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THE MONTH.

THE efforts of the representatives of the silver-lead mining industry who went to Ottawa this spring have been eminently successful, and the Dominion government has, in consequence, agreed to bonus the manufacture of pig lead from Canadian lead ore in Canadian territory. This bonus is OPPORTUNITIES arranged as follows: \$5 a ton for OF every ton of refined lead produced LEAD REFINING. during 1902; \$4 during 1903; \$3 during 1904; \$2 during 1905, and \$1 during 1906. This bonus is a much needed encouragement to the silver-lead industry and if it is sufficient for the purpose for which it is designed, namely, to encourage the home manufacture of pig lead as opposed to the export of crude lead ore, it has been given precisely at the proper time. The silver-lead industry of British Columbia must either at the present time give rise to the manufacture of pig lead in Canada itself or must undergo very severe and unnecessary restrictions in its development. The changed conditions which have brought about this condition of affairs are partly due to natural and partly to artificial causes.

A great change has taken place in the United States as a lead-producing country during the past eighteen months. Prior to that time the United States could not produce as much lead as it required, and was consequently a lead-importing country. The protective tariff of the United States was so arranged as to favour the importation of such lead as it required in excess of its own production in the form of crude ore or bullion. This, of course, had two effects. It preserved in the United States the manufacturing industries of smelting and refining all the lead required for home consumption. At the same time it acted as a bonus upon the shipments of crude ore into the United States from countries adjacent to its borders, of which British Columbia is one. The difference between the duty on refined lead and the duty on crude ore was a difference in favour of the British Columbia miner, but at the same time a difference against the British Columbia smelter and refiner. Just so soon, however, as the United States was able to produce more lead than it could consume and obliged to find a foreign market for a surplus, this bonus to the foreign miner of lead ore was bound to disappear. In other words the United States could no longer afford to pay the New York price for refined lead, for lead contained in foreign ore and then after refining it sell that lead at the world price, when the New York price was maintained by a higher tariff on lead than applied to the lead in crude ore imported into the United States. This change in market conditions in the United States removed the bonus which that country was paying the British Columbia miner for the privilege of retaining the smelting and refining of his ore, and reduced his market for lead to the London or world price of lead. Very naturally the silver-lead industry of British Columbia showed evidences of demoralisation. But there is another point of view. If the bonus provided for the British Columbia miner who would consent to export his product in the shape of crude ore was removed, the restriction against the British Columbia smelter and refiner was also removed at the same time. The transition period through which the industry is passing must lead to its final establishment on a broader and more enduring basis, on which not merely the mining of the ore but the smelting and refining of it with all the subsidiary manufactures to which they lead will find a firm foothold on Canadian soil. The assistance of the government at such a crisis is both timely and encouraging. Such have been the natural circumstances and conditions which have recently affected the silver-lead industry of British Columbia. There have also been others,

however, of a more artificial character. The enormous increase in the production of lead in the United States has led to the formation of an iron-bound trust to regulate and if necessary to restrict that production. It must be quite clear that if there were a large number of competitive agencies at work in the United States in the purchase of lead ore and the manufacture of pig lead, and if at the same time the production was increasing in excess of the home demand that the price of lead in the United States would soon be regulated by the surplus which had to be exported or in other words would fall to the London price of lead. This the American Smelting and Refining company has been consolidated to prevent. Whether it can do so or not is a question rather beyond the scope of this article. But, certainly before it is proved that it cannot, the American Smelting and Refining company can exert a very potent and disastrous influence on the development of the silver-lead mining industry. Naturally its first point of attack in endeavouring to regulate the industry in North America would be those districts on which the United States was formerly dependent for supplies of crude lead ore. It was absolutely necessary, for the reasons given in the forepart of this article, that the price of lead should be marked down against British Columbia producers of lead ore, that the basis of payment should be transferred from the New York to the London price; and it was also essential for the furtherance of the policy marked out for itself by the American Smelting and Refining company that the cost of treatment should be marked up. But the very fact that this has been done, while it subjects silver-lead mining to a double discrimination in this Province, provides a further inducement for the establishment of the smelting and refining industry on Canadian soil. The question of competing against a trust is merely a question of owning the sources of the raw material, being able to reach the market, and procuring the capital necessary to extract the raw material and manufacture it. But of these three factors the first is by far the most important. In British Columbia we own a silver-lead producing area beside which the whole similar area in the United States sinks into absolute insignificance. British Columbia may be a rugged and mountainous country, but it is not wise to forget that these mountains contain the most numerous and largest deposits of the precious and base metals known in the world.

Emanipated from the hampering conditions imposed on their development by the exigencies of an American corporation and possessed of ready access to the market of the world it is much more likely in the event that the silver-lead mines of British Columbia will dominate the American Smelting and Refining company, than that the American Smelting and Refining company will dominate the silver-lead mines of British Columbia.

The issue of the Greenwood *Miner* dated the 11th of May, contains a most admirable review of the mining development of the Boundary district during the past

twelve months. After reviewing the conditions which have so far restricted development, particularly the inadequate equipment of many of the mines with machinery, due to the difficulty of getting heavy machinery into the district before the advent of the railway and the limited amount of outside capital invested in the district, the writer goes on to say: "The prospects for early improvement are, however, very encouraging. With

transportation and ore reduction needs largely provided for, several of the mines settled down upon a producing basis and so encouraging the further expenditure of capital for their adequate equipment and more extensive operation, the contemplated early resumption of work on properties that have been closed down and the general local experience, that values improve with depth, the outlook is becoming increasingly satisfactory." Doubtless this forward view is justified by the large extent of still undeveloped, or only partially developed, mineral territory in the Boundary district. But it should not be taken as implying that results, so far, have not been most satisfactory. The last twelve months have seen two smelters placed in successful operation and 216,568 tons of ore mined and treated, of which 97,593 tons were mined during 1900 and 100,954 tons during the first four months of 1901. Here surely is progress enough to satisfy the most exacting.

The review under consideration takes up the various camps in the district and gives in detail the amount of work done on each of the principal mines and the machinery with which they are equipped. In this we have not space to follow it here, but the following summary of the dead work done in the Boundary district is interesting in itself and a monument to the painstaking assiduity with which the figures have been compiled:

Camp.	Feet of Work.
Greenwood	24,449
Deadwood	15,102
Summit	9,997
Central	7,739
Wellington	6,581
Long Lake	3,176
Smith's	1,650
Skylark and Providence	2,000
Prospecting and other work	5,000
Total	75,694

Over 12 miles of underground exploration have been accomplished in the Boundary district, the greater portion of it done at the greatest possible expense and under very severe difficulties from lack of transportation facilities. Now that it is stimulated by returns the work of development will go forward much more rapidly than before. The figures given in the review with reference to the successful establishment of the smelting industry are most interesting:

Last August, at Grand Forks, the Granby company started its first furnace and in October its second furnace was "blown in." The quantity of ore treated at this smelter to April 30th, is 136,453 tons. The British

Columbia Copper company commenced smelting at Greenwood on February 18th, and in a little more than ten weeks, to April 30th, smelted 24,857 tons of ore. The tonnage treated at these smelters month by month is as under :

Month.	GRANBY.	Tons.
August, 1900 (11 days).....		2,002
September.....		8,753
October.....		14,215
November.....		18,050
December.....		18,467
January, 1901.....		17,640
February.....		17,708
March.....		19,713
April.....		18,995
		136,443

Month.	B. C. COPPER COMPANY.	Tons.
February, 1901.....		3,016
March.....		10,519
April.....		11,322
		28,857

A table has also been compiled giving the approximate number of men employed in the different sections of the country :

Camp.	Men.
Greenwood.....	400
Deadwood.....	200
Summit.....	130
Wellington.....	30
Central.....	25
Other camps.....	50
Smelters.....	120
Total.....	955

On the whole it is impossible to look over this review of the year, which carries on its face the proof of accuracy and conservation, without realising what a stupendous future lies before the district with which it deals. For that reason, if for no other, it is a most valuable contribution to the mining literature of the Province and a very great credit to the Greenwood *Miner* in which it appears.

Arrangements have recently been made to re-commence operations at the Texada iron mines on an importantly extensive scale. The announcement is chiefly significant in that it may indicate the inauguration of a new industrial era on the shores of the British Pacific. Heretofore but little effort has been directed in British Columbia to the exploitation of the large occurrences of both magnetic and hematite ore, the existence of which is already known, but lately the extent of the deposits, the high percentage of their metallic contents, and their generally advantageous situation near deep water, have contributed to attract the attention of Eastern American capital to the industrial possibilities here afforded. Without presuming to compare the iron resources of the British Columbia coast with those of Eastern Newfoundland, for no such comparison is possible at the

present time, it is nevertheless certain that ultimately the manufacture of iron and its products on the Pacific coast will become an important industry, and its development will be only less remarkable than that which has attended the industrial movement in Nova Scotia. A few years ago the town of Sydney was a sleepy little fishing village; it is now a centre of extraordinary activity, the population in the last two years having increased from 3,500 to 12,000, and during this period between six and seven million dollars have been expended on works and furnaces. The chief source of supply is Great Bell island, on the east coast of Newfoundland, where the iron occurs as hematite which is so easily worked that the cost of mining, handling and delivering by water a distance of 400 miles is only \$1.62 per ton, and this cost it is expected will be reduced to \$1.25. Lime and coal are also abundant in the immediate vicinity of the works and in consequence of these and other advantages steel rails can be manufactured at Sydney and placed upon the market at six dollars a ton below Pittsburg rates. In many respects the natural conditions of British Columbia are not greatly inferior to those which have contributed so materially to place the iron industry in Nova Scotia upon a so pre-eminently successful footing. While perhaps the Newfoundland hematite deposits, which are operated by means of a steam shovel, can be mined at less cost than the British Columbia iron bodies which require blasting, but which owing to their size could, in many cases, be quarried, the difference would certainly not exceed \$1.00 per ton for mining and delivering. In British Columbia the deposits are all situated on deep water or within easy reach of it, and there is an abundant supply of both lime and coal. The cost of skilled labour is not much if higher than in Nova Scotia; and India, the Orient, and even the states of the Pacific slope provide a market for the finished product. The fact that the Dominion Government have offered a bounty for the production of iron and steel within Canada during the next seven years, may further stimulate enquiry and investigation regarding British Columbia iron resources. This bounty is given on the following scale :

Per ton of 2,000 lbs.	On Pig Iron.		On Steel.
	From Native Ore.	From Foreign Ore.	
To April 21, 1902.....	\$3 00	\$2 00	\$3 00
April 21, 1902, to July 1, 1903..	2 70	1 80	2 70
July 1, 1903 to July 1, 1904....	2 25	1 50	2 25
July 1, 1904 to July 1, 1905....	1 65	1 10	1 65
July 1, 1905 to July 1, 1906....	1 05	70	1 05
July 1, 1906 to July 1, 1907....	60	40	60

Our Boundary Creek correspondent in his letter this month affords some interesting particulars in respect to the Morrison mine in Deadwood camp, and upholds the action of the directors in levying the assessment of two cents per share of which recently there has been so much complaint. Point is given to his argument in that the representatives of the indignant shareholders in Greenwood failed to take advantage of an opportunity

though specially invited to do so, to discuss the matter at issue with the directors who visited the locality chiefly with this object in view. While, however, the grounds upon which the call is made in this instance may be perfectly justified, the fact remains that this method of raising additional capital in the case of local companies whose shares are placed on the market on the understanding that they are fully paid up, is intensely unpopular, and is likely to have the effect of seriously restricting the successful inauguration of new enterprises of a legitimate character in the local field. The mistake made in the past is that too many local companies have been floated with utterly inadequate working capital, and the inevitable consequences are now beginning to be realised by the public. In the majority of cases these were foreseen by the promoter, but his immediate concern was to make as much money as possible from the flotation of his company, and let the ultimate success of the undertaking take care of itself. The remedy rests with the investing public. If the basis of assessable stock is not acceptable, then to protect his interests the purchaser of fully-paid stock should be careful to ascertain that the company in which he proposes to become a shareholder is financially able, within reasonable bounds, to carry out its objects. The incorporation of the recent additions made to the English company laws with our own would also materially aid in remedying existing evils.

We print elsewhere in this issue an interesting account of the coal and asphaltum deposits of the Queen Charlotte Island, in which the author, Mr. W. F. Best, who recently visited this locality, speaks of the very favourable indications of the presence of petroleum oil on Graham and the adjacent islands of the group. During the past few months the discovery of petroleum occurrences, promising an almost inexhaustible supply, in California and other states of the Pacific sea-board, has created, in addition to a more or less wild and in not a few instances, fraudulent stock-jobbing movement, a genuine enquiry and interest concerning localities in the west, where the prospects of discovering oil by boring are sufficiently good to warrant exploration, and it is not therefore unlikely that attention will ere long be directed to the possibilities of the British Columbia field, both on the coast and in the East Kootenay division.

On the hypothesis that the origin of mineral oil was the effect of chemical action on sea-weed and the remains of fish and marine animals, a well-known writer on mining topics, Mr. Theo. F. VanWagenen, E.M., advances the opinion in the course of an article published in a recent issue of the *Mining Reporter*, of Denver, Colo., that petroleum can only occur near ancient shore-lines, and he proceeds to outline these on the North American continent by showing that in the geological era when sea-weeds, as a form of vegetation, were most luxuriant but a very inconsiderable portion of the present land areas were not submerged, and such land as remained

above ocean-level consisted mainly of long and narrow islands, among which is included a belt following the existing line of the continental divide, passing through Western New Mexico, Central Colorado, Wyoming and Western Montana, and continuing northward through British Columbia to the Arctic regions, and southward through Mexico. In view of recent discovery this theory is at least plausible.

From further information we have received in reference to the liquidation of the Granite Mines, Ltd., it appears that the engineers who reported upon the property must be exonerated from all blame for the unfortunate position in which the company now finds itself. The engineers who reported on the property, Messrs. Hardman and Kendall, were in practical agreement as to the value of the ore, and their estimates have been borne out by the mill returns. They were also in practical agreement as to the amount necessary to equip the mine. Mr. Kendall placed the cost of milling machinery and power plant at \$22,000; Mr. Hardman including tools and such equipment in his estimate, at from \$25,000 to \$40,000. In addition Mr. Hardman estimated that \$20,000 spent in development would make a going concern of the mine. He maintained that \$50,000 would be ample working capital. However, prior to January, 1901, \$65,000 had already been spent on plant and construction. The machinery installed was not fitted for the work it had to do and was not adjusted with any regard to economical management so that not only was the working capital of the company wasted but economical working was not secured. A very simple calculation based on the output estimated as conservative in the reports will show that the profit on this mine could not be expected to exceed \$40,000 or £8,000 per annum. Yet the basis on which it was promoted placed £100,000 in the hands of the Duncan Mines, Ltd., while £10,000 only was set aside as working capital. It is true that this is the sum mentioned in the engineer's report as adequate. But there was no engineer's or any other authority for supposing either that the mine was large enough to pay satisfactory dividends on £110,000 or that if it were, that £10,000 would be enough money to develop and equip it on such a scale. The company was overcapitalised, money was wasted by the management and the result is a crippled mine where there might have been a property returning a steady if not considerable profit to its owners.

According to telegraphic advices the sale of the Britannia mine on Howe Sound, negotiations for which have been in progress for some weeks past between local owners and a London syndicate, represented by Messrs. Bewicke, Moreing, has failed in consummation. If we may rely on this information as correct—and owing to the disfavour in which British Columbia is held at present in London financial circles, it very probable is—the

fact that negotiations have been broken off cannot be looked upon as altogether regrettable. The Howe Sound property is admittedly an extremely low-grade mine. The ore does not probably exceed an average value of six dollars per ton. Its character is such that it is not self-fluxing, and consequently lime and iron would necessarily be required to be purchased to convert the ore to a matte. Again it is not amenable to water-concentration treatment. Though the ore body is of enormous extent and so situated that it could be quarried at a minimum cost on a system similar to that adopted at the great Rio Tinto mine in Spain, yet the other conditions would demand the most economical management to admit of the mine being operated upon a profitable margin. London companies are not notoriously economical in the management of mines and another failure, involving British capital, particularly of so large an undertaking as the operation of the Britannia would be, is certainly not desirable. As is well known more than one of the great operators of copper mines in America, including Mr. Clarke, of Butte, Montana, have made overtures to the owners of the Britannia mine, and but for the option obtained by Messrs. Bewicke, Moreing, Mr. Clark would doubtless, ere this, have effected the purchase of the property. We sincerely hope it may yet pass into his or equally competent hands, for there can be no question—at least we have duly qualified expert opinion as our authority for the statement—that by judicious and careful management the Britannia mine could be profitably operated and certainly become one of the largest copper-producing properties in Western America. It is not often that prospects so comparatively undeveloped as the Britannia can show an exposure representing at least one-and-a-half million tons of ore in sight averaging even six dollars per ton.

We publish elsewhere a letter from Mr. A. C. Galt, of Rossland, in reply to our comment last month on certain statements which appeared over his signature in the local press to the effect that the mining industry of British Columbia is retrograding. With much that Mr. Galt says in respect to the restrictions by which the mining industry is hampered, we are in hearty agreement. But his conclusion, that on account of these restrictions the mining industry has not been and is not at the present time progressive, is ridiculous. There are three facts to which Mr. Galt's attention may be drawn:—

1. One mine in British Columbia during 1900 earned more money than was paid in dividends by all the mines in British Columbia put together in 1896.
2. The cost of mining, freight and treatment, including in this cost the taxation of which Mr. Galt very justly complains, has been reduced from 50 per cent. to 200 per cent. in different classes of ores since 1896.
3. The gross value of the metal product of the Province has increased from \$4,257,179 to \$11,340,756

since 1896. Until these facts can be explained away by Mr. Galt, we must stick to our opinion that the mining industry is progressing, and progressing rapidly, in spite of natural disadvantages and legislative interference.

A correspondent, a well-known mining engineer, sends us an interesting letter on the lead question, in which he calls attention to the somewhat extraordinary circumstance that when the price of lead in New York last year was very low, the London price was exceptionally high, and this year the position is exactly reversed. Thus, at one time last year lead was quoted in London at over £18, in New York the price per hundred pounds was \$3.00 and a fraction; at the present time the London price is under £13, and the New York quotations are considerable over \$4.00. To many people the fact that lead mines in the Slocan had been closed down on the grounds of the low price of lead, appeared inexplicable in the face of New York quotations, but the matter may be readily understood when it is stated that at the beginning of 1900 all Canadian lead purchases by American smelters were based on London prices and not, as formerly, on those of New York. Meanwhile the St. Eugene mine, at present the most important lead-producing mine in the Province has resumed operations in order to fill the contract made with an Antwerp firm, and, as according to London advises, the outlook in the lead market is improving, it is possible that the recent depression will have but a temporary effect on this year's total production. For the first four months of the present year the output from the Slocan is valued at rather under a million dollars, which after all does not compare so unfavourable with the returns made during the same period of 1900.

Mining in the Slocan partakes, perhaps, more of the nature of a gamble than is the case in any other locality in the Province. A mine in that district may one day be almost valueless and the next a rich chute or chamber of ore may be suddenly encountered which will entirely change the complexion of affairs. Instances innumerable could be cited in verification of this statement, but a recent case in point is that of the Noble Five mine at Cody. Until quite lately the Noble Five company's prospects were exceedingly black. The discovery of the continuance of the rich Last Chance vein on the property, however, has so far improved the situation that the mortgagor, Mr. James Dunsmuir, instead of foreclosing his mortgage of \$150,000, has taken the unusual and certainly magnanimous course of advancing a further considerable sum of money sufficient to develop and exploit the new find. The ore as discovered is of exceptional high-grade and if the exploration work which is now under way proves the continuity and extent of the ore body as expected, it will be a comparative easy matter to raise the debt and place the mine on a sub-

stantial dividend-paying basis. It is satisfactory to note that shareholders are to be kept regularly informed of progress made, a resolution having been passed at the general meeting held this month instructing the manager to issue monthly reports to this end. If shareholders in local companies would insist on the adoption of this system generally, a cause for much justifiable dissatisfaction would be removed.

and the members of the class visit, under the auspices of the professors, important mining centres in Canada or the United States. The fourth year is given up to specialization. Our illustration represents the members of the summer school of 1901, who are now making an itinerary of the mining districts of British Columbia. The photograph was taken before the rear entrance to the legislative buildings, Victoria.

Thanks to the lavish generosity of Sir William McDonald, of Montreal, McGill University in point of

Arrangements have now been completed for an amalgamation of interests of the Old Ironsides Mining Co.,



Dr. J. B. Porter, Mr. H. Carmichael, Dr. Frank Adams, Mr. LeRay, Prof. Draper, Mr. W. F. Roberson,
Prov. Analyst, Miss Watson, M.A., Victoria High School, Prov. Mineralogist.

MEMBERS OF THE SUMMER SCHOOL, 1901, OF MCGILL UNIVERSITY, MONTREAL.

equipment and endowment compares favourable with any of the great technical educational institutions of the continent. With funds now available, the mining course has been much elaborated, the first year being devoted to mathematics, descriptive geometry, physics, drawing and practical instructions in carpentry, smith and foundry work; the second to a continuance of mathematical study, practical surveying in the field, chemistry and machine-shop practice; the third year sees the conclusion of mathematical work, chemistry is continued and a geological and mineralogical course, including fire assaying, general metallurgy and the principles of ore dressing is commenced. In the vacation at the close of this year the summer school in mining is held,

the Knob Hill Gold Mining Company, Ltd., the Gray Eagle Gold Mining Company, Ltd., and the Granby Consolidated Mining & Smelting Company, Ltd., the shareholders of the respective concerns having expressed their approval of the scheme as submitted. The original capitalisation of these enterprises aggregated \$4,900,000, but this is now to be increased to \$15,000,000, and the affairs of the four undertakings conducted under one management. The organisation which henceforward will be known as the Granby Consolidated Mining, Smelting & Power Co., Ltd., has undoubtedly valuable assets and there is every reason to believe that notwithstanding its large capitalisation, it has a successful career before it. While as yet no in-

formation has been received as to profits made by the Knob Hill and Ironsides mines and the Granby smelter, since operations on a large scale were commenced last year, but the fact that large additional expenditures in equipping the mines and increasing the capacity of the smelter have been recently made, and other extensive improvements are in contemplation, should at least indicate that the result of initial effort has not been unsatisfactory. We are further informed that the Granby company proposes erecting smelting and refining works on the coast, and to that end have entered into negotiations for the purchase of the Britannia mine at Howe Sound.

B. C. IN LONDON.

(From Our Own Correspondent.)

WHEN one remembers the enormous sums which have been put up by the English investor for the development of British Columbia mines it seems a little unfair, as has lately been done, to tax this country with a lack of interest in the Province. As a matter of fact the results produced by the large number of companies which have been formed since 1896 to carry on operations in British Columbia, are so very poor that it is not surprising that home capitalists have been considerably disappointed, and have shown their disappointment by a disposition to await further dividends before displaying any keen desire to send more money out to British Columbia. All the better-class shares are well held, but, of course, in addition to the poor character of the dividends already declared the home investor received a rude shock over the collapse of the British America group. At the present time the market for British Columbia shares is an exceedingly limited one, and although there has been rather more interest shown in it during the past few weeks owing to the hopes indulged in that we have seen the worst of the Globe-British America crisis, business in the various shares dealt in has continued to be of very moderate proportions.

To a certain extent the government of British Columbia is responsible for the lack of interest in B. C. companies shares, for if instead of spending a few pounds a year in one or two papers they had launched out a little bit, the publicity thereby gained would have been invaluable in keeping the Province and its mineral resources constantly before investors in this country. I know quite well from intercourse with the secretaries and directors of leading mining companies that they have been exceedingly annoyed and disappointed at the very poor way in which the government have helped them in bringing British Columbia to the front. No such niggardly policy was pursued by South Africa or West Australia, and if West Africa is ousting British Columbia it is only because its friends are more than ready to spend money in advertising what they consider to be a good thing. In these circumstances it is highly gratifying to hear that the government has decided to pursue a more enlightened policy. Mr. Turner is expected in this country at about the end of May, and it is to be hoped that we shall then see an effort made to systematically advertise the Province. Mr. W. Walter, whom Mr. Turner is to succeed as Agent-General, has been most energetic in endeavouring to bring British Columbia before the public in every possible way, but with the resources at his disposal, the amount of advertising in the press he has been able to secure has been, of course, very limited and knowing full well as he does

the requirements of the case, his task (well as he has done it with the little at his command) must have been a thankless one.

One of the few features in connection with British Columbia mines during the past few weeks was the sharp recovery in Le Rois, which after having been as low as £4 at Christmas, were carried up at the end of April to £9 1-2. Le Roi No. 2 have also been taken in hand, and it is said that a strong group has been formed to secure a predominating interest in the property and so checkmate the Whitaker-Wright interests. British Americas, which at one time were quoted at a little more than half a dollar, recovered to 5s. 6d., and the rest of the group strengthened when it began to be whispered that the worst of the trouble in connection with the Christmas crisis had been overcome. Of course, the much dreaded Rossland, Great Western & Kootenay Mining, special settlements have yet to be adjusted (they have been fixed for May 21), but I hear this afternoon that in the market it is considered that these will be safely negotiated and that the market having had such a long time to prepare for them, there is not likely to be any further crisis. This may or may not prove to be the case, for it is indisputable that the differences which have to be paid are very heavy, whilst I have yet to learn that the strong group in the Stock Exchange have withdrawn their legal claims against the Globe and the B. A. C. Only a day or two ago it was asserted that the Stock Exchange creditors of the Globe, etc., had decided to spend, if necessary, up to £3,500 in taking legal action against the so-called "Syndicate" whose defection was the primary cause of the downfall of the Globe group. With all these legal questions hanging about, it is perhaps not surprising that the British Columbia market does not display any of the feverish activity which has lately characterised the West African market. Under the circumstances it is really a matter for congratulation that there is any market at all left to deal in British America securities, in view of the severity of the crisis which culminated at the beginning of the new century in the failure of a large number of members of the London Stock Exchange, all of whom traced their misfortunes to the machinations of the Whitaker-Wright group.

Amongst other features may be mentioned the issue of their report by the Investigation Committee formed to enquire into the position of the B. C. Development Association. The recommendations of the committee are decidedly drastic, but it is to be hoped that this company will in the future have a less tempestuous time so far as its management is concerned. Ymir, which will, I understand, pay another 1s. dividend in a few days, has recovered to 1 11-16, while London & B. C. Gold Fields, one of the leading solid companies (whose report will probably be published next month, and which will—I hear on good authority—be, in all the circumstances, a satisfactory one) after having been under par have recovered to a small premium. Another point worth mentioning is the sharp advance which took place at the end of April, in the shares of the reconstructed Hall Mines Co. This was due to a reported rich discovery on the property, and the price, which had been for a long time dull at about 5s., jumped to 9s. This company has, however, had such a bad time lately that it will require something very definite in the way of new discoveries to rehabilitate in the public mind. As an instance of how the methods of promoters may react to the disadvantage of a mining country it may be pointed out that the Gold Fields of British Columbia group which was brought out with such a flourish of trumpets a few years ago and which, in its reconstructed form, included its subsidiary properties

the Waverley and Tangier, has practically relinquished all active operations in British Columbia, now calls itself the Empire Gold Fields, and is turning its attention to West Africa. I do not think, however, that the cessation of such a group is a material loss to the Province.

RECENT PUBLICATIONS.

Gold Milling, Principles and Practice: By C. G. Warnford Lock, F. G. S., M. Inst., M. M. London, E. & F. N. Spon, Ltd.; New York, Spon & Chamberlain, 1901. Pp. 824. Illustrated. \$10.00.

A VERY fair criticism of this volume might be summed up tersely in the one sentence:—"A big subject well treated," for big as the subject is Mr. Lock shows himself as familiar with it as could be expected, having regard to the fact that the attainment of knowledge and experience is necessarily limited in the individual. In the preface, however, it is announced that an attempt is made to present in this book, "between one pair of covers, a comprehensive guide to the whole series of operations embraced in the industry of extracting gold from the various rocks and ores with which it is associated," and this promise is excellently well carried out, except in one that is in respect to smelting practice, a very brief chapter of the most superficial character being devoted to this important subject. We merely refer to this omission as it has a local application, most of the auriferous ores of British Columbia being also refractory, requiring this method of treatment. But it is only fair to add that the author has obviously limited the range of his treatise to the discussion of the treatment of free-milling ores and those amenable to cyanidation and chlorination processes. The book is divided into thirteen chapters, the first being devoted to storing, screening, and sorting; the second to breaking; the third and fourth to wet milling; the fifth to amalgamation followed by chapters on dry-milling, concentration, roasting, chlorination, cyanidation, melting bullion, smelting ores and a final chapter entitled "Complete systems, and results and costs." As an appendix to the volume is a very complete set of tables, data for calculations and report and other forms. Not the least interesting feature of the book is the number of comparative tables of costs at various centres. Of course, as is pointed out, these are only relatively valuable, as no account can be taken of the nature of the ore, which is the prime factor. In the comparative table of milling costs per ton, the first place, in point of cheap handling, is taken by the Alaska-Mexican, the total cost being 13¼d. per ton, including the cost of concentration. Alaska-Treadwell possibly comes next with a return of 1s. 11d. including concentration, though the Richardson mine in Nova Scotia, the Myalls and Lucknow, in New South Wales, the Plymouth in California, and the Transvaal estates in the Rand, practically make remarkably good showings. The extreme variability of milling costs, however, may be judged from the fact that the figures range from a little over one shilling to over twelve in one instance. Mr. Lock has long been regarded as an authority on milling practice and this present work will merely increase his high reputation. While it is obvious that the scissors and paste have been freely utilised in the compilation of the work, they have also been used with discretion and in connection with the valuable original material the book will prove of great assistance to mining engineers having to deal with milling problems. In one particular only we would suggest improvement. In the American edi-

tions calculations would be facilitated if costs, etc., were given in American currency. It may be here remarked that Mr. Lock has already recognised the advantage of greater simplicity of the metric system of weights and measures.

British Columbia, The Mineral Province of Canada. Being a short history of mining in the Province, a synopsis of the mining laws in force, statistics of mineral production to date, and a brief summary of the progress of mining during the year 1900. King's Printer, Victoria, B. C., 1901.

This very busy-like pamphlet has been prepared by the British Columbia Department of Mines for free distribution at the Glasgow and Buffalo expositions. Accompanying it is an excellent map of the Province. The illustrations are also well selected, but we notice, by-the-way, that no acknowledgment is made to the *MIXING RECORD* for the loan of two representations of the Ymir stamp-mill. This, however, is excusable perhaps in view of the hurry of publication. In the review of progress made last year, attention is directed to the satisfactory increase in coal, lode gold, silver, lead and copper production, though so far as the last mentioned is concerned it is noted that the output from Rossland is less than half that of the previous year, notwithstanding an increased tonnage of 25 per cent. The increase in copper is therefore chiefly due to production from Boundary creek. The concluding chapter is entitled "Concerning Prospects," and contains much that is valuable, sensible and interesting. To quote: "Prospects are 'promises' and the degree of faith placed in their fulfillment will be measured by the manner in which our mines—the prospects of a few years ago—are now fulfilling the promises then given. The statistics show what these mines have, during the past year (1900), paid back in principal and interest to the lenders of the money for their development. This total amount so returned was, in 1898, \$6,520,420; in 1899, \$6,751,604; and in 1900 reached the sum of \$10,069,757; an increase of 49 per cent. over 1899, and 54 per cent. over 1898." But these of course, it should be understood, are gross and not nett profits. Again "If the investing public . . . would exercise ordinary business caution and see to it that the money for the stock they buy is used as it should be—on work and not to fatten the promoter—there would be more successful working mines in the Province to-day." An eminently wise remark.

In the last issue of the *Journal of Geology*, Mr. Thos. S. Watson draws attention to the granite areas of the Georgia-Piedmont plateau, in which a gradation from a porphyritic periphery to a non-porphyritic granite of the same mineral and chemical composition, is readily traceable. This gradation and the character of the phenocrysts point to the conclusion that the phenocrysts are contemporaneous in growth with the ground-mass constituents, and have, therefore, been formed *in place*, and not at greater depth as advocated, until recently, by geologists. In his second article on "The structure of Meteorites," Mr. O. C. Farrington treats of certain characteristics of stony meteorites, especially their chonoritic structure, slickensides, faults, veins, points and cleavage. Other articles of technical interest are: Problem of the Monticuliporoidea, by Mr. F. W. Sardeson; Correlation of the Kinderhook; Formations of Southwestern Missouri, by Mr. Stewart Weller; and Certain Peculiar Eskers and Esker Lakes of North-eastern Indiana, by Mr. Chas. R. Dryer.

WEST FORK OF KETTLE RIVER AND ITS TRIBUTARIES.

(By James Atwood.)

THERE has been a good deal written about the West Fork of the Kettle river and its tributaries, but as a rule, only one or two localities have been described in such a manner as to give people any real idea of the vast possibilities of this important mineral section of British Columbia.

Leaving Westbridge at the confluence of the West Fork with the Kettle river, and following the stream for six miles, we come to Boomerang creek. This creek marks the southern boundary of the Boomerang mining camp, a mineral granite belt about three miles wide by nine long, commencing about two miles east of the West Fork and running in a westerly direction for nine miles.

On the west side of the river the mineral belt is crossed by French and Kelly creeks. These creeks run through deep rugged canyons. The belt does not seem to extend beyond Little Goat creek, two miles farther on. The principal mineral zone appears to lie in the southeast corner of the belt, and about equally divided by the river — area something near four square miles. Here are located the chief claims of the camp, some of which are showing up exceedingly well as far as they have been developed.

The ore is gold, silver, copper and iron, carrying some tellurium, and is partially free milling.

Assays of ten to thirty dollars in gold per ton are quite common. The writer has had assay returns showing values of from fifty to three hundred and seventy-five dollars, from specimens taken by himself from claims in this camp.

By referring to the accompanying map it will be seen that French creek is a small tributary of the West Fork. Here are some good-looking claims, but so far very little work has been done on them.

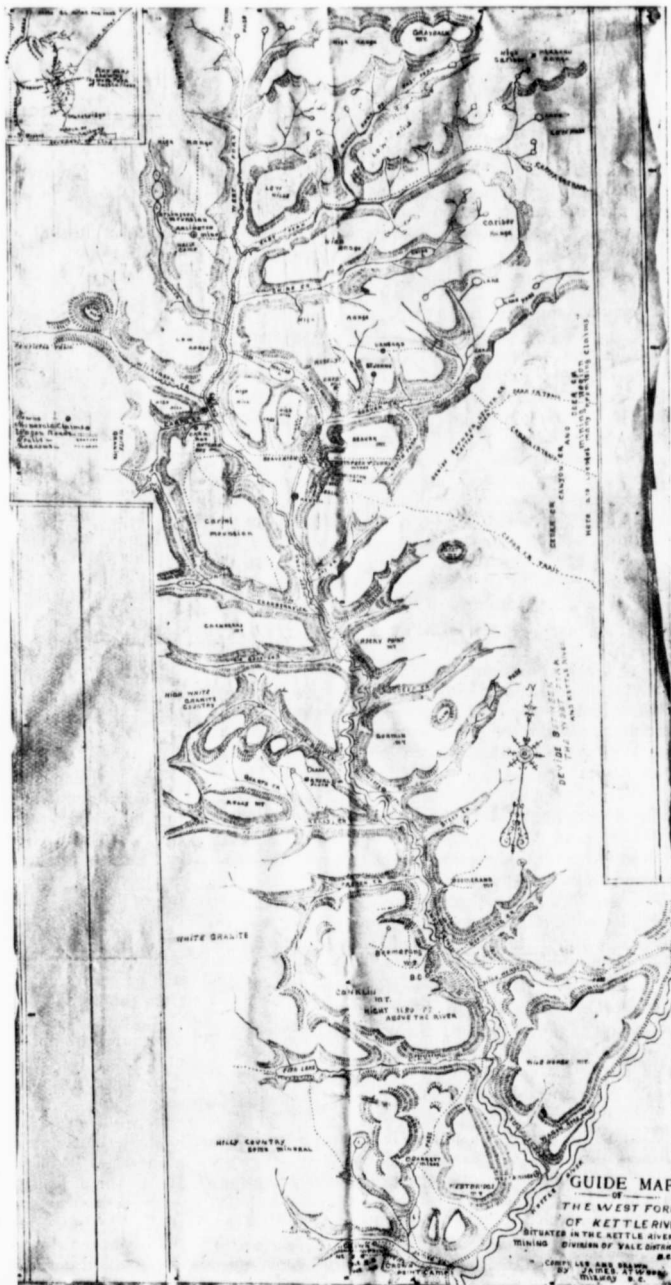
The country rock along the canyon is heavily impregnated with iron, and the same may be said of Kelly creek — two-and-a-half miles farther on, and Quartz, a tributary of the Kelly.

Leaving Kelly and keeping on up the main stream we arrive at Bull creek. No mineral has yet been found here.

About a mile beyond is Little Goat, and then Big Goat creek, both on the opposite side of the river, with Deep creek interven-

ing on the other side. I have not heard that mineral has been discovered on either of these three tributaries.

Crossing the river at the mouth of Big Goat and about three miles distant from it, is Cranberry creek. This is the southern boundary of the great Beaver creek mining belt. The belt lies on both sides of the West Fork, and so far as explored extends to three miles



north of the East Fork, having an area of one hundred and fifty square miles. The country here is more or less mineralized throughout its entire area.

The first settlement in this district is Rendell, situated on Beaver creek, but the supply point for the surrounding country is Beaverton, which lies about a mile and a half farther up and seems destined to become ere long a place of considerable importance. The Boundary Falls Smelting Co. are largely interested in this property and its rapid growth and ultimate prosperity appears to be assured.

There are two mineral zones in the Beaver creek belt. The Beaver mountain zone takes in that part of it lying east of the West Fork, and from the mouth of Cranberry to the head waters of Beaver creek, about fifteen miles in length by five in width, the area being somewhere in the neighborhood of seventy-five square miles, the centre of mineralization being around Beaverton. Some good claims have been found on Knob Hill mountain, three miles farther up the creek, and also some very promising ones were staked two miles beyond and likewise at the head of Beaver, but this was only last year and very little work has been done upon them. Samples of ore from the surface assayed well in gold and some copper, but the principal claims of the zone are situated around Beaverton.

The ore in this zone is of very good grade, ten to twenty-five dollars in gold being common, and some claims with good-sized ore bodies assay better. Ore that was shipped from the "Sally" this winter is said to have run over \$100.00 to the ton, and free gold is often taken from claims in this camp.

Five miles above Beaverton is Carmi, the centre of mineralization of the Beaver creek mineral belt lying on the west side of the West Fork, and known as the Carmi zone. It takes in the whole of the Carmi and Arlington country with an area of thirty square miles.

The first discovery here was made by James Dale, a prospector in 1896, and it is now in a fair way to become a prosperous camp. The Carmi claim shipped one thousand tons of ore to the smelter during last winter. It is of good grade, I believe averaging forty-five dollars to the ton, and assays of seventy-five to three hundred in gold have been obtained from claims in this camp.

Continuing up the river we pass Wilkinson creek. The trail from Beaverton to Pentiction follows this creek to its head, and then on down Pentiction creek to Pentiction situated on Okanagan lake.

Farther on is Hall creek, where some good claims have been located. Across the river is China creek. Some placer gold has been taken from this, but it appears that in most of the creeks I have mentioned the gravel bottoms are auriferous.

Two miles from Hall creek we reach the East Fork, a considerable stream ten miles in length.

Keeping on up the West Fork we arrive at the summit of the divide and the head waters of the stream, which takes its source in some meadows and small lakes. The total length from there to its confluence with the Kettle river being about forty-five miles.

In the summary report of the Geological Survey Department for 1900, a short description is given of the geological features of this region, from observations made last year by Mr. R. W. Brock, I quote as follows: One mile above Rock creek, dolomites, serpentine, argillites and greenstones, probably belonging to the Cache creek series, occur. After continuing about a mile, these give place to a conglomerate, probably Ter-

tiary. The conglomerate is soon succeeded by more of the Cache creek rocks which continue to James creek. From James creek to Westbridge, and from Westbridge to Boomerang creek on the West Fork of the Kettle, the dark purplish and reddish basalts (birds-eye porphyries of the prospector) obtain. From Boomerang creek to Ranch creek the rock is gray granite. From Rock creek to Beaverton it is mostly the reddish younger granite. At Beaverton is an important area of greenstone and some altered sedimentary rocks in the granite.

WATER SUPPLY IN THE ATLIN DISTRICT.

(By Livingston Thompson, P. L. S., Etc.)

In almost the extreme northwest of British Columbia lies the Atlin Lake mining division which forms part of the Cassiar electoral district. In spite of its northern latitude the climate is a very good one, and the cold in winter is by no means so extreme as might be expected.

The town of Atlin is situated on the east shore of Atlin lake about two miles above where Pine creek, a stream flowing from Surprise lake into Atlin lake, empties into the lake. It was on this stream, Pine creek, that the first discoveries of gold were made by Messrs. Miller and McLaren in 1897, or earlier. Since placer mining has been carried on upon a fairly extensive scale with reasonably satisfactory results.

In addition to the placer deposits, quartz showings have been discovered which promise well; but it were better to await further developments before expressing a definite opinion on the possibilities of this branch of mining, nevertheless investigation has been carried further than is generally known and recently two prospecting stamp mills have been in operation.

So far as placer and hydraulic mining are concerned the future of the Atlin district depends largely on an adequate water supply, and in some cases no doubt the problem of bringing water long distances will have to be faced. The water in some of the creeks is very plentiful; in others there is a scarcity at the end of the season, and in consequence of this scarcity many properties showing good prospects cannot be worked to the best advantage. But on the benches or higher altitudes where rich deposits of auriferous gravel are frequently found the greatest difficulty will be encountered in obtaining a sufficient water supply for washing operations on a large scale. In most of these localities the facilities for storage are not particularly favourable, and it is therefore possible that before commencing engineering undertakings involving large expenditures, to overcome local drawbacks and convey water any great distance by fluming, dredgers of the New Zealand type, which do not require much water in their operation, will be employed to break down and wash the gravel from the banks. Of course the chief difficulties in the storage question are the want of timber at high altitudes and the porous nature of the soil. The first is, of course, the greatest and entails haulage which, in many cases, would greatly add to the expense. The second may be overcome by time but the loss in efficiency would be so very great until the sediment naturally carried in the water had filled the interstices that remunerative returns would be considerably delayed. Hence the difficulty for obtaining solid foundations for any reservoir or dam may be regarded as a serious obstacle. I may, in fact, safely say that in many cases the hydraulic claims in the district will not be operated until capital is found ready to invest more or less large sums in the construction of elaborate works to ensure

a continuous and ample supply of water in these localities. Meanwhile in some of the creeks the conditions of grade make it easier to handle the gravel profitably. In Pine creek there is an abundance of water available for ordinary hydraulic work in the vicinity, and a great deal could be done to increase this supply to meet the requirements for all the leases applied for, some combined action must necessary be taken. It will be found that if proper use is made of the water at present available good returns will be made from the different creeks in the Atlin district. The introduction of modern methods and machinery will, of course, have a notably beneficial effect in increasing the output of gold from the district.

THE MINER'S INCH AND THE DISCHARGE OF WATER THROUGH VARIOUS ORIFICES UNDER LOW HEADS.*

(By Thos. Drummond, B. A. Sc., A. M. Can. Soc. C. E.)

[In sending this paper to the MINING RECORD, Mr. Drummond writes from Quesnelle Forks, B. C.: "This paper is the result of a large number of experiments carried out in Montreal during the past three winters. The tabulated results give values of the "miner's inch" up to and including 100 miner's inches, and they are actual observed results and can be depended upon so far as accuracy is concerned. The miner's inch adopted is 1½ cubic feet per minute. It is obtained by deciding the observed flow by the area of the different orifices. The number of miner's inches for each orifice, "x" by 1½ gives the number of cubic feet discharged per minute. The discharge is thus given both in miner's inches and cubic feet and one objection to the "miner's inch" is thus removed."—EDITOR.]

THE observations here recorded should be especially useful in British Columbia as furnishing data for the delivery of water at mines, and this leads to the question of the miner's inch of water.

The *Miner's Inch of Water*, it may be explained, is an arbitrary module adopted in mining districts for selling water. It is variously defined as being the amount of water discharged by an orifice one inch square, or an equivalent fraction of a larger orifice with a head from 6 to 9 inches. The thickness of the orifice is usually 2 inches.

One great difficulty is that it is a variable quantity depending upon the specified head, and therefore all such modules should also define the flow in cubic feet per minute.

In British Columbia it is defined as being 1.68 cubic feet of water per minute, or that quantity of water which will pass through an orifice ½ an inch wide, 2 inches high and 2 inches thick, with a constant head of 7 inches above the top of the orifice, and every additional inch shall mean so much as will pass through the said orifice extended horizontally ½ an inch. As a definition, unfortunately, this is wrong. In the first place, widening the orifice as above, changes the coefficient of discharge, and therefore the discharge itself. In the second place, this orifice actually discharges 2.147 cubic feet of water per minute, instead of 1.68 cubic feet, and this brings out a curious point referred to above, that certain small orifices, with a thickness of 2 inches run full like a short tube, the vein is not contracted, and they actually give a greater discharge than they should give. The 1 x 2, ½ x 2, and 2 x 2 inch orifices run under these conditions, and the 1 x 1 inch orifice is also the same, though it was not actually tried. The ½ x 2 inch orifice runs full.

The 1 x 2 inch orifice 2 inches thick is just on the

margin between flow with contraction and full bore. If fixed in the vertical position, with longest diameter vertical, the vein contracts. If fixed in the horizontal position, with the longest diameter horizontal, it will also contract, but if rubbed with the fingers on the edge it will run full for a time and then contract again. If kept running full in this way it will discharge about 1 cubic foot of water per minute more than when full contraction takes place.

The 2 x 2 inch orifice runs partly full, that is to say the lowest part of the orifice where the issuing vein curves down, runs full while the upper half contracts. This largely increases both the discharge and the coefficient, the flow becomes irregular, and it makes it practically impossible to determine the value of a single miner's inch when the orifice is 2 inches thick. For this reason 1-12th of the flow from the 6 x 2 inch orifice was chosen for the standard for the unit miner's inch.

There are practical difficulties in the way of delivering absolutely exact quantities of water, and they cannot be measured out as a pound of tea is weighed over the counter. The definition of the module or unit, however, should be correct within a reasonable limit of error. If it is a definition of a single miner's inch from an orifice of 1 square inch, it should go no farther. If the inch is defined as being some fractional part of the discharge from a larger orifice, it should go no farther than the capacity of that orifice, and as it is an unknown quantity to the outside world the discharge should be given in cubic feet per minute. Convenient discharges are 1½ and 2 cubic feet. The flow under low heads is irregular. Heads of 1 foot or more are not convenient because the water is delivered from ditches or flumes where the depth of water is never great. The question thus resolves itself into a choice of a standard module or unit from a flow under two conditions.

(1) With a low head of 6¼ inches above the centre of the orifice, giving a discharge of 1½ cubic feet per minute, with the advantage that it is already practically recognized as the miner's inch, and with the disadvantage that the flow is irregular.

(2) With a head of 11½ inches above the centre of the orifice, and a discharge of 2 cubic feet per minute, the flow being much more regular, but the quantity discharged new to the people.

The author personally favors the first and a definition of the inch is given, including discharges of from 1 to 100 miner's inches.

Definition of the miner's inch :—

The water taken into a ditch or sluice shall be measured at the ditch or sluice head. It shall be taken from the main ditch, flume or canal through a box or reservoir arranged at the side, and the water shall have no appreciable velocity of approach. The orifice shall be fixed vertically at right angles to the delivering waterway, and the edges and corners shall be square and sharp, and the top, bottom and sides of the orifice at right angles to the pressure board. The issuing vein shall be fully contracted, and the discharge shall be freely into air. The distance between the sides and bottom of the waterway, and the sides and bottom of the orifice shall be at least three times the least dimension of the orifice.

One miner's inch of water shall mean 1-12th of the quantity which will discharge through an orifice six (6) inches wide and two (2) inches high, made of two-inch planks, planed and made smooth. The water shall have a constant head of 6¼ inches above the centre of this orifice. It shall mean a discharge of 1½ cubic feet per minute.

* Excerpt from a paper read before the Canadian Society of Civil Engineers.

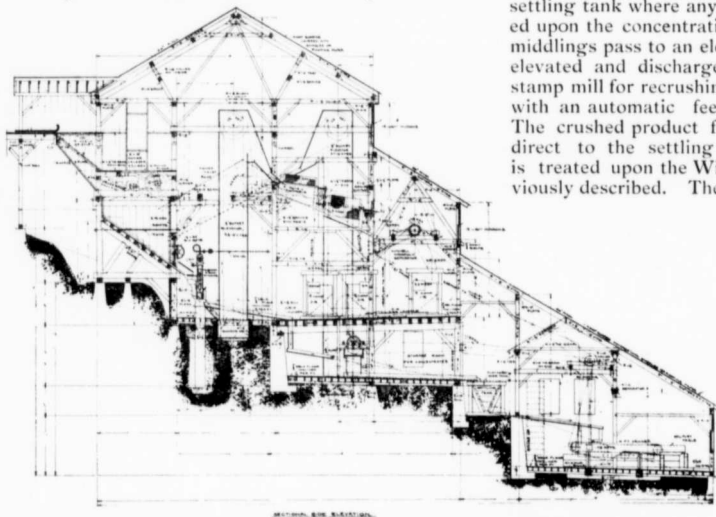
Discharges up to and including 101.5495 miner's inches of 1.50 cubic feet of water per minute shall be as in the following table :

Dimensions of orifice inches.	Head in inches over centre of orifice.	No. of miner's inches of 1½ cubic ft. per minute.	Discharge in cubic ft. per minute.
6	2	11.9858	17.9787
12	2	24.2485	36.3727
18	2	36.3851	54.5776
24	2	48.6865	73.0257
4	4	15.6998	23.5497
6	4	23.5560	35.3340
12	4	47.2853	70.9280
18	4	71.6296	107.4444
25½	4	101.5495	152.3243

The actual value of the miner's inch, as taken from the standard adopted is 1.4982 cubic feet of water per minute, which value increases as the orifice widens ; 1.500 cubic feet per minute, therefore, is an average differing by very little from the actual average obtained.

THE NEW CONCENTRATION MILL AT THE ARLINGTON MINE.

THE ore as received at the mill is first dumped upon a grizzly or inclined ore screen with one-inch spaces between screen bars. That portion of the



ore which passes between these bars drops into a storage bin, while the coarse part of the ore is reduced by an 8 x 12-inch Dodge crusher to about 1 inch size, and joins the screened ore in the storage bin. This bin is provided with an ore-bin gate through which the ore is fed to a Tremain steam stamp mill, provided with an automatic feeder. This mill has three screen openings, one at each end and one in front, and the mill is operated at a speed of 160 to 180 blows per minute. The screens are of steel with diagonal slot-punched holes, width of opening .125 in.

The crushed ore from this mill passes to a vertical elevator with 8-inch cups, is raised and discharged into two Trommel screens, operated in tandem, both screens being 36 in. diam. x 60 in. long, the first screen being covered with 8 mesh No. 16 steel wire cloth, the second screen with 12 mesh No. 19 steel wire cloth. The oversize from the 8-mesh screen passes to a two-compartment

Hartz jig, provided with 16 mesh No. 20 brass wire-cloth screens, the countershaft of this jig making 164 revolutions per minute. The undersize from the 8-mesh screen passes to the 12-mesh screen. The oversize from this screen is also treated upon a two-compartment Hartz jig provided with 16 mesh No. 20 brass wire-cloth screen. The counterpart of this jig makes 191 revolutions per minute. The undersize from the 12-mesh screen is conveyed to a two-compartment Mitchell classifier. The product from the first compartment of this classifier is treated upon a two-compartment Hartz plunger jig provided with 20 mesh No. 23 brass wire-cloth screens, the countershaft of this jig making about 250 revolutions per minute.

The product from the second compartment of the Mitchell classifier is treated upon a Wilfley concentration table, while the overflow from the Mitchell classifier passes to a four-compartment settling box. Two products are drawn from this box and treated upon a Wilfley concentration table and a 6-foot Gates' vanner with smooth belt. The rich middlings or tailings from the jigs which require retreatment pass by gravity to a revolving screen 24 in. x 36 in., having a double covering of wire cloth, the inside covering being 16 mesh and the outside covering 35 mesh. This screen is used simply to separate the excess of water from the jig tailings and middlings, this water passing direct to the settling tank where any slimes are settled out and treated upon the concentration table. The jig tailings and middlings pass to an elevator with 8-in. buckets, being elevated and discharged to a second Tremain steam stamp mill for recrushing. This mill is also provided with an automatic feeder and has 35 mesh screens. The crushed product from this mill passes by gravity direct to the settling tank mentioned above, and is treated upon the Wilfley tables and vanner as previously described. The above plant was supplied to the company operating the Arlington mine, by the Gates' Iron Works of Chicago.

THE NORTH STAR AND NICKEL PLATE MINES*

SOME DETAILS OF THEIR OPERATION.

(By J. M. Turnbull, B.A.Sc.)

SHAFT SINKING.—The shaft is located by survey, and then a peg put in the ground at each corner. The North Star shaft is a two-compartment vertical one, and was pegged out about 8 ft. by 14 ft. The miners dug to bed rock, about 4 ft. down with pick and shovel, then began to drill and blast, generally placing cut holes so as to blast out a wedge along the centre of the shaft and squaring up with vertical side holes. The drilling was done by hand, using 7/8-inch steel, and blasting done with 40 per cent. Giant powder exploded by 3x caps and ordinary fuse. When the shaft reached a depth of 8 feet the timbering was started. Two thin stulls were put in about 8 feet from the bottom, and 3 feet away from and parallel to the ends of the hole. The wall plates were then laid on these, the end plates laid in place, and the centre plate, and the whole accurately squared and levelled by the aid of squares and diagonal sticks and

* Abstract of paper read before the Applied Science Society of McGill University.

carpenter's level. Before wedging up, the sett should be set by the surveyor if the shaft be intended to make any connections; when in the right place and accurately levelled, the sett is wedged so that no force tends to bend any of the timbers. This operation must be carefully performed so as to get the timbers good and tight, equally strained, and at the conclusion perfectly square and level. The six posts are then put in and the sett above is placed in position.

In the wall plates of each sett four holes are bored, two at each end. Iron hangers are passed through these to hold the setts together. These hangers are made usually of $\frac{7}{8}$ -inch round iron, occasionally of 1-inch stuff, while the washers are the ordinary cast-iron washers which are designated as " $\frac{7}{8}$ -inch" or "1-inch" cast washers, according to the size rod they are to fit. The sett being screwed up tight by the hangers is carefully plumbed at the corners over the sett below and wedged and blocked in as before, always watching the squaring, etc., carefully.

The posts are placed above this sett as before, and the third sett placed in position. This sett projects about 3 feet above the ground, and is held in place by hangers. In some cases the timbering is carried higher than this, as where the ground is level, and therefore facilities for dumping are poor. The waste is in this case dumped around the shaft till the projecting timbering is all banked in and the dump can then work out radially according to circumstances.

At the North Star 2-inch rough sawn plank was used as lagging in 10-inch and 12-inch widths. Each plank was lowered endways outside the timbers until its lower end was opposite the centre line of the end or wall plate, and then wedged in place; this was continued until the whole setts were closed in. The lagging lapped over the posts slightly. All the spaces between the shaft walls and the lagging were filled and packed with earth and broken rock, making a solid job of the whole thing.

In continuing the shaft down a new sett is swung into place, as the blasting out makes room for it, always having three or four feet, if possible, below the most advanced timbers. This set is plumbed, squared, etc., blocked into position, and lagging shoved into position from below or through the sett openings between the posts. The lagging is cut long enough to reach from the centre of a wall plate to the centre of the one below exactly. Filling is generally put in behind each plank as it is put into place. The North Star shaft had two compartments, each 4 feet 6 inches square. The length of the posts is regulated by the distance apart of the setts, being shorter in heavier ground but usually four to five feet centres between setts. In framing timbers care should be taken to choose good sticks and allow for slight variations in the dimensions which occur in ordinary timbers, always remembering to cut so that the inside face of the setts will be accurately in line. At the North Star timbers cost about \$25 per 1,000 feet, board measure, delivered four miles up hill to the mine.

In the Nickle Plate shaft in Rossland there were some modifications. Two trenches were dug, one on each side of the shaft, forming a V, with the point higher up hill than the shaft, and the lower ends about 50 feet apart. These extended to bed rock. Stulls were set across about two feet from the bottom, and round poles 6 inches to 8 inches thick, got by contract for from 4 to 6 cents per foot, were laid lengthwise on these, and earth was shovelled back in till the trenches were full up, thus forming two drains one on either side of the shaft to carry away all surface water and keep it out of the shaft. In this case also the top sett was about 8 feet above the ground, and two long sills 12 inches by 14 inches by 30 feet were stretched one on each side of

the shaft. A framework was then built up around the shaft timbers which formed a support for the gallows frame, which of course could not rest on the shaft timbers. The cost of 10-inch by 10-inch timbers in Rossland was \$12.50 per 1,000, delivered on the railroad siding from the State of Washington, where it was cut. In this connection I might describe the dumping arrangement used on the old shaft of the North Star, which was an incline shaft.

In this case a home-made skip of 2-inch plank was used, wheels being taken from an old car. The track was made of wooden rails broadaxed out of small trees (this was the usual material for houses, rails, ore bunkers, etc., in this out-of-the-way place), these were from 3 to 4 inches square, and a double set of rails put in one above and one below the wheels, holding the skip to the rails at any slope. At the required dumping height the lower rails were cut, leaving spaces through which the front wheels could pass forward. On arriving here the front wheels would enter these spaces, and the skip tip forward on account of the way it is hung below the centre of gravity, while the back end would be lifted up and the ore dumped out. This skip held about 7 or 8 cubic feet. The hoisting engine was an old vertical boiler stationary engine, borrowed from a railroad, with a drum about 16 inches in diameter; the cable was a $\frac{5}{8}$ inch iron one, and as indicator the engineer had a bit of rag round the cable, which rag just came to the drum when the skip was high enough.

In Rossland iron or steel buckets are generally used, which are usually about 42 inches long and 36 inches greatest diameter. The bale is usually of about 1-inch round iron with a loop for the clamp hook. A couple of lugs of 1-inch round iron or steel, spread out at the end into a square plate, are rivetted on to opposite sides of the bucket near the bottom. The bucket runs on skids about 20 inches to 24 inches apart on which pieces of strap iron about $1\frac{1}{2}$ inches by $\frac{1}{4}$ inch are nailed with the flat-side tangent to the bucket at point of contact. These are greased with a mixture of half-and-half tallow and black oil, which sticks very closely, as one will learn by contact. Near the point of dumping two outside skids are placed a little farther apart than the diameter of the bucket, these catch the lugs on the bucket and straighten it up. At the point of dumping two irons are let into these skids (the inner skids do not reach this high). The bucket is hoisted just high enough for the lugs to catch in these depressions, and the engine reversed lowering the top of the bucket, which falls forward and dumps, the bucket is then hoisted a foot or so above the depressions, and is lowered, the lugs catching on swinging irons, which swing forward by the weight of the bucket, carrying the lugs over the depressions, and then the bucket is lowered to the bottom on to a flat truck, the cable is unhooked, the empty is run into the drift, and a full one run out and hooked on.

General Details.—The North Star ore (a large fish-shaped mass of galena), was broken down as best suited the place it was mined, most of the work being drifting, raising and sinking of winzes. The idea was when regular mining began to start at the ends and mine out, filling temporarily with square setts or otherwise, and then allowing the surface to cave in by removing timbers as in coal mining. A great deal of the ground was picking ground, but in harder ground powder was used, mostly No. 2 Giant, with 40 per cent. nitroglycerine. Drill steel used was $\frac{3}{4}$ -inch and $\frac{7}{8}$ -inch octagonal, of a variety of brands as Canton, Crescent and Jessops, no comparative test being made as to their qualities. Three-and-a-half pound ordinary single hammers were used—picks, etc., were all of ordinary pat-

terns. The ore was run out in cars which were loaded by muckers in the mine shovelling, or sometimes the miners themselves did their own mucking as in starting a winze. In fact working on a small scale every man had to be ready for temporary changes of occupation when occasion demanded.

The ore was dumped through the roof of the ore house on to the floor, any sorting having been done underground, and was shovelled into sacks, throwing out any barren lumps the shoveller happened to notice. This crude treatment was all the ore received. The sacks of ore ran about 18 to the ton. They were loaded on to sleighs (all hauling being in winter), which took about 4 to 5 tons down the hill each trip, making two trips a day with four-horse teams, the return trip being eight miles, and the difference in elevation of top and bottom about 2,500 feet. From bottom of hill to the landing, about 17 miles, it is mostly a slight down grade, and when the road gets icy and well packed a four-horse team has taken 10 tons on a load, making one trip a day, and occasionally have made 1½ trips. The record was claimed to be over 14 tons, which the members of the society are privileged to believe if they care to do so. From the landing the ore is loaded on boats and goes down the Kootenay river to Jennings, Mont., thence by rail to the smelter at Great Falls, Mont.

The method of sacking ore formerly in use at the Payne mine, Sandon, B.C., is an improvement over the crude method used at the North Star and was as follows: The ore was fed over a grizzly into a crusher which was run by a small gasoline engine, the crushed ore fell into a bunker from the lower point of which a spout with gate projected into the ore house, about 3 feet above the floor. A sack filler was used consisting of a piece of pipe of galvanized iron about 8 inches in diameter, with a funnel top, the pipe being a little longer than the sack. This funnel was placed in the sack, and the whole held under the spout of the bunker; enough ore was run in to fill the pipe to the throat, when the pipe was withdrawn leaving the ore in the sack. The sack was then sewn up and thrown on to a small chute leading to the top of the 3-rail tramway, where it was loaded into the car which took loads of nearly four tons. In the North Star a handful was taken from each sack as a sample and the combined sample went to the assay office as a check on the shipment.

Outside of the hoisting engine mentioned there was no plant worth mentioning, the blacksmith shop being a log house with a forge and bench, and a few ordinary tools including pipe cutters and pipe wrenches. The fuel used was charcoal made from the dry trees spoken of, and was poor in quality, even when apparently well burnt. Later on coal was obtained from the Crow's Nest Pass. But before the railroad arrived all freight had to be hauled 188 miles to reach the mine from the nearest railway point, which made coal and coke cost from \$75 to \$100 per ton at the mine.

I regret that I can give no exact statistics of costs of work at the North Star, but as sinking No. 3 shaft was the only piece of work done continuously long enough to furnish figures of any value I will specify the labor and costs approximately. Two shifts were worked of two men each. The shaft being about 5 feet by 8 feet in hard diorite, the day shift was 10 hours, and the night shift 9 hours. The night shift drilled all night and blasted before going off shift; the day shift came on and mucked out the shaft, the engineer hoisting the muck. Generally one miner acted as topman, and the other shovelled, and they took turns. The bucket was an oil barrel, cut in half and ironed, and a bale put on. It took about 2½ to 3 hours to clean the shaft, and then

the men drilled till about 3.30 p.m., and then blasted and hoisted out muck till quitting time, leaving the shaft clear for the night shift. Between whiles the engineer cut down trees for firewood, helped in the shop, repairs, or other odd jobs round the place. A man was kept who looked after the horse and did all teaming, etc.; he hauled in the felled trees to the engine house where a small circular saw attached by a removable belt to the engine was used to cut it up for the engine, and for domestic use. This horse was also used on a horse-whin to hoist out of a prospecting shaft on a neighboring property. The approximate cost for a week's work was about as follows:

		Per ft.
Miners 4 x 7 = 28 days at \$3.50	... \$98 00	\$19 60
Engineer about 7 hours a day x 7 =		
4.9 days at \$2.50 a day	... 17 15	3 43
Boy about 7 hrs. a week at \$2 a day.	1 40	28
Blacksmithing about 35 hrs. at \$3.50		
a day	... 12 25	2 45
Powder about 30 lbs., average at 25c	7 50	1 50
Candles, fuse, caps, etc., about	... 5 00	1 00
	\$141 30	

Average distance driven 5 feet per week equals \$28.20 per foot, exclusive of superintendence and outside charges. There was no timbering required except to fasten the skids to. It may be mentioned that the miners were not of the highest class, being weak in placing their holes, a weak point of most ordinary miners. It may be of interest to compare this cost with similar items in sinking a two-compartment shaft in Rossland, B. C., in somewhat similar rock, but where air-drills, compressor, etc., were used.

	Rossland.	North Star
Drilling and mucking	... \$20 54	*\$22 10
Miscellaneous supplies, etc., proportioned—		
Timbering	... 15 73	
Hoisting	... 3 05	3 71
Blacksmithing	... 2 10	2 45
Surface labor	... 6 94	
Office	... 64	
Ventilation	... 1 44	
Pumping	... 7 02	
Superintendence	... 2 44	
	\$59 90	

*Including powder, fuse and supplies.

Rossland total cost includes a lot of preliminary and surface labor, but drilling is fairly comparable with the North Star and shows that often the advantage of air-drills is chiefly in speed.

In conclusion I might say a brief word or two about the assaying of the North Star ores. The charge used for both galena and carbonate ore in the fire assays for lead consisted of a flux of the following composition:

Pot. carb., K₂CO₃, 16 parts.
Sod. bicarb., NaHCO₃, 16 parts.
Flour 5 parts.
Borax glass, Na₂B₄O₇, 8 parts.

Five grams of ore were mixed with 20 grams of this flux in a 5 or 10 crucible, and 20 grams more flux added as a cover, with two or three nails for the galena ores. This gave slightly higher results than fusing with cyanide, and a much more satisfactory slag, while with the carbonates the cyanide often gave no button at all.

It was usual to cupel the lead button and weigh the silver bead, thus the lead assay and the silver assay by the ordinary scorification process formed some check on each other, sufficient for ordinary mine samples.

STATE-OWNED SMELTING WORKS.

THE suggestion having been made that the establishment and operation of smelting works by government might have a beneficial effect on the mining industry in British Columbia by admitting of the treatment of ores at a less cost than under existing conditions, a committee was appointed by the Victoria Board of Trade to elicit information on the subject. As a result of this enquiry it was learned that a government metallurgical works had been established in the colony of New South Wales, but had been closed on grounds which are stated very fully in a report of a board appointed to deal with applications for the position of government metallurgist to that colony. It is pointed out in this report that when the works were first established there was some necessity for their establishment, but since then two highly-equipped metallurgical works had been set up by private enterprise, and, to quote, "In order to give the same satisfaction to mine owners as is afforded by these large privately-owned establishments, it would be necessary for the government to expend a very considerable capital sum in equipping the works on a much more extensive scale than now exists; and by the non-filling of the appointment there will be the saving of this capital sum, as well as the large annual expenditure that would be required for the maintenance of a proper staff.

Also, in works of this kind it is necessary to constantly renew the plant and procure all new appliances and apparatus that may be brought before the public. This would likewise saddle the government with a large burden, all of which might be saved by the abolition of the works.

"We also desire to emphasize the fact that if the government were to establish works that would fairly compete with private enterprise, the result would be that for half the time the works would be idle, but the staff would have to be paid just the same.

"It may be mentioned that when the agitation for government smelting works was initiated in parliament one of the principal arguments used was that similar institutions were in existence, and had been found to work successfully, in other parts of the world; and it was desirable that New South Wales should not be behind other countries in endeavoring to work out the metallurgical problems connected with her metalliferous deposits. That this contention was based upon incorrect premises is evident in the fact that there is only one place in the world where government metallurgical works have been successfully established, viz., Freiberg, in Germany, and the conditions which exist there are totally different from the conditions in New South Wales, because the Freiberg works are run in connection with state-owned mines, whereas the New South Wales mines are all in the hands of the public.

"Hence it follows that government works in this colony, if run on commercial lines, must compete directly with private enterprise. The only alternative is to conduct the government works on an extremely extravagant scale. The chief contention is that these works should be available for the treatment of small parcels of ore of all classes which may be sent in by mine owners desirous of ascertaining the best method of treatment. If such a policy be continued, it is clear that all the machinery employed would require to be cleaned up after each parcel had been operated upon, inasmuch as each owner would demand the metal actually obtained from his particular ore. An idea of the expense entailed by such a mode of procedure may be obtained when it is mentioned that in similar establishments, which are run on commercial principles, the method invariably follow-

ed is to buy the various ores, in parcels of all sizes, according to their assay value, and when large quantities have been acquired to treat, in conjunction, those varieties which are mutually suited for any metallurgical process. Thus at the present time the argentiferous galena and zinc-blende ores of Broken Hill, Burragorang, and Borah creek are being successfully smelted with the complex tellurium gold ores from Western Australia; mixed sulphides containing a small proportion of copper, are being economically smelted with low grade auriferous slates which could not be profitably treated *per se*. Many other analogous cases might be quoted to prove that any attempt on the part of the government to treat small parcels of all the ores occurring in New South Wales must result in very great cost to the state.

"If further arguments are needed to show the inadvisability of establishing government metallurgical works on these lines, it may be stated that there is considerable doubt whether the services of a gentleman possessing all the qualifications necessary for the carrying out of the ideal aimed at could be obtained. There are probably very few, if any, persons who, in the course of an ordinary life, have acquired a thorough practical experience of the extraction of all the different metals, and any such person could command a very large salary indeed. But if an individual could be found who, in addition to such attainments, possessed sufficient genius to enable him to devise original methods for the treatment of complex ores, it is hardly conceivable that he would accept a salary at all, inasmuch as he could rapidly acquire a fortune in commercial enterprises.

"The principal arguments in connection with this question may be summarized as follows:—

"1. Government metallurgical works have not been established in any country in the world where the conditions are similar to those existing in N. S. W.

"2. If such smelting works were run on commercial lines in New South Wales there would be an unwarrantable interference with private enterprise.

"3. The only alternative would be to conduct the works in an extravagant manner, and at considerable cost to the state, for which the state would get no adequate return.

"4. We are of opinion that it is not possible to obtain a metallurgist possessing all the qualifications which seem to have been expected, and especially that of being able to devise an economical process for the treatment of every variety of so-called intractable ore which might be forwarded to him.

"This is said without disparagement to any who have applied for the position, among whom are some possessing very high scientific attainments and great metallurgical skill and reputation in regard to the extraction of certain metals.

"5. There is really no necessity for government metallurgical works in this colony, as the requirements of the public are provided for by the two very efficient customs works, viz., at Cockle creek near Newcastle, and at Dapto, Illawarra."

NOTES ON THE TREATMENT OF HIGHLY ACIDIC TAILINGS BY THE CYANIDE PROCESS.*

(By F. B. Stevens, F. G. S., Director School of Mines, Victoria, N. S. W.)

AS the treatment of accumulated tailings for gold by the cyanide process has become such an important industry in Australasia, some account of the difficulties encountered in treating the large heaps of

*Paper read before the New South Wales Chamber of Mines.

accumulated tailings of the Transvaal gold fields may be of interest to the members of this chamber.

The Rand mines were worked at first on the free milling surface ore, but gradually, as the permanent water level was approached, the ore became pyritic, and the amount of gold obtainable by amalgamation grew less and less. Some mines erected extensive concentrating plants, Frue vanners being the chief machines used, although buddles and blankets were also used by a few mines. The concentrates so collected were at some mines treated by pan amalgamation, and at others they were chlorinated or else sold to chlorination works. The output from a battery on the Rand is high, averaging about 4 1-2 tons per stamp per day, and it took an extensive concentrating plant to effectively treat tailings going from 3 to 4 per cent. of pyrites, and the up-keep of the vanners was very high. By no means, however, could the tailings be sufficiently impoverished, and only the richer mines could go on working at a profit, and it looked as if the fields were going to collapse. The introduction of cyanide, saved the situation. The African Gold Recovery Company put up an experimental plant, and having once demonstrated the efficiency of the process, the work of treating the accumulated heaps went on apace.

The Rand batteries are almost all situated on a gentle southward slope, and the tailings had been accumulated in earthwork or sandbag dams. The tailings settled in one dam and overflowed into a second, where the last of the slimes settled and the comparatively clean water was pumped back to the battery. The tailings entering the dam, in most cases at the shallow end, deposited the bulk of the heavy pyrites that had escaped the vanners and the coarsest of the sand at that end, towards the middle of the dam medium sands and finer pyrites, and at the end and deepest part the slimes and very fine sand and pyrites settled. A section of the dam would consist of pyrites and coarse sand and would leach well. In another section the sand would be largely mixed with slime, and percolation would not be so good, while the third section would be too slimy to treat even with the aid of a vacuum pump. The first tailings accumulated being from the free-milling ore gave a splendid extraction with a low consumption of cyanide owing to their freedom from sulphates and sulphuric acid. In some cases, however, they had been dammed in water courses where there had been a considerable growth of grass and rushes, and the decay of this vegetable matter generated such an amount of humic acids that all attempts to profitably treat such tailings ended in failure. The African Gold Recovery Company acquired the rights over tailings deposited over three miles of the Natal creek, but the enormous consumption of cyanide and the low extraction, combined with bad precipitation left little, if any, profit, although the tailings were fairly rich. In the treatment the ore was mixed with lime after a preliminary water washing and washed with caustic soda solution till quite alkaline, but still the consumption of cyanide was high. The solutions came through the boxes an earthy-brown colour and quite thick, very often with organic compounds formed from the action of the vegetable acids on the cyanide. This brown matter coated the zinc to such an extent that precipitation almost ceased, and nothing but continual stirring would keep the zinc clean. The precipitate when cleaned up from the zinc boxes was very poor in gold, and was troublesome and expensive to smelt.

In 1893 I was appointed a manager of a company that was working the tailings of the Wemmer Gold Mining Company, Johannesburg. At the time I took over the management the company was in difficulties; the extractions were bad, the consumption of cyanide

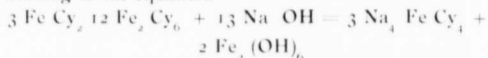
and caustic soda was high, and the precipitation of the gold was very bad. The solutions after running through the boxes, assayed over an ounce of gold to the ton of solution, and the bottoms of all the solution sumps were caked to a depth of a foot with solid iron hydrate. The tailings were highly pyritic, and the pyrites oxidized in a remarkably short time owing to the pyrites being largely marcasite. The tailings were heavily charged with ferrous and ferric sulphates and free sulphuric acid, and if put into a funnel and leached with water the solution came off deep red in colour (this colour had nothing to do with the action of potassium sulphocyanate on salts of higher iron). Shovels only lasted a fortnight on these tailings, becoming as thin as paper in that time. The works had always shown a large discrepancy between the extraction as shown by assays and the actual extraction, in spite of very careful sampling. The sampling was done by taking a sample from each truck going to the works and from each truck leaving the vats by means of an ordinary hollow rod. Moisture assays were continually made to get the correct dry weight of the tailings. Sampling a treated vat with a rod is a very bad method, as the ore is generally poorer on top than down below, owing to imperfect draining off of dissolved gold, and the rod filling at the top with poor sand goes down to the bottom filled, and the result is a lower assay and a higher extraction than is really the case. It had been the practice to leach these tailings with water in the same vat that cyanide treatment was being carried on it. Mr. W. R. Feldtmann, who was a director of the company, suggested that gold was being lost during the water washing owing to sufficient cyanide remaining in the wood and filter bottom to react with acid and generate cyanogen which would rise through the ore, forming soda cyanide with the caustic soda with the water washes. On assaying the tailings before and after water washing as high a loss of 1 dwt. of gold per ton was found. Mr. Feldtmann then suggested that water washing should be carried out in a separate vat and the sands transferred to another vat for cyanide treatment. This course was adopted and the loss of gold ceased. The process as then carried out was as follows:—After 12 hours washing with water only, the sands were transferred to another vat and mixed with lime and given a wash of caustic soda. All these washes were run to waste. To prevent iron hydrate from getting into the zinc boxes it was found a good plan to fill the vat to a depth of three inches with sand and then spread over it a layer of lime. In spite of all the water washing there would be as much as three inches of iron hydrate over the layer of lime in some very acid vats, owing to the proportion of insoluble basic iron sulphate in the sand being high. After the washes began to come off distinctly alkaline the ordinary cyanide treatment was carried out.

Before the prolonged water-washing treatment was carried out it was no uncommon thing, I believe, for the solution to come off sky blue from the formation of prussian blue by the action of basic iron sulphate on cyanide of potassium. This acid solution was run through the zinc boxes just as it was, causing a great consumption of zinc with very little precipitation of gold, and after that, probably run into a sump containing cyanide solution, the result being wholesale decomposition of cyanide according to the following equation:—



So charged were the solutions with HCy that they were positively dangerous, and two cows that managed to get only one lick each at a vat tumbled over dead without a quiver. Once or twice afterwards, owing to in-

sufficient washing, prussian blue came down, but we took care to run on caustic soda, which broke it up according to the equation.



and any free acid was neutralized at the same time. The solution was then strengthened with fresh KCy and run through the zinc boxes.

We never succeeded in reaching a normal consumption of KCy, owing to the fact that the ferrous hydrate precipitated in the vat by the caustic soda acted on the cyanide to form caustic potash,



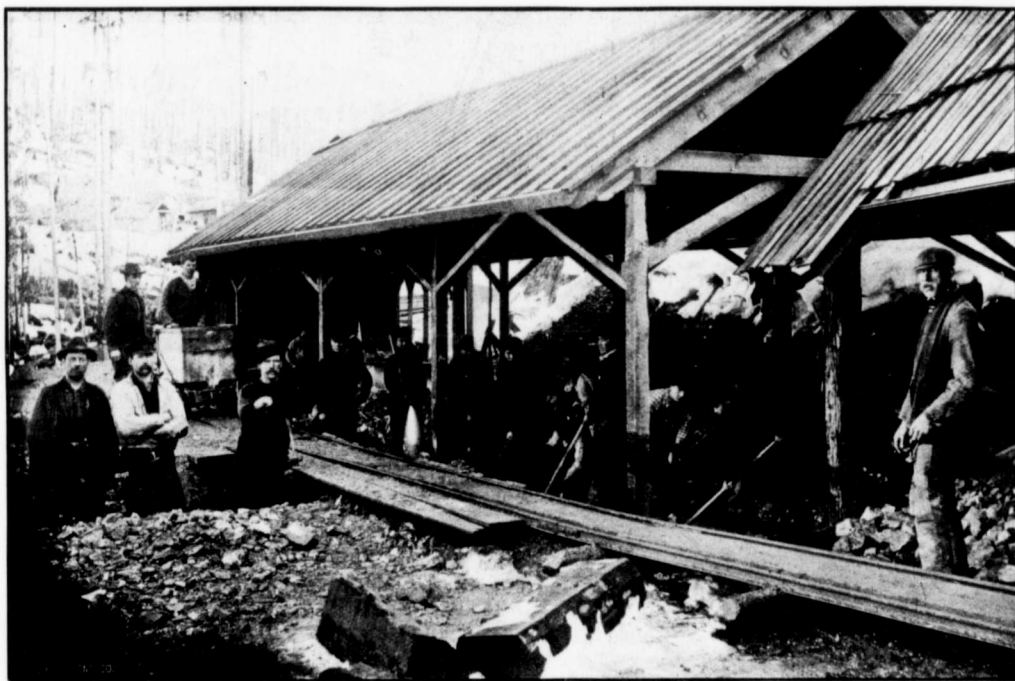
and this difficulty could not be got over. The ferric hydrate has no action on cyanide, and fortunately, fer-

sian blue which, however, very seldom penetrated more than an inch. Some managers used to break up the slime in fine lumps and mix with clean tailings. This might answer where the slime was dry and consisted of very fine quartz sand, but with clayey slimes I doubt very much whether it is not a waste of time owing to the absorption of solution by such material.

THE MINES OF VANCOUVER ISLAND.

THE MOUNT SICKER DISTRICT.

DURING the past year the area known as the Mount Sicker district, on the East coast of Vancouver island, has been the scene of much mining activity and development. The result of operations has been



THE LENORA SORTING SHED.

ric sulphate is the principal sulphate formed when iron pyrites undergoes oxidation. Covering the bottoms of the tailings vats with a layer of lime effectually stopped the iron hydrate from reaching the zinc boxes, and the solution came through quite clear. The slimes in many dams were far more acid than the tailings, not through their containing more pyrites, but owing to the fact that the rain water washed the iron salts out of the tailings, and they were absorbed by the slimes, which, after a stretch of dry weather became ready to absorb more acid, and no matter how heavy the rain was, it never washed any acid out of the slimes. The lumps of slime that got into the vats along with the tailings invariably went out rather than they went in. The slime lumps went into the vat comparatively dry and absorbed gold carrying cyanide solution, and no amount of washing would wash that solution out. Such lumps of slime when broken showed concentric rings of prus-

to justify, in the most satisfactory manner, the earlier high expectations entertained concerning the extent and value of the ore deposits of this locality. While the actual ore production is at present, relatively speaking, inconsiderable — only one mine being on a productive basis, it can now only be a question of a short time before the district contributes in an important respect to the annual copper and gold output of the Province. The principal properties, or rather those in the more advanced stage of development, of the district, are the "Lenora" and "Tyee," while there are several prospects and groups of prospects in the near neighbourhood of unquestionable promise.

The country rock is a belt of quartzose schists having an average strike of N. 60° E., tilted up at an angle of 80° and dipping S. E. The ore occurs as bedded lenticular veins, lying parallel and conformable with the enclosing schists, and occupying fissures and bulges in

them. Therefore the strike and dip of the ore bodies and country correspond. The lode matter consists of a quartz gangue, unusually dark blue in colour, carrying chalcopyrite (copper pyrites), and ordinary iron pyrites (FeS) with same value in gold. They are thoroughly typical copper ores of their class, and not likely to present any difficulties in treatment by ordinary methods.

THE LENORA MINE.

We are indebted to Mr. Henry Croft, M.E., for the following description of the Lenora mine:

The Lenora mine is situated at an altitude of about 1,400 feet above sea level, on the western slope of Mount Sicker, and is connected with Westholme and Duncans, V. I., by wagon roads seven and nine miles in length respectively; it is also connected with Westholme by The Lenora-Mount Sicker Railway which

be taken to the camp from the Mount Sicker siding.

A saw mill has been erected at the Lenora mine, and has been the means of starting the townsite upon which about eighteen houses have been erected. A large hotel is being erected, which will be a boon to the district.

On the Tye, which joins the Lenora to the east, over \$100,000 have been expended in development work; two 50 h. p. boilers, one air compressor and two steam hoists comprise the machinery on this mine which has the same veins as the Lenora.

The country rock has been in some cases impregnated with the copper sulphides on each side of the vein. The vein dips to the north at about 80 degrees; the ore body is composed principally of chalcopyrite with an admixture of iron in places and varies in width from 15 to 35 feet. Some portions of the main vein contain an-



THE SAW MILL AT THE LENORA MINE.

is $6\frac{1}{4}$ miles in length, the gauge being three feet. The railway is graded to Osborne bay (with the exception of about a $\frac{1}{4}$ of a mile) a distance of $5\frac{1}{2}$ miles.

The country rock in this mineral belt consists of talcose quartz schist, in places almost chlorite schist, graphitic schists also occur in large bodies. The rock is not very close grained and is easy to work. In places outcrops of diorite occur and overflow the schists in some cases. The main Lenora vein has a strike of about 12 degrees north of east magnetic, and appears to be the result of a fissure filled.

Mining can be economically carried on in the Mount Sicker schist belt; tunnels 5 by 7 can be driven for \$4.50 per foot.

The railway has cost about \$45,000 and is operated by a Shay-gear locomotive and self-dumping cars of 15 tons capacity each. A new locomotive will arrive about the 1st of June, when passengers and freight will

timonial ore carrying silver and gold; this occurs principally in the quartz generally along the north wall. The vein is about 40 feet in width, the principal ore bodies lying along the two walls. The outcrops show heavy iron capping, and the ore runs to the surface in many places. Quartz and baryta and quartz with schist form the gangue of the deposit. A north vein parallel to the main vein has been found. This vein contains antimonial ore and free gold, and high assays have been found in this vein which is about 30 feet in width, the first assay went \$130 in gold; 696 ozs. in silver and 14 per cent. copper.

Numbers of assays went over 200 ozs. in silver, and in the Tye vein which joins the Lenora on the east, coarse free gold has been found. The Lenora is worked by two tunnels the lower being 60 feet below the upper; a new tunnel has been started 80 feet below the present No. 2 tunnel. This No. 2 tunnel will

be run by air drills which are about to be installed, and will be 1300 feet long on the vein. No. 1 tunnel and drifts are about 1100 feet long besides stopes which contain 17 different floors. No. 2 tunnel and drifts are about 600 feet in length.

It is estimated that above No. 1 tunnel there are at least 50,000 tons of shipping ore; the lower tunnel has proved the existence of other ore bodies, and the developments on this level prove conclusively that the ore body is wider at the lower level.

To March 23, 1901, the Lenora mine shipped 11,867 tons; value \$175,831.42 as per smelter returns.

March 23 to May 6, 1901, 2276 tons of similar ore have been shipped.

In addition there are about 16,000 tons of ore that

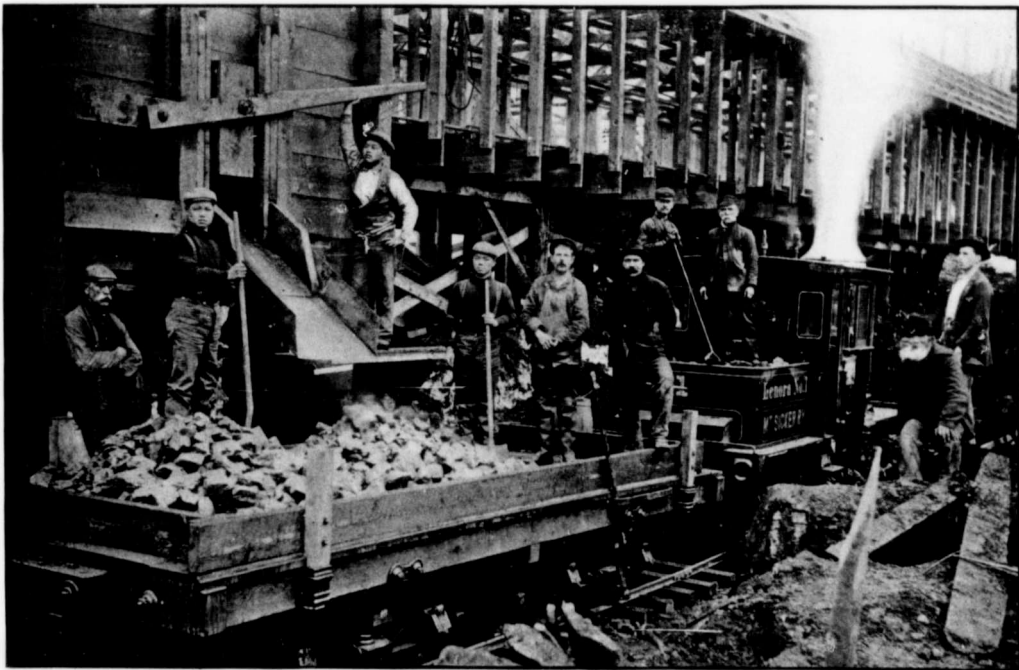
have forced the Lenora company to arrange to ship at Osborne bay.

THE TYEE MINE.

We are indebted to Mr. Edward C. Musgrave, B. A. Sc., for the following description of the Tyee mine:

The Tyee Copper Company commenced operations at this mine on the 1st of July, 1900, but prior to this the property had been opened up by the Tyee Development Company, a shaft 6 x 8 having been sunk to a depth of 200 feet with crosscuts north and south from the 160-ft. level, and a crosscut north from the bottom of the shaft.

This shaft was sunk on an exposure of copper ore which was an extension of a series of exposures on the adjoining mine, the Lenora, and proved in that mine to



THE NEW BUNKERS AND SORTING SHED AT LENORA MINE.

will pay to concentrate or ship to the smelter which is expected to be erected near the mine.

Several other veins appear on the surface, the veins upon which the property was staked being on the north side of the Lenora; this is a very strong vein of quartz and schistose matter. No work has at present been done on this vein, but it shows good indications.

The ore at present is shipped by the three-foot gauge railway, owned by the Lenora company, to Mount Sicker siding near Westholme in self-dumping cars carrying 15 tons each, then loaded by shutes into 30-ton cars of the Esquimalt & Nanaimo Railway and afterwards conveyed to Ladysmith from which port it is taken by steamer to Tacoma smelter. Ere long it will be shipped direct from the mine in the Lenora company's cars to Osborne bay, thereby saving the high freight rate of \$1.00 per ton charged the company by the Esquimalt & Nanaimo Railway Co., which conveys the ore from Mount Sicker siding to Ladysmith. These high charges

be the outcroppings of a large and valuable ore body. The shaft is situated one hundred and twenty-five feet from the Lenora boundary line, and was sunk on ore for a depth of thirty feet, when the ore twisted away to the south, but at seventy feet it was again encountered in the shaft, but thenceforward as sinking was continued no more ore was discovered. In the crosscuts to the north at the 160 and 200-ft. levels the ore was encountered and crosscut, showing a width of about sixteen feet. This ore body lies in a shattered zone of schists, the width of which has not yet been ascertained, about twenty-two feet from the south wall of the zone near the surface, and sixty-eight feet from the wall at the 200-ft. level. Imbedded in the schists masses of graphitic schists have been found, varying in thickness from three feet to one hundred feet, and near these schists the ore bodies have been found to lie. From the north crosscut at the 200-ft. level of the Tyee shaft, a drift has been driven in an easterly direction for a dis-

tance of three hundred and fifty feet. This drift was started on the ore encountered in the crosscut and for fourteen feet was in solid ore, at which point the ore was cut off and graphitic schists took its place, the drift being along these for the remainder of the distance. Crosscuts have been driven at intervals of one hundred feet, which show the existence at this level of large bodies of ore bearing schists. Upraises have been made from these crosscuts and have in every case, after going up a few feet, touched a large body of solid ore of good values. None of these upraises were carried far up into the ore body as it is intended to explore it by other means which will be explained later. There is very little doubt that this ore body is a part of the same deposit which has been explored in the Lenora. Its outcroppings have been discovered in several places

foot level was extended and cut this ore body at a distance of 150 feet from the shaft. The two spots where so far the ore body has been met, that is in the Lenora and Tyee, are six hundred feet apart, and in each case it occupied the same position with relation to the south wall of the ledge and was similar in appearance and size. In the Tyee this ore body has not been sampled for assay, but a selected sample taken from it gave returns of copper, 11.1 per cent.; gold, 1.2 oz.; silver, 64.2 ozs., or a total value of \$83.72 per ton. A crosscut is now being driven from the eastern extremity of the drift along the graphitic schists, which will have to be carried for a distance of eighty feet to cut the ore body, but when it is completed it will show a continuity of 350 feet. As this ore body outcrops about 400 feet east of the shaft and where it has been encountered in



LENORA ORE ON E. & N. RAILWAY CO'S CARS.

on the Tyee, and the lower part of it has been touched by the upraises, a short distance above the 200-foot level of the Tyee shaft, so that there is good reason to believe that between that level and the surface, over a distance from the boundary line of the Lenora to the eastern extremity of the drift along the graphitic schists or a distance of nearly 500 feet, there is a large and valuable body of ore, also there is no reason to think that its eastern end has yet been reached and how much farther east it extends can only be discovered by future development in that direction. A few months ago a new ore body was discovered in the Lenora mine about ninety feet north of the No. 1 ore body. This, although much smaller, was found to be very rich, some samples from it being assayed gave returns running into the hundreds of dollars per ton. In order to find this in the Tyee, the north crosscut from the shaft at the 200-

the first crosscut it is solid and in place. There is no doubt that it will again be met with in the crosscut now being driven. As the body is three feet in thickness and apparently extends for a long distance in an easterly direction and down from the surface to at least a depth of 200 feet, it is evident that its discovery has greatly added to the value of the property. During the past winter equipment consisting of two 50 horsepower boilers, a hoisting engine and a three-drill Ingersoll-Sergeant air compressor has been installed, and a working shaft with two 4 ft. x 5 ft. hoisting compartments and one 5 ft. x 5 ft. man and pump way has been sunk to a depth of 120 feet. As soon as this shaft is sunk to the 200-foot level of the old shaft, and is connected with the workings from it, all work will be carried on through it. Levels will be run from this shaft and all the blocking out of the two ore bodies

that have been already discovered will be done from it.

Machine drills are being used for sinking this shaft and they will also be used in future operations from it, such as drifts, crosscuts, etc.

It is the intention of the company to ship no ore for some time but to confine operations to a systematic exploration of the ore bodies already discovered and to defer any extensive system of operation until these bodies are blocked out and show a considerable tonnage in sight.

THE COPPER CANYON GROUP.

Another very promising group of claims known as the Copper Canyon, situated on the western slope of Mount Sicker and on the southeastern slope of Mount

the bank shows other ore bodies, but nothing worth mention has been done to exploit these. The work is valuable as showing that a belt of about 150 feet in width forms a mineralized zone and anywhere in that belt development will strike more or less ore. At the present time three parallel veins have been found on the properties, the distance between the outside walls being about 142 feet. It may be that these three apparent veins are only one vein, as no great amount of development work has been done on them, but there is every indication by taking into consideration the direction of the strike of the Lenora lead with the strike of the Victoria lead that the veins are the same; at a distance easterly from the above work of about 1000 feet two shafts have been sunk, each about six feet deep on two veins of exactly the same formation as the river,



TERMINUS OF MOUNT SICKER MINE.

Brenton, has recently been acquired and a company known as the Mount Sicker & Brenton Mining Company incorporated for the development and operation of the property. On one of the claims, the Victoria, an outcrop of silicious schist occurs and forms a bluff known as Red Hill, owing to the gossan resulting from the decomposition of the pyrites in several veins of ore forming an iron capping. An open cut has been put in across the formation and three separate veins exposed. The work done is insufficient to permit of exact data being given but the indications demonstrate the existence of ore. At the Chemainus river bank a drive has been run for thirty-seven feet, with a shallow winze in face five feet deep. Strike of ore N. 60° E. (mag.) dip 80° S.E. The average variation of width of ore is from a few inches to twelve or eighteen feet, and at places three feet width was found when driving. Some fifteen tons of good quality ore are upon the dump assaying 14 per cent. in copper (\$28). Certain small work along

the vein matter consists of quartz carrying white iron which is likely to be replaced with copper at depth. On the Susan also a similar vein has been found with identically the same iron capping as exists on the Lenora. The workings of the Victoria claim are about 500 feet above the Chemainus river, and the workings on the Susan, which consist of stripping, are about the same height above the Chemainus river. It may be discovered when adequate development work has been done that the schistose matter, which is mainly silicious impregnated with calcite and often having the structure and appearance of steatite and which contains the mineral, is one vein. If this is so it will be the same formation as exists in the Lenora mine.

Owing to the soft character of the schist formation development work can be conducted at a comparatively low cost, and a tunnel, for instance, 5 x 7 feet can be driven for \$4.25 per running foot. Power is obtainable from the Chemainus river; there is an abundant supply

of timber and the proximity to deep water admits of economical transportation of ores. In fact the economic conditions are eminently favourable and with the undoubtedly large and rich ore exposures in the neighbourhood there is no longer room for doubt but that the Mount Sicker district will shortly become a valuable addition to the productive copper-gold area of British Columbia.

It has long been recognized as a remarkable geological fact that, while the productive coal areas of the Eastern States and Nova Scotia belong to the true Carboniferous formation, those of the Pacific coast are found in a more recent series of rocks, viz., the Cretaceous division of the Mesozoic. Lower Cretaceous rocks cover a considerable area in British Columbia, and embrace within their limits the coal measures of the Crow's

Nest Pass, on the mainland, and of Graham island and part of the adjacent Moresby island.

The Nanaimo and Comox coal areas on Vancouver island also belong to a period more recent than the true Carboniferous age, viz., the upper portion of the Cretaceous.

Graham island, which is some 60 miles long by 40 wide, is divided for more than half its length by a broad and deep arm of the sea, called Masset Sound, which has its entrance near the village of Masset on the north side of the island. The banks of this inlet are for the most part low and flat, with occasional lines of hills and isolated cones of volcanic origin. At its upper extremity in the interior of the island, the inlet enlarges to form a lake-like expanse of water, with many bordering lagoons and small lakes.

Between the upper end of Masset inlet and the waters of Skidegate inlet on the south of Graham island, are the most important of the known coal areas of the island. This coal district has never been explored in a systematic manner, although a few surface showings of coal have been followed for a few feet in several cases. The exposures of coal seams in the district are the result of distortion of the strata by pressure and upheaval of the west coast mountain range. A few square miles of coal land have been taken up in the district northwest of Skid-

egate, but there is reason for the belief that extensive areas of undisturbed coal measures exist in basins beyond the boundaries of lands already taken up, some of which were seen by the writer during a visit to the island in the summer of 1900.

Exploration work which was undertaken some thirty years ago in the vicinity of the Ya-koun river resulted in very little information being gained as to the extent of the coal deposits of the district. The chief difficul-



THE LENORA ENGINE AND RAILWAY LINE.

THE COAL AND ASPHALTUM DEPOSITS OF THE QUEEN CHARLOTTE ISLANDS.

(By W. F. Best.)

RECENT legislation providing for a railway between the sea coast and the interior of Graham island, has served to awaken interest in the almost unexplored Queen Charlotte group,

ties encountered by the explorer in that district are those resulting from dense forest growth, and the distorted condition of the rock formation in the vicinity of the outcrop of coal.

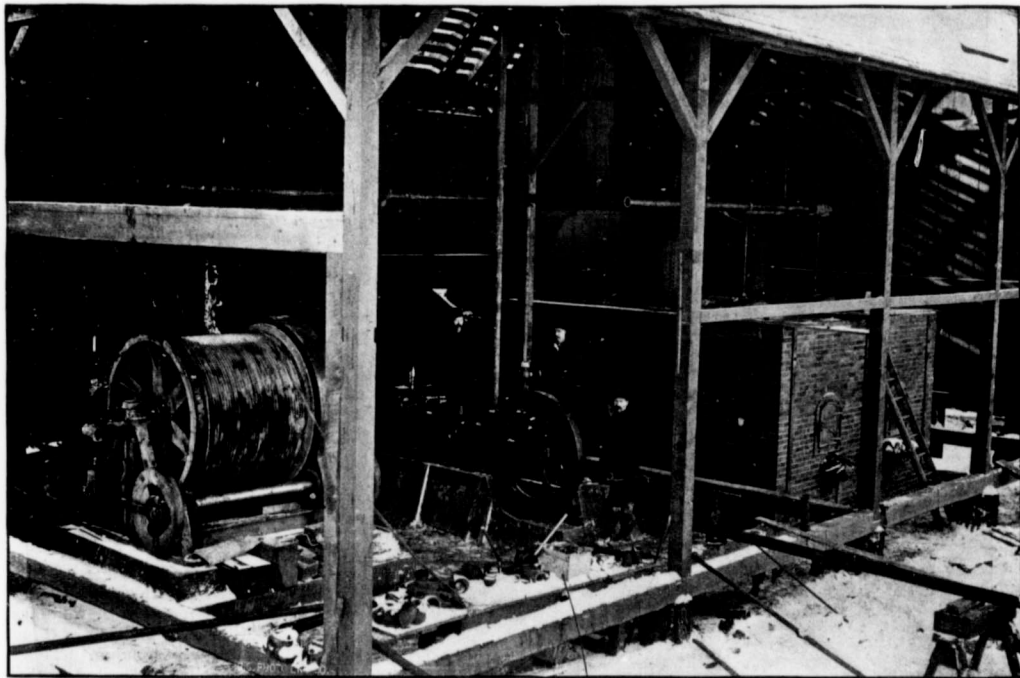
The proximity of the mountain range which skirts the west coast of the island close to some of the finest exposures of coal-bearing rock, accounts for the extensive twisting and faulting of the measures, wherever the seams of coal have been noticed.

Much more suitable localities for systematic prospecting in undisturbed strata are to be found in comparatively level sections of country both east and northeast of the Ya-koun river and also between Cape Ball and a small stream which enters the upper part of Masset inlet. The outcrops of semi-anthracite which occur a few

anthracite were also tested with good results. Up to the present time lack of transportation facilities has prevented the development of these promising areas, but with the advent of the projected railway, and the construction of trails through the district there will no doubt be a remarkable development of these coal fields.

The similarity of the geological conditions existing at the Crow's Nest Pass with those on Graham island are sufficient to warrant the expenditure of capital in the systematic exploration of the coal measures of the Ya-koun basin, and no doubt British Columbia will shortly be able to place Graham island in the list of productive coal fields of the province.

An interesting feature of the tertiary formation in the



THE TYEE HOIST AND COMPRESSOR PLANT, MOUNT SICKER DISTRICT.

miles northwest of Skidegate village, stand almost on edge. Naturally the coal found at and near the surface, under such conditions, is very much broken up and crushed by the pressure of the adjacent mountains, and intrusive dykes of igneous rock.

The gradation of this coal from semi-anthracite in the vicinity of the intrusive rocks, to bituminous coal near Masset inlet, is undoubtedly due to the relative distance of the coal from the mountain range.

The chief outcrop of semi-anthracite has a thickness of some six feet, while the less compressed bituminous coal, found near the Ya-koun river, is said to be eighteen feet in width. Some years ago a shipment of several tons of the bituminous coal was made to Victoria and the result of tests made indicated that the coal was a very satisfactory fuel. Samples of the semi-

northwest part of Graham island is the extensive area of country in which asphaltum "seepages" and other indications of mineral or petroleum oil are found. At several points ten or fifteen miles apart small streams of liquid asphaltum issue from the rocks near the sea shore, and harden on exposure to the atmosphere.

Recently extinct craters of small volcanoes which still retain their form, are seen in many places, while beautiful masses of basaltic columns, rivaling those at the Giant's Causeway, are numerous at certain points on the coast.

It is generally in the immediate vicinity of these extinct volcanoes that the liquid asphaltum makes its way to the surface and cements the gravel and rounded stones of the sea shore into fantastic forms, towering to the height of thirty or forty feet above the general level.

At points to the south of B. C., notably in California and adjacent states there are large tracts of country where seepages of asphaltum have been known to exist for a number of years. Some of the asphaltum districts of California have recently been found to contain petroleum oil below the surface, and extensive development of these oil-bearing districts is being carried on at the present time.



TUNNEL ON COPPER CANYON, MOUNT SICKER DISTRICT.

As is well known coal oil or petroleum oil is a liquid or semi-liquid substance which has been formed by the action of subterranean heat on coal and other carbonaceous matter enclosed within the rock formation below the earth's surface.

The volatile portions of the carbonaceous matter that have been driven off by the heat ascends through fissures in the rock formation till it condenses in the cool-

er strata above, from which it penetrates sands and porous rocks till it finds suitable lodgment in basins and rock reservoirs.

One cubic foot of oil sand will hold more than a gallon of petroleum oil, and an acre of sand one hundred feet deep will hold more than 2,000,000 gallons of oil. It will thus be seen that a small area of oil sand may contain a very large amount of oil.

When the volatile oil is driven off by subterranean heat the tar-like asphaltum is forced to the surface of the earth where it hardens sufficiently to cement together the gravel and small stones among which it flows.

This is exactly what takes place on Graham island also on another island, south of Skidegate known as Tar island.

If certain sections of Graham island are prospected with drills to the depth of perhaps 500 feet it is probable that oil basins will be encountered, and at no distant day there may be a rush to the British Columbia oil fields.

At the present moment there is at least one geologist engaged in studying the possibilities of Graham island as a coal and oil region, and perhaps before the year ends there may be important developments in that district.

COMPANY MEETINGS AND REPORTS.

YMIH GOLD MINES, LIMITED.
ENGINEER'S REPORT.

LAST month we published the report of the annual general meeting of this company in London. This is now supplemented with excerpts from report of Mr. S. S. Fowler of operations at the mine during the past year:

The new battery of 40 stamps was put in operation a little before July 1st, but during June the whole mill was hung up for practically three weeks in order to connect the new and old parts and rearrange shafting and various parts of the plant. During July and August the old battery was being extensively repaired, and during the latter month we suffered from an accident to the engine, at a time when the water for power was at a very low stage. Again in November the heavy countershaft, through which the water and steam-power systems join, was broken. All of these, together with other delays, such as are caused by freezing and accidents to the

flume line, have made our mill record one not to be looked upon as an example of what we may hereafter expect.

The monthly crushings were as follows :

January,	40 stamps,	22 days	7 hours,	2160 tons
February,	"	23 "	0 "	2263 "
March,	"	27 "	2 "	2682 "
April,	"	29 "	2 "	3000 "
May,	"	30 "	7½ "	2990 "
June,	"	9 "	2½ "	892 "
July,	80 stamps,	23 "	19½ "	4650 "
August,	"	20 "	9 "	4100 "
September,	"	28 "	16¼ "	5730 "
October,	"	29 "	3 "	5630 "
November,	"	18 "	12 "	3663 "
December,	"	25 "	11½ "	4900 "

Total 80 stamps 216 days 10 hours 42,660 tons

Average per 24 hours, 197.10 tons, or 2,464 tons per stamp per day, as compared with 2,483 tons during 1899. This difference against 1900 is principally, if not entirely, due to the increased hardness of the quartz.

The cost of mill operation during the year was 66 cents, and of repairs 24, making a total of 90 cents. As compared with 1899 (76¼ cents), the increase of 13¾ cents is due principally to repairs, and partly to the fact that 40 shoes and dies, supplied with the original mill, were not taken into account as supplies, but the actual operating labour during 1900, including the share of extra cost incurred by running the steam plant, was three cents per ton less than in the preceding year. We confidently expect to show a considerable decrease for 1901.

Tramway.—The duplication of milling plant created the necessity of altering the wire tramway plant. This was effected by the introduction of a better loading device, and the provision of larger buckets. Operations for the year shows a good saving, the cost being 7¾ cents per ton, while in 1899 it was 15 1-2. This difference, however, is largely due to the greatly increased tonnage handled with a labor increase of only one-third. The total cost per ton during 1900 was 10.76 cents, and this amount includes the cost of two new cables, one of which proved to be of very poor material and had to be discarded after carrying about 20,000 tons. Had this not been the case the year's cost would have been reduced by three cents per ton.

General Expenses.—Under this head there has been an unavoidable and considerable increase, and the largest item is \$4,281 for the British Columbia government mineral tax on our output. This tax was formerly 1 per cent. and since July 1st, 1900, has been 2 per cent. of the value at the mine; and although our mining costs are as low as we think it possible to make them, the amount paid for the year is very nearly 2 1-2 per cent. of our operating profits, and since 1st July on the present basis, we are actually taxed 3½ per cent. of our profits before allowing anything for depreciation or London expenses. Per ton of ore milled, this tax item amounts to 10 cents, and all other general, office, salaries and contingent charges to about 40 cents.

General Remarks.—It will be noted that we have shipped a small amount of crude ore during the year, viz., 83 tons. This is owing to the fact that the ore body from which we shipped in 1899 (385 tons) has been exhausted, and it is seldom that we now find material in which the values are sufficiently concentrated to make it worth while sorting.

We expect to have our experimental cyanide plant, of ten tons daily capacity, in operation 1st February, and trust that the results will justify our advising the construction of plant to handle 150 tons or more.

During the year several cottages have been built for married employees at the mill, and these are bringing in a fair rental, while the accommodation and convenience afforded appear to be much appreciated by the occupants.

Beginning the new year, the rates for smelting our concentrate were increased by one dollar per ton, while the price paid for lead has been decreased by 30 cents per one hundred pounds. This means a decrease in returns of about \$2.15 per ton of concentrate, and probably will amount to \$10,000 less than would have been received under the rates which prevailed during the two years past.

PRODUCE OF THE MINE.

	Tons.		Tons.
Milling ore stoped	41,643	Ore milled	42,660
Milling ore from shaft	1,339	Crude ore	83
Crude galena	83	On hand in mine	322
Total	43,065	Total	43,065

QUANTITIES AND VALUE OF PRODUCT.

	Ozs.	Gold Ozs.	Silver Ozs.
Bullion	23,063	12,036.625	8,730.13
Concentrate	2,950	3,327.830	36,717.23
Crude ore	83	219.822	1,411.88
Totals		15,584.277	46,859.24
Average per ton	42.743	0.3046	1.096
Average 1899	17.522	0.4812	1.425
	Lead lbs.	Gross value.	Value P.T.
Bullion		‡254,098.80	‡5,9448
Concentrate	1,265,738	*119,467.13	2,7950
Crude ore	36,248	*6,046.10	0.1415
Totals	1,301,986	\$379,612.03	\$8.8812
Average per ton	1.523 2/3		8.8813
Average 1899	1.863	\$209,145.33	\$11.94

AVERAGE RECOVERY FROM MILL FEED PER TON, FOR 1900 AND 1899.

	1900	Oz. Gold.	Oz. Silver.	% Lead.	Gross val. \$
Bullion	0.2822	0.2046			5.9560
Concentrate	0.0780	0.8607	1.474		2.8004
Total	0.3602	1.0653	1.474		8.7564
1899					
Total	0.3965	0.8930	1.114		9.4607
Concentrate	0.0702	0.6680	1.114		2.5887
Bullion	0.3263	0.2250			6.8720

The former table very well illustrates the effect of the rich carbonate and galena ores shipped during 1899. The table of mill feed recoveries shows a net decrease of about 70 cents per ton; the decrease of bullion recovery of \$0.916 having been partially offset by an increase in concentrate of \$0.2117. The condition of the ore which partly accounts for this is further reflected in the statement that whereas, in 1899, 82.3 per cent. of the mill ore recovery of gold was in bullion, it was, during 1900, only 78.3 per cent. This percentage may of

‡ All gold at \$20.67 per ounce; all silver at market price.
*95 per cent. gold at \$20.00 per ounce; 95 per cent. silver at market, 90 per cent. lead at M.
† Corresponding figures in last annual report were exclusive of express, freight and smelting charges.

course still further be decreased as the volume of material treated from the lower levels increases; still it is expected that any increased degree of refractoriness will be more than compensated by our cyaniding operations.

COSTS PER TON (42,743 TONS).

MINING.

	Labour.	Other charges.	Totals.
Stoping	\$1.4483	\$0.3561	\$1.8043
*Development	0.2425	0.0570	0.2995
Repairs	0.0187	0.0143	0.0329
Totals	\$1.7095	\$0.4274	\$2.1367

MILLING.

	Labour.	Other charges.	Totals.
Operation	\$0.3670	\$0.2930	\$0.6600
Repairs	0.1823	0.0573	0.2396
Totals	\$0.5493	\$0.3503	\$0.8996

TRAMWAY.

	Labour.	Other charges.	Totals.
Operation	\$0.767	\$0.0010	\$0.0777
Repairs	0.0096	0.0202	0.0299
Totals	\$0.0863	\$0.0212	\$0.1076

*Other than No. 10 adit and Ymir shaft.

SACKING AND TRANSPORT TO YMIR STATION.

	Labour.	Other charges.	Totals.
Express, freight and smelting	\$0.0399	\$0.1627	\$0.2027
			0.9901

OFFICE, ASSAYING, ETC.

Salaries	\$0.1558
Telegrams and postage	0.0138
Assaying	0.0131
Office supplies	0.0073
Traveling	0.0278
	\$0.2198

CONTINGENT.

Exchange	\$0.0091
Insurance	0.0386
Legal charges	0.0031
Taxes	0.1002
General	0.1327
	\$0.2837

SUMMARY.

	Amount.	Cost per ton.
Mining	\$91,327 48	\$2.1367
Milling	38,451 93	0.8996
Tramway	4,597 29	0.1076
Transport, etc.	8,662 44	0.2027
Salaries and office	9,397 24	0.2198
Contingent and general	12,125 09	0.2837
Freight and smelting	42,319 04	0.9901
Total	\$206,880 51	\$4.8402
Total omitting freight and smelting		\$3.8501

Comparison of these costs and the total of \$3.85 per

ton for all operating expenses, except smelting, with the figures given in our last annual report, wherein the total cost per ton was shown to be \$3.32, appears to manifest an increase of 53 cents per ton during 1900; but it must be remembered that the mining costs per ton of mill feed during 1899 were much reduced on account of our having had at that time over 5,000 tons of ore on the dump, the cost of producing which was partly incurred by the vendors of the property, and partly was included in development. As a matter of fact, had all the ore which was milled in 1899, been stoped the total cost would have been almost exactly the same as in 1900.

On the whole, I am glad to say that the present condition of the property and plant is excellent; and that while there is always the possibility of geological disturbance below our lowest workings, there has been thus far little, if any, cause for anxiety as to the future, in this respect. The outlook therefore seems to be a very bright one, and the general situation one on which I think the company is to be congratulated."

GRANITE GOLD MINES.

An extraordinary general meeting of the shareholders of the Granite Gold Mines, Limited, was held on Monday, at Winchester House, Old Broad Street, E.C., for the purpose of considering, and, if thought fit, passing the following resolutions, namely:

1. That it has been proved to the satisfaction of the company that the company cannot, by reason of its liabilities, continue its business, and that it is advisable to wind up the same, and accordingly that the company be wound up voluntarily.

2. That Mr. William McEwen, of Monument Square Chambers, London, E.C., chartered accountant, be and is hereby appointed liquidator for the purposes of such winding-up.

Mr. Alex. McNab (Chairman of the company) presided. The Secretary, (Mr. R. Roy Meldrum), having read the notice convening the meeting

The Chairman said: Gentlemen,—As Chairman of the Board of Directors, I cannot tell you how greatly I regret the necessity of having to call you together today to consider the position of the company and to pass the resolutions which our secretary has just read to you. When I last addressed you at the general meeting in December of last year, I told you of our purchase of the Poorman mine, and of our debt to the Duncan Mines, Limited, and our overdraft to the bank. Neither of these debts embarrassed us at the time I addressed you in any way, for not only were we satisfied with the value of the property, but I also told you that financial arrangements were on foot by which the directors had every hope of finding the further funds necessary to ensure the success of the company. In January last your directors were threatened with proceedings in British Columbia by certain of the Poorman shareholders, and as a consequence both the bank and the Duncan Mines, Limited, obtained and registered judgments against the company in order to protect their interests. These judgments amount, respectively, to £2,000 and £26,913 18s. 7d. As these threats have not been withdrawn, your directors are advised that it will be wholly inadvisable and prejudicial to the interests of the shareholders to discuss the details of that matter at this meeting, except to say that the whole position has been laid before the principal shareholders, who have approved the course the directors are taking, and that the directors have also been advised that there is not the

slightest doubt but that the proceedings will result in favour of the company. Negotiations are in progress—and although I cannot yet give you the details, they will be submitted to you as soon as possible—by which it is hoped you will be enabled to participate in an amalgamation scheme which is on foot, and which it is considered, when carried out, will be of a beneficial character to the shareholders. The last reports from the mine are as recent as 13th April, and are extremely satisfactory, and the directors feel assured that, before very long, if the proposed scheme, which will provide for working on a much more extensive scale, is carried through, our properties will be very successful. I may mention that the directors have received proxies representing £100,000 worth of capital in favour of the proposal now submitted, and none against. I have also to state that Mr. McEwen, who is referred to in the second resolution as the proposed liquidator of the company, has written a letter regretting that he cannot accept the appointment. Therefore it will be for this meeting to elect some one in his place. The Chairman concluded by moving the first resolution.

Mr. Mitchell seconded the motion, which was carried unanimously, without discussion.

THE MONTH'S MINING.

KAMLOOPS.

(From Our Own Correspondent.)

THE mining developments of the past month have been more encouraging. It has been known all along by a favoured few that the Iron Mask was more than fulfilling the best hopes of the owners, but it remained for the owners to make this public, which was done during the month by a cablegram from Capt. Argall to the London office. The management propose to continue opening up the mine to the proposed adit level at the depth of about 200 feet, the present depth of shaft being 250 feet. The adit

SATISFACTORY DEVELOPMENTS. tunnel is then to be driven. All this, however, will take time, but when the programme has been carried out, the mine should be a steady producer.

The Hall Mines smelter have leased the Glen iron mine for five years, and are opening the mine up on a large scale by means of a tunnel from near the railway track. They expect to ship three carloads of ore (magnetite) a day, and at present are employing twenty men.

Early in April a shipment of a little over eleven tons of high-grade ore, taken from the exploratory workings of the Copper King mine, was made to the Trail smelter. The returns, which are very satisfactory, are as follows: Copper, 18.6 per cent. (dry assay); gold, 1 oz. per ton; silver, 6 ozs. per ton—a total value of \$45 per ton; net value, slightly over \$56 per ton. The net proceeds of the shipment were \$616. Most of the recent work performed on this property has been in the drift from the bottom of the shaft, which is down 40 feet. The drift was continued for about 90 feet. Besides the high-grade ore forming above shipment, several carloads of lower-grade ore were taken out, which will average about \$25 in all values. Forty feet of work has been done in the tunnel to tap the ore body at a depth of about 106 feet. Low-grade ore is seen in the face of the tunnel, but the main ore body is not expected to be met until another forty feet of work has been done in the tunnel.

The Python continues to work steadily, the tunnel being in 350 feet. The upper workings are being drained at the rate of about a foot a day, and will soon be quite dry.

The Wheel Tamar group is being worked by Boillot Bros., of Paris. The shaft is in low-grade copper-gold ore.

There is no better place in British Columbia at present for prospectors than the Kamloops mining division; but it is a lamentable fact that instead of hundreds of prospectors working in the hills here, there are only some half-dozen men who claim to be prospectors, and most of these are obliged to obtain work in the mines for a greater part of the season. There is undoubtedly a great field here for investigation.

The Dredge at Jamieson Creek nears completion. It is an immense affair, as may be judged from the fact that three carloads of machinery for it have already gone up the river. It is to be hoped that it will prove a big success.

Mr. E. C. Wood, of Boston, is here, preparing to commence work on the Chieftain group, on Sugar Loaf. This group has been floated in the East.

REVELSTOKE.

(From Our Own Correspondent.)

Revelstoke itself is, as usual, very quiet, though there are many waiting in enforced idleness till it shall please the powers that be to make the Big Bend wagon road passable; for, unfortunately, a considerable portion of the work done on it last fall has been destroyed by the (fully expected) landslide, and will have to be repeated this year. In fact the trail

THE BIG BEND. is worse than ever, and some points require the assistance of one's eyelashes and the skin of the teeth to hang on by. But there are very favourable indications of the near advent of a steambot, which will be constructed at Nakusp, probably by the C. P. R. workmen there, and proceed up to Revelstoke and the upper river when built. As regards the Big Bend, work will be resumed on the Blue Jay placer claim as soon as communication can be established, and in addition the lumber industry should flourish, as nearly twenty new timber limits are being applied for, to furnish logs for the new saw-mill now being erected at the Big Eddy (close to the town). A pulp mill is also in contemplation, so that this old railroad town may be said to be looking up again. There is a small force of men at work on the Jordan trail, which gives access to some well-known and very extensive claims a little way up the Jordan Pass; the said claims will prove exceedingly valuable when means of transportation are provided, though that can hardly be accomplished for a year or two yet to come.

A very interesting report on the general country in the extreme northerly part of the Big Bend was recently made by Mr. Adair, who made the trip via Beaver, B. C., and followed the course of the river down to Revelstoke. He says there is plenty of fine agricultural land, a light snowfall, and any amount of first-class timber. When the fact of the existence of the mica mines that have been already referred to in that immediate locality, is added to these inducements, it seems hard that the district should be so difficult of access, as it is evidently well worth the attention of settlers, who will, when transportation is provided, find a ready market for their produce. The Keystone Mountain properties (near Downie creek) will try to ship this summer, and also the Prince Mining Co., in Standard Basin. But everything depends upon transportation, and while we are trying to help ourselves, it is not too much to ask the government, that collects our taxes with so much alacrity, to help us, by developing our resources, to put ourselves in a position to pay these same taxes with more cheerful feelings (if any such are ever possible) than we can have at present.

In the Lardean, mining matters are very quiet just now, as the Nettie L. has been obliged, on account of water, to lay off most of the miners. This will not last more than a month or so, and when that mine starts with full force, and the Double Eagle Company's adjoining property, the May

LARDEAU. Bee, together with the Triune and the other almost innumerable mines and partially developed prospects, the Lardean will be busy indeed during the coming season. It is worth recording that the Nettie L. has found another unexpected body of very high-grade ore in the course of development towards the next claim (the Ajax), so keeping up the lucky record of this mine.

It is intended to instal an electric light and power plant in or close to Ferguson by utilising the power of the Lardean river, so that the district fully intends to have all modern improvements, in addition to a very considerable pay-roll. On Poed creek (near Fish creek) there has been made a new find of what is said to be higher-grade free-milling gold rock than that found in the Eva already reported, and there can be no doubt that as that difficult country gets explored more finds, equally good or better, will be made. We are in our infancy yet (though that is no reason why we should be taxed almost to death!) but wait till we grow up!

BOUNDARY DISTRICT.

(From Our Own Correspondent.)

In last month's letter, the estimated output of ore for April from the three producing mines of the Boundary District was given as 33,000 tons. The quantity actually shipped by these mines was 34,216 tons, as under:

	Tons.
Old Ironsides and Knob Hill Group.....	18,904
Mother Lode	9,480
B. C.	5,832

Total

34,216
There were two or three small shipments besides, but these together did not bring the gross output up to 35,000 tons. During the first half of May the output did not maintain quite so good a daily average as during April. The latter half of

the month may, however, bring the average up, so that it is not too much to expect that the total output for May will be very little, if anything, short of 35,000 tons. In any case, the aggregate output to the end of May should be not less than 240,000 tons, allowing an estimate of only 33,000 tons for May, as follows:

	Tons.
Ore shipped during 1900.....	97,533
Ore shipped during 1901 to April 30.....	110,246
Ore shipped during May, 1901 (estimated).....	33,000
Total	240,839

There is not much to comment upon in connection with the month's work at the producing mines of the district. All three have continued to carry out a progressive policy, and by their substantial output are begetting an increasing confidence in the district. The month was a record one for both the Mother Lode and the B. C., in regard to output of ore, the former having shipped 9,180 tons, as compared with 4,539 tons in March, its previous highest record; and the latter 5,832 tons, as against 3,672 tons shipped last October, and which constituted its maximum monthly output until exceeded by its April total. Construction work is for the time practically completed at the Mother Lode, the new plant and machinery having all been installed and several new buildings erected. An interesting feature is the successful opening up

of these quarries, which are together equ-quarrying at tributing materially to the output of the MOTHER LODE mine, the ore carrying values more than sufficient to make its treatment a source of profit. The working of these surface openings, with their big faces of ore, has not, however, in any degree withdrawn attention from the underground stopes, which are still supplying the bulk of the ore sent to the smelter. Although the Old Ironsides and Knob Hill group did not, as regards total for the month, make a fresh record in April, its December shipments having totalled 19,513 tons, or 609 tons more than the April total, it did make a new record in its daily average. For the 31 days of December the daily average output was 628 tons, while that for the 30 days of April was 630 tons.

Mr. Jay P. Graves, general manager for the Miner-Graves Syndicate, visited the Old Ironsides and Knob Hill mines early in May. A local newspaper published an account of an interview with him, but it contained general rather than particular information as to the intentions of the management in the direction of additions to plant and buildings. There does not, though, appear to be any reason to doubt that a large air compressor and hoisting engine, both larger than anything of the kind yet installed in the Boundary district, are to be added to the plant ere long. Machinery firms have already been asked to submit prices for these. As preparations are now in progress at the smelter to double the treatment capacity of those works, it is apparent that provision must soon be made at the mines from which the smelter draws its main supply of ore, to double their output, so that the installation of larger plant at the mines has now become a necessity. Mr. Graves is reported as having stated that "the new plant to be put in by the company, with the accompanying improvements, would probably cost in the neighbourhood of \$250,000 when completed." This is indefinite, both as to amount to be immediately expended and the length of time over which the total expenditure is to be spread. However, if during the current year only from \$80,000 to \$100,000 be spent in additions to the equipment of the Old Ironsides and Knob Hill mines, they will then be the best in the district, and will be more than equal to the intended larger output of 1,200 tons daily that four or five months hence will be required of them.

It has been announced that a new company, named the Snowshoe Mines, Limited, has been organized in London, England, to acquire the Snowshoe group, in Greenwood camp. This group has for some time past THE SNOWSHOE, been under development by the British Columbia (Rossland and Sloean) Syndicate, which has promoted the new company. Particulars of the new organization have not yet been received, but these will no doubt come to hand shortly. An illustrated description of the property appeared in the April issue of the Mining Record. The following is additional information relative to the mine:

The mine continues to open up very satisfactorily. To date about 5,100 lineal feet of work has been done in developing the mine, nearly 1,000 feet being sinking and raising, some 3,500 feet crosscutting and drifting, and about 200 feet surface or open cuts. Latterly most attention has been given to what is known as the railway tunnel and its connecting workings. This tunnel has been driven about 500 feet into the hillside, and from it several crosscuts have been run both north and south. Those in the latter direction passed through the ore body in much less distance than those to the north. This was only to be expected, since the ore dips north, which makes the property all the more valuable, the workings above referred to being in the southern part of the claim. One north crosscut is in ore for more than 200 feet. A raise to the surface for air is about 200 feet on the incline, and is in ore

all the way but a few feet, where a shaft was sunk some 20 feet to meet it. A winze sunk from the lower tunnel level is down 100 feet, and a crosscut from the bottom of this winze is now in more than 100 feet. These several workings have exposed a deal of ore, and as the development progresses much ore is being blocked out in readiness for stopping so soon as the management shall commence shipping in quantity. So far only shipments for test purposes have been made at intervals, the tonnage to date aggregating only about 450 tons. There is now, though, a large quantity of ore accessible, so that whenever the conditions in the direction of freight and treatment charges shall better meet the views of the management, a considerable and continuous output will be quite practicable. Meanwhile the mine is being extensively prospected, and preparations are in progress towards making it a regular producer whenever the time shall be ripe for this forward movement.

Four directors of the Morrison Mines, Limited, lately visited the Morrison mine, near Greenwood. The party consisted of Mr. F. H. Oliver, managing director; Mr. John Hunner, who was lately appointed president of the company in the place of Mr. E. J. Roberts, resigned; and Messrs. E. K. Erwin and T. J. Graham. An invitation was afterwards extended to Mr. G. H. Collins and other Morrison stockholders, including several who took part in the meeting held recently in Greenwood, to meet the directors to discuss the affairs of the company. This opportunity to obtain information was not, however, taken advantage of by local stockholders.

In the course of conversation with the directors, it was ascertained that they court examination and enquiry into the accounts and expenditures of the management. They state that the total expenditure to date, including all payments connected with the purchase, development and equipment of the Morrison mine, has aggregated only about \$55,000. All costs of incorporation of the old Morrison company and of organization and incorporation of the present company are also included in this amount. Approximately 2,500 feet of work have been done underground in development of the property; and a power plant, consisting of a four-drill Rand straight-line air compressor, a 30x10 air receiver, three machine drills, a 20-horse-power upright boiler, a 7x9 double-cylinder Lidgerwood hoisting engine, Snow boiler feed-pump, and other appliances, have been installed. There is a deal of ore showing in the mine workings, and now it is only a matter of additional equipment and the putting in of a railway spur, to cheapen the cost of transportation, to make the mine a regular shipper. An 80-horse power horizontal return tubular engine and a No. 7 Cameron sinking pump have been ordered, and more machinery and plant will be added as circumstances shall require and warrant the outlay. The directors point out that they are themselves comparatively large holders of stock so that if it were practicable to further develop the mine without assessments, they would be only too glad to dispense with them. No assessment was levied for a time, in the expectation that the arrangement made with the Standard Pyritic Smelting Company—and which was made in good faith by both parties thereto—would be carried to a successful issue, and provide from the proceeds of the ore sufficient money to more extensively open up the mine, and to ensure a continuous output. It is not their fault that the Standard company is not now able to carry out its part of the arrangement. Under the altered conditions, assessments had to be resumed, and in their judgment the assessments of one cent per share for the months of May and June, respectively, were necessary to, as announced by circular letter to the stockholders, pay off an indebtedness of about \$5,000; to continue the development work at the mine; to build a spur from the mine to the railroad; and to add more machinery. The railway spur will not be built, however, until after suitable arrangements for the disposal of ore to a smelter shall have been made. The statement reported in the Greenwood Times to have been made by Mr. Collins, that the assessment had jumped to two cents per month, was an erroneous one. If the mine is to be developed, there is no present alternative known to the directors to levying assessments; but these must be made, otherwise development cannot be proceeded with.

The Montreal & Boston Copper Company, Limited, owning the Sunset, Crown Silver and C. O. D. mineral claims, in Deadwood Camp, is making surface openings in ore on the Sunset and Crown Silver claims, and it is expected that it will be practicable to maintain shipments

from these workings for some time. The main shaft on the Sunset was lately deepened to 400 feet, and the plans of the management include crosscutting at both the 300 and 400-foot levels, also a raise from the 100-foot level to catch the ore chute now being opened in one of the "quarries." Another development proposed is to run a tunnel through the hill which constitutes the outcropping on the Sunset. Some 20 men are now employed on the property, and an endeavour is being made to conclude financial arrangements that will admit of the working force being increased to 100 men. This group adjoins the Mother Lode, on which, as has already been mentioned, a deal of ore is being taken from the surface openings.

Instructions have lately been received from England to resume work on the Jewel, a gold-quartz property, situate in Long lake, at a distance of about 2,000 feet from the mine Jewel group includes the Jewel, Denero Grande, Gold Drop,

Massachusetts, and the Imperial and Exposition fractions. An incline shaft has been sunk on the Jewel to a depth of 348 feet, with levels at that depth and at 230 and 120 feet.

The number of lineal feet of work done in development on this group is 2,292; 749 feet being sinking and raising, and 1,543 feet drifting and crosscutting. A large quantity of ore has been blocked out in the mine, which has been favorably reported on by several mining engineers. After a very careful sampling, Mr. D. J. McDonald, for a while a provincial inspector of mines, and later with the British America Corporation at Rossland, gave, as a result of 35 assays, \$13.36 as the average value per ton of 2,000 lbs., and estimated the cost of extraction and treatment at \$5 per ton. In connection with the mine, there is an excellent mill site at the edge of Long Lake, at a distance of about 2,000 feet from the mine and some 260 feet below the mouth of the shaft. There is on the property a small power plant, including a 50-horse-power horizontal return tubular boiler, a 25-horse-power upright boiler, a four-drill Rand straight-line air compressor, a 28x10 air receiver, three machine drills, a 5x5 Bacon hoisting engine, and four pumps. A 6x8 hoist has been ordered, the intention being to sink another shaft at the north end of the claim, as recommended by Mr. McDonald. Twenty men have been put on for the present, but it is thought probable that when the manager, Mr. Gilbert Mahon, returns from England a few weeks hence, operations on a larger scale will be entered upon. The erection of a stamp mill and installation of a plant for cyanide or other suitable chemical treatment has been under consideration for some time past, and it is understood that this project will now be carried out.

Mr. Nicholas J. Tregear, for twelve months superintendent of the Winnipeg mine, has resigned, and Mr. Simon Jacobs, a thoroughly practical miner, who for several

months has been employed in the mine under Mr. Tregear, has been appointed to take charge. Mr. Richard Plewman, managing director, states that it is now a question of values only, for there is plenty of ore in sight in the Winnipeg. The 100-foot winze from the 300-foot level was sunk in ore for between 70 and 80 feet, and at the bottom the ore is 12 feet in width and still going down. Crosscutting from the bottom of the winze, or at the 400-foot level of the mine, is now in progress, and developments are being awaited with much interest. Assessments are being met regularly, none of the stock having been permitted to become delinquent. There is still a sum of \$28,000 available for calling up, and assessments will be continued so that this amount may be expended in proving to the stockholders whether their confidence in the property is or is not warranted. The 250,000 shares of new stock, added at the time the company was reorganized, remains intact, and will be available for disposal later should developments give it a sufficient value. The Winnipeg company has had an uphill task to perform since it was reorganized, but its larger stockholders have stood by it, determined to give the mine a thoroughly good test. Competent management and strict economy have done for it all that could be done, so that if, after all, it proves a failure—which is not now likely—those who have so persistently put money into it will have the satisfaction, poor though it be, of knowing that they have lost their money in legitimate mining. This time, whatever may have been the case in the earlier history of the property.

The Dominion Copper Company's mines are now being actively worked. The group includes the Brooklyn, Stenwinder and Idaho, adjoining claims, and the Rawhide, which adjoins the Snowshoe, all in Greenwood Camp. All but the Stenwinder are in course of development, and larger plant is being put in for the purpose of facilitating the opening up of the ore bodies met with. Mr. James Breen, formerly part owner of the Northport smelter, who is directing the working policy of the company, lately spent a week at the mines. He was questioned as to the company's intentions in regard to the erection of its own smelter, but no definite information was elicited from him. A shaft now being sunk on the Rawhide recently ran into some copper ore of good grade, and developments on both the Brooklyn and Idaho are stated to be satisfactory.

A 60-horse-power boiler, 6½x8 hoist, No. 5 Cameron sinking pump, machine drill (steam) and other appliances are being placed on the Lake, situate in Skylark Camp and distant about a mile and a half from Greenwood. A vertical shaft, now down 65 feet, is in solid

ore, and the indications are favourable enough to induce the Chicago-British Columbia Mining Company, owning the Lake group, to continue development. The group consists of the Lake, Yellowstone, Don Pedro, Idaho, and the Crescent and Yellowstone fractions. The newly installed plant on the No. 7, in Central Camp, is now in operation, and a contract has been let for hauling ore from the mine to the Greenwood smelter. The R. Bell, in

Summit Camp, and the Blue Bell, in the same camp, are both still at work and giving promise of becoming shippers during the ensuing summer. Two other Summit properties—the Maple Leaf (of the Rathmullen group) and the O. P.—are having attention, as too is the Rambler, situate near Elhot.

ROSSLAND.

(From Our Own Correspondent.)

Le Roi No. 2.

The following report has been received from the mine manager for the month ended March 31:

Output.

Under the arrangement made with the Northport smelter to treat a maximum of 250 tons per day of the ore of your mines and those of the Rossland Great Western Mines, Limited, the shipments to the smelter amounted to as follows:

No. 1 Mine.

	Tons.
200-foot level, East stope.....	400
200-foot level, East stope.....	527
400-foot level, intermediate.....	380
	—1,307

Josie, Poorman and Annie Mines.

	Tons.
Surface tunnel, Middle stope.....	122
Surface tunnel, Poorman stope.....	594
300-foot level, West stope.....	143
300-foot level, No. 1 East stope.....	197
300-foot level, No. 2 East stope.....	522
300-foot level, No. 3 East stope.....	157
500-foot level, Annie stope.....	358
	—2,093

Grand total 3,400

Gross Value in the 3,400 Dry Tons Shipped.

1,507,933 oz. gold at \$20.00—\$30,159.96, or \$9.95 per ton.

4,635,410 oz. silver at \$0.80—\$3,708.08, or \$0.84 per ton.

136,013 lbs. copper at \$0.16½—\$22,442.14, or \$6.72 per ton.

Making the total gross value \$55,419.35.

Shipments from your mines were first commenced last fall, in a small way, by sending a few cars of ore each week to the Northport smelter. The shipments thus far have been made from ore coming from the drives running through the ore bodies, or from the sill floors of the stopes being opened on the ore chutes. In only one instance have these stopes been extended above the first floor. The total tonnage shipped from the mine to date amounts to 8,592,198 dry tons, containing gross values as follows:

4,390,489 ozs. gold at \$20.00—\$87,809.78, or \$10.22 per ton.

15,778,380 oz. silver at \$0.60—\$9,467.03, or \$1.10 per ton.

413,387 lbs. copper at \$0.16½—\$68,208.65, or \$7.94 per ton.

Making the total gross value \$165,485.46.

NELSON DISTRICT.

(From Our Own Correspondent.)

The force at the Athabasca mine has been much reduced. Active development work is to be continued

ATHABASCA. at the mine, however, while the tailings at the mill will be treated by the cyaniding process.

The rich strike made at the Silver King mine some time ago has been confirmed. The ore body was encountered in what is known as the south vein on No. 6 level. It is claimed that the ore body is eight feet wide and assays 120 ounces silver and 17 per cent. copper.

SILVER KING. Under the management of Mr. J. J. Fleuret, the May and Jennie mine is being actively developed.

MAY AND JENNIE MINE. Work has been resumed on the ten-stamp mill which is being constructed at the property. The May and Jennie is a free-milling gold property, and will soon be one of the producing mines of the province.

YMIR.

(From Our Own Correspondent.)

The estimated profits on last month's run at the Ymir mine are placed at \$27,590, being the net proceeds from 80 stamps running 29 days and 18 hours. At the annual meeting of the company, recently held in London, it

THE YMIR MINE. was stated that the gross value of the ore treated during last year amounted to \$395,000, from which a net profit of over \$150,000 was obtained. At the same time an extract from Mr. Fowler's report stated that at the time of writing there

remained about 97,000 tons of ore above the No. 3 level, while over 43,000 tons had been blocked out between No. 3 and No. 5 levels, representing a potential net profit at the present rates and values obtained of nearly one million dollars, and sufficient ore to keep the present equipment of stamps running at their full capacity for nearly three years. Besides this tonnage blocked out, however, the developments at the upper levels show that the ore body is even wider than in the upper claims, while the values are well maintained. The total depth now attained is in the neighbourhood of 800 feet, while the adit tunnel which is being run on the 1,000-foot level is now in some 1,200 feet, with about 300 feet further to run. A dividend of 5 per cent. has already been declared this year, and the chairman of the meeting stated that the company anticipated being able to make a similar distribution every three months, which they thought would still leave a handsome balance for further distribution at the end of the year.

The Tamarac Mines, Limited, have just completed the shipment of 100 tons of ore to the reduction works at Silica, near Rossland. This shipment has been made more for test purposes than anything else, and will undergo

THE TAMARAC. a cyaniding process, which it is believed will prove the most economical method of treating the ore. Should the test be satisfactory, the directors of the company contemplate the immediate erection of a cyaniding plant near the railroad terminal of the aerial tramway which connects the mine with the Nelson & Port Sheppard railroad. The correspondