conscientious, and able officials. The point we desired to make, and which we again repeat, is that until the Commissioner of Crown Lands appoints to the department a first class metalliferous engineer, to report upon the economic features of the gold mining industry, the department must be considered defective. Further it is quite apparent that the Bureau is inadequately equipped in its office staff which should be increased to keep pace with the great accumulation of work incidental to the expansion of mining in the province.

We understand that it is the intention of the Commissioner to to appoint a mining Inspector at Rat Portage with the magnificient salary of $1,400 per year. Needless to say the chances of obtaining the services of any really good mining engineer at this figure are remote—and nothing but a first class man will fill the bill.

In view of the increase in the duty on mica proposed by the Dingley Tariff, the following comparative statement will be of interest. In this connection however, it is worthy of remark that there is a steadily increasing demand for our micas in Great Britain and Germany.

GRADES.	Ton Rough Split Value.	Ton Trim'd Edges Value.	Wilson Tariff 20 per cent		Dingley Tariff 3c. per lb. & 15p. c.		Difference	
			R. S.	Trim'd	R.S.	Trim'd	Rgh.	Tr.
1 x 3 to 2 x 4	$120	$200	$ 24	$ 40	$ 78	$ 90	$54	$50
2 x 4 to 3 x 5	300	500	60	100	105	135	45	35
3 x 5 to 4 x 6	500	1000	100	200	135	210	35	10
4 x 6 to 5 x 7	1200	2000	240	400	240	360	35	40
5 x 7 and up	2000	3000	400	600	360	510	40	90

The first two grades are principally used in the United States, while the larger sizes have a ready sale in England. The bulk of the Amber Mica produced in Canada is shipped to the United States.

Rapid progress is being made with the equipment of the Mining Museum at Montreal, to be operated nnder the auspices of the General Mining Association of the Province of Quebec. Very commodious premises, admirably situated in the heart of the business portion of the city, have been secured in the new MacDonald Building, Victoria Square. Every mining company in Quebec has promised its co-operation, and it is expected by the 1st of June, when the Museum will be opened to the public that the display will be in keeping with the importance of the mineral industries of the province.

Owners of mineral lands who have specimens to exhibit are cordially invited to co-operate with the Association, and they may be assured that every prominence will be given to their display. It is not unlikely that an endeavor will be made at an early date by the Federated Canadian Mining Institute to enlarge this Museum on national lines.

Our friend Capt. R. C. Adams of Montreal, who has been in England during the winter has, we are delighted to learn, succeeded in organizing the Adams British Columbia Company, Ltd. with an authorized capital of £100,000 to operate his mineral properties in the Boundary Creek District.

It has been suggested that an interesting exhibit might be got for the summer meeting of the Mining Society of Nova Scotia, if the Gold Miners were to collect specimens showing the various minerals associated with gold in Nova Scotia. The list is perhaps larger than is now supposed, and includes iron, copper and magnetic pyrites, mispickel or white iron pyrites, galena, calcite, &c. Gold is also got in quartzite and slate without any admixture of quartz. The Secretary is already informed of some specimens that will be available, but he makes this appeal to *all* the gold mining members, requesting them to be on the look out for suitable specimens and to advise him later on of their success. Certain prejudices are said to exist in favor or against the finding of gold in leads carrying certain minerals, and in this connection such a collection would be of great practical value. We trust this suggestion will meet with the hearty co-operation of every gold miner in this province.

The General Mining Association of the Province of Quebec, and this Federated Canadian Mining Institute are making application to the Quebec and Dominion Governments respectively for Charters of Incorporation.

In view of the comments which have from time to time appeared in these columns with respect to the economic aspect of the Rossland Camp, it is significant that our views should be endorsed among other eminently qualified authorities, by Mr. R. G. McConnell, who has made a special study of the camp for the Geological Survey. His remarks on the general character of the ore bodies, as given in the summary report are worth repeating. He says:

"The Rossland ores, as a rule, are not of high grade, and a large proportion of those in sight cannot be profitably worked under present conditions. The cost of freight and treatment is given by Mr. Carlyle at $10 to $14 per ton. If the cost of mining, a variable factor, is added to this, it will be evident that ores carrying less value than $15 per ton can only be worked at present at a slender profit, if at all. In order to utilize this material, reductions in both freight and smelting charges are imperative, and will doubtless be made as the treatment of the ore becomes better understood and competing lines of communication are opened up. Should the railway now projected through the Crow's Nest Pass be built, and the mines connected with the extensive coal-fields known to exist in the Rocky Mountain Range, fuel, the principal item in the expense of smelting, could be obtained at a much lower figure than at present, and the smelting charges reduced in proportion. A large percentage of the ores are too low-grade to be worked under any circumstances, but it is believed that with smelters built on the spot, cheap fuel and improved processses, those with a valuation of $8 and upwards will eventually be profitably treated."

Under date of 12th March, the directors of Bell's Asbestos Co., Ltd, operating at Bedford Mines, Ont., report for the year ended 31st December as follows:—

The result of the year's operations is a net profit of.....	£ 9,767.15.5
To which has to be added the amount brought forward.....	2,200.4.10
	£ 11,968.0.3
The directors place to reserve.....	4,000.0.0
Leaving for appropriation.....	£ 7,968.0.3

The directors therefore recommend the payment on the 8th April of a dividend at the rate of five per cent.; and carry forward £1.968.0.3.

Preliminary Hoisting Plant for Mines.

By Robert Peele.*

It is intended here to give some account of the hoisting appliances appropriate to the temporary work generally preceding serious mining operations, and which are employed sometimes also in connection with the development of established mines.

The sinking of a prospecting shaft may be followed by actual exploitation on a small scale, and it may be necessary to sink several hundred feet without the use of a steam-power hoist. No sharp line can be drawn between the work of the prospector and the beginning of the development of the mine which results from his discoveries. In every new camp mining may be seen in all of its stages; the use of the hand windlass for beginning a shaft; then, as greater depth is reached, perhaps the introduction of a horse whim, or a light, portable engine and boiler, and, finally the erection of the permanent hoisting plant.

The Hand Windlass.

The simplest apparatus for hoisting, and in its first cost the cheapest, is the ordinary wooden windlass and bucket. It is used not only for prospecting shafts, but often even in large mines for sinking winzes from one level to another, in places where power hoists cannot be introduced. The winding drum, or barrel, generally from 6 to 10 inches diameter, is supported by a framework and platform set over the mouth of the shaft or winze.

Two uprights, say 4 inches by 6 inches in section, are mortised into sills running across the mouth of the shaft, braced and notched at the top to receive the axle of the barrel. Occasionally the uprights are made merely of two pieces of 2-inch plank, spiked to the sills For the passage of the bucket there is a rectangular opening in the platform, which may or may not be closed by a door when the bucket is being dumped. It is always advisable to cover the mouth of the shaft by a platform, because the edges of the opening are likely to be loose or fissured, so that pieces of rock might be broken away and injure the men below, or in dumping the bucket some of the material might fall back into the shaft.

When the barrel is of small diameter it is hewed or turned out of a solid stick of timber, well smoothed to prevent undue wear upon the rope; or it may be made of a straight section of tree trunk, with the bark removed. For a solid barrel the axle is usually formed by boring a hole in the center of each end, 8 inches to 12 inches deep, and driving in a steel pin, ¾ inch to 1 inch in diameter. The pins are slightly larger than the hole, and the part entering the wood is of square section, or provided with "feathers," to prevent them from turning loose and working out. An iron collar should be shrunk or driven upon each end of the barrel to avoid splitting. The handles, or cranks, of which there are usually two, are continuations of the axle pins, and are set at 180° from each other. They are operated by from 1 to 4 men, according to the depth of shaft and weight of load. The crank radius is usually 16 inches; length of handle, 15 inches; to 20 inches; height of center of barrel above the platform, 42 inches.

Sometimes the barrel is made of larger diameter, up to 16 or 18 inches, and for convenience and lightness is then generally built up like a hollow drum Two or three thick wooden discs, forming centers, are mounted upon a 4 or 6 inch square wooden axle, which is turned down at the ends to form bearings, or provided with pins, as described above, which pass through iron plates screwed to the ends of the axle. The surface of the barrel in this case is of longitudiual lagging strips, of say 2 by 3 inch stuff. Occasionally windlasses are provided with gearing In such case ordinary bearings are required for the barrel

* School of Mines Quarterly.

and separate crank shaft. These ready-made patterns are furnished by several of the mining machinery builders.

The rope is put on the windlass by giving it several turns around the barrel to furnish the necessary grip, and fastening the loose end by a staple. Hemp rope 1 to 1¼ inches diameter is used; sometimes a ⅝ inch soft wire rope. The buckets are generally of wood, bound with iron, though light iron buckets are occasionally employed. They hold, say, from 250 to 400 lbs. There may be one or two buckets. With two a greater net load can be hoisted, because the weight of the bucket is eliminated, as well as that of part of the rope, when the empty bucket is descending. The length of rope required for two buckets is manifestly but a few feet more than for one. Generally speaking, a windlass should be manned by two men. Under no circumstances should a single man be allowed to raise or lower another man.

In point of efficiency and economy nothing can be urged in favor of hoisting by manual labor, except its expediency under temporary conditions and the cheapness and facility with which it may be applied. Much work is done in a small way in every mining district by men whose capital is their muscle and ingenuity, and who are able to "knock together" a windless and make wages. Prospectors, also, must resort to the windlass if their investigations are to extend more than a few feet below the surface. An average man will do 2,200 foot pounds of work per minute, and in turning a windlass crank the effort exerted by his arms should not average more than, say, 15 pounds. This gives a proper velocity for the crank of $\frac{2,200}{15} = 147$ feet per minute; or, with a 16-inch crank radius, the speed would be about 17½ revolutions per minute. With a single unbalanced bucket the useful work of a man is reduced to about 1,400 foot pounds per minute.*

The limit of depth to which hand power may be reasonably employed is from 70 to 100 feet, depending largely upon the quantity of water which must be raised in addition to the excavated material. The weight of the rope also enters into the calculation. By using the above data it is found that, in a shift of 8 hours, with a single unbalanced bucket, two men cannot raise more than 6 tons from a depth of 100 feet, and in regular work a duty of not more than 4 to 5 tons should be expected. With balanced buckets, on the other hand, and by employing 4 men, the amount hoisted is much greater: 2,200 ft. lbs. × 4 × 8 × 60 = 4,224,000 ft. lbs.

$$\frac{4,224,000}{100 \times 2,240 \text{ lbs.}} = 18.85 \text{ long tons, maximum duty.}$$

The Horse Whim.

When a shaft has become too deep for a windlass a horse whim may be substituted. The useful machine is very extensively employed in the mining regions of the United States for depths not greater than, say, 250 to 350 feet. In Mexico and South America, however, it is often used for shafts of much greater depth. The whim is light, inexpensive and is easily and quickly erected.

In one of the simplest forms the drum is set upon a vertical shaft, and has a long arm, or "sweep," to which the horse is attached. More power is gained by introducing gearing and this is often done, though the weight of the machine and its cost are correspondingly increased. A serviceable form of mining whim frequently employed in the West, is set upon a light timber foundation, the frame and drum being of iron.

The drum should be placed far enough from the shaft to allow ample room for handling hoisted material, etc., between the circular path traversed by the horse and the shaft mouth. With a vertical drum the rope must be led off horizontally, the horse stepping over it at each turn. At a little greater cost the drum can be set lower, so that the rope runs in a shallow, covered trench, thus leaving the surface unobstructed. Close to the shaft collar is a small sheave, under which the rope passes to the hoisting sheave, mounted on the frame over the shaft. When the drum is mounted horizontally the rope may be led directly to the hoisting sheave with sufficient head room for the horse to pass underneath. This plan requires a stronger frame ("gallows-frame") braced to withstand the diagonal pull of the rope. It is found in practice that the minimum diameter of the circle traversed by the horse should not be less than 20 feet; better 25 feet, or more. If it be too small the animal is worried by the work, and is apt to injure his legs by interfering. It is well to make the whim sweep from 12 to 16 feet long.

The work done by an average horse per minute is taken as 19,600 foot lbs.; speed of travel while hoisting, 3½ to 4 miles per hour, and the average tractive force about 55 lbs. The power developed and the hoisting speed will then depend upon the relative diameters of drum and the circular path traversed by the horse.

Duty of One-Horse Whim. With a well constructed whim the duty of a single horse may be taken as a gross load of 600 lbs. raised at a speed of 35 feet per minute. This includes the weight of bucket and rope. With an unbalanced bucket the *useful* work of a horse is reduced from 19,600 to say 14,000 foot lbs. per minute. Under these circumstances, at a depth of 250 feet, a maximum of 15 tons can be hoisted by one horse in 10 hours. Light steel buckets for whim work weigh 200 to 300 lbs., and the rope would generally be of steel, ½ or ⅝ diameter, weighing respectively 0.35 and 0.60 lb. per foot. One-horse whims have been used to as great a depth as 450 feet, but such practice is very unusual, because the speed must be slow and the net load reduced on account of the weight of the rope.

Two-Horse Whim. With two horses a gross load of 800 lbs. can be raised 50 feet per minute in regular work. It is generally better to increase the speed than the load, by using a larger drum, because small buckets can be more conveniently handled at the surface. The horses are usually kept at a walk. With gearing the angular velocity of the drum is about one-third that of the sweep, that is, if the bevelled pinion on the vertical shaft have 20 teeth, the spur wheel on the drum shaft would have 60 teeth.

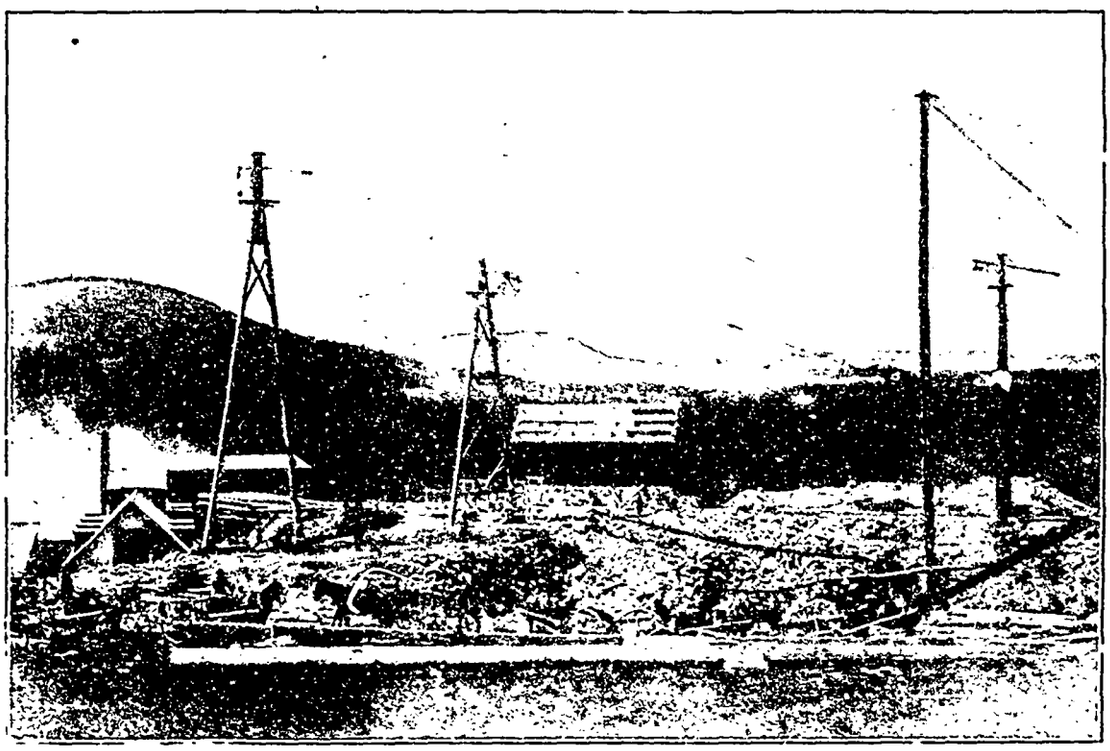
For one and two horse whims only one man is actually required at the surface; for larger machines two men are employed, one as driver, the other to handle the bucket and brake. Whim horses may be controlled by the voice, being taught to start and stop without a driver. In the United States whims are commonly provided with strap brakes, so that the empty bucket may be lowered while the horse is standing at rest. They are made generally for a single bucket, as a pair of buckets are liable to strike each other in passing in the shaft, but, of course, there are the same advantages in using balanced buckets as obtained with the windlass.

The Malacate. What has been said thus far regarding whims applies particularly to practice in the United States, or any district moderately easy of access. In some of the Mexican and South American mining regions, however, distant from the coast and from railroads, and where the introduction of steam power would be difficult, whims of very large size are used, capable of hoisting from great depths, and employed in the regular exploitation of mines. In these countries the machine is known as the malacate. This form of whim has been used to some extent also in the western and southwestern parts of the United States. It consists of a large drum mounted 8 or 10 feet above the ground upon a heavy vertical shaft or spindle. To

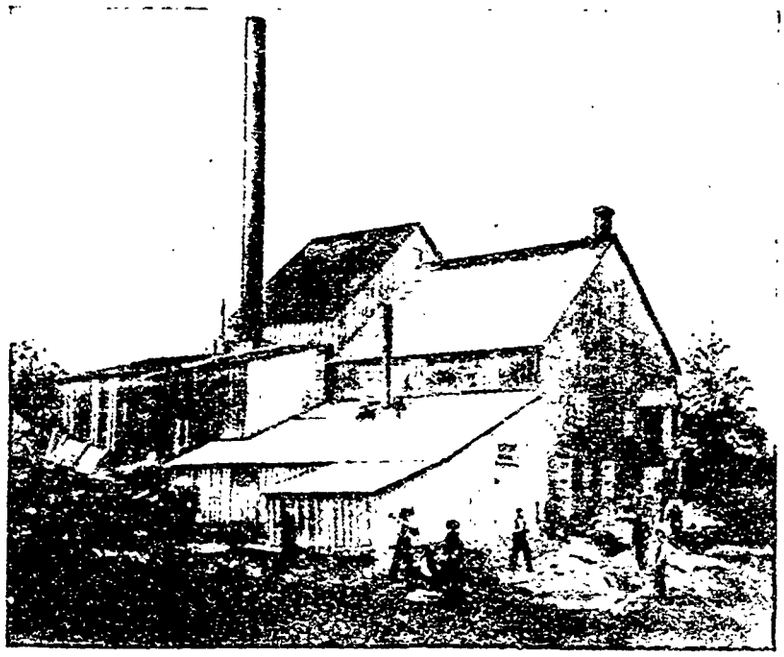
(Continued on Page 163.)

*These data are from actual work. See Colliery Engineer, June 1 95, p 2-7.

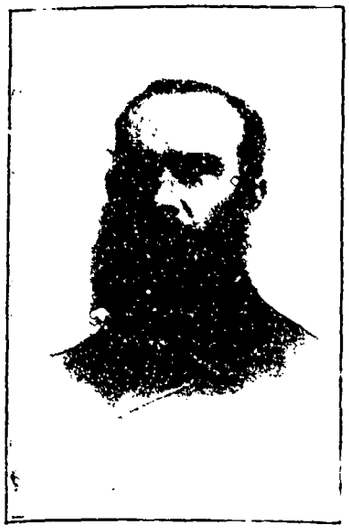
PROF. W. A. CARLYLE, B.A.Sc., M.E., Government Mineralogist to the Province of British Columbia.



Asbestos and Asbestic Co. Ltd. Surface Works at Danville, Que.



Ten-Stamp Mill, Bonnechere Mine, Hastings Co., Ontario.



Mr. H. S. Poole, M.A., A.R.S.M.
Acadia Coal Co., Stellarton, N.S.

Mr Charles Fergie, M.E.
Intercolonial Coal Co., Westville, N.S.

Mr. E. Joud, Manager,
Hamilton Blast Furnace Co.

Mr. John Leechman, A.R.S.M.
Regina Gold Mine, Rat Portage.

Mr. Elliott T. Galt, Lethbridge,
Alberta Railway and Coal Co.

Mr. J. H. Chewitt, C.E., Toronto,
Consulting Engineer, Foley Mine.

Dr. W. L. Goodwin, Kingston,
Director School of Mining.

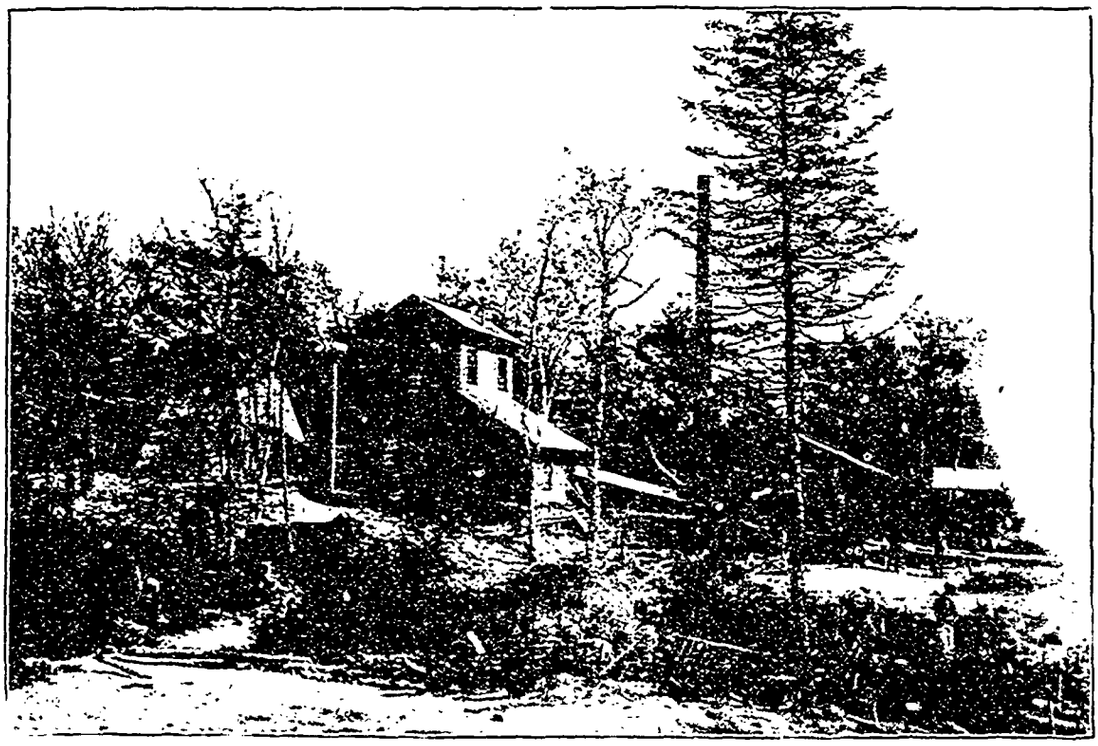
Mr. W. A. Sanders, M.E.
Lake Lesle Gold Mine, N.S.

Mr. J. D. McGregor, New Glasgow,
New Egerton Gold Mining Co.

MR. JOHN E. HARDMAN, S.B., M.E., Montreal,
Past President Mining Society of Nova Scotia, Vice-President Gen'l Mining Ass'n Prov. of Quebec.

MR. F. AUG. HEINZE, President B. C. Smelting and Refining Co., Trail, B.C.

Golden Lode Mining Co., South Uniacke, N.S.

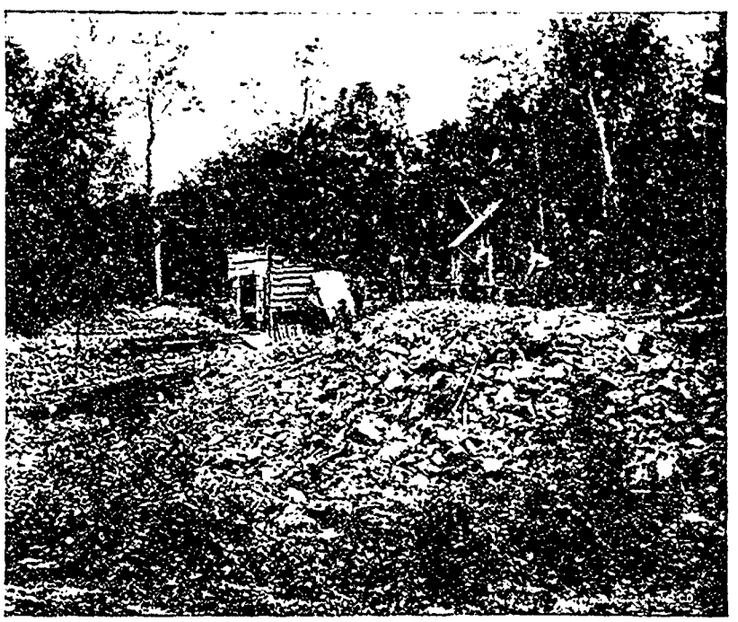


Golden Lode Mining Co., South Uniacke, N.S.

Mr. John J. Drummond, Radnor, Que.
Canada Iron Furnace Co.

Mr. C. E. Willis, M.E., Halifax, N.S.
Halifax, Chrome Co

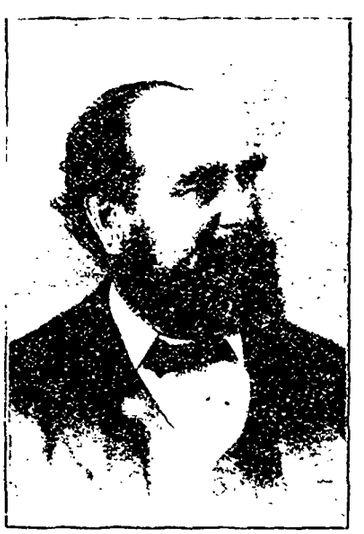
Mr. A. J. Swinney, Delora, Ont.
Can. Gold Fields, Ltd.



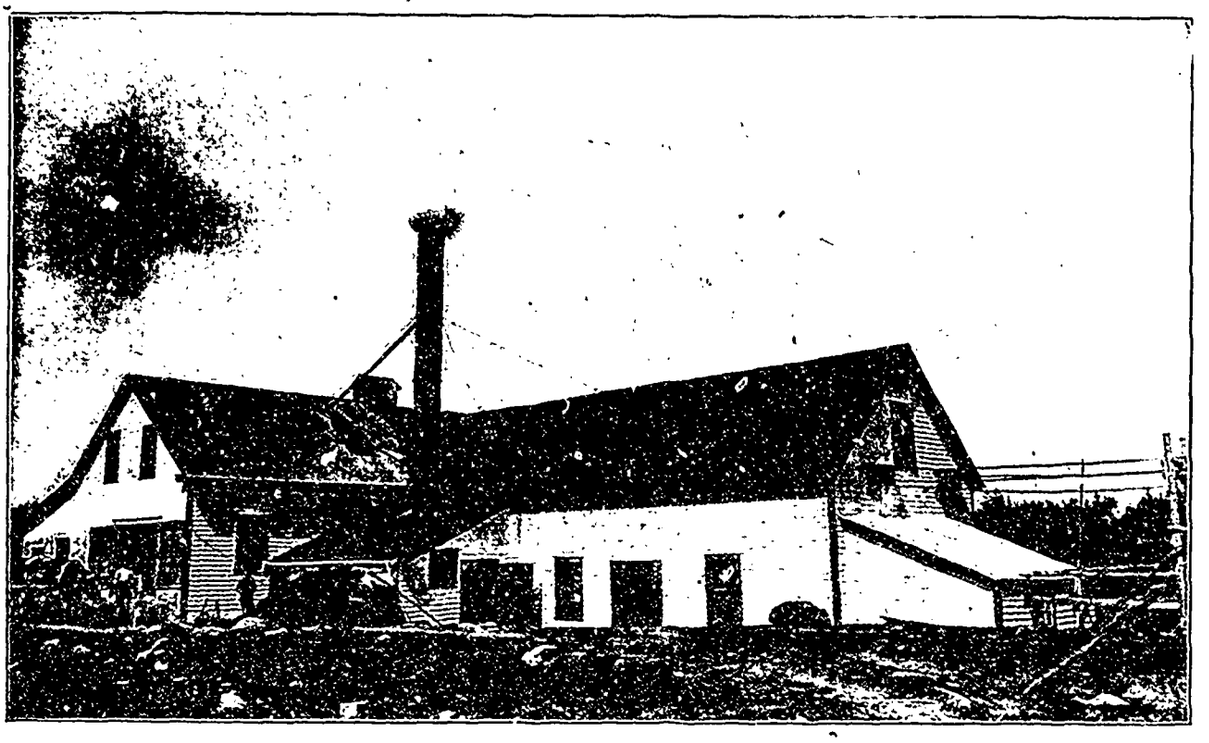
Bannockburn Gold Mines, Hastings County, Ont.

Capt. H. F. Harding, Brookfield,
Brookfield Mining Co., N.S.

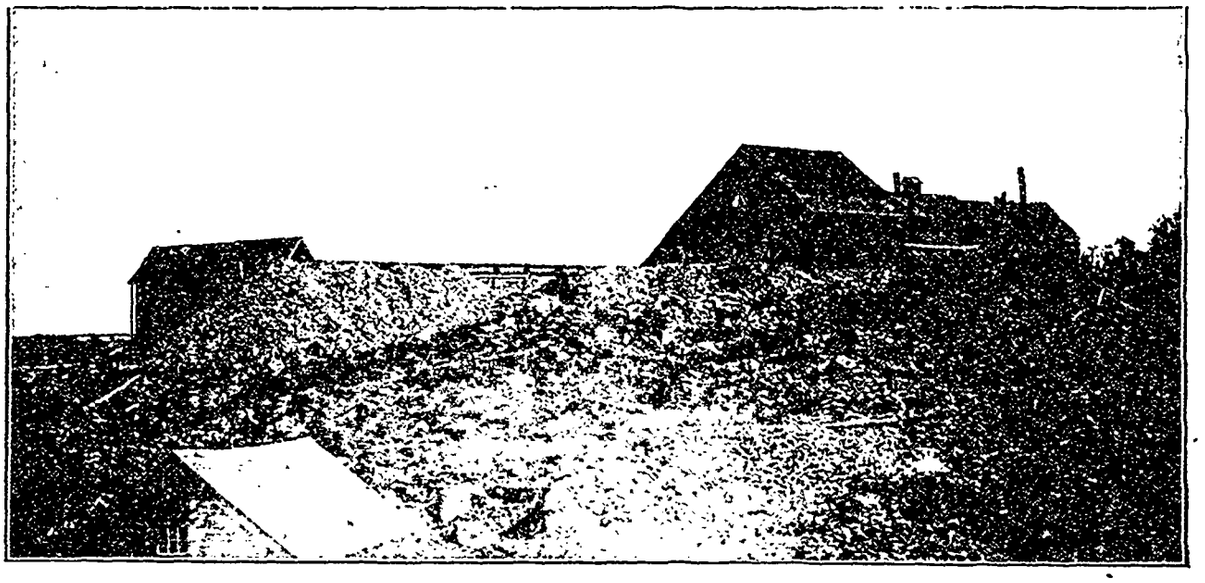
Dr. E. Gilpin, F.G.S., Halifax, Deputy Commr.
and Inspector of Mines.



Mr. H. A. Budden, Montreal,
Intercolonial CoalCo., Ltd.



Golden Group Mining Co.—Exterior of Mill Building at Montagu, Waverley District, Nova Scotia.



Tudor Gold Mining Co. Ltd.—Shaft House and Mine Buildings at Waverley, Nova Scotia.

The Protection of the Forest in the Mineral Belt.

By J. BAWDEN, Kingston.*

The frequent references to forest fires in the reports of our Geological Explorers, and the known destruction of extensive areas of timber land through the carelessness of mining prospectors, point to the importance of safe-guards for the preservation of the forest from wasteful and wide-spread destruction, and show the necessity that such should engage the attention of the Government at this time. It is important that every prospector should not have only the protectiou of a Miner's License, but it is also important that the right to traverse the public lands for purposes of private gain, shall carry with it responsiblity for the use of fuel for the camp fire in a careful manner. The mining prospector should be required on taking out a license to enter into a bond to observe rules respecting the use of fire for cooking purposes. Rangers should be placed at different parts of the mineral district with authority to arrest prospectors and travellers not in possession of miner's licenses. The value of forest fuel to the working miner is of immense importance. The mining community will hail with satisfaction any efforts on the part of the Government to protect the natural fuel supply from the destruction which invariably follows the careless use of camp-fires in the dry season.

It is scarcely necessary to refer to the great forest fires in the mining regions of Minnesota, which ended in the destruction of mining camps and lumbering towns, attended with loss of life, as a warning that similar results may be looked for in the Rainy River District. The companies which are about to erect valuable mills will be well advised to urge upon the Government the importance of strict legislation for the preservation of the forest.

In British Columbia it is within reasonable probability that the immense forest wealth of that great Province will be swept away by forest fires following as a necessary consequence the careless work of explorers. Whether the mineral riches of individuals may be advantageously purchased at the expense of the destruction of forest wealth is a question about which publicists and politicians will differ. There is no reason why the advantages of mineral development should be purchased at such enormous cost, as the history of the destruction of immense forest wealth in California and elsewhere would warrant us to expect in British Columbia. The destruction of the light timber and soil of a mineral range may perhaps expose mineral wealth which otherwise would lie unknown for ages. There is a certain degree of temptation before the unwatched prospector who contemplates the cheaply won gain which a forest fire may reveal. The danger which follows from converting a good servant into a bad master will hardly warn a reckless prospector. It is to be hoped, however, that the public and the Crown Lands Department will not allow him to try conclusions in such reckless fashion that the holocaust of an entire forest region, with many crisply burned human victims, may be among the sad consequences.

*Paper read before the Ontario Mining Institute, April meeting, 1897.

The Western Ontario Gold Fields and their Genesis.

By MR. F. HILLE, M. E., Port Arthur, Ont.

When I first became acquainted with this country, now nearly eight years ago, silver mining and prospecting were very actively pursued, and locations were almost as thick in the market as the mosquitos which guard and viciously defend the treasures of these lands. The great richness and the success of a Silver Islet Mine, which was not only well known abroad, but was also believed would be repeated in other mines, as the bonanzas of a Badger, Beaver and Silver Mountain Mines were loudly talked about. This was why I was sent here to examine a greater number of locations which were held at low and high figures, and at still higher pretentions in the market.. I came, I saw, and—I was conquered, then after I had finished my work and had seen quite a stretch of land and recognized the possibilities of its mineral resources, I concluded to settle down here, to stay with them and learn more about them.

During my numerous travels through the country I came repeatedly in contact with mineral deposits and especially in the form of quartz veins, which were of quite a different character from those veins in the Cambrian silver bearing rocks, with their calcite filling, and also in quite a different formation from the argillites presented in the latter. The samples which I took with me and tested contained more or less gold, silver, copper, lead, zinc and iron, but always in such an amount that it encouraged me to commence teaching our prospectors, and inhabitants of Port Arthur, and urged them through the papers as well as verbally, to search for other metals than silver, but especially for the more precious—gold.

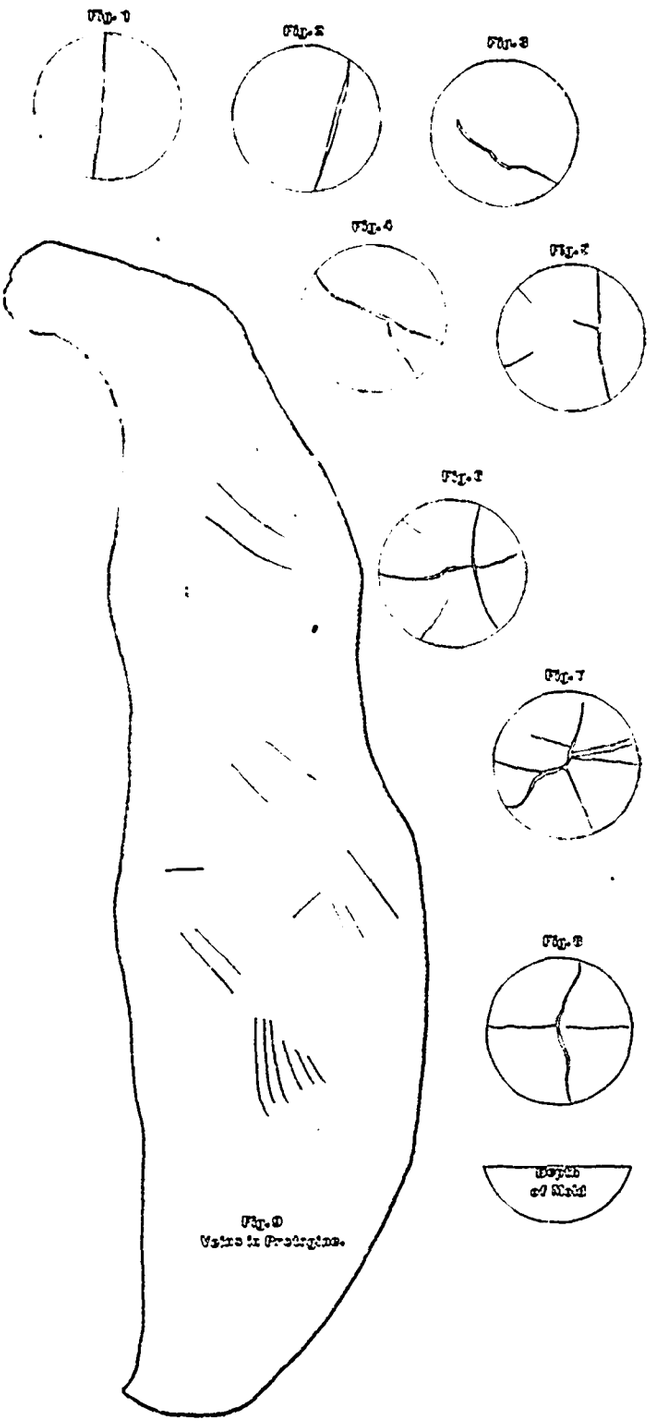
It was indeed a hard uphill work to lecture at that time against those silverites which were almost as numerous there as the followers of the late Mr. Bryan. High and low "compliments" were tendered me so frequently, and in such varying phrases, as if they had been prompted by Illinois' versatile Governor. But a good cause will always win at the end; the prospectors who had followed my advice were handsomely rewarded; they found iron, copper and gold, the latter especially widely distributed through the country. As far back as five years ago I was so sure of the frequent occurrence of gold that I could answer with confidence to an article in one of our Mining Journals in which the writer asked, "How we should make up for the deficiency of gold without going to the interior of Africa?" I tried to console him that it would not be necessary to rove so far from his penates, because there were alone fifteen thousand square miles of gold bearing land at the very doors of the States of Minnesota and Dakota, and if any country would make up for the deficiency of gold it would be Canada. Now, gentlemen, what I said in 1892 is still more true in 1897, because we have found in our two western districts on so many places, and distributed over so wide an area, very good and in many cases phenominal gold deposits.

I had first the intention of giving you, gentlemen, a detailed description of all the different localities where gold is found in our two western districts, but a second thought led me to conclude differently, because our able and hustling Director of Mines is two much on the "qui vive" to leave me anything to tell you in regard to new finds and their localities. Also those naughty inquisitive newspaper men get at our most sacred secrets and reveal them in ever renewed and enlarged editions, so that I am obliged to treat upon a subject which is for most people too dry to be spoken of among the daily news of our papers. I mean the origin—the genesis of our gold deposits. Now I shall not attempt to speak here in detail of all of them; instead of doing so I shall select two which I consider the most interesting from a geological and from the standpoint of the miner in our western districts, that is, the Bad Vemilion Lake and the Saw Bill Lake deposits. Perhaps I should have included here also the important Lake of the Woods camp, but I will spare this for another paper.

Most of you, gentlemen, will be aware that all of our gold veins are found in the Archaean and principally in the upper part, in the Huronian and there again in the younger series, in the metamorphic rocks, named by Dr. Lawson, the "Keewatin"; but I might add the most important in perhaps "post Keewatin" eruptive rocks. Now

we may justly ask, why do we find so many veins, and especially such containing gold just in rocks of that period? The answer to this is not so difficult; if we make a resume of our observations and studies in the field. In the first place before a vein can be formed a space has to exist in which vein matter may be deposited, that is, an opening, a split or rent in a rock must first be produced, in which a current of mineral water can flow and deposit its contents therein. Now after the Coutchiening—the lower Huronian, and the Keewatin rocks were laid down, the floor of these rocks, which was the magma of the present gneisses, solidified, contracted and tilted thereby the overlaying older rocks which became fissured, torn assunder and contorted in all shapes, especilly so opened the layers of the slates at the anticlinals We can produce this dynamic action in the laboratory, by taking a number of thinly rolled out sheets of half plastic clay, the lower should be a little thicker and more plastic; put them on top of each other on a table, then take both hands, press slowly and move them inwards. We observe how synclinals and anticlinals are formed and how the axis of the latter breaks and opens, that is the layers will separate at the top of the anticlinals, and the fissures are produced. In this manner we see also how the openings for bedded veins are formed. Now these fissures served for different purposes, not only as receptacles for the contents of mineral waters, but also for the magma of the gneisses which became eruptive by its contraction and was injected therein, or became the vents for later intrusive rocks. But it seems as if that same period had been not very favourable for the deposition of economic minerals in paying quantities; this was left to a later which we might call "post Keewatin," when the granites, diorites and diabases broke through the fissures of the gneisses and their overlaying rocks. These eruptions must have extended to the post Cambrain age, as this is plainly visible among the upper copper bearing rocks, in the Thunder Bay and Nepigon Bay regions. The granite eruptions were undoubtedly the indirect cause of the filling of the fissures of our Huronian rocks. When the principal plutonic activity ceased at that time, that is, when the extravasation and injection of lava through and into the fissures of the rocks stopped, Fumaroles, Solfataras, and Mofettes in or near the craters followed, and the thick, hot, moist air which must have existed at that time took up their fumes and gases and precipitated them very soon again, whence they were carried away by the waters. Now these waters in flowing in the fissures, or in percolating through the interstices or capillaries of the rocks, came not only at or near the surface in contact with those gaseous products, but also in the lower parts of the vents of the craters, or along dykes, and apophysis, and were forced up from these hot places as thermal springs and geysers. But where the column of these waters stood too high and in consequence too heavy in the vents or rock fissures, the mineralized water would not have reached the surface at all, but forced in the lower fissures of the rocks as plutonic or baryspheric waters. Now when we consider the relative nearness of the fiery interior towards our earth's crust in those times, the fumaroles and solfataras must have not only brought up sulphur or haloid gases, but also combined with them metals in gaslike form which like the others were taken up by the waters and carried on till they found in their course a precipitant and were deposited, or the hot saturated solutions reached a fissure in a cooler rock stratum where the contents crystallized out of them. Also sublimation has to be considered, and especially in impermeable rocks in which through a later fissuring or any other dynamic action the water had access to these deposits, dissolved and distributed them in the fissures.

These processes of depositing minerals have to be classed under the ascention theory; but in certain instances lateral secretion has also to be considered, because there are undoubtedly cases in which the country rock furnished at least a part of the contents of veins. That is, the circulating mineral waters percolated through the fine pores or little fissues of the rock, dissolved the minerals which were contained therein and deposited them again in the open spaces of that or a neighbouring rock. By superficial observation we might come to the conclusion that also the fahlbands had been mineralized in that way, but by closer study we find that most of the slates and schists which contained those fissures and openings of which I spoke above, were



filled with the contents of hot mineral waters which overflowed these rocks, because in most cases it would have been hardly possible to extract so much quartz or minerals out of these very basic rocks to fill all the open spaces therein; further we have to consider, the deeper we go into these rocks by mining the poorer it becomes, which would offer another proof.

I have considered above only one, but perhaps the principal cause how our slates and schists became tilted and fissured; that there must have been other causes is easily understood, but they are of no great importance here at present, because our most important gold deposits are not in these old rocks, but in a somewhat younger and often granitic rock, or are contact veins between these and the slates or even gneisses. Now I wish to be understood that I do not assert that there are no good gold bearing veins in our metamorphic rocks. Surely there are, but there are many more bedded veins. These like most others follow the foliation of these rocks, seldom that they cross their planes. This is different in the case of the veins in the younger rocks because we find them striking in all directions as I have shown in Fig. 9, and Saw Bill Lake map.

I come now to the description of two so far the most important gold deposits this side of the Lake of the Woods, and commence with the one situated at the lower part of the Seine between Shoal Lake and Bad Vermilion Lake.

The one acquainted with our regions will have observed that our most important gold deposits are usually in the neighborhood of eruptive rocks, of "post Keewatin" times, and especially near granite eruptions, as we can see in the Lake of the Woods, along the Seine River, Saw Bill lake, Moss Township, Greenwater lake, Shebandowan lake, and not less so in the region between Schreiber and Jackfish. Now this has also occured around Bad Vermilion lake and Shoal lake near Rainy lake; we see here in and on the south shore of the former lake the root of an immense volcano of post Keewatin time, represented by a mass of granite of three and a half miles in diameter. Surrounding this rock we find still the former corona or collar of the volcano consisting of a very basic anorthite gabbro which was formed by the first extravasation. Adjoining at the east we see another rock partly overlaying the former, which was once a granitic rock, but almost wholly changed into a protogine, as I have called it several years ago. This rock interests us here especially because we find in it the principal gold veins in that country. There exists a diversity of opinion in regard to its age, that is, if this protogine is the older, or the gabbro, but after a close field study and consideration of volcano characteristics, we soon should come to the conclusion, that the gabbro must be the older, but surely not the granite which was the last lava and forms now the root or filling of the former vent. Therefore it is also younger than the protogine, and why? Because we find intrusions of this younger granite in both gabbro and protogine. I showed here in a little sketch how we may imagine the volcano at the time of the extravasation of the lava of the present protogine which would harmonize very well with the configuration of the latter as we find it lying now between gabbro and conglomerate. It was also said that the veins in the protogine were formed through the pressure of the eruptive gabbro while breaking through the granite. If this were correct we would see the apophysis, or also called dykes, crossing the protogine, consisting of gabbro and not of granite; further we would see the veins radiating from the west and southwest, while they radiate from the east and southeast, as I showed it on accompanying drawing, Fig. 9. I said in a former paper that the fissures in this rock were undoubtedly produced by its contraction while cooling, radiating to that part where the lava was thickest and cooled most slowly, and I can add here, may have widened and increased in number by the pressure and intrusion of the granite eruption which filled the few fissures striking westwards to the eruptive centre of the volcano. These intrusions have disturbed the present vein fissures somewhat, that is, have thrown them in several cases 10 to 20 feet out of their course, but usually the later coming solutions have cut the dykes which seldom were in the protogine wider than 12 to 16 inches.

We come now to the question, by which process were these fissures filled? In considering the great number of veins in this rock, and the great difference in their filling in regard to economic minerals, and also in regard to the mode of filling, we have here perhaps both the above mentioned processes to consider which were active at the same time, that is, the filling through ascending mineral waters, and also by secretion through the pores or capillaries and interstices of the rock, and thereby a lateral filling. We find two classes of veins in the protogine, one which is heavily mineralized with sulphurets with little and again with much gold, the other with only a few sulphurets, but a good deal of free gold. One class again with absolutely no stratification, while the other very regularly stratified. The cause for this might have been that a certain number of the fissures had no communication with the ascending waters while others had; the waters from the latter were forced through the rock, changed the mica, leached its contents of minerals out of it, and deposited them in the last class of fissures, leaving at the same time a certain amount of the sulphide of iron and copper in the rock, which we find to-day in there fossilized as pyrites. If this explanation represents the exact mode by which these veins were filled cannot be decided with certainty, because our knowledge of these processes for each instance is still too limited, but in drawing the resume of our observations and studies of the geological and chemo-mineralogical occurrences, we might come to the conclusions above meationed.

Now, gentlemen, from what I have said above in regard to the veins in the protogine and their genetic relation to the Bad Vermilion volcano, you will have recognized that they are all good true fissure veins, and as far as development work has shown, also very promising for a profitable mining.

But now it is time to leave this very interesting region and travel up the Seine where we pass several similar occurrences of gold deposits. However, before we leave this river I would like to make you acquainted with a small extinct volcano and its wonderfully preserved crater of post Keewatin or perhaps Cambrain times. This volcano is situated at the extreme point of a cape on the lower part of Steep Rock lake, projecting only 150 feet above the lake, and forms there, as seen from the distance, the end elevation of a chain of hills striking to the north-east. The outer walls are in this direction very much eroded and perhaps also plowed away by passing icebergs, so that we see now the former more interior part of the wall, consisting of the breccia of different kinds of rocks, brightly burnt red by the fiery lava which was once emitted from the vent. There is only one place at the south-east side where it is possible to climb up to its sides and top, up a very shallow steep depression. Halfway up the crater we come to an opening about 3 x 5 feet, looking at first like the entrance of a cave, but as soon as the eyes become more accustomed to the dark interior we see the smooth walls of a vent of irregular eliptic form of about 24 feet in its largest diameter. Smooth as the walls are around us, so they are also in their vertical course downwards, till they strike in nearly 70 feet water which stands in there almost level with the niveau of the lake. These walls are indeed as well preserved as if the lava had quite recently receded downwards again, only a thin effloresence of a calcareous and fluoric matter covers the walls like the dust in an old abandoned coal drift; otherwise they are completely intact. In its later years of activity this crater must have served as the vent of a geyser, because not only the breccia of the walls is cemented together by calcite, zeolites and baryte, but we see these minerals also distributed in the fissures of the surrounding rocks. The interior of the crater owes its preservation to the falling in of its corona which formed an arch over it, and protected it thereby against atmospheric influences. The largest part of the

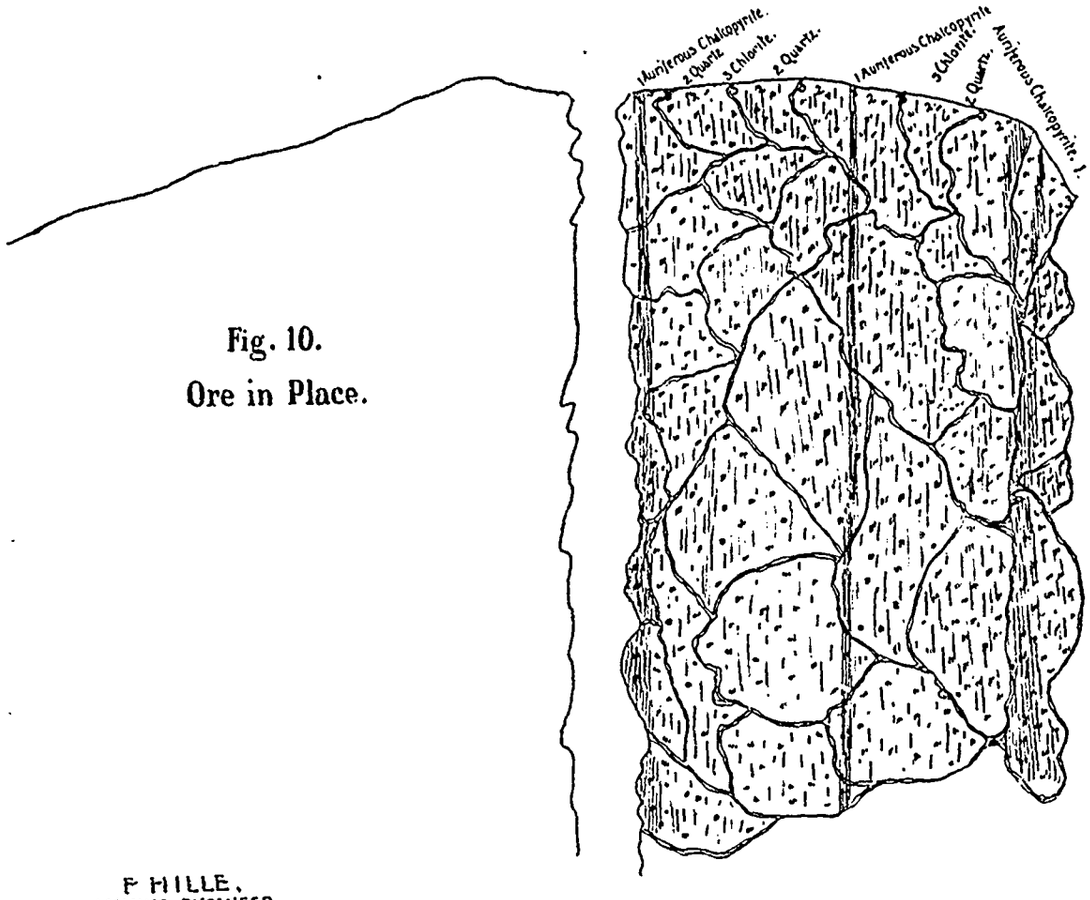


Fig. 10.
Ore in Place.

F. HILLE,
MINING ENGINEER
— AND —
ANALYTICAL CHEMIST.

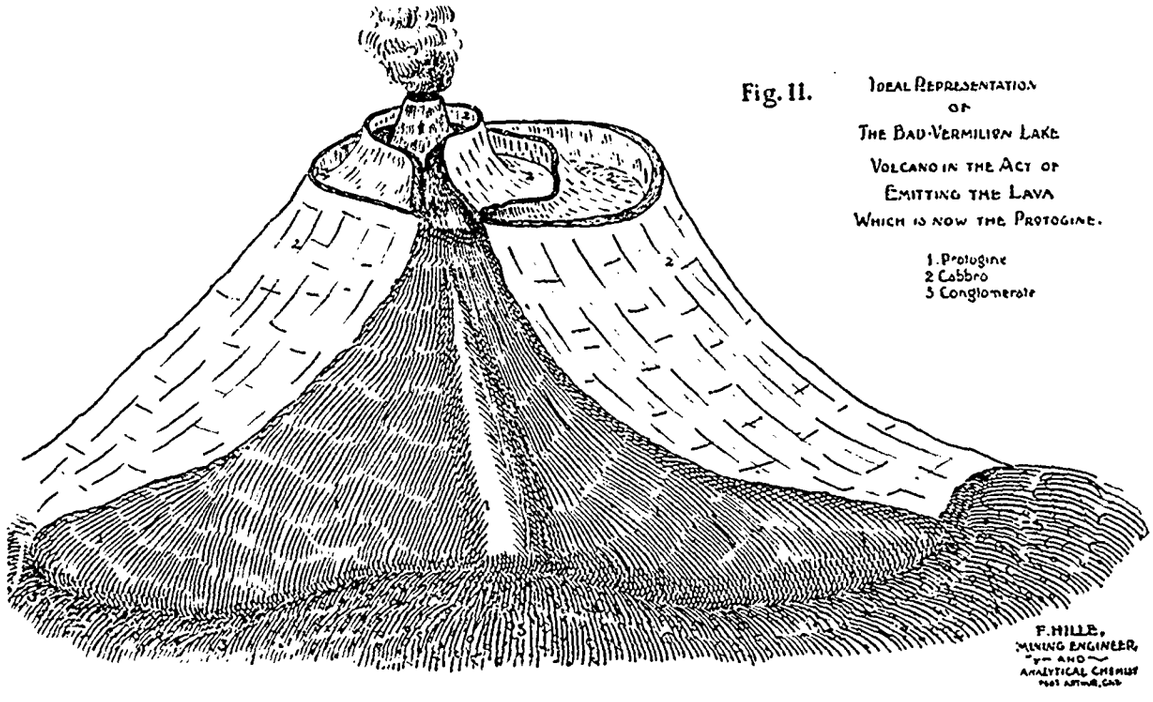


Fig. 11. Ideal Representation of The Bad-Vermilion Lake Volcano in the Act of Emitting the Lava Which is now the Protogine.

1. Protogine
2 Gabbro
3 Conglomerate

F. HILLE,
MINING ENGINEER,
— AND —
ANALYTICAL CHEMIST

rock breccia consists very likely of an andesite, but it is so much burnt and altered that their determination is rather difficult. Quite a number of such small craters can be seen on Steep Rock lake, easily recognizable by the red color of their walls, but none shows its interior so well as the above described. The ejections of calcareous, fluoric and barytic minerals at those times would give us also an indication how the calcite veins of our silver mines are filled, if the former thermal springs in our silver bearing rocks had stopped flowing. But they show us also how great the activity of geysers has been after the volcanic activity stopped.

Such conditions have also existed around the east shore of Sawbill lake not very far north from the former lake. Unfortunately I am not able to speak about the geological condition of that part of the country so positively as I wished, because my time while I visited this gold belt was always too limited for a close investigation in regard to the relation of the different rocks to one another. Notwithstanding this I could not resist giving you, gentlemen, a short account of the great size of some of the gold deposits which occur there.

As I mentioned above we find also here the intrusive granite, which as we have seen has played such an important role in the depositions of gold in our veins. These veins are also here not in the older metamorphic schist or slates, but in a somewhat younger, which by microscopic examination appears to be a quartzeous diorite. However by a closer study of specimens taken from deeper workings and at a greater distance from the wide vein, we might recognize this rock as a very much altered granite. Unfortunately the result of a microscopic examination which I intended to have made, has no reached me on time.

In a country whose formation is so old and so highly eruptive as the Seine river and Thunder Bay Districts, it is not astonishing to find and see the manifold freaks which the plutonic forces have played in forming our earth's crust. How many times must the first hardened crust have been remelted, how many times the rocks of certain locations? We can trace this back even as late as Keewatin times, if we look at the gneisses and their rock enclosures. What a role have heat and chemical agencies played in the metamorphism of the older rocks! What the dynamic forces in altering and shaping our sphere! Pluto must have been a busy god while he was young, but sometimes reckless in tearing apart what he had formed as a whole, and if it would be only for making room for a few "fountains." And this he did at Saw Bill Lake.

I have shown above that the fissures in our metamorphic rocks were principally produced through the contraction of the gneissic magma; while those in the later eruptive rocks through the contraction of their magma, and seldom through a later eruption. This latter could have been produced only by the diabases, which followed the granite eruption, but there is no sign which speaks for such phenomena, because we see the neighboring rocks of these trap-dykes (as usually called here) quite undisturbed, perhaps dislocated here and there somewhat, but they caused no tilting, as the contracting gneisses, or some plutonic intrusions of granite. Indeed the argillites through which the diabases became eruptive are not more moved than 5, sometimes 10, degrees from their former horizontal position, and then even it is questionable if the traps did it, or the later movements and lifting of several of our hills, Thunder Cape, Macay Mountains, Pie Island, etc. We have to come therefore to the conclusion that the fissures and rents in the rock on Saw Bill Lake were principally caused by contraction. When the magma had solidified but not cooled yet this rock formation was split by an immense rent, separating it nearly in two halves, that is, the tension in the rock must have been equally strong towards both sides. This phenomenon is easily repeated in the laboratory by pouring a crucible full of an acid slag not too liquid in a shallow mould and allowing it to cool slowly. We see in this experiment a wide rent passing through the middle or near the middle of the slag, as I have shown in the accompanying little sketches Fig. 1 to 8, which are taken from a number of experiments. We see here as well, as in the Saw Bill rent, that where the lava or slag was thickest the opening is the widest, while thinnest towards the ends; and where the cooling was much retarded the fissures showed not the same width, while on the other hand when moderately fast they became wider and were naturally also formed more quickly. Map 2 shows the Saw Bill vein and some of the measurements; you will observe that it is of an immense size, and surely worthy of attention; the more so as its fillings promise very profitable mining. The components consist of quartz and chlorite intermixed in the way I have shown in Fig. 10, by which you will notice that they are idio-genetic products, that is, had the same origin and were formed at the same time, but solidified perhaps by molecular attraction, the quartz by itself in smaller and bigger lumps, and so also the chloride, surrounding the former. They are also mineralized at the same time, with gold free and combined with chalcopyrite, but both usually in very fine particles, on some places in large quantities, on others less so, but always of very encouraging richness.

As you will notice on the sketch, there are a number of other smaller but pure quartz veins, mineralized with copper and iron pyrites, galenite and some sphalerite and gold free and combined with the former minerals. These veins strike not only towards the big vein, but can also be traced to its immediate neighborhood, but unfortunately lose themselves there under heavy cover. Now we may ask, why is it that these veins do not contain chlorite mixed with the quartz, as does the big vein, and why do they contain galena and blende, and all other minerals in much larger crystals, and why not so the big vein? The answer to these questions would be: the different classes of veins in this rock are filled at different times and with different solutions. On closer study we have to come to the conclusion that the small quartz veins must have been filled first, because if the contrary would be the case, they would have the same constituents as the bigger ones, that is, chloride and quartz, and not quartz only. Again if these small fissures were of later origin than the larger, we would see them not stopping right in front of the former, but these fissures would have crossed, that is, extended surely over and beyond the wider deposit, because the filling would have acted as a cement between the two walls and had yielded with the rock. No, the fissures may have been produced at the same time, but not their fillings. Perhaps you may say that the process of filling could have been going on at the same time owing through the different pressure and temperature of the solutions in those veins. Or that the present filling of the big lode might be a secondary product. But also these hypotheses could easily be disproved. In my opinion the small fissures were first filled, very likely soon after the granite eruption, while the bigger one later through hot geyser waters, containing silica, magnesia, iron and copper sulphides with some gold in solution. These geysers must have been enormous, not only to fill a fissure several miles in length and considerable width, but also to force these solutions into the surrounding rock, in which we find to-day the same minerals as enogenitites disseminated throughout, but especially so for several feet into the adjoining walls. Another occurence which led me to conclude that geyser waters were the cause of filling, is, that we find here and there the ore in horizontal shale like layers and not in vertical crustifications as are often seen in veins filled by secretion. As I said above the adjoining rock is so completely changed that I was first led to believe it to be a quartzeous diorite heavily mineralized

with chalcopyrite. This part shows at the surface a thick coating of hydro-ferric-oxyd which gives it the appearance of the miners well known "iron hat." The walls between the lode and country rock are well defined, and the ore breaks from them as smooth as could be desired.

There are a few more such deposits in this rock striking towards the large vein of which I have examined only two, but I should not be surprised to hear of a number of similar veins being found next summer, as soon as that part of the country is more thoroughly prospected, and the prospectors are more accustomed to distinguish these quartz deposits from the country rock. Should this be the case, and only half of the expectations be fulfilled, which the owners of the land have a right to cherish on account of the good surface indications, then I have no doubt that the Saw Bill Lake region will be one of the principle gold mining camps, not only in Western Ontario, but also of the whole Dominion

If I did not feel, gentlemen, that I had tried your patience too long in listening to this paper, I could have added here some more items for a better characteristic and for a better acquaintance with our Western Mineral deposits, especially for the benefit of those of you who are less familiar with them, but I shall spare this for another occasion.

In conclusion allow me to thank you, gentlemen, for your kind attention.

A New Use for Scrap Mica.

By Mr. H. C. Mitchell, Toronto.

The new use for Scrap or Waste Mica which I have been asked to describe this evening, is at present confined chiefly to its manufacture as an insulator of Steam Heat, although it can also be applied for other insulating purposes. It will be well at the outset to define what is commonly termed Scrap or Waste Mica.

As you are all aware Mica is found in irregular shaped crystals in almost endless variety of size and colour. It is one of the most perfectly foliated of all minerals, the laminæ being so delicate in many specimens as to require the almost incredible number of 300,000 of them to form a thickness of one inch. The Mica crystals are more or less seamed or cracked, so that often an apparently perfect crystal when split open, parts and subdivides into a number of small fragments. This unfortunate characteristic has really been the cause of much of the disaster which seems so often to have dogged the steps of mica mining in this and other countries. It is bad enough to have to deal with any mineral which occurs in pockets which pinch out without warning, and which leave no particular indication or lead as to where it may be found again. If all the deposits of mica which have been found in Canada had produced crystals more or less free from cracks and flaws, most miners would have been content with their strikes, and would not have been so much concerned as to whether or not it was a pocket or a true fissure vein. Then again many deposits of mica disclose a large proportion of crystals twisted and destroyed to such a degree as to render their cleavage almost impossible. These, together with the fragments already referred to, find their way to the dump, having thus far served no other purpose than to add very largely, and in some cases prohibitively, to the cost of mining the merchantable article. We shall, however, resurrect them presently, and I trust be able to demonstrate that instead of a loss, this hitherto costly waste may become a valuable by-product of mica mines. The proportion of waste or unmerchantable mica in every ton mined is very considerable. I do not know that the percentage of it to the ton has ever been approximated, but the evidence of a large number of miners would seem to indicate that it would average not far short of 70 per cent. of the total product. There are many instances I am aware where the average waste per ton is considerably less, but there are also as many cases where the percentage is as much higher, so that I think I am justified in venturing that estimate. It will be readily seen then that mica miners have had to contend with a very serious problem in the matter of this abnormal amount of refuse, and they have heretofore been unable to reckon upon a return of any kind for almost three-quarters of their total output.

So far I have referred to mica in general, but now we must notice the particular groups of it in Canada. These we may determine chiefly by the variety and color of the material. There are as I have said almost innumerable variations of colour and shade, from the nearly pure white to jet black, muscovite and phlogopite, but for general purposes we may divide them into three groups—White, Amber and Black. White mica appears to be very scarce in this country as compared to the quantities of amber and black, and as it is almost perfectly transparent, it has always commanded a much higher price than the other varieties. I may say, too, in speaking of white mica that there is a value for the waste of scrap of it, as when pulverized it has a beautiful lustrous appearance which lead to its being utilized for wall paper silvering, and other decorative purposes. As however it does not appear to have been discovered in anything like the same quantity as amber and black in Canada, it has not as much interest to us as the commoner varieties. The great bulk of Canadian mica is included in all these shades of amber, silver, red and brown, which range from cloudy or milk white to dense black, which latter as far as I know has no value whatever. I now come to this new use for waste mica. Although we can use the refuse of nearly all these varieties, excepting badly twisted crystals, it is the soft amber and light brown micas which we prefer for our purpose. This is fortunate for all concerned, as it appears to be the most abundant. We find that by taking these scraps or waste pieces and subdividing them as finely as possible, and then quilting them between galvanized wire netting, that we produce a fireproof mat, flexible clean and a magnificent non-conductor of heat. It will be noticed that all these flakes are ribbed or corrugated, the object being to increase the number of dead air spaces in the mat, and also to add to its bulk without increasing its weight. The finer we are able to divide these flakes, the more effective they become, as each one in itself is a splendid non-conductor, so that the greater number we are able to get into a given space, the higher the results are in checking the escape of the heat waves.

It will be seen that these mats or quilts are not only fireproof, but very flexible and elastic, which is a most valuable feature as they will expand or contract with the iron they cover without cracking or flaking off. No doubt many of you have seen boilers covered with some of the old fashioned cements, which being put on wet and allowed to set hard, often crack and split to make room for the expansion of the material beneath. In time it will loosen and fall off and require constant patching to keep in order. The real value however, in making these mats in sections, is that they can be removed whenever it is desirable to examine the shell of the boiler, and can be replaced easily and quickly without injury. As you will notice they are secured to the boiler by means of hooks attached to iron bands which are passed round the boiler under the mats. Besides this covering for boilers, the waste mica is made into sectional covering for all sizes of steam and hot water pipes, the only difference being that the mica is stitched between a wire core which fits the pipe, and an outer covering of canvas. The sections are secured to the pipe by lacing around the

* Paper read before the Ontario Mining Institute, April meeting, 1897

hoop hooks which are rivetted up the seam at convenient distances. Covering for all sized and shapes of fittings including Elbows, Tees, Crosses, Globe Valves are also made and secured to the iron in the same way. These have been difficult to make owing to the intractable character of the mica flakes themselves, as being very elastic, it was found hard to bend them to the various shapes. We found the same difficulty in making the flakes bend around the smaller sizes of pipes, but finally succeeded by separating them into different sizes, in the same way as coal is graded, the larger flakes being used on the larger sizes, and so on down to the small half inch-pipe.

Perhaps I may be allowed to refer here to the not unnatural idea that using the mica in this loose dry form it would be liable to shift or sag in the wire netting or canvas case. This however, is not the case, for the reason that the flakes being of irregular shape with rough edges and ribbed surfaces, they catch and bind one another, matting together as hair does. As a proof of this I may say that after nearly two years in constant service on locomotives where there is probably heavier and more constant vibration than is found anywhere else, the mats have been found in perfect condition, and in the opinion of railway engineers, are likely to last an indefinite number of years.

Before passing on to the probable effect of this new use for waste mica on the mining of the mineral in this country, I may be allowed to refer to some of the expert trials which have been made of the manufactured material. It is obvious that unless the results obtained from the use of this new non-conducting covering are really substantial and beyond question that the efforts now being made to establish a new use for mica must fail. Fortunately however, there is no longer any doubt or uncertainty on this point, and I believe I am justified in asserting that we have discovered absolutely the highest non-conductor of heat in the World, which can be used commercially, and that there is no substance used in the United States or Great Britain which equals this new insulator. It is no small satisfaction to think that it has been brought into use by the enterprize and pluck of Ontario men, and that there appears no reason to doubt that the mines of Canada will be able to produce sufficient of the raw material to permit of an almost unlimited expansion of this new industry on the markets of the world. How vast this market is may be imagined, when I remind you that every locomotive in use the world over, has to be protected with some substance; that every steamer that puts to sea has boilers which require hundreds of tons of coal to feed them, (in one of the great battle ships of Great Britain lately launched, there were no less than 48 of them), and that every stationary steam plant has a boiler or a battery of boilers, which require covering to minimize the loss of steam and power by radiation. How great this loss is few manufacturers, or indeed engineers seem to realize. As you of course know it is occasioned by the condensation of steam, that is, you allow the steam which you have generated often at great cost of fuel to cool off and condense by allowing the surface of the boiler and pipes to remain exposed to an atmosphere many degrees colder than they.

With steam at 75 lbs. gauge pressure, it has been estimated that the loss of horse-power on different sized pipes uncovered is about as follows:—

2	inch pipe	1	Horse Power	lost for every	132	feet long
4	"	1	"	"	75	"
6	"	1	"	"	46	"
8	"	1	"	"	40	"
12	"	1	"	"	26	"

So that when you complain that you cannot get power out of your engines or that the boiler seems too small for the job, you may solace yourselves with the thought that it is very often because you don't know enough to keep your steam dry! An argument often heard amongst mining men is that as many of them use wood for firing their boilers, it is not so much consequence if it does take a little more of it to keep up steam. Suppose that is true, it is difficult to believe that it is wiser to tie down the safty valve and pile in wood to carry steam through long runs of pipes than to remove the necessity and expense of doing so.

Fire Proofing.

Another use for this waste mica is for fire proofing. Mica, like everything, will fuse if there is heat enough, even "the elements will melt with fervent heat," but it will stand an almost incandescent heat without injury, and for that reason it is a very valuable substance for fire-proofing. Considerable quantities of it have been already used for protecting smoke flues, kilns, &c., and in some factories the fire underwriters have reduced the premiums after the flues have been insulated with mica. In this connection it is not without interest to refer to the fire risk in some mines from unprotected steam pipes. I have heard that a serious fire occured in a mine lately in Canada, which was directly attributable to a live steam pipe which ran in close contact to a wooden sheeting or boxing, and which subsequently took fire. It is very questionable whether a fire could be started from steam heat alone, but it is perfectly certain that wood may become so charred and calcimed from contact with a live steam pipe that a drop of oil or grease falling on it would quickly cause combustion. So that here again we find a use for mica. I can not refer in detail to all the other actual and possible fields of usefulness for this hitherto despised waste product of our mica mines, but I must not leave the subject without touching on its qualities for resisting the other extreme of heat. namely frost. It is said extremes meet. They do in this instance, for the identical covering made for fire proofing give splendid results in frost proofing, and I have no doubt at all that mica will shortly be used for insulating cold storage chambers. Being free from organic matter to mold or smell, it is not liable to taint even such susceptible commodities as milk or butter, which is not the least valuable of its advantages. Such are some of the uses to which we are putting waste mica.

As those interested in mines and mining, you will doubtless enquire what effect this discovery is likely to have on the mica industry in Canada. This altogether depends on the demand. If it increases as it is doing now (the sale of it advanced 98 per cent. last year), very large quantities indeed will be required. In that event we shall be able to pay better prices for it, and we shall be glad to do it. I believe the most successful industries are those whose produce are profitable to the customers, the manufacturers, and to those who sell the raw material. But so long as we are expected to sell as cheap as the cheapest without regard to quality or value, so long will we be forced to buy at prices which have no regard to the living wage of miners. Buying in the cheapest and selling in the dearest market is a phrase well enough in theory; for my part I would like to see the demand sufficiently large to justify us in paying prices that would start every pit in Canada, and make every mine an indirect source of general revenue to the people, in whose prosperity the success of our business depends.

I do not know that we can expect quite such fortune as that, but I do believe that while this new industry may not justify mining solely for its requirements, yet every ton of waste or refuse used in it, means so much less cost of mining, and so much more profit in the year.

It should make a considerable difference to the expense of mining if in the future it is known that by simply laying aside in some protected place the waste and scrap which has hitherto been consigned to the dump, a certain amount of revenue may be earned which will lessen the general expense of mining. In conclusion may I express

the hope, which does not emanate entirely from the selfish standpoin; of the manufacturer, that the progress of this new industry may be such as will result in such an increase of the demand for waste mica as will make the discovery of this new use for it profitable to the miner and manufacturer alike.

The building up of industries in Canada which use as their base raw material produced entirely in this country, must be of ultimate benefit to the general community, and I think we must all deplore the conditions which appear to result in so much of the raw material of this country being shipped out of it, to benefit the towns and villages of the countries in which it is manufactured. We must recognize the enterprise and pluck of foreigners who come to this country and develop our latent wealth, but we must also deplore the fact that it often results in the larger profits of the enterprise being carried away and spent amongst other peoples. The profits of much of our Nova Scotia coal mining are not unappreciated in Boston; the great lumber mills of Michigan know something of the value of Canadian logs; the paper pulp mills of the United States are not indifferent to the wood-pulp of British America, and even distant Spokane has associated the gold mines of British Columbia with many a new brown stone front in that city. Let us hope that this new use for waste mica may conduce to the prosperity of Canadians at home.

Some Notes on the Milling of Gold Ores.

By John E. Hardman, S.B.M.E., Montreal.

To the mine owner, whose property has passed from the stage of a prospect into that of a partially developed mine, the subject of the proper treatment of his ore is, perhaps, the most immediate, if not the most important, one he has to consider.

The rapidly accumulating evidence which Western Ontario offers of possessing large areas of free milling, or partially free milling gold ores, may make these notes I have to offer more or less valuable to some of you who are the fortunate possessors of lands carrying such ores.

The old distinction between "Free Milling" and "Refractory," gold ores is getting less and less sharply defined each year, owing to the progress made by metallurgists in their treatment.

Broadly speaking, a gold ore may be termed "free" milling if the *major* part of its gold value can be extracted by amalgamation with mercury; to be "partially" free milling if a considerable fraction (but less than one-half) of its gold can be extracted by crushing and amalgamation; and "refractory" when no part, or a very inconsiderable fraction, of its gold contents are thus recoverable.

For the treatment of free, or partially free milling ores, the recognized steps are:—Fine crushing by stamps, amalgamation within the mortar and on the plates by mercury, and the concentration of the metallic sulphurets in the tailings by means of vanning machines.

Various combinations of these three steps or processes may be used to advantage, depending upon the nature and character of the ore, the gangue and the manner in which the bulk of the free gold is contained in the vein stone.

Various supplementary processes, also, such as chlorination for treatment of the metallic sulphurets, and cyaniding for treatment of tailings with or without previous concentration, are employed by the competent metallurgist to extract the highest economical percentage of the gold contained in the ore.

The various details of precipitating the gold from its solution, and the use of combined cyanides (such as the Bromocyanide process), are all details of the main steps in the consecutive treatment of a gold-bearing rock.

It is of importance, then, that a proper selection of a method or process should be made at the outset, before incurring any heavy expense for a reduction plant, since failure to recognize and adopt the proper process at the start, may entail double expense on the owner or company through the pulling down and re-building of his mill, or, what is worse, and perhaps more frequent, cause the abandonment of the enterprise through failure to extract a remunerative amount of gold from the ore as treated.

It will manifestly be impossible to attempt to give you a full or complete account of all the varieties of conditions and of ores met with in practice, the limits of this paper will only permit me to note the outlines of the most prominent conditions.

In selecting the approximately correct process for milling a gold ore, comparatively simple tests at the beginning will show you whether your rock is free milling, partially free, or refractory.

A weighed *average* sample of your stone, about four pounds in weight, should be finely pulverized, and all of it passed through a 30 or 40 mesh sieve. Note whether any of the gold contained is large enough to remain in the sieve, if so, separate it and add it to what you obtain afterwards. Take the full four pounds, put them in an iron mortar with water sufficient to make the whole into a paste and add from a teaspoonful to a dessert spoonful of clean mercury, then grind the whole mass vigorously together for half an hour, when a small lump of potash cyanide may be added, not bigger than a 32 bullet, and grinding continued for ten or fifteen minutes more. After this pan off your pulp, taking not more than one pound at a time, and thinning it when in the pan with plenty of water.

The resulting quicksilver and amalgam obtained is then strained through a bit of soft buckskin and retorted, and this gold added to what was obtained in the sieve. All the gold thus obtained should be weighed.

Save your tailings from panning and have them assayed. If you find that you have extracted the greater part of the gold by panning, the usual stamping and amalgamation process is the one indicated, and the value of your tails when concentrated to clean sulphurets, will indicate to you whether it is advisable to add vanners to your mill or not.

Should the test show that the larger value of the ore is not in free or metallic gold, but is contained in the sulphurets and tailings, then a sufficiently large sample (not less than one ton) should be sent to a testing laboratory for determination of the proper method, or the services of a competent metallurgist should be engaged to examine and test your ore.

In cases where the larger value of the ore is contained in the metallic sulphurets which occur in the vein, it has frequently been found advisable to crush such ore coarsely by means of rolls, and concentrate the sulphurets first, subsequently grinding the tails from concentration, either by pans or light stamps, and amalgamating them with Hg, following such amalgamation again by vanners. Care must be exercised, however, in considering this method, and in the further treatment of the concentrates, that the gold contained is not coarse, or "nuggety," else may occur the same disaster that many of you may know more of than I do—I refer to Deloro, where the tails from the roasted and chlorinated mispickle gave good returns of free coarse gold by panning and even by sluicing.

I can only say enough on selection of process to give you an idea of its importance, in order to have the first step made rightly, and to advise, in all cases, obtaining expert advice.

From what has been published, and from what I have seen of the ores of your great gold field, the usual method of stamping, amalgamation and concentration, automatically and in regular order will be

the prevailing process employed—a few notes, therefore, on some of the machinery and its operation may be of value.

The design of the plant is entirely dependent upon local topography and circumstances, the idea governing such design should be to make the whole as automatic as possible, avoiding labor of handling, which is always the chief factor of costs.

The item then of foundations requires attention—the foundations of your mortars should always be of wood placed on end, such wood may be large sticks, dried and well fitted or of dressed plank spiked together, as circumstances and costs may determine, but always carry this wooden mortar block to the *solid* rock, and do not have the length of the mortar blocks less than 10 feet. There is a certain resilience or elasticity in wood placed on end which is not fully developed in lengths of less than 10 feet.

The foundations of your mill, engine and concentrators are of nearly equal importance; for the former a solid bed of concrete, of the form of a truncated pyramid is advisable, for the latter, well weighted mudsills, braced to ensure stiffness and freedom from wracking horizontally, are desirable.

The prime motor of your mill, be it steam engine, water wheel or electric motor, should run steadily without serious variations of load.

The best modern practice is not to put rock breakers on the mill engine, but to locate them at the shaft-house or rock-house and operate them by independent motors. When both concentrators and rock breakers are run off the mill engine, the variations of speed due to the working of the breaker cause constant attention to adjustments of the vanners and correspondingly poor work by them and infinite annoyance to the mill man.

Whether the California "Knee frame" or the Dakota "Bin frame" for the superstructure of the mill is adopted may depend upon the idiosyncrasies of the designer: the pros and cons are briefly these—Knee frame—accessibility of line-shaft for alignment, ease of oiling and inspection—horizontal driving belt against a vertical one. *Cons*—less stability; more likely to get out of alignment.

Bin frame greater stability, but dark, hard to keep free from grit and dirt, harder to oil, less accessible, necessitates tightened pulley, wearing belt quicker.

Choice of the wood to be used in the important parts of the frame, like the battery posts, bridges, guide-binders and braces must be governed by character of the local timber and by cost. Where cost is not prohibitive, I have preferred of recent years putting in southern pine (long-leaved yellow pine), which never checks nor seasons to cause disturbance.

A question which has been frequently asked of me is whether two 12 x 12 in. posts may be bolted together to make a 12 by 24 in. post. There is not the slightest objection to joining two posts thus, provided you have a competent workman to fit the two surfaces together; the joint must be as perfect as possible, and the two sticks pin-dowelled together as well as thoroughly bolted.

I have used battery posts thus joined for over six years, and have never observed the slightest weakness in them nor any objection to their use.

In coming to the iron work of the mill, let me draw your attention to the use of friction clutch pulleys on the line shaft for driving the cam-shaft pulleys. In many years' use I have found them the most convenient, speedy and desirable device, enabling one to disconnect any battery quickly and without danger.

Of the materials from which the wearing parts are made, there is a decided tendency to replace iron by steel in every place possible.

The mortar remains of cast iron, of a tough, but soft character; the can-shaft of mild steel, running in cast iron boxes, made of a soft graphitic iron I have found most satisfactory. Cams and tappets are now almost universally made of a hard steel, such as Chrome or Manganese, and must be ground on wearing surfaces to a true smooth face.

Stems still remain of best wrought iron or of mild steel, and heads or bosses are usually of the same material as the mortar, viz.: tough cast iron. As to shoes and dies, I need not specify, for I imagine you all have your preference. I may, however, add that very few small mills keep their records in such shape as to really know what is the cost of iron per ton of rock melted.

In ordering a new mill, it is of the utmost importance that your specifications should be clear and exact, and that you should know just what duty comes upon each part of the mill and provide for it. If you do not know, get your specifications vised by someone who does.

A device regarding apron plates which is worthy of adoption is one permitting their adjustment to different degrees of inclination. This is particularly valuable when rock from two or more different veins is to be milled; one rock may carry more clay or slate than another, and it is of advantage to be able to adjust the plate for the mortar in which such ore is being milled. For it is surely unnecessary say, that stone from each vein should be milled in its own mortar, and not mixed with other stone. By this means only can one ascertain the relative values of rock from different portions of the vein, and locate approximately the limits of the pay chute.

Having such a mill, well designed and well adjusted, there are some few notes as to its daily running which may be of use:

As to the rock breaker, it is good policy to set this to crush to pass a small ring, one inch, if possible; first, because the self-feeder runs with less attention; secondly, because the wear of shoes and dies is more uniform, and thirdly, because your daily capacity per stamp is much increased. Of course the limitation in this respect will have to be governed by the capacity of the breaker you have, but it is good policy always to put in a much larger breaker than the rated capacity of your stamps requires.

The introduction of the water to your mortar is also an item worth noticing. It should be fed from a tank with constant level, to ensure a uniform quantity per unit of time, and it is advisable to have this tank at a considerable height above the mortar, say 20 feet.

Instead of the old-fashioned faucets, one to each stamp, the better practice is to introduce a three-quarter inch pipe with straight-away cock between stems Nos. 1 and 2 and Nos. 4 and 5, making only two cocks to each 5-stamp battery.

A device which has been used in Ontario, and also recently in Nova Scotia, is the introduction of upward pointing jets of water from the base of the check block, one jet between each die, the advantage claimed being an avoidance of the hand packing of sulphurets between the dies, and consequently aid to amalgamation.

The matter of the height of the discharge opening above the top of the die is one which is directly dependent upon whether the stamp mill is used only as a crushing machine, or as a crushing and amalgamating machine combined, and also in the latter case upon the amount of, and manner in which, the gold is contained in the ore. For subsequent concentration, when the chief value lies in the sulphurets, a low discharge and coarse screen prevents much of the shining which is fruitful of loss on the vanner.

Directly connected with this matter also is the speed and height of drop of the stamps, but the order in which stamps drop, other conditions being equal, governs only the matter of discharge through the screen, and the even distribution of pulp throughout the mortar, so as to prevent banking and give each stamp a uniform quantity of work.

The preparation and introduction of mercury into the mortar is an item frequently disregarded, and productive of losses when not properly attended to.

Mercury as it comes in the flask is too dirty for use in gold amalgamation, and should be purified by retorting at least once. Whenever grease, oil or other fatty matter, or other substances like graphite, some sulphide ores like mispickel and partially oxidized sulphurets containing sulphates, like galena, are churned up in the mortar by the stamps, the mercury which has been fed becomes partially sickened or "floured" as it is called, breaking up into minute grey globules which do not coalesce, and which usually escapes the traps and get lost with the tails. This loss usually entails a loss of gold also.

Naturally, the cure depends upon the cause:—if due to grease, the addition of small amounts of slaked lime, thrown into the hopper of the self-feeder from time to time, will usually "cut" the grease or saponify it and remedy the trouble; if, however, too much in quantity the addition of a stronger alkali is required. Screened wood ashes are used with good results in many places.

If due to mispickel or the presence of much graphite, the addition of common salt has often been found effective, but some cases do not yield to such treatment.

Mecury should always be purified by retorting under a cover of quicklime, putting the retorted mercury subsequently into a large porcelain-lined vessel and covering it with a dilute solution of nitric acid in the proportion of one of acid to 4 or 5 of water. The mercury for the mortar and plates should be dipped out of the vessel and washed free from acid before using.

Another difficulty met with in the use of coppers which have not been silver-plated is the "verdigris" or green stain often forming in spots or streaks on the plates. This stain is due simply to the formation of oxy-salts of copper where the metal has not been thoroughly amalgamated with quicksilver. With care and attention these spots can be permanently removed.

Having thoroughly cleaned the spot to be attacked, dry it and scrape it with a blunt-edged chisel or other edged tool until the copper shows bright and clean, then thoroughly rub into it mercury with a piece of canvas, or chamois, moistened with cyanide of potassium solution; when well silvered, paint over the spot with a very fine gold amalgam, and let the amalgam set for 24 hours before using the plate again.

To prepare this very fine gold amalgam, it has been my habit to buy or acquire a bit of old copper plate well coated with gold amalgam, and by "sweating" this plate carefully over an ordinary kerosene lamp to scrape off the adhering amalgam, which is then put into a wedgewood mortar with a little quicksilver and well ground together, rapidly pouring off the mercury after the skimming, leaves the coarser particles of amalgam behind, while the portion poured off if allowed to stand 24 hours, may be carefully decanted from the fine amalgam which has settled to the bottom, and which will be found to be of the consistency of cream and admirably adapted for doctoring sick apron plates. It is advisable to always carry a small stock of this cream amalgam on hand.

I may also caution you against the lavish use of cyanide of potassium, which is detrimental to the plate rather than beneficial, if used in excess or too frequently.

Again if you would have clean plates, avoid the use of pit water which usually is acid and carries too much of dissolved sulphates and other mineral matter to give clean amalgamation.

The percentages of amalgam recovered in the mortar and in the outside plates are very various, differing with the design of the mortar and its appurtenances, with the regulation of speed and height of discharge, and with the character of the ore.

A free milling ore, treated in a gravity stamp battery of suitable design, can be milled so as to recover fully 90 per cent. behind the screen, i. e. within the mortar Many instances have been recorded by myself where the saving in the mortar has reached as high as 95-96 per cent. of the whole amount recovered.

The few cases in which a steam stamp has been used on free milling ores (whether of the portable type like the Gates or Tremaine, or the copper type—as at the Home-stake) seem to show that saving in the mortar is impracticable; due doubtless to the heavy churning and swash of the pulp in the mortar; in several cases this has been so great as to scour any inside plate used. I am, however, inclined to believe that this detriment to the small steam stamp can be removed by a simple change in the pattern of the mortar.

The main factors upon which the saving of amalgam within the mortar depend are:—

(1) The shape of the inside of the mortar,
(2) The height of the discharge,
(3) The characeter of the screen,
(4) The height of the drop,
(5) The shape and location of the inside plates used.

It would prolong this paper beyond the limits allowed, to discuss the influence of each of these factors upon the result, or to touch upon many other minor points of importance, which the skilled amalgamator usually regards as secrets of his trade.

And let me say a good word for the real amalgamator, the honest, patient, hard-working, watchful man who is continually studying his ore and his mill, and who takes as great delight in saving an extra halfpenny weight from his tails as does his employer.

For the quack, who knows it all, who has some "Secret" device or some combination of chemicals that will save "105 per cent.," beware of him, and get him to leave your camp as quickly as his health permits.

I regret exceedingly that the limits of time prevent me from giving you many more items gathered during a somewhat extended period of 13 years, which might perhaps have been of interest. I shall hope, in the near future, to be permitted, by your kindness, to add perhaps to what I have said here, and perhaps also with the then added experience of personal acquaintance with parts of your great gold field of Western Ontario.

The Loss of Head Due to Elbows in Pipes.

In a series of articles describing the engineering department of the Yorkshire College, Leeds, *Engineering* has given some particulars of the results of experiments conducted in this institution to ascertain the effect of the friction of water in a pipe fitted with sockets, elbows, tees, bends and a sudden enlargement. The experimental pipe was half an inch in diameter, and the friction was measured by loss of head in the usual way. It is shown in works on hydraulics that the loss of head due to resistance of this nature to the free flow of water in a pipe may de expressed in terms of a length of plain pipe that will give the same loss of head due to friction. Experiments extending over several years show that the loss of head resulting from a socket is equal to that due to from 15 to 17 diameters of the plain pipe; while that of easy right-angled bends may be from 10 to 15 diameters; and that due to sharp right-angled elbows from 30 to 36 diameters. At one place, the experimental pipe is suddenly enlarged to five times the regular diameter. The total loss due to this and the contraction should, by calculation, be equivalent to the friction of 1.92 feet of this half inch pipe. Experimentally, however, the loss is only equivalent to the friction of a length of from 1.2 to 1.4 feet. The experiments show the detrimental effect of sharp elbows on the discharging capacity of a pipe system.

Preliminary Hoisting.

(Continued from Page 152.)

the drum and shaft are attached a pair of sweeps. The drum has a light but strongly braced skeleton frame of steel or wrought iron, though the smaller sizes are often made wholly of wood. A stick of timber, 6 by 6 or 8 by 8 inches, with pins let into each end, forms the drum shaft. The lower bearing is a cast-iron socket (or even a hard stone in which a hole is drilled), while the upper bearing is carried by a framework spanning the circular track. The drum is generally from 8 to 12 feet in diameter, with a face 2½ to 4 feet wide, lagged with strips of wood, or covered with light plate iron. Hanging from the extremities of the sweeps, which are frequently 25 feet long, are vertical yokes for one or two mules.* The animals are trained to keep at a steady trot. They reverse the motion of the drum by turning rapidly in their own length—the yokes being swivelled to the sweeps—and trot in the opposite direction. From the drum the rope passes off horizontally to the sheave over the mouth of the shaft. When there are two buckets, as is usually the case, the rope has several turns around the drum to prevent slipping. Brakes are rarely used.

Malacates are frequently erected underground. A tunnel is driven to the vein and the ore lying about having been worked out, the malacate is used for sinking below the tunnel level. To accommodate it a large chamber is excavated in the rock, close to the mouth of the shaft or winze. In the high altitudes of the Andes Mountains this work is severe, and the mules do not often work more than six hours per day, generally in shifts of three hours each. An example may be mentioned of a malacate in a Bolivian mine (the Amigos, at Colquechaca), situated at an altitude of 15,000 feet, which was used to a depth of 750 feet, the shaft being sunk at the end of a tunnel nearly 1,600 feet long. Two malacates were in operation, each with four mules at a time, and millions of dollars' worth of silver were taken out in this primitive way. In Mexico malacates of great size have been employed, operated by from eight to twelve mules. In remote districts both ore and water are sometimes hoisted by raw-hide sacks instead of buckets. They hold from 800 to 1,000 lbs., and are made by trimming a hide to an approximately circular shape; around the edge holes are cut at intervals, through which a rope or strip of raw-hide is threaded so as to gather up the skin in sack form. As the sack (Spanish, capacho) swings loosely in the shaft, frequently striking against the sides, it does not last long, but possesses the advantages of being light, unbreakable and cheap.

The whim, in any of its forms, is a useful appliance for preliminary mining operations. It is durable and portable and, while the ready-made patterns are commonly used in this country, but little skill is required to extemporize a whim that will serve for sinking to a considerable depth.

* In Spanish American countries mules are almost invariably used instead of horses, as they stand the work better, especially in high altitudes.

Moss Litter.

By Mr. T. W. Gibson, Toronto.

Agriculture and Mining are the chief members of a group of arts which lie at the base of all others, without which indeed none others could exist. Agriculture supplies the primal necessities of man by giving him food and clothing, and both together furnish him with raw materials for the wonderful and complex series of manufactures by which his ingenuity strives to gratify the tastes or satisfy the wants which seem to enlarge with his expanding civilization. They have both the same arena, the capacious bosom of mother earth, and both deal with the substances which are therein found. One enlists in her service those vital forces which raise the inanimate atoms of inorganic matter from air and soil and raise them from the mineral into the vegetable, and from the vegetable into the animal kingdom; the other has to do directly with the mineral substances themselves, and by the mere act of changing their situation and separating them from one another, rescues them from inutility and makes them subservient to the uses of man. One may be called an adaptive industry, whose processes if rightly directed, move in a circle, and appear capable of being conducted for all time; the other may be termed a destructive industry, dealing with large yet strictly limited quantities of material which once brought into play are forthwith subject to decay, and are scarcely, if at all, capable of being restored to their original condition. Agriculture and Mining touch each other at many points. The farmer feeds and clothes the miner, the miner warms the farmer, supplies him with fertilizers, keeps him in ploughs and harrows, and puts gold and silver in his purse. No market is worth so much to the tiller of the soil as a mining camp in full and flourishing blast. Miners usually want the best, and are quite willing to pay for it.

There are processes performed on the surface of the ground which in their nature seem intermediate between agriculture and mining, and to partake of the character of both. One of these is the reclamation of peat bogs and the utilizatian of the material of which such bogs are composed. As agricultural operations such processes restore to cultivation considerable areas of land previously lying waste and barren, while viewed as incidents of mining, they convert to man's use actual portions of the earth's crust unchanged except by a certain amount of manipulation.

The origin of peat bogs is well understood. They are found chiefly in the colder parts of the globe, where evaporation goes on less actively than in the more tropical regions, and occur in low situations or where some natural or artificial obstacle impedes the drainage. The abundant moisture favors the growth of a low order of plants such as the sphagnum mosses, of which some fifty or sixty species are known. This plant is distinguished above all others by its capacity for absorbing and storing water, for which its peculiar structure eminently fits it. The epidermis of the stalk and the leaves of the plant are mainly composed of large empty cells, into which the water is drawn through a number of small holes. The cells are provided with rings or spiral-formed thickenings on their inner sides, which keep them from collapsing. They are consequently always distended, and always ready for use. Smaller cells occur between the larger ones, which contain chlorophyl and supply the plant with nourishment, but these occupy comparatively little space. The whole arrangement is that of an aggregation of reservoirs in successive layers, which are kept filled by the force of capillary attraction even when the plant itself is above the water level. It is curious to note that the properties of the sphagnum mosses which render them so well adapted for living in a low and moist situation, tend also to bring their existence to an end. They require a constant supply of moisture, yet they are continually pumping up to the surface of their tufts the water in which they stand, thus promoting its evaporation, and at the same time, by their constant decay, they deposit the detritus which adds to the solid contents of the bog. This process continues until the bog is raised above the level of the surface water, when the sphagnum vegetation ceases, having exhausted the conditions favorable to its growth. In process of time bogs of considerable depth are formed in this way. As the mass increases, decomposition takes place in the lower portions and these become consolidated into a black or dark-brown earthy substance, which in some parts of the world is extensively converted

into fuel. The usual method is to dig up the peat in cakes or blocks, and dry them by exposure to the wind and sun, after which they are stored and used as required. Hand labor is generally employed, though numberless attempts have been made to facilitate the process by the introduction of various kinds of machinery. The great difficulty in the economic employment of mechanical processes is the tenacity with which the peat retains the degree of moisture remaining after it has yielded up all that naturally evaporates in the air. Pressure and artificial heat have been resorted to to overcome this difficulty, but while the end aimed at is capable of achievement, it has usually been at too great a cost for economical results. A process which would put us in possession of a good and cheap peat fuel would be a great benefit to Ontario, destitute as the province is of workable beds of coal.

It is these absorptive properties of the sphagnum moss which have led to its utilization as litter or bedding for cattle, in lieu of straw or other materials commonly employed for such purposes. Its suitability for litter was doubtless recognized at an early date by people living in the vicinity of peat bogs, but it was as late as 1880 that the preparation of moss litter as an article of commerce was first begun by Hollman, at Gifhorn in Hanover. Since that time it has come rapidly into use in the countries of continental Europe and in Great Britain, as well as to some extent, in America. The advantages claimed for the litter are that it affords drier and healthier bedding for horses and cattle than any other material; that by reason of its great power of absorbing moisture it binds the valuable portion of the animal excrements and consequently yields the best manure, that it acts as a disinfectant and improves the air of the stable, and that a smaller quantity of it is required than would be needed if straw were used. Experience in the use of litter in Euorpean countries, seems to show that the claims made for it are well founded, and that it is the best article for the purpose yet introduced. The cells of the sphagnum moss in its manufactured condition, retain very much of their power of attracting and holding water, and the litter in consequence is able to take up ten or fifteen times its own weight of moisture. It has the faculty of absorbing gases as well, and hence fixes the ammonia always present in greater or less degree in the atmosphere of buildings where animals are confined and fed. The soft, springy, elastic moss litter forms a more comfortable bed for cattle than straw, and greatly facilitates the task of keeping the animals and stables clean, a fact which has an important bearing on human welfare, in the case of milk cows whose product is used as an article of diet. Careful trials of moss litter in army stables in Germany where formerly straw was employed showed its superiority in the following points: dry beds, dry fresh air free from ammonia, and the ceilings, walls and leather trappings remained free from moisture and mould. If proper care were taken to remove those portions of the litter which became charged with moisture, to shake it up every day, and fork it from one part of the stall to another, the horses found their quarters very much improved. Their skins remained clean and in activity, catarrhs of the nose and eyes, generally the result of bad air in stables, were less frequent, wounds on the legs healed more speedily, colic was almost eliminated, inflamations of the glands seldom ocurred, and rotting of the frog was almost entirely prevented. In cases of contagious disease, the litter proved of great value and surpassed all other disinfectants. In other cases, too, moss litter mixed with superphosphate has had the effect of protecting cattle from foot and mouth disease even while the infection spread to an alarming extent on neighbouring farms. This property would doubtless make it valuable for use in railway cars employed in the transportation of live stock. Many cases have been known in which disease was introduced or spread by cars in which infected animals had been carried. The manurial value of moss litter after it has served its purpose in the stable, is greater than that of straw for the reason that there is less evaporation of the liquid and volatile constituents. It would appear that no greater proportion of the potash, lime or phosphoric acid is recoverable by means of the litter, but the easily soluble nitrates are retained to a much larger extent than in the straw, which allows of their escape in the form of ammonia. As the agriculturist well knows the nitrogen thus rendered available for plant food is a most valuable element of manure. In the manufacture of moss litter, as carried on in Europe, a fine dust is sifted out at a certain stage of the process, which, as well as the litter itself, is used as a deodorizer and absorbent of sewage and fecal matter, especially in small towns or cities where there are no proper systems of sewerage or drainage. Accumulation of noxious matter of this sort often gives rise to epidemic and infectious diseases. The employment of moss litter and peat-dust not only remedies this evil, but actually transforms deleterious waste into a valuable fertilizer. The absorbent properties of the litter check the growth of bacteria and retard the decomposition of organic substances. Fresh fish, fruit and vegetables are all said to have been preserved in excellent condition for a long time by being packed in peat moss. There are many other uses to which moss litter is put, such as raw material for coarse textile fabrics, a non-conductor of heat or noise in house building, paper-pulp, etc.,with more or less success.

The peat bogs of Canada, and of Ontario in particular, are of great extent. By virtue of their vast stores of carbon, they constitute a potential source of fuel supply to be made available when the right process of manufacture is invented and applied. Meantime a beginning has been made in the utilization of these bogs in the manufacture of moss litter. In the townships of Wainfleet and Humberstone, between the feeder of the Welland Canal and Lake Erie, about five miles from the town of Welland, lies a peat bog of some 5,000 acres owned by the Canadian Peat Fuel Company. At the northern edge of this bog the company has erected a plant for the manufacture of the litter according to a process, which, in some respects differs from that prevailing in Europe. The upper layer of the bog consists of undecomposed sphagnum moss varying in depth from 18 inches to 4½ feet, is said to be free from sand or other inorganic material, and to be well fitted for litter. The works have been erected and put in operation, and a considerable quantity of product turned out. The first stage of the process is to drain the bog by cutting trenches in it, and so allowing the surface to become sufficiently firm to enable the workmen to go upon it. The upper or undecomposed layers of moss are then cut into pieces about 18 inches square, which are piled together into rows and exposed to the sun and wind. When the moisture has sufficiently evaporated, these blocks are gathered and wheeled in small cars over a portable tramway to the factory. The first operation there, is to pass them through the picking machines, two of which stand side by side. These are provided with heavy revolving cylinders, armed with strong teeth which act upon similar teeth set in the concave surface of a breast against which they work. In the pickers the moss is loosened and torn apart, the object being to separate the fibres rather than break them. The moss is discharged upon moving carriers, three in number, ranged above each other, which carry the moss horizontally through a drying passage or tunnel 116 feet in length, 8 feet high and 16 feet wide. These carriers travel against a current of hot air drawn through the tunnel by a disc fan revolving at the farther end, the object being to remove the greater part of the moisture remaining in the moss. The heat for this purpose is generated by a furnace situated parallel to the tunnel whence the hot air is drawn by the suction of the fan into a mixing chamber, where the temperature can be regulated at will by the admission of cold air. The hot blast

after passing over the moss emerges laden with moisture into a wooden shaft and so into the air. At the end of the drying tunnel the moss falls into a conveyor from which it is elevated into a weighing bin or hopper situated above a baling press or packer. The hopper works automatically, and as soon as a sufficient weight is received, it deposits its load in the press, which is a machine of peculiar design worked by steam power. On a revolving circular platform are four stout wooden moulds. In one of these, wooden slats are placed to assist in securing the bale after it is pressed; it passes under the press, a workman above moves the lever, and a plunger descends with a pressure of 200 tons, forcing the moss firmly into the mould. The platform makes a quarter revolution, and while the second mould is being filled, number one is being tied firmly with wire, and at the third turn the finished bale is removed ready for shipment. The weight of a bale is 250 or 260 pounds. A knuckle-joint press is subsidiary to the steam press, but it is seldom required. The bales are then stored in sheds whence they can be shipped as called for over the Michigan Central Railway, a spur of which runs into the property.

In the finished state the litter contains about 30 or 35 per cent. of moisture. It is said to take up liquids more readily in this condition than when the cells of the plant are completely deprived of water, and is not so easily broken to pieces under the feet of horses. The output of the factory is about 40 tons per day of 10 hours, but can easily be increased. The consumption in America is about 18,000 tons a year at the present time, which hitherto has been imported exclusively from Europe. New York, Brooklyn, Baltimore, Philadelphia, Chicago, and other large cities are the chief places of use in the United States, but the market for litter is rapidly growing. It is employed in the stables of milk and transportation companies, liverymen and other large owners of cattle and horses, and even in the stables of many private individuals.

The Canadian Peat Fuel Company has entered into a contract for supplying an average quantity of 22,000 tons per annum for five years to parties in the States. They do not anticipate any trouble in marketing this quantity. One difficulty in the way of a more general use has been the cost of storing cargoes at the point of importation. Moss litter is a bulky article, and the rates charged for storage are high. They will be evaded in the case of the Welland factory, as the litter can be kept on hand there, and shipped only as required direct to consumers. The price at which it retails in New York is $15 to $18 per ton. In London, England, it sells at 35 shillings per ton.

The factory at Welland is the only one of the kind in America. The machinery used in it is from the designs of Mr. A. A. Dickson, the president of the company, and is patented in Canada, the United States, Great Britain, Germany, and other countries of continental Europe.

Beneath the layer of moss suitable for litter on the Welland bog lies a very large quantity of dark, decomposed peat, which it is the intention of the company to manufacture into fuel. The depth of this peaty section varies from a foot or two at the edge of the bog to 20 feet in the centre. The process of converting the crude peat into fuel is also one patented by Mr. Dickson, and as now perfected, does away with artificial heat. The peat is cut and air-dried, after which it is pulverized by being passed through a picker and deposited automatically in a hopper which feeds a steel tube about two inches in diameter and fifteen inches long. The pulverized peat is forced through this tube by pressure and formed into cylindrical blocks about three inches in length, and almost equal in density to anthracite coal. This part of the business has not yet been brought into operation.

Below the bed of peat lies a deposit of clay which experiments have shown to be of fine quality for the manufacture of vitrified brick, pottery, etc. The prospects is that a very large business will be built up by the company in the manufacture of moss litter, and perhaps also in peat fuel. In the utilization of such dormant resources they are really adding to the wealth of the country, and whether they can command success or not, they certainly deserve it.

A Few Notes on Material Used in Mining Machinery.

By H. W. DeCourteney, Montreal.

Last fall while on the way to the coast, I had the pleasure of stopping at several of the prominent mining districts, Lake of the Woods, Trail Creek, Rossland, Slocan, etc.

I was very much impressed with the fact that sooner or later a large amount of machinery would be required for the development of these districts.

In some of these districts many propositions will show up what are known as "Free Milling," and such being the case a great deal of machinery for this class of ore will be required.

The Lake of the Woods has presented some of this class, and also in certain districts east of this.

In British Columbia there are already several mines of this character. The recent showing from the LeRoi ore put through the stamp Mill with certain results, and the work of the O. K. Mine at Rossland, tend to show what may be done in that district. The Cariboo Mining & Milling Co., in Okanagon Section also has been demonstrating results on this kind of rock.

In the Lillooet district and on Vancouver Island, free milling propositions are also found, the same in the Cariboo district, which at present is largely placer, but already prove the necessity of ultimately requiring other machinery than hydraulic to get out the full value of the properties.

Referring to these probable requirements the source of supply must be from the East as very little manufacturing is done in the West, and none of that class adapted for the purpose, as air compressors and drills, rock crushers, stamp mills, pumps, etc.

With these vast fields before us stamp mills will be required and the desire will be to obtain the best appliances, of latest and most improved patterns.

To properly equip such plants, the machinery should be built to certain specifications and of certain materials and requirements of each individual part, in order that uniform working in every part may be the result. This all should be done under the supervision of a thorough practical Mining Engineer so that the plant will do the work economically according to the character of ore it has to work upon, the ore or rock having been previously tested.

To dissect a stamp mill into its essential and important parts I will take those composed of iron and steel.

As steel advances into the field of construction, the engineer naturally asks "what am I to do with it"? Can it be worked safely, is it reliable? Shall I use high steel or low steel? Facts are systematized and theories formulated by scientific men, but the practical men supply the facts. Miners are usually the practical men, the pioneers of civilization and progress in a mining country.

Iron and steel enter very largely into all kinds of mining machinery, but not all kinds of iron and steel can be advantageously employed in their manufacture.

Without going into the detail of their manufacture I would say that from the ore we have pig iron for the foundry or rolling mill. Its chemical relation to one of the metallic elements, carbon, are such that the addition of a small quantity of this element converts iron into steel, far

surpassing iron in the valuable properties of hardness and elasticity, whereas a larger quantity of carbon gives rise to cast iron, the greater fusibility of which permits it to be molded into shapes which could not be produced by forging.

Five elements enter into pig iron in greater or less degree—carbon, silicon, phosphorus, manganese, sulphur; the same with steel but in re-arranged condition.

Cast iron, when poured into iron molds, hardens just as steel does when quenched in water; this is known as "chilling." A chill is of silvery white color, bright lustre, and consists of elongated crystals generally normal lengthwise to the surface of the mold.

If iron contains little or no silicon, it will chill very deep or entirely through the mass in small castings. Silicon is as yet present in steel only by sufferance, and generally it is well known that steel is better without any of it. Steel is mainly an alloy, compound or mixture of iron and carbon.

Which of these it may be, it is difficult to say whether it is a combination of two or of all three of these conditions. The iron used in making steel determines its quality.

Crucible cast steel is recognized the world over as the best steel. Low priced steels prove to be very dear to the consumer.

Steel when heated and hammered from the ingot, has its specific gravity largely increased, its strength is also greatly increased and its grain is made very fine and uniform—this is called "hammer refining."

This hammer refining may be illustrated by comparing the hot steel to a certain solution of a salt. If the solution be allowed to precipitate slowly and undisturbed, very large crystals will be formed, but if it be violently shaken, the crystallization is hastened, and very fine crystals are formed.

Now dissecting the stamp mill into its principal parts we take up the *Shoes and Dies*. These have been in the past of cast iron or cast steel. Within very recent years a great improvement has been made in the manufacture of steel shoes and dies. Formerly owing to their tendency to chip and cup their introduction met with but little success. It was found by some mills advantageous to use cast steel shoes and iron dies, the iron dies wearing more evenly with cast steel shoes than cast steel dies did.

The majority of the mills in California, remote from foundries, where transportation is an important item in the cost, have replaced those of iron with steel Cast iron furnishes more or less uneven wear, thus cutting down the crushing capacity, the dies wearing more or less convex and the cast steel concave. Cast iron also furnishes another feature, that of the great tendency to splitting and splintering off of the outside diameter of the die, presenting an irregular diameter of surface to that of the shoe, which also cuts down the capacity of crushing.

Shoes and dies are some of the most vital parts of a stamp mill—results depend upon it, and therefore cost of material for this purpose is a second thought.

Forged Crucible Steel Shoes and Dies are proving superior to those of cast iron or cast steel castings, owing to the belief that a more smooth and less rapid wear will result, and therefore greater crushing capacity per 24 hours. They have also the recommendation of requiring less change and time lost in adjusting the tappets, etc. Having gone through the process of hammering or forging into the required shape, the steel has become hardened to a very great extent, and is tough and dense. This quality of shoe and die is being extensively used in the mining sections of South Africa, where you may walk for miles without getting away from the sound of the stamps.

The matter as to the quality of material or stock from which these should be made became quite an important matter with the steel maker and one prominent concern made a series of experiments and trials to determine the question, which they finally solved and found that the steel when made from certain fine brands of iron and forged into shoes and dies proved superior, giving results impossible to obtain from iron or steel castings or other forged steels. The item of freight transportation to more or less inaccessible locations is a factor also in favor of steel over iron. Then again the natural wear is 2½ to 3 times that of white iron.

Some cast shoes and dies are called semi-steel. This is a misnomer, as the product is either iron or steel, although the mixture may be composed of both in certain proportions.

The shoes require to be tough so to lessen the tendency to break at the neck, should not cup, but wear evenly, smooth and true from beginning to end. Being forged are therefore sound, homogeneous and free from hard spots and blow holes.

The dies go through the same process of manufacture, but the stock from which they are made differs somewhat from that of the shoes, with view of securing a uniform wearing surface with the shoes. These are also tough, dense and hard, but not in the same degree.

Cams.—These should be of special steel castings, hard, tough and dense. Tough so not to split when the keys are driven as in the case of ordinary iron and to withstand the sudden shock from contact with the tappets when the stamps accidently fall upon them.

In a properly constructed mill there is no shock to the cam when lifting the tappet. This is overcome with the cam designed from the actual distance between cam shaft centre and stem centre. It is to be regretted, however, that in many mills now in use and being built, the cam sustains an unnecessary shock; this is due entirely to the negligence or ignorance on the part of the mill-wright.

These castings require to be hard and dense, to present a long smooth wearing to the surface. They should be properly bored and fitted to cam shaft with steel keys, duly marked as to position to give the required drop and machined on outside wearing surfaces, in order to lessen the friction in working against tappets, thus employing less motive power.

Tappets.—Should be of hard, tough and dense steel castings. Tough so as to avoid splitting when keyed. They require to be properly bored and fitted to the stem, machined on the two end surfaces which come in contact with the cam, to lessen the friction as much as possible in working against the cam. Being hard and dense they wear smooth and uniform. Ordinary iron or steel castings are not liable to do this and also have tendency to split.

The cams and tappets being properly fitted to the shaft and stem, and with the smooth machine contact surfaces offer less resistance and require less motive power.

Boss Heads.—These should also be of steel castings bored out for the stem and recessed for the neck of shoe and of great toughness as the neck of shoe is wedged in place by strips of wood which swell from constant contact with water and hold the shoes in place. In dry crushing pieces of iron are used.

Stamp Stems which are about 3½ inches diameter, 12 to 14 feet long, should be made of special crucible cast steel of high grade, with both ends tapered to fit the head, to be reversed in case of breaking. The stem receives the shock from the blows or drop of the shoe, in some mills as high as 105 per minute, but usually about 90, and therefore requires to be of a high grade of steel. In many plants ordinary wrought iron or cold rolled steel is used, but I believe the above will be found to wear the longer.

The first cost is greater however and so manufacturers put in the cheaper.

Reading a report in regard to the life of stems in stamp mills, I find the average (covering five years) was about 46 weeks and it stated that the stems generally broke square across the fibre (iron has fibre but steel has not) just above the upper part of head and sometimes below this or in the head. The best of wrought iron made into bolts, for an old fashioned trip hammer, have broken apart in two days running from crystallization. Iron is very susceptible to this even if it is fibrous. The fracture in this case showing no flaw or cold short.

Cam Shaft may be of cold rolled steel, key seated for pulley and cams. It has not the same character of work as the stem and is housed or boxed in three places in 10 stamp mill. Some manufacturers use wrought iron turned.

Cam Shaft Boxes.—In most mills these are of cast iron, babbited and bored. planed on back. There have been mills built with these boxes of soft graphitic iron (silicon iron) smoothly bored and properly fitted to shaft without being babbited. This style of box requires more care to make and fit for the mill wright, but is very advantageous for the mill man, using less oil and avoiding the trouble of rebabbiting, also running no risk of getting babbit into the mortar by its breaking under the shock that the cam shaft sustains.

Jack Shaft may be of cold rolled steel or soft steel turned.

Jack Shaft Boxes should be of same stock as cam shaft boxes.

Pulley on cam shaft is usually built of wood on cast iron flanges, turned and fitted, bolted through flange. The wooden pulley sustains better the rapid successions of jars from the dropping of the stamps, whereas an iron pulley would soon break from weakness.

Mortars are usually of cast iron, tough, free from blow holes or cold short, and of special design in connection with each particular mill, and are planed on the bottom, and for screen frames bolt holes are drilled and arranged for front and back copper lining.

Breakers or Ore Crushers.—These are of various makes and designs with merit to each and all; some requiring extra power according to class of rock crushed. The stationary and moveable jaws of the Blake crusher should be made of special hard steel castings of a character to withstand the effects of the great breaking strain employed while crushing hard rock. The wear and tear on surface of these jaws is also an item to be considered; when made of proper material, will wear uniformly throughout their contact surfaces and be a source of economy in reference to the output of a mill per 24 hours. It frequently occurs that the stamp mill has to lie idle from breaking of one or both of these jaws until replaced; therefore extra jaws should be kept on hand, to avoid any delay caused by waiting until new ones are received.

Each stamp mill should keep a dupiicate set on hand of the principal wearing parts in case of emergency.

While in the West I saw a shipment of a 10 stamp mill received at the mine. Evidently this was the first of any kind that the manufacturers had built. There was no evidence of machine work having been done on the castings and therefore in all probability no part had been properly fitted together before leaving the shop, and the shoes and dies had the appearance of rough forgings made in any ordinary blacksmith's shop. This showed lack of experience and knowledge of the requirements in this class of machinery, and furthermore that the machinery had not been built under the supervision of an experienced mining engineer. I presume the mill owners paid for the experience in this case.

Drill Steel.—The last but not least that I will say a few words about is, the bar steel used in both hand drilling and in steam or air drills. The common-shape is the octagonal used in both methods of drilling, but within the past few years a special shape commonly called ribbed or cross-shape steel—(the shape being of a St. Andrew's Cross) has come into general favour in air drills. In some sections the whole drill is of this shape, but in South Africa and British Columbia, they use the octagon bar for the shank and weld on to the end a piece or length about 18 in. of this cross shape steel for the cutting part or bit. The advantage in using this style of bit is that the time consumed in sharpening or repairing worn drills is much less and the bit more advantageously worked upon by the smith and with less labor, resulting in that the drills are kept in better condition. There being sufficient stock of steel in the 4 ribs to spread out in each direction the size bit required for the different size holes, prevents the drill from binding in the hole even if used all one size. This shape comes in a series of sizes 1¼ to 2¼ so that the regular following bit comes in use as the depth of hole increases from the starter. In making drills from the octagon bar considerable work is done in upsetting the steel into shape so as to make the 4 cornered bit spread sufficiently for the size hole required to be dirilled. This continues throughout until the drill is used up, whereas with the cross-shaped steel, after the labor of welding it to the shank has been done, the work of dressing is easily and quickly done.

A great deal is expected of steel furnished for rock and mining drills. With the ordinary consumer the matter of price is a first thought, as they all have the idea that "steel is steel" and therefore should be able to do any work required of it, over-looking the fact that there are steels and steels of all grades made and adapted for specific purposes.

The quality of the steel for drills is an important item in working a mine to produce desired results. It is the experience of the old gold miners and drillers that the best is none too good for the work, especially working on hard rock and also when quite a distance from blacksmith shop, particularly in the case of prospectors. As a rule the better the quality the more cutting the steel will do, before having to be dressed over, unless "doctored" in the smith shop. Some smiths wish a soft working steel under the hammer on account of its easy working and less attention required to heating, whereas on the other hand tools that are made from the best quality of steel to be had require little more care and judgment in working ready for use, but when properly made and tempered produce results that more than pay for the extra time consumed. Cutting more rock within a given time therefore requires less re-sharpening as compared with bits made from steels that dull up rapidly and have to be taken out of machine frequently and replaced by new bits. In other words steel at 8 cents per lb. is dear compared to steel at 12 cents or more.

Crucible drill steel made from Swedish Iron for its base is cheaper in the end than steel made from sponge metal or dephosphorized converted O. H. or Bessmer Steel, requiring it to be "physiced" to bring it to the proper contents of carbon, etc., as it is quite possible to make a comparatively low priced steel which shall show precisely the same chemical analysis as the best cruicible cast steel; nevertheless it is found by practical experience to be inferior in quality. Steel for all cutting tools and drills requires to have "body," therefore the base or stock must be pure.

A By-Product Plant in Scotland.

At the Glengarnock Iron Works, in Scotland, the gases are carried from the blast-furnaces to the ammonia plant, where the ammonia and tar are sucked out of them by three sets of coupled horizontal engines specially provided for that purpose. After being so treated the gases are returned to the steel-works by a largr culvert of 96 in. diameter and 500 ft. in length, at a pressure of 1½ to 3½ in. At the steel-works the same gases raise the steam in a battery of 21 horizontal Lancashire boilers (independent of the iron-works boilers), at a very trifling cost, all the coal used being a little dross with which to cover the fire bars.

Gold Mining in the Yukon District.

By W. M. OGILVIE, McGill University.

In these notes, I propose not only to give a detailed description of the different methods of gold mining in the Yukon District, but also to give some information in regard to the various routes by which one may arrive at the gold fields, and also to give some points which may be of special interest to the miner.

The Yukon District, as I will refer to, will be understood to be the country adjacent to the Yukon river, from where the International boundary crosses the river, thence up the river for several hundred miles.

Of the different routes by which one may go into the country, the one which affords the least trouble and hardship, is via Seattle or San Francisco to the mouth of the Yukon river, by the ocean steamer, there transferring to the river steamer and thence up the river. This route is not patronized to any great extent by ingoing miners. In the first place, they cannot arrive in the mining country until about the first of August, which time is rather late to begin any operations in prospecting. Secondly, it takes about double the time to get in by this route that it does by the others. In the third place, ingoing miners are usually not in such a good financial standing as to pay their way while there is a means of working it.

In regard to the other routes, in general it may be said that they all start from Juneau, cross the mountains in different places, and strike the head waters of tributaries of the Yukon river, thence floating down stream to the mining camp at which the miner may desire to locate.

There are several of these routes, and as they would all answer fairly well to one description, I will only go into detail with the one which is being chiefly used at present.

Starting from Juneau and travelling along the coast in a northerly direction for a distance of about one hundred miles, we arrive at the head of Lynn canal. At the head of this arm of the sea there are a number of rivers flowing in, three of them which lead up to low divides in the mountains, which are at the heads of tributaries of the Yukon.

The first river one would meet when going in is the Chilkatt, which flows into the Lynn canal on the left hand side. The head of this stream is at a low divide in the mountains known as the Chilkatt Pass, while on the other side of this pass a tributary of the Yukon known as the Tahk-henna river takes its rise. The portage from the head of the Chilkatt to the head of the Tahk-henna river, is rather a long one, and consequently this route is not travelled to any great extent.

The next river which enters Lynn canal is known as the Skagway, which flows in on the right hand side. This river takes its origin at a low divide known as White Pass, while directly on the other side of this pass, the tributary of the Yukon known as the Lewes river rises. This route has not been patronized in the past, as difficulty has been experienced in going up the Skagway river, as it possesses a number of bad canons. The White Pass possesses some advantages over the other divides. In the first place it is not so high, being about 2,500 feet above the sea, and secondly fire wood may be obtained nearly all along the way, which is a very important feature. This portage is about forty miles long.

The next route which is the one usually adopted, is by the Taiya river, which flows in at the head of Lynn canal, and the Chilkoot Pass to Lake Lindeman, which is at the head waters of the Lewes river.

This portage is about thirty miles long, and is a somewhat difficult one to travel on. The pass is about 3,500 feet high, and for a distance from six to eight miles, fire wood is not to be had, which induces severe hardship at times.

The miners usually start early in the spring, sometime in March, and haul their outfits over to Lake Lindeman. Here some of them remain until the ice breaks, in the meantime building their boats and making preparations for their down stream journey. The miners who have not remained usually continue their journey on the ice until it becomes dangerous, when they stop and build their boats, starting off as soon as the water is clear of ice.

A few remarks as to the methods of boat-building may not be uninteresting:

A suitable site being selected, where the largest trees are the most convenient, a frame-work of four vertical posts, which are in the form of a rectangle, the length of this rectangle depending on the length of the boards which are required for building the boat. The two posts at one end are somewhat shorter than those at the other end, and on top of these posts at both ends are placed cross pieces, on which rest the logs which are to be sawn into lumber. After the trees have been cut down and trimmed, they are cut up into the necessary lengths and placed on top of this frame-work, where they are marked with a chalk line and slabbed with a whip saw, the process of whip sawing being as follows:—One man stands on top of the log to be sawn, which is placed on top of the frame work which has been constructed, and another man stands underneath, alternately pulling a saw up and down, at the same time both men guiding the saw so as to follow the mark which has been made by the chalk line. Continuing in this manner the necessary lumber is obtained, and the building of the boat is started.

The first step is to make a frame for the boat; this is usually made of 2 inch by 2 inch, or 3 inch by 3 inch scantling, except the keel, which is made heavier, depending on the size of the boat. Sometimes a keel is not used, the boat being in the form of a rectangular box, the bottom having a slight batter towards the ends.

When a keel is used the boat has the form of a V in section, and tapers in towards the ends. This latter form is the better one, as it is much easier to control, and may be used in going up stream.

After the frame has been fastened together the next step is to sheet it on the outside with boards; much care is needed in this part of the work, as the boards must fit together tightly. The edges of the boards are usually planed, thus giving them a much smoother surface. When the sheeting is finished all the joints and cracks are well caulked with oakum and then well coated with pitch. This pitch is a mixture of spruce gum and grease; it being thoroughly mixed and melted, it is put on the boat when in a fluid condition, and allowed to cool. The grease tends to make the gum tough and not so apt to crack. After the boat has been well pitched it is then launched and ready for use. They are usually fitted up with masts and sails which are of great assistance at times on the lakes.

Continuing our journey from the head of Lake Lindeman; the first seventy-five miles of which consists of a chain of lakes connected by small streams.

Lake Lindeman is about five miles long and is connected to next lake, namely, Lake Bennet, by a short swift stream about three-fourths of a mile in length. About midway in this stream there is a sharp bend, and at the foot of this bend a large rock projects out, which makes it very dangerous for going through in a boat. This is always portaged, the portage being an easy one, being a low sandy flat.

Lake Bennet is twenty-six miles long, and averaging about two miles in width. At the foot of this lake a small stream flows out to the right, into Lake Noses, which is an arm of Tagish Lake. Tagish Lake is about thirty miles long and is connected to the next lake,

namely, Lake Marsh, by a small stream about six miles long, known as Tagish River. Near the foot of this stream on the right hand side, are situated a number of frame houses which belong to the Tagish Indians. This chain of lakes being their hunting and fishing grounds.

Lake Marsh is about twenty miles long, and is drained by the Lewes River proper, flowing out from the left hand corner. Here the river is about two hundred yards wide, and it maintains this width for a distance of about twenty-five miles, where it suddenly narrows up to about thirty yards, and averages this width for five-eighths of a mile. This part of the river is known as the Canon, its sides consisting of columns of balast from eighty to one hundred feet in height. About midway in the Canon there is a circular basin about one hundred and fifty yards in diameter, with steep sloping sides. The total fall in the Canon is about thirty feet, and consequently the water is very swift and portaging is usually done at this point, there being a good portage road on the right hand side.

Below the Canon there is a stretch of rapids for about a mile, then half a mile of smooth water, following which are the White Horse Rapids, which are about three-eighths of a mile in length.

This rapid is by far the most dangerous one on the river, and is very unsafe for boats, being scarcely ever run through except by accident. It is confined by low basaltic rocks, which at the foot suddenly close in and make the channel about thirty yards wide. It is here the danger lies, as there is a sudden drop and the water rushes through at a tremendous rate.

On the west side a portage road has been constructed, and rollways have been put down in some places, on which to shove boats over.

The distance from these rapids to Lake Labarge is about thirty miles; about half way down the Tahk-heena River joins the Lewes.

Lake Labarge is about thirty miles long, and averages four miles in width. This lake was named after one Mike Labarge who was engaged by the Western Union Telegraph Company, exploring the river and adjacent country, for the purpose of connecting Europe and America by telegraph, through British Columbia, Alaska, and across Behring Straits to Asia, and thence to Europe. This exploration took place in 1867, but the successful laying of the Atlantic Cable, put a stop to this project and the exploring parties were recalled as soon as possible.

Below Lake Labarge the river is very swift and crooked. About twenty-five miles below the foot of the lake, the Tes-Lin-Too River joins the Lewes. A few miners have prospected parts of this river and report very favourably on it as a gold producing stream, but as it is difficult to procure enough provisions to last any length of time, there has consequently not been much work done in mining.

Below the Tes-Lin-Too, there are a number of rivers which join the Lewes, all of which carry gold to some extent, but on account of the difficulty of obtaining provisions in this part of the country, they never have been worked to any extent.

The next notable part of the river is known as Rink Rapids. Rink Rapids are formed by several islands standing in the channel and backing up the water so much, as, to raise it about a foot causing a swell below for a few yards. These islands are composed of conglomerate rock, similar to the cliffs on either side of the river.

Six miles below these rapids, there is another rapid, known as Little Rapid. It is simply a barrier of rocks which extends from the westerly side of the river half way across. On the easterly side the water is smooth and deep.

The next remarkable part of the river is at the confluence of the Pelly River, which is about sixty miles below Rink Rapids.

At the mouth of the Pelly there are a great many islands below the junction a short distance stands all that remains of the Hudson's Bay Company's trading post. This post was established by Robert Campbell in 1848.

He only remained in the country about four years, as the Indians became hostile and gave him a limited time to get out of the country; after he left they pillaged the place and set fire to it.

Below the mouth of the Pelley, the river widens out to about six hundred yards and maintains this width for about a hundred miles, when it is joined by White River.

White River is readily distinguished by the amount of sediment it carries, it being impossible to see through more than one half an inch of the water. It is about one quarter the size of the Yukon and its waters discolor the waters of the Yukon completely, and a couple of miles below the junction the whole river appears as muddy as White River.

The reason of White River being so muddy, is, because it flows through a bank of white volcanic ashes. This bank is about one hundred feet deep and thirty miles from the mouth of the river.

The distance from the mouth of White River to the boundary, is about one hundred and fifty miles. There are a number of important rivers flowing in, along this part of the river, which carry gold in large quantities, and are being worked at the present time.

The first one is Stewart River which enters about ten miles below White River. It is said to be one of the richest rivers in the country; it has been worked for several years and gave good results, but on the discovery of a new mining camp, was abandoned.

The other streams are, Sixty Mile and Forty Mile Creeks, on which are situated the great mining camps of the present.

At the mouth of these streams there are trading posts, the largest one being at the mouth of Forty Mile Creek. These companies supply the miners with their mining equipment and provisions.

After the miner has obtained all that is necessary for a prospecting trip he starts out to select a claim for himself. The method of prospecting is as follows:—When a miner discovers a bar he "prospects" it by washing a few panfulls of the sand or gravel of which it is composed, in his pan. According to the number of "colors" or specks of gold he can find in his pan, after all the dirt has been washed out, he judges of its richness.

The process of "Placer" mining is as follows: After clearing away all the coarse gravel or stone of a patch of ground, the miner lifts a little of the finer sand or gravel in his pan, which is a broad shallow dish made of sheet iron; he then puts water enough in the pan, and gives it a few rapid whirls and shakes; this tends to bring the gold to the bottom on account of its greater specific gravity. The dish is then shaken and held in such a way, that the gravel and sand are gradually washed out, care being taken as the process nears completion, to avoid letting out the finer and heavier parts which have settled at the bottom. Finally all that is left in the pan is whatever gold may have been in the dish, and some black sand which almost invariably accompanies it. Should the gold thus found be fine, the contents of the pan are thrown into a barrel containing water and a pound or two of mercury. As soon as the gold comes in contact with the mercury it combines with it and forms an amalgam. This process is continued until enough amalgam has been formed to pay for "roasting." It is then squeezed through a buckskin bag, all the mercury that comes through the bag being put back in the barrel to serve again, and what remains in the bag is placed in a retort, if the miner has one, if not, on a shovel and heated until all the mercury is vaporized. The gold remains in a lump with some mercury held in combination with it. This method is called the "pan" or "hand" method, and is never continued for any length

of time on account of its slowness, but a rocker or sluice box is used when possible.

A rocker is simply a box about three feet long and two feet wide, made into two parts, the top part being shallow and having a heavy sheet iron bottom, which is punched full of one-quarter inch holes. The lower part of the box is fitted with an incline shelf about midway in its depth, which is six or eight inches lower at its lower end than at its upper. Over this is placed a heavy woollen blanket. The whole is then mounted on two rockers and when in use it is placed on two blocks so that it may be readily rocked. After the miner has selected a place for his rocker, which must be near a good supply of water, he clears away the stones and coarse gravel, gathering the finer material in a heap near his rocker. The shallow box on top is then filled with this finer sand and gravel, and with one hand the miner rocks it, while with the other he pours in water. The finer material with the gold falls through the holes onto the blanket, which checks its progress and holds the finer particles of gold, while the sand and other material passes over it into the bottom of the box. Across the bottom of the box are fixed thin slats, behind which some mercury is placed to catch any particles of gold which may escape the blanket. If the gold is nuggety, the large nuggets are found in the upper box, their weight detaining them until all the lighter material has passed through, and the smaller ones are held by a deeper slat at the outward end of the bottom of the box. The piece of blanket is at intervals taken out and rinsed into a barrel. If the gold is fine, mercury is placed in the bottom of the barrel as already stated.

Sluicing is always employed when possible; it requires a good supply of water with sufficient head. The method is as follows:—Planks are obtained, and formed into a box of suitable width and depth, slats are fixed across the bottom of the box at suitable intervals or shallow holes bored in such order that no particle could run along the bottom in a straight line and escape without running into a hole. Several of these boxes are then set up with considerable slope, and are fitted into one another at the ends like joints of a stove-pipe. A stream of water is now directed into the upper end of the highest box. The gravel having been collected as in the case of the rocker, it is shoveled into the upper box, and is washed downward by the water. The gold is detained by its weight, and is held by the slats or the holes mentioned. If it is fine, mercury is placed behind the slats or in the holes to catch it. In this manner a great amount of dirt can be handled, and consequently a great amount of gold secured in a given time. After the boxes are done with they are burned, and the ashes washed for the gold in the wood.

The miners call Sixty Mile and Forty Mile creeks "bed rock" creeks. They are creeks in which the drift is not very deep, varying from six to thirty feet In such streams nearly all the gold is found laying on bed rock. In places where the drift is shallow they usually ground sluice it, that is they drive the top surface off with water.

In places where the pay streak is deep the miners have devised another scheme, namely, that of "burning" or thawing out the ground in the winter time.

As the frost never heaves the ground during the entire year, and the small streams freeze solid in winter, the miners are not troubled with surface water, consequently a great amount of dirt can be taken out during the winter and be in readiness for the first spring freshet.

The method of working is about as follows:—Early in the winter, as soon as the snow comes, wood is hauled to the mine, where it is chopped into three or four foot lengths, this wood being about one-half green and the other half dry. After enough wood has been procured, a patch of ground is cleared of snow, and a pit three feet wide by seven feet long is started. This is usually picked out until the gravel is reached, then fires are made and the ground thawed out. This is continued until bed rock is reached. As soon as bed rock is reached, drifting is commenced, that is the gravel which lays on the bed rock and contains gold, is thawed out and lifted to the top of the ground, where it is dumped in a heap ready to be shoveled into a sluice box.

Two fires a day are usually made, a fire requiring two armfuls of wood, one green, and one dry, the green wood being placed on top of the dry, thus helping to keep the heat in. One of these fires thaws out about twelve bucketsful of dirt, a bucket being eighteen inches square in the bottom, twenty-two inches square at the top and nine inches deep. This method enables the miner to handle a large amount of dirt, being able to work all the year round, otherwise he can only work on an average seventy days in the summer season.

When the miner gathers the gold from the sluice boxes it is usually mixed with dirt, and has consequently to be cleaned. The process of cleaning is called "blowing," and is executed as follows:—After the gold has been thoroughly dried, small quantities of it are put in a small shallow pan which the miner possesses for the purpose, he then tosses the gold in the air continually and at the same time blowing it, thus separating the light dirt from the heavy gold. This process is continued until the gold is thoroughly cleaned, when it is ready to be used.

ONTARIO MINING INSTITUTE ORGANIZED 1894

ANNUAL MEETING

OF THE

ONTARIO MINING INSTITUTE.

Election of Officers and Papers Read.

The fourth annual general meeting of the members of the Ontario Mining Institute was held, by courtesy of the Ontario Government, in the Railway Committee Room, Parliament Buildings, Toronto, on the evenings of Wednesday and Thursday, 31st March and 1st April.

There was a good attendance, MR. J. J. KINGSMILL, Q.C., president, in the chair.

MR. B. T. A. BELL, secretary, read the minutes of previous meeting, and submitted a verbal report of the work of the Institute during the year, which was adopted.

MR. T. W. GIBSON, treasurer, followed with a statement of accounts, showing a cash balance on hand of $71.37. The statement was, on motion, adopted.

Election of Officers.

The meeting then proceeded to elect the following officers and council for the ensuing year, as follows:

President:

MR. J. J. KINGSMILL, Q.C., Toronto.

Vice-Presidents:

MR. JAMES MCARTHUR, (Canadian Copper Co.), Sudbury.
MR. JOHN F. CALDWELL, (Sultana Gold Mines), Rat Portage.
MR. JOHN LEECHMAN, A.R.S.M., (Regina Mine), Rat Portage.
MR. W. HAMILTON MERRITT, A.R.S.M., F.G.S., Toronto.

Treasurer:

MR. T. W. GIBSON, (Bureau of Mines), Toronto.

Secretary:

MR. B. T. A. BELL, (Editor Canadian Mining Review), Ottawa.

Council:

MR. F. S. WILEY, (Saw Bill Lake Gold Co.), Port Arthur.
MR. J. BURLEY SMITH, C. & M.E., (Burley Gold Mining Co.), Rat Portage

MR. G. R. MICKLE, M.E., (School of Practical Science), Toronto.
DR. A. P. COLEMAN, (School of Practical Science), Toronto.
MR. A. BLUE, (Director of Mines), Toronto.
MR. A. J. SWINNEY, (Canadian Gold Fields, Ltd.), Deloro.
MR HERBERT C HAMMOND, (Osler & Hammond), Toronto
MR. J. H. CHEWITT, C.E., (Foley Mines Co.), Toronto.

Auditor :

MR. THOMAS SHORTISS, Toronto.

New Members

The following gentlemen were elected members of the Institute :

Prof. E. B. Shuttleworth, Toronto ; H. W. Kennedy, Rat Portage ; M. Koppelman, Toronto ; Major Harstone, Toronto ; W. Smaill, M.E., Rat Portage ; F. A. Schrietendorff, Toronto ; Dr. James Musgrave, Toronto ; Thos Musgrave, Cork, Ireland ; C. H. Waterous, Brantford ; J. McAree, O L S , Rat Portage ; E. Bristol, Toronto ; J. E Hardman, M.E , Montreal ; S C Duncan Clark, Toronto ; A. T. Anderson, Toronto ; A. J. G. Swinney, Deloro ; H. W. De Courtenay, Montreal ; E. B. Haycock, Ottawa ; A. Jarvis, Toronto ; J. Cotterill, Toronto ; W. R. White, Q.C., Pembroke ; J. Leechman, M.E , Rat Portage ; E. Strachan Cox, Toronto ; F. A. Hall, C. B. Jackes, S. R Clark, G. Ritchie, W. H. Knowlton, S. R. Curzon, Thomas Davies and C. R Clark, Toronto.

Place of Next Meeting.

Some discussion was had as to the next place of meeting, various points being suggested. It was finally decided to leave the matter to be decided by the council.

Rat Portage Resolutions.

The resolutions adopted by an assembly of citizens at Rat Portage on 10th September last, and referred to the Ontario Mining Institute for discussion at the present meeting, was then brought up for consideration. Resolution No. 1, calling upon the Ontario Government to extend all legitimate assistance in the development of the mining industry, was approved unanimously. On resolution No. 2, requesting the government to prepare and distribute free of charge maps of the Lake of the Woods gold districts :

MR. A. BLUE stated that some time ago the government had given directions for a map of the Lake of the Woods district to be prepared, with all mining locations laid down upon it to date, and this was now in course of preparation. This map would accompany the sixth report of the Bureau of Mines, and like all the reports of the Bureau, it would be distributed without charge.

DR. GOODWIN moved, seconded by MR. W. R. WHITE, Q.C., that the government be requested to prepare maps of the various mining districts up to date for free distribution.—Carried.

On resolution No. 3, asking the government to appoint a mining land's agent at Rat Portage, and to establish a mining collection there :

MR. JAMES CONMEE, M.P.P., stated he believed that provision was being made at the present session of the Legislature for the appointment of such an agent.

MR. A. BLUE, said there was already a Crown lands agent at Rat Portage, who was supplied with blue print and other maps of the district, and provision was made in the estimates now before the Legislature for enlarging the scope of the agency. A year ago an appropriation had been taken for a collection of mineral specimens at five different points in the Province, viz.: Marmora, Sudbury, Sault Ste Marie, Port Arthur and Rat Portage. These collections had now been made by Dr. Goodwin, of the School of Mining, at Kingston. He (Mr. Blue) had had the pleasure of examining one of them which he believed was typical of all the others, and it was an admirable collection. The main use of the collections would be to assist the work of the professors who conducted the Summer Mining Classes, and in the regulations for their management, provision would be made for throwing them open to the public.

MR. B. T. A. BELL, suggested the advisibility of forming a permanent collection of the minerals of the Province to be shown at the Industrial Exhibition at Toronto.

DR. GOODWIN said they had been nearly a year making these collections, their aim being to secure Ontario representatives of the various species, which made the work somewhat slow. They were now however, practically complete. Each collection consisted of between 200 and 250 specimens, representing particularly the valuable ores and minerals, arranged in gronps. Pains had been taken to make the collections as attractive as possible. Each was placed in a polished oak case, set upon a polished oak table provided with drawers, in which were deposited duplicate samples of the most important minerals and rocks for handling. The samples in the cases could not be handled, the covers being screwed down. Labels were placed in front of the samples, which were arranged on an incline in such a way as to be plainly seen. A descriptive catalogue had also been prepared, and he understood that Mr. Blue intended to print it in the forthcoming report of the Bureau of Mines. As far as possible, the catalogue would deal also with the uses and value of the minerals.

MR. W. HAMILTON MERRITT remarked that such collections would be very useful by affording standard specimens to which prospectors could bring their finds for purposes of comparison. They would also serve another very important object in bringing about the formation of local collections, for which they would be a nucleus.

DR. GOODWIN added that steps had been taken to place the collections in the hands of trustees, and to have them used under proper regulations. The cases were roomy and would accommodate a certain number of additional specimens.

MR. B. T. A. BELL moved, seconded by Mr. W. R. WHITE, Q.C., that resolution No. 4, as follows : "As to the formation of joint stock companies for mining purposes, be it resolved, that the Ontario Government be urged to pass an enactment whereby such companies can obtain a charter with greater speed and at much less cost than at present," was not in harmony with the aims and views of the Institute, and be not approved.

MR. CONMEE said he believed it was the intention of the government to provide some machinery on the lines of the resolution. He thought it unnecessary, therefore, to discuss it.

MR. W. R. WHITE, Q.C., thought the very fact that a bill was pending before the House dealing with the formation of joint stock companies made it all the more important that the meeting should give expression to its views. He did not think the resolution was one which ought to be approved. There was no reason why they should wish to facilitate the obtaining of charters. It was quite easy to get one now, if the object was a proper one.

MR. CONMEE believed that the views just expressed were not those of a majority of the members of the Institute He saw no reason why, when four or five men wished to engage in mining operations, they should be delayed for six weeks or two months while a lawyer manipulated the charter for them. In England you could get a charter in 24 hours, and in some of the States a charter for either a mining company or a railway can be had in two or three days. He believed the public interest would be served by the legislation which he understood was to be proposed.

MR. B. T. A. BELL said the question had been discussed at the late meeting of the Federated Mining Institute at Montreal, and a very strong feeling had been expressed against any law which would facilitate the organization of companies such as some of those that had lately been formed. In British Columbia a law was being prepared which would have the effect of preventing the floating of these wildcat companies. The public must be protected A committee of the Federated Institute representing four different Provinces was preparing a report which would be submitted to the Dominion and local governments protesting against any system which would allow companies with an inflated capital of six or eight millions to be formed at the instance of every worthless scalawag.

MR, T. E. WASHINGTON, Toronto, said that three-fourths of the companies that had been formed within the last six months had taken out charters on the other side, for the reason that they could get them there for one-tenth the expense they could here, and in almost no time.

MR. W. R. WHITE, Q.C., thought the organization of companies whose object was not to develop a mine but to sell shares, should be surrounded with every possible safeguard, and time should be given the public to investigate their proposals. He gave an instance in which even with the existing protection an attempt had been made to incorporate a company for the purpose of building a canal which would have drowned out what he considered to be one of the best mining properties now under development in Ontario. If charters could have been got without notice being given, this company might have been incorporated before anyone was the wiser.

MR. CONMEE asked how the public could be protected by delay. Had anybody ever heard of anyone coming forward and saying that such and such a mining charter ought not to be granted? The case Mr. White mentioned was not that of a mining company at all. The proper way was for the government to determine by law what powers a company should have, and then issue charters under the Act. There would then be no object in delay. Now when the public were organizing mining companies, it was time to bring the law into harmony with the requirements of the people.

MR. J. VAN SOMMER thought that the question as to the liability of promoters was of much more importance than that of the speedy issuing of charters.

MR. J. W. CHEESEWORTH said the Ontario government ought to provide facilities by which Ontario capitalists might incorporate under Ontario laws, and not be obliged to go to the States for their charters. American companies doing business here were not subjected to the same inspection of books, accounts, &c., as Ontario companies.

A lively discussion was continued until 10.30 p.m., when the meeting adjourned without having expressed any opinion on the question.

Thursday Evening.

The Institute re-assembled on Thursday evening for the reading of the papers set down on the programme. MR. KINGSMILL, Q.C., again presided. Unusual interest was manifested in the proceedings, the committee room being crowded, and among the most interested listeners were a number of members of the Legislative Assembly then in session.

The following papers were then read :

"Notes on the Western Ontario Gold Fields and Their Genesis," by Mr. F. Hille, M.E., Port Arthur.

"Some Notes on Gold Milling," by Mr. John E. Hardman, S.B.M.E., Montreal.

"Notes on Materials Used in the Manufacture of Mining Machinery," by H. W. De Courteney, Montreal.

"A New Use for Scrap Mica," by C. H. Michell, Toronto.

"Notes on Moss Litter," by Mr. T. W. Gibson, Toronto.

CORRESPONDENCE.

A Correction.

SIR,—Will you please insert the following correction of Mr. C. F. Andrews, of a statement credited to him in the last REVIEW, giving the transactions of a late meeting of the Mining Society. Mr. Madden writes that he is very much obliged to Mr. Andrews for his correction. He further wishes me to say as it would appear from Mr. Andrews' letter that the remark referred to was made at the meeting in question, that he has always carried

out at all mines in operation his instructions, as in the case of the Richardson mine, namely, that he visit them underground to see that operations are carried on with a due regard to the safety of the mine and the workmen.

Yours truly,

E. GILPIN, JR.

Halifax, 19th April, 1897.

"SIR,—In the report of the proceedings of the last Annual Meeting of the Mining Society of N. S., I notice a remark credited to me which certainly never emanated from its accredited source.

I believe such a remark was made at the meeting, but this remark was not made by me, or in connection with the Richardson mine. I refer to the remark that the "Deputy Inspector, at the Richardson mine, simply drove in and had a talk with the superintendent and drove out again."

At his last annual visit I had not the pleasure of seeing him at the mine, but understood from the superintendent that he went below ground. The last time I saw the Deputy at the mine was in '94, when I requested him to go below and take a look at the east turn of the belt. This he did.

Will you kindly give this correction a place in the Transactions of the society and in the columns of THE CANADIAN MINING REVIEW.

Yours truly,

C. F. ANDREWS."

Isaac's Harbour, N.S., 16th April, 1897.

COMPANY NOTES.

The New Gold Fields of British Columbia, Ltd.—At a recent meeting of this company held in London, the chairman, Mr. John Sowles, M.P., said the directors were glad of the opportunity of stating to the shareholders what work had been done up to the present time, and what the prospects were. They got to work in the second week in January. The issue was £50,000 out of a total capitalization of £250,000. Out of that £50,000, £40,762 was applied for and allotted amongst 335 shareholders. Sir Charles Tupper, the chairman of the company, left England in the early part of February, and been on the other side since. There had been a good deal to do to get the company into working order, and when he told them that in eleven weeks they had held twenty-two meetings, it would be understood that the directors had not allowed the grass to grow under their feet. Sir Charles Tupper, before they made any appointments of experts, consulted Dr. Dawson, the eminent Canadian geologist, and they were fortunate in getting on this side a man whom they were told was one of the most capable mining experts and a man of unblemished record. He referred to Captain Morrish, employed for a long time by the Chartered Company in South Africa. His testimonials were of the highest class, and he had had ten years experience in the United States and British Columbia; so that he did not go there as a stranger. There was this advantage in appointing an English engineer, namely, he would not be led away by the enthusiasm which might affect a local man on the other side. Captain Morrish had left that morning for his work in Canada. The company also had the inestimable advantage of having an excellent advisory board in Canada. As to Sir Charles Tupper, anyone acquainted with Canada must know the position he occupied there. There was no doubt that his services would be of great benefit to the company. Sir Charles was not simply a Canadian statesman, but a statesman of the Empire, and he, like many of them, was warmly interested in the development of the great Dominion. Another advantage was that they had the security in any investment they might make in Canada of British laws and the British flag. Referring to the constitution of the board, he said: First, they had Sir Charles Tupper, whose long official experience and careful habits would be a safeguard and a conservative element on the board. They had Mr. C. Ashworth, himself a Canadian with weighty experience. Then there was Mr. Harman, an accomplished Fellow of the Institute of Mining and Metallurgy, and with a wide acquaintance of the methods of mining from an expert point of view. As to himself, he was a sort of *omnium gatherum*, having a large amount of energy and of faith in the future of this great portion of the British Empire. As the work of the directors was overwhelming when so many properties were offered to them, they handed the particulars to one director, who went into them closely, and then they were passed on to another. After this they were discussed by the whole board, who were then able to determine whether they could deal profitably with the business, and they thus minimized the time of the directors' meetings. The board hoped that the result of the first two or three operations would be of such a successful character as to justify the public in supporting the issues they might make. They had already taken up, as every shareholder would know, the New Fraser Gold Mine. They had received a fair response from the shareholders, in accordance with the terms of the prospectus sent out before offering the shares to the public. The response of the shareholders had been exceedingly gratifying, and the board had reason to believe that when it was issued to the public they would get all the money they wanted, if not considerably more. Whichever way it came out, it would show a considerable profit to the company. With regard to the Fraser river properties, they expected a return in a much shorter period than one would get on an ordinary quartz mining venture. They had dispatched a man of whom they had the highest opinion to superintend the erection of the dredge, and a cable had been received that it was ordered and should be shortly in operation. The board were negotiating with some practical and responsible parties for the erection of smelting works in British Columbia. They were awaiting reports from the advisory board before finally deciding, but if the figures put before them were borne out by results the enterprise would show a very considerable return to the company. They had made arrangements with a strong company in London, who had arranged with them to come into any venture which commended itself to them. That company had interests in other parts of the world, and it was possible that they might get a share of these from time to time. The idea of the board was to minimize their risk, and to take advantage of every opportunity of making legitimate profits for the shareholders. Without being unduly sanguine he believed they had prospects as good as, or better than, those of any company of the kind. (Applause).

A vote of thanks to the chairman and directors closed the proceedings.

The Gold Fields of Ontario.

Mr. W. McInnes, who has spent the past three seasons in the mining regions of Western Ontario in field work for the Geological Survey, contributes, in his summary report of the survey, recently published, a page or two descriptive of the characteristics of the ore deposits of many of the mines and claims which are, at this moment, attracting attention. The following excerpts will be of interest to our readers:

SAWBILL LAKE.

"Sawbill mine (location 313 X.) was visited, and the rocks about Sawbill Lake examined. They were found to consist in the main of hornblende gneisses and hornblendic granites and syenites often much crushed and sheared, in places becoming schists in structure.

"In one of these much crushed and sheared bands the vein occurs on which the Sawbill shaft has been sunk. The shaft, which follows the vein, was down about 40 feet at the time of my visit, and work was continued actively during the summer. The vein at the surface has a width of about 4 feet. It strikes N. 9° E. astronomical (or N. 15° E. mag.) and can be followed in a southerly direction for 300 feet, where it bends to a direction S. 24° W. for another 300 feet, gradually failing in width until it becomes very small. In a northerly direction it has been traced about 900 feet, beyond which point the surface falls away into a swamp. It was stated by those in charge at the time, that the vein could be picked up again beyond the swamp. The hade of the vein is easterly at an angle of a little over 10 degrees from the vertical. Though running 'with the formation' there seems to be no doubt about the true fissure character of the vein. The walls are well defined, the hanging-wall particularly so, often showing slickensided surface and a parting of crushed chloritic material between the wall and the vein-matter. On the foot-wall there is a certain amount of mingling of the vein-matter with the inclosing rock and a number of stringers and small parallel veins, so that the vein contents do not come away so freely from this wall as from the hanging-wall. The dump showed quartz carrying iron and copper pyrites and a considerable amount of free gold, and the vein at the bottom of the shaft was well defined and solid."

LAKE HAROLD.

"After a few days spent in an examination of some points about Steep Rock and Moose lakes, where the geology is somewhat complicated, Harold Lake was visited. A number of veins have been exploited here, and half a mile of tramway has been built, connecting the different openings with a five-stamp mill at the lake shore. The outlet of the lake has been deepened to allow sinking on a vein known as the shore vein, which outcrops at the base of a low cliff near the south-west corner of the lake. This vein strikes N. 29° W., with a hade to the north-east of a few degrees from the vertical; it is rich in free gold, but small and somewhat irregular. On No. 1 and No. 2 veins, which vary in width from one to two feet, were drifts about 200 and 140 feet respectively with a shallow winze on each. The mill was not working at the time of my visit. Work was continued during the summer, and Mr. Wiley informs me that a more promising vein, near the tramway, was being opened up. The veins occur near the contact of a highly crushed and altered granite with Keewatin schists and diorites."

THE FOLEY MINE.

"A week was next spent in the region about Bad Vermilion Lake, in an examination of some of the gold locations. In this vicinity, on the north shore of Shoal Lake, at Foley's (locations 174 E. and 175 E.), the veins occur in the so-called protogine granite area. This granite is first seen on the road leading northwards from the shore of the lake, at a point about 200 yards from the shore, and extends continuously northwards nearly to the southern shore of Bad Vermilion Lake. Two shafts have been sunk on a vein on this property to depths of a little over 200 and 100 feet respectively, with drifts aggregating over 300 feet. The vein is a true fissure, and has a width, as exposed on the surface, of from 18 inches to 3 feet. At the bottom of the deeper shaft it is stated that the vein has widened to 5 feet or more. The dump shows very rich looking quartz with iron and copper pyrites, galena, and a good portion of visible free gold.

"Other good looking veins occur on the same property. One of these, about 100 feet to the south-west of the first-named vein, promises very well. It has a surface width of about 2½ feet, and shows free gold in good quantity. Since my visit the company have continued active work on the property, and a mill is in course of construction.

"Further to the east, on the road running northward from Mine Centre towards Hillier's and Ferguson's, the first rock exposures after leaving the Keewatin rocks, which are seen on the immediate shore, are met with about half a mile south of Hillier's, or about three miles north-west of Mine Centre, on Shoal Lake. They are greenish, highly altered granites with prominent blebs of opalescent quartz. The same granite is continuous to and beyond Ferguson's (A.L. 110). To the north, between the granite and the south shore of Bad Vermilion Lake, occurs a belt of alternating bands of gabbro, and Keewatin diorite and schist. A great part of the area crossed by the road is covered with a thick coating of fine white sand, with large boulders of granite, which conceals the underlying rock, except where occasional bosses protrude.

FERGUSON MINE.

"At Ferguson's (A.L. 110 and adjoining locations) in addition to a considerable amount of surface stripping, cross trenching, etc., two shafts have been sunk to depths of about 50 feet each. On one of these the vein is divided into two small veins of a few inches each, separated by an intervening mass of granite about 18 inches in thickness, which continues to the bottom of the present shaft though narrowing down to a few inches."

LUCKY COON.

"In the other shaft on the same vein, further west, the vein is better defined though still narrow. Among the other veins on the property is one, on which only stripping has been done, which can be traced for over 1000 feet, varying in width from 6 inches to between one and two feet. These veins carry free gold in quantity sufficient, it is claimed, to well repay working. Work was continued during the summer on this property, preparatory to the building of a mill.

"At Hiller's (the 'Lucky Coon,' 655 P.) the mill was idle and nothing was being done. The shafts, which were filled with water at the time of my visit, have been sunk on two parallel veins about 80 yards apart, one vein showing a surface width of from 3 to 6 feet and the other varying from a little over a foot to a broad, irregular vein showing about one foot of crushed country-rock, a foot and a-half to three feet of quartz, and 2 to 3 feet of mixed stringers of quartz and country-rock. These are fissure veins cutting the granite mass. This whole area of granite lying between Bad Vermilion and Shoal lakes has been very much crushed and is fissured in all directions, so that the number of veins is very great, some of them promising well. On locations A.L. 103-4-5-6, are many good veins, the principal among them striking from N. 20° W. to N. W. They vary in size up to a width of from 3 to 7 feet and generally show good walls. Many show visible free gold and others are strong in sulphides. At K. 244, on the north shore of Bad Vermilion Lake, a band of greenish-gray, quartzose, massive rock, fairly mineralized with iron and copper-pyrites and from 50 to 100 feet in width, is inclosed in green hornblendic schists of Keewatin age with a trend parallel to the strike of the schists. This band appears to be an arm from the granitic area; it is cut in all directions by stringers and small veins of quartz from 9 inches in thickness to mere threads, running generally across the trend of the band but following also every possible direction. These stringers, where weathered on the surface, it is stated, pan well.

"On K. 231, are a number of veins, some of good size but irregular and difficult to trace on account of a swamp one side and a sand-hill on the other. What their gold content is was not ascertained. Many other properties from which good assays are stated to have been obtained, have been taken up in the neighbourhood, some in the granite, and others both in the interbanded gabbro and diorite and in the Keewatin bands.

"There does not seem to be any good reason why gold-bearing lodes in these last-mentioned rocks should be less permanent or persistent than in the granite.

"Prospectors in the district informed me they have observed that the gabbro in places sends arms or apophyses into the granite mass. This I was not able to verify. My own observation has been to the contrary, and where the two were seen in contact on the south shore of Bad vermilion Lake, the granite cuts the gabbro in an unmistakable manner. The gabbro at this point has an indistinct schistose or foliated structure from crushing, and this foliiation is cut across abruptly by the granite."

EAGLE AND WABIGOON LAKES.

"The regions lying immediately to the south of Eagle and Wabigoon lakes offer a field which promises well for the prospector. In both these districts are bands of Keewatin of very irregular outline, with intrusive areas of hornblende-granites and saussurite-gabbros. These two districts and that to the south of Lower Scotch Lake, have been particularly mentioned only because they are all easily accessible and do not seem to have attracted the notice of prospectors to any great extent, though the character of their rocks is such as to warrant their examination."

REGINA AND SULTANA MINES.

"While on Lake of the Woods, the Regina and Sultana mines were visited. The vein in the case of the former of these, traverses both an intrusive area of altered hornblende-granite and a Keewatin diabase, the line of contact between the two cutting the drifts in the mine and showing an overlap of the diabase by the granite.

At the Sultana, the vein occurs in a very much crushed and sheared hornblende-granite which occurs here, as it does generally, as an intrusive mass not far from the contact between the biotite-gneiss area and an area of Keewatin rocks. The Scramble mine, which lies to the north of the railway, within six miles of Rat Portage, occurs in a band of Keewatin hornblendic schists or crushed diorites, and close to the edge of the Rossland granitic area. Some surface stripping has been done here, and a shallow shaft has been sunk on a band 25 to 35 feet in width, made up largely of quartz and heavily charged with iron-pyrites, occurring both in thin sheets along the planes of cleavage, and irregularlw distributed through its mass. Parts of the band were found to pan well, and an average value of over twenty dollars to the ton is claimed for the whole band.

"Considerable activity has been shown in developing and exploiting gold properties about Lake of the Woods generally, and attention is being again devoted to various properties which have lain undeveloped for years. New discoveries of gold-bearing veins have been made in various places in the district, notably about Shoal Lake, where the Mikado and other properties have been attracting attention.

"Here, as in the Seine River country, the gold has been found, in every case of which we have any record, at no great distance from the contact between the Keewatin and intrusive granitoid rocks, which occur most frequently as narrow rims along the edge of the more extensive areas of biotite-gneiss, but which also invade the Keewatin rocks as isolated intrusive masses. I know of no case where gold-bearing veins have been found to occur in the main body of the biotite-gneiss areas which we have classed as Laurentain."

MANITOU LAKE REGIONS.

"As surveys of Manitou Lake were already available from the work of previous seasons, it was not thought necessary to visit this lake during the summer. A number of claims have been located along the shores of the lake as well as about Little Manitou Lake. These claims lie in the Keewatin belt, which extends all along the lake in the form of a narrow band, between the large Laurentian areas to the east and west, and connecting the Keewatin area of Pipestone Lake with that of lakes Wabigoon and Minnietakie. It was known from last season's work that the Laurentian areas approach the shores of the main Manitou closely, and a trip eastward from the foot of Osborne Bay, made by Mr. Lawson last summer, proved that the gneiss area of Eagle Lake extends eastward at least to beyond Niven's 22-mile post on the Base Line of 1893-94. The marginal area of hornblende-gneiss which so commonly surrounds the biotite-gneiss areas, was found to intervene here also between the main gneiss area and the Keewatin.

"Prospecting was extended northward during the summer into the region lying to the north of the Canadian Pacific Railway along the Minnietakie Lake Keewatin belt, which is a continuation north-easterly of the Wabigoon Lake area. Promising veins are reported in this district, and assays of specimens from there made in the laboratory of the Survey gave small quantities of gold, enough at least to confirm the occurrence of gold in the region."

EMPRESS MINE.

"Work for the season was closed on the 6th of October, but on the way back to Ottawa, the Empress mine, situated on the north shore of Lake Superior, was visited. This is a low-grade proposition, largely free milling. It lies to the north of the Canadian Pacific Railway, near Jackfish station. At the lake-shore, the rock exposed in the cuttings on the line of railway is a medium-grained, red, hornblende-granite, and along the road leading to the mine the same rocks are seen to within a half-mile or less of the mill. The veins on which work is being done occur in green, somewhat hornblendic schists striking N. 67° E. and dipping eastwards at an angle of 64°. Where work was being carried on, there is a series of closely parallel veins, striking and dipping with the cleavage of the schists. The largest of these was about six feet in width where stripped. The belt has been uncovered by cross-trenching for upwards of a mile along the strike, varying, of course, very considerably in quartz contents in that distance. The outcrop occurs on the slope of a southerly-facing hillside at a height of two hundred feet or more above the valley bottom. The ten-stamp mill now on the property, has been placed near the bottom of the hill, so that a tunnel may readily be driven which will catch the veins at a depth of about 140 feet below their outcrop, and will prove the property pretty thoroughly and permit also the economical stoping of a large amount of vein-matter. At the time of my visit no mining work of a permanent character was being done, the ore for the mill was being taken by shallow shaft and drift from wherever it could be got at most conveniently. It was the intention of the management, however, to proceed with the driving of the tunnel during the winter. The owners claim only a low grade ore, but they claim also that the unusual facilities for working economically will ensure them a reasonable margin of profit.

"Other discoveries of gold-bearing veins were reported during the summer from different points along the north shore, but none of these were seen."

MINING NOTES.

Nova Scotia.

The year has finished well for the Dominion Coal Co., who make up their balance sheet to end of February, their shipments in January and February greatly exceeding those of last year. The following are the figures:

1897.	OUTPUT.	SHIPMENTS.
January	34,101	29,623
February	30,233	24,389

For the month of March, owing to increased shipments to the States, the shipments will approximate to 30,000. What, with a largely augumented output reaching nearly 1,200,000 and the many economies which have been effected during the year, the financial statement to be submitted at the annual meeting of the company next month, ought to be a satisfactory one.

The Mineral Product Co., of New York, propose working the deposits of wad (bog manganese ore), for the purpose of making ferro-manganese. This industry will have a beneficial effect on Nova Scotia, as the company will require a large proportion of the products of our coke ovens.

The result of the Finance Minister's pronunciamento on the subject of coal duties has been to remove the paralyzing influence of uncertainty which effectually prevented large buyers from closing their annual contracts, and we now learn that it is practically assured that shipments of Nova Scotia coal up the St. Lawrence will be greater this year than last. On the other hand tonnage to the States is very uncertain.

The highly favorable reports published of the coking and gas-producing plant of the Heat & Power Co. at Halifax, fully establishes the success of this system, and will no doubt stimulate its development in the States, where Mr. H. M. Whitney's charter is operative, to the increasing advantage of the Cape Breton mines.

Gross output for the year ending 28th February, 1897:

Reserve	274,045	tons
Caledonia	259,094	"
Dominion	163,996	"
Old Bridgport	139,307	"
Hull	136,728	"
International	103,080	"
Victoria	66,279	"
Gowrie	50,629	"
	1,193,158	tons

The North Brookfield Mine is getting back into its old form again. Last month it produced 446 ounces of gold.

The Richardson Mining Company propose putting in blankets to save their concentrates, which in the past have been allowed to go to waste. The return from this mine for last month was 242 ounces.

The General Mining Association are busy setting things in order for a good season, and expect to exceed their last year's tonnage. They will have 50,000 ton in bank by the time shipping commences.

The old mines at Uniacke produced 153 ounces of gold last week.

The famous old Dufferin mine is being stocked in Montreal, and it is probable that work at the mine will be started on a comprehensive scale this spring.

Major R. G. Leckie has taken an option on the Stuart-Hardman block of areas at Goldenville. This property has by far the finest record of any property in Eastern Canada, and has produced in the past nearly two million dollars worth of gold. The restarting of this property, which has been locked up now for a number of years, will be of incalculable benefit to the province.

Operations have been started at the Elk mine, of which we spoke in a recent issue. It produced 180 ounces of gold last month. Owing to the wonderful richness of the quartz, the owners are having trouble with some of their men. A considerable amount of ore has been stolen, and one of the men is known to have sold $300 worth of gold. Stealing has been one of the greatest banes Nova Scotia has had to deal with in the past, and it is high time some steps were taken to prevent the selling of gold unless it can be shown that it is lawfully obtained.

The New Glasgow mine at Goldenville continues to show very excellent results. Over 200 ounces were "cleaned up" last month. The company intend increasing their stamping capacity this spring.

Mr. Hill Catherins, representing English capital, paid a flying visit to the province and bonded two properties. It is probable that he will return later, and will likely take one of the properties over, and possibly both.

Mr. J. A. Fraser has bonded a property adjoining the Modstock mine for New Glasgow people.

The Thompson-Hill property at Cow Bay is being stocked in Halifax at a capital of $100,000.

We are pleased to see the returns from the New Egerton mine have greatly improved. For January and February the mine produced 411 ounces.

The yield from the Blue Nose Co. at Goldenville was 238 ounces from 911 tons of ore.

There is a considerable amount of activity in the western part of the province. Small bricks have been brought in from Malaga and other places.

Quebec

Mr. Robert Chalmers of the Geological Survey, in reporting of his season's work in the Chaudiere Gold Fields, says: "The present languishing condition of the gold mining industry in Beauce county, appears to be due to causes other than the scarcity of gold in the alluviums. It would be invidious to make any remarks, however, concerning these causes. That gold still exists in a number of these valleys in paying quantities, *i. e.* in quantities sufficient at least to warrant a skilful and economic expenditure of capital in their exploitation, is a fact which no one who has examined the district can deny. But on the other hand it must be remembered that this district can show a total of a large number of failures in gold mining, and that there are other causes for this besides want of scientific knowledge or skill and want of capital. In much of the Chaudiere district, the gold exists in a very thin and scattered condition, and the gravels containing it are capped by such thick beds of boulder-clay and quicksands that it is doubtful whether it can be profitably mined. In the deeper parts of the river-valleys there are still greater difficulties to contend with. In the old pre-glacial channels, the gold has, of course, been more or less concentrated, but when it is considered that these often lie below the present water-courses, and that tunnels or shafts at these levels are likely to receive a portion of the drainage waters, the expense of exploration would be great and only deposits of considerable richness would probably prove remunerative.

The further development of the gold mines of the Chaudiere area should, it seems to me, lie in the direction of introducing machinery and plant adapted to alluvial mining under the peculiar local conditions which are found there. But first the gold-bearing gravels, in a great number of places, should be tested anew and their gold content per cubic yard proved, with the view of ascertaining whether it is sufficient to pay for the expenditure in the direction indicated. To effect this exploration adequately, it would seem that boring machines are absolutely necessary. The great thickness of the boulder-clay, which never contains gold in paying quantities, but which must be penetrated by shafts or tunnels before the auriferous deposits can be reached and worked, as well as the difficulty of locating the old river-channels in which the auriferous deposits mainly lie, have hitherto proved serious obstacles to exploration in the deep-lying beds. With boring appliances these difficulties could be overcome, at least to a much greater extent than by the methods hitherto employed, the position of the old channels could be located in less time and at much less expense, and the thickness of the auriferous beds in these ascertained before commencing actual mining operations."

In Kingsley Brook, a considerable amount of work has been going on this season. A company has been formed to operate the mines on this stream, called The Rodrigue Mining Company, and the mining rights along the whole stream have been secured. Mr. H. C. Donnell, of Boston, U.S., is manager. Early in the season a dam was constructed near the source of Kingsley Brook, and an 80-horse-power boiler and hydraulic pump were put in, principally to work the gravels. Mr. Donnell informed me that he finds gold in paying quantities in these, but his ultimate object is to find the auriferous quartz or matrix, which he hopes to do as he sluices the gravels and uncovers the rock surface in the valley of the stream from the foot of the mountain up towards the dam. The boiler, Mr. Donnell states, is large enough to furnish power to drive a 50 or 60-stamp mill, and can be utilized for that purpose when gold is found in the rock in sufficient quantity to warrant the purchase of a mill.

British Columbia.

Boundary Creek.

The winter, although unusually long this season, is at last fairly passed, and except on the summits the snow has all disappeared.

Work is proceeding regularly on the Jewel. A drift on the vein at the 120 foot level has been started and will be continued towards the "Deuero Grande" 150 feet.

Work was recently resumed on the "R. Bell" shaft, but on striking the vein at 85 feet, the shaft was making about 700 gallons of water per hour. Work has accordingly been suspended at that point but will be resumed on the arrival of a steam hoist and pump, which it is stated will be installed by the end of May.

The "R. Bell" is one of the most promising copper-silver properties in camp, and is owned by a Salt Lake syndicate—The Keough Mining Co.

The final payment was made last month on the Mother Lode bonded by the Boundary Mines Co., Limited. It is understood that a 100 foot winze is to be sunk on the ore body at the end of the 200-foot tunnel.

The allotment of 50,000 shares of Brandon & Golden Crown treasury stock has all been taken up at 10 cents. A second allotment is, we learn, to be put on shortly at 15 cents.

On the "D. A.," owned by the Boundary Creek M. & M. Co., the adit is in some 70 feet. The vein (average width about 10 inches), being followed appears very persistent and carries a very high gold and silver value throughout.

On the Republic Mining Co's properties, the "Last Chance" shaft has been temporarily abandoned, owing to excess of water and work has been transferred to the "Republic" shaft.

Tenders are being called for 300 feet of tunneling on the "Sunset" and "Crown Silver" Deadwood Camp. Tenders to be in by April 20th. These properties are held under a bond of $16,000 by Mr. W. L. Hogg.

Slocan District.

The Slocan's season of raw-hiding is over. The snow of the lower slopes fast leaving and the slides higher up becoming very unstable as usual at this time of year. During this past winter season there have been more casulities on account of snow-slides than in any previous year. One man was killed in January by the "Ibex" slide. one in February by the "Blue-bird" slide. One in April by a slide in the "Surprise" basin, and just lately three fell victims to a short man-slide which crushed in the snow sheds of the upper part of the Slocan Milling Companies tramway.

Considering the activity out in these plains, the record is not very alarming. At this time of year people are pretty careful where they travel.

The annual report of the British Columbia Bureau of Mines has made its appearance, and is much larger than usual, containing reports and statistics of the different mining divisions sent in by the divisional recorders, and also having incorporated within it the three bulletins issued during 1896-97 by the Provincial Mineralogist. These bulletins cover Alberni, Trail and Slocan, Ainsworth and Nelson divisions.

There is also a brief reconnaizance of East Kootenay, which is welcome as interest in that district is on the increase and many prospectors are heading for the place.

So many transfers have been made in the Lower Slocan country since mid-summer last, that there is not much left of known merit to be taken up at present, especially as the snow prevents examination of prospects only.

The Little Daisy and Golden which are rich gold properties on Eight Mile Creek, Slocan Lake, have been bonded for $35,000 to John Tingling, also the Chapleau on Lemon Creek to The Hall Exploration Company, who have the adjoining claims, Skylark and Ranger.

The Howard Fraction Group worked for the past 18 months by the original locaters who have made several shipments of rich gold and silver ore has been bonded to the British Canadian Gold Fields Company. This is also tributary to Lemon Creek.—The deal was for $50,000; 10 per cent. down.

A large deal is talked of which will take up some half dozen properties along the slopes of Lemon Creek in the vicinity of the Skylark Group. These are gold and silver properties as is usual in that section.

During the first three months of 1897, that is, to April first, the total production of ore and matte of West Kootenay reached a value of $2,346,871. This is a greater value than the whole of the output of 1895; and about half that of 1896. March leads the value in production, being somewhere about $750,00. April on account of the general breaking up of the roads will fall off somewhat.

The Ontario & Slocan Mining Developement Company recently organized in Guelph, Ont., to develope the Canadian Group has for incorporators, Geo. Sleeman, Prof. James Mills, G. B. Ryan, T. P. Coffee, James C. Kelcher, John McCarty, D. J. Branden and W. H. Branden; Capital stock, $450,000. Shares at par, 30 cents. This group is situated high above Sandon on the summit between south fork of Carpenter Creek and Four Mile Creek. It is in the close neighborhood of the Ivanhoe and Mount Adams groups, in which latter Capt. R. C. Adams and associates are interested.

The *Nelson Miner*, under the heading of the "Mew of the Wild Cat," criticizes the recently formed London company called "The Gold Fields of British Columbia," which has a capital of £600,000. This company has produced a good deal of interest over in London.

The list of Location Records is daily growing larger. Some of the lower slopes of the mountains being free from snow, and the prospector, very keen to be out again, especially to stake ground which lies near some promising property, for there ground is valuable, and fetches fancy figures with great companies who delight in acreage.

The Rambler has declared its second dividend of 2 cents per share, or $20,000, making a total so far, of $40,000. The Slocan Star and the LeRoi are again equal, each having paid $350,000. The Idaho and Payne are also pulling well up to the front.

We hear nothing more of the reported discovery of tin down in Nelson Division. Some native copper, said to have come from Lemon Creek has been shown round lately. It has not been found in this Division, so far, I believe.

Rumors of strikes to the West of Slocan Lake make their appearance once in a while and cause an interest in this long neglected field. The formation is of a landed, gneiss-like character, with but little encouragement so far.

The two small boats, W. Hunter and New Denver, are struggling hard to keep the freight from piling up at Roseberry. Lumber barges are brought down to Slocan Lake points as fast as they can be handled, but still there is a famine for lumber. The new C. P. R. boat is not yet complete.

Everything points to a great advance this summer. The past record of the Slocan has been good, without much of the boom element. This boom element will figure somewhat during the coming season. So many new joint stock companies have been formed, and, there is the usual influx of those brainy men who make their money between the time the prospector sells his claim and the time when the public possesses the stock thereof.

J. C. G.

April 17th, 1897.

Nelson District.

In a country like this, where all preliminary mining is so completely influenced by the weather, it may be excusable to refer to the "climatic conditions" even in mining notes. We are now rejoicing in splendid spring weather, very hot bright days with south-westerly winds, and an occasional shower of warm rain, which is fast causing that prospectors' barrier, the snow, to disappear, and is clothing all vegetation with the most lovely verdure.

On all sides men are preparing to get out into the hills to do their assessment work and hunt for more mineral resources, while the uaual complement of mining experts, both the yellow-legged and the long-booted variety, is very much in evidence around the town, and the mysteries of fine fissures, blow-outs, horses and iron capping are freely discussed by all who wish to be considered experienced mining engineers.

The old camp of Ainsworth is still busy, properties are changing hands daily, and in particular the "Mile Point" (one of the oldest locations there) has just become the property of the British Canadian Gold Fields Co. who intend to work it for all it is worth. This mine frequently shows most beautiful specimens of native silver, and is undoubtedly a very fine property.

Although all the signs of a good season are at hand, (or in sight should we say?) yet nothing of importance has been done in this district during the last month, transfers of course in any quantity and no doubt a few locations made in the snow, but no new discoveries have been announced, from the simple fact that there has so far been too much snow to permit of any prospecting.

The tin discovery announced in the last issue, remains just a sit was. The old prospector who found the metal and brought it to your correspondent, was taken ill with fever on his return to camp, and has not yet recovered sufficiently to go out and dig through three or four feet of snow to hunt for more of the rock, though another week at furthest should render that unpleasant work unnecessary. As soon as further information comes to hand it will be forwarded without delay.

At the town site of Salimo, (north fork of Salmon river) there is still some excitement over the placer gold lately found there, and great expectations are entertained for the neighboring district of Quartz and Wild Horse Creeks, the Ymir mine on the latter claiming to have free milling gold rock in addition to lead and silver.

The old familiar Forty-nine Creek, nearer to Nelson, seems not to be exhausted yet by any means, as the owner of the Maple Leaf claim there says he has uncovered a pay streak that will run up to $250 in free milling gold, and that he intends to form a company to work the property, which has been handed about from one man to another for an old song for years. Such, however, is miner's luck. In the vicinity of Forty-nine, on Rover creek, the "Imperial" claim is reported to have been bonded to O. G. Labarre for $10,000, though nothing but assessment work has been done, and the published assays are by no means high.

The Fern mine on Hall creek has struck a good vein carrying free gold, though at present time of writing no details are at hand of the assay value or size of the vein.

New finds in old claims are constantly being reported, and some very high essays are mentioned. One heard of the other day came up to 103 per cent. lead besides much gold, silver and copper; unfortunately, there was no more of the sample, it would have been a very interesting specimen for a museum. If people would try and confine their statements to some point not too far away from the truth it would be better for all concerned, as the prospective purchaser wants to know what actually is offered for sale and when wild statements are made, naturally fights shy of the whole matter and discredits what even may be the actual fact. Toad Mountain however still holds its own. The Silver King is putting out some 150 tons of smelting ore daily in addition of course to the waste rock naturally met with; and the Exchequer and Goldendale groups both report themselwes well satisfied with the appearance of their mines.

Speaking of the Silver King necessarily means a reference to the Hall Mines smelter, whichcontinues to work steadily and well; (Rossland) War Eagle ore is being used to a considerable extent, and smelts very well with the Silver King ore, partly by providing a certain excess of sulphur in which the King ore is deficient. The Hall Mines Co. are pushing the new furnaces to completion as fast as possible, and in less than a month they hope to be concentrating their matte from 50 per cent. copper to at least 90 per cent.; not at present contemplating the further refining of the product, though such a proceeding is by no means unlikely in the near future.

The natural sequel to the incorporation of a town, is the election of a Mayor; and Nelson has just passed through the trial most successfully by electing one of the foremost business men in the city to act in that capacity. Mr. John Houston has been connected with the place from its infancy, and is most highly respected by all. It is unnecessary here to refer to his public aciions in all matters affecting the welfare of the district, and it is sufficient to say that the honour of being the first Mayor of what we believe to be the first city in West Kootenay, has descended upon Mr. John Houston.

The value of the ores shipped, as given by the Customs up to this date is as follows, (for 1897) $1,331,193.00, and the value of the ore and matte exported, up to date, is $2,559,062.00, thus shewing that West Kootenay, little as is actually known of her immense universal treasures, is a district well worty the attention of capitalists. With better railway facilities, and cheaper fuel from the Coast or rather Vancouver Island, we shall hope soon to see other smelters arise and so make this favored province a veritable hive of industrious workers, who in the not far distant future will bring up their offspring loyal to Canada and Canada's Queen.

A. H. Holdich.

New Denver.

The mines have certainly made a splendid showing all round so far this year, and there is every reason to expect that this will be continued during the remaining nine months, so that a tremendous output far exceeding that of ninety-six will have to be recorded at the end of the year.

The best criterion of the flourishing condition in which many of the mines are now to be found, is seen in the enormous amount of development which is being quietly undertaken all over the district, and the dividends which turn up with unfailing regularity almost every week. The Reco announces another of $50,000, to be distributed some time during this month, and the Idaho Co. have recently increased their dividend account to a grand total of $152,000.

Shares in North Fork properties seem to hold remarkable firm; the Phoenix and Roulette groups are both looking well and give indications of eventually becoming large producers.

A temporary curtailment is being made in the quantity of ore shipped from the Payne, but as soon as the snow melts and the waggon-road can be put in thorough repair, these will be resumed on the same scale as before.

It is not generally known that a great many of the galena ores of the Slocan carry at least a trace of gold, and in some instances a great deal more. The Slocan Star ore is said to average about $2 in gold, and a shipment from the Monitor mine near Three Forks gave returns of over $10, so that in view of these facts it is highly advisable for shippers to have a complete analysis of their ore before sending to the smelter, or otherwise they may not obtain returns for the entire contents.

For mines in a partially developed condition, which are not able to support a concentrator of their own, or who wish to try the adaptability of their ores to the process, customs establishment is very convenient. The Corinth mine taking advantage of circumstances as they stand, is now sending ore regularly to the Slocan Milling Co's works for treatment, over five hundred tons being now on the way to the cencentrator.

The prospects ahead of the Fisher Maiden on Four Mile appear so promising to the promoters that all shares have been taken off the market and it will now be developed in the nature of a close corporation.

The people of Slocan City and neighborhood have apparently succeeded in convincing the Government of the necessity of establishing a Record Office at that place to attend to the enormous business which they expect there this summer. Unfortunately, government assurances too frequently indicate very little, but it is to be hoped in the interests of those having occasion to refer to the record books there, that they will not be disappointed.

F. HOWARD WEST.

April 17th, 1897.

BOUNDARY CREEK MINING AND MILLING COMPANY.

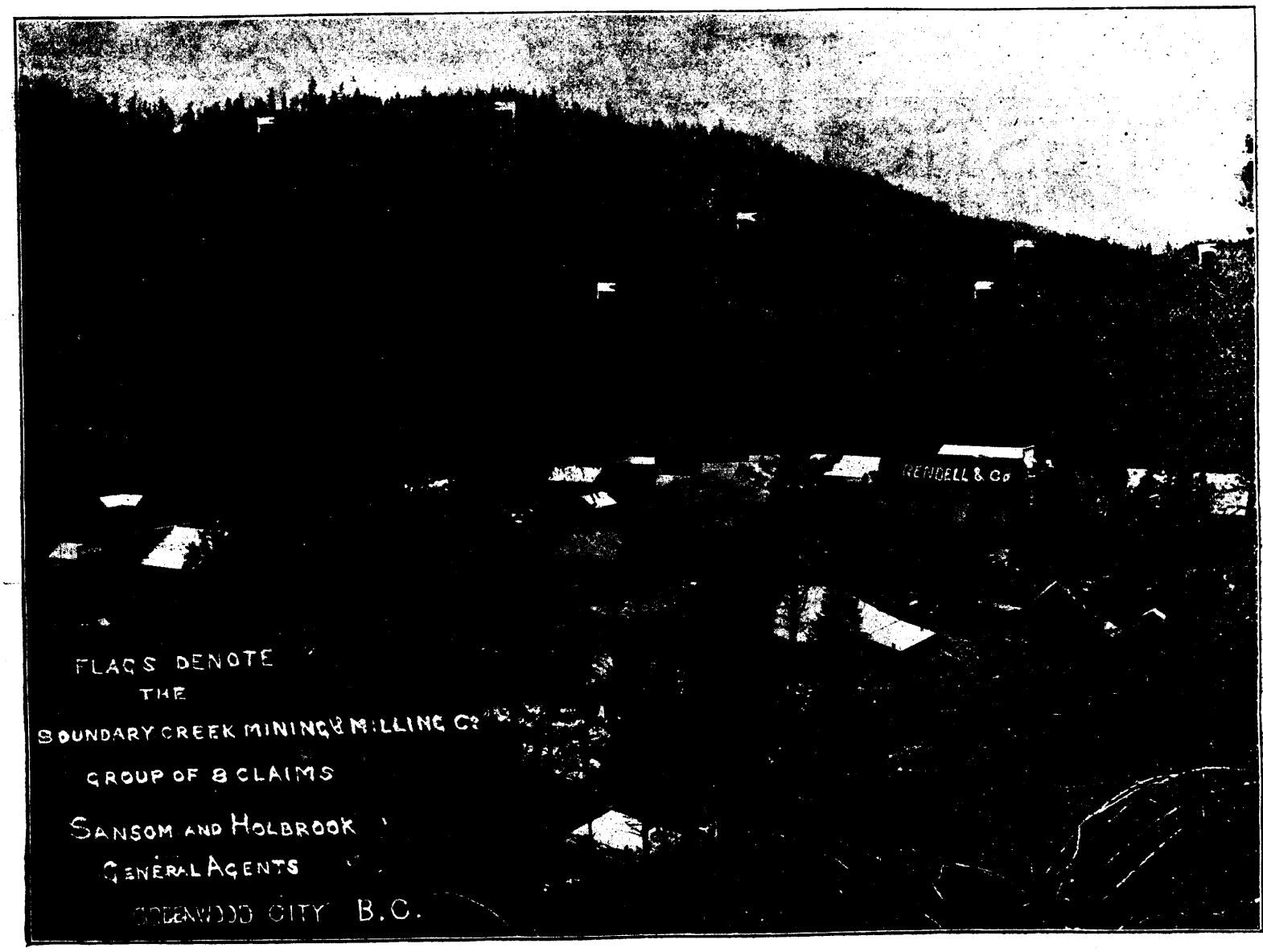
INCORPORATED OCTOBER 21st, 1896.

CAPITAL, $1,500,000. - - - - 1,500,000 Shares at $1.00 Per Share.

. . 700,000 Shares in the Treasury for Development. . .

THIS Company owns and operates a group of the highest grade in Gold, Silver and Copper properties in Boundary Creek.

CLAIMS—The G.A.R., D.A., O.B., S.H.B., J.A.C., FRED D., S.F., C.S. & H., D.H. and BIG LEDGE, constitute the group which is the most compact and advantageously situated of any under one ownership in Boundary Creek. The proposed Columbia and Western R.R., being surveyed to pass right through Greenwood City and along the base of the hill.



From the above photograph it will be readily seen that, lying as they do on a steep sloping hill the properties offer unusually good facilities for drainage and rapid and economical development, by main working tunnels driven in from the base of the hill.

The veins lie in the Granite Area—which occupies the upper part of Boundary Creek basin—along the line of contact with the more basic eruptures, and are among the oldest locations in the camp.

A small shipment of 8,653 lbs. was made to the Everett Smelter in 1894, yielding per ton, gold $103.15 ; Silver 74-7-10 ozs. ; Lead 2 per. cent. and a considerable amount of shipping ore is at present on the dumps of the different claims.

Careful investigation is earnestly invited by the Company as their properties are being developed with a view to making mines and not to booming stock.

Attention is drawn to the large amount of stock (700,000 shares) put into the Treasury and to the fact that the properties are all fully paid for.

150,000 Treasury shares fully paid up and non-assessable, have been put on the market at 10 cents, and most of the stock so far sold has been taken up locally. A large proportion of the miners now working are also taking stock in payment. For further particulars address,

BOUNDARY CREEK MINING AND MILLING COMPANY,

SANSOM & HOLBROOK, - - - - Greenwood City, B C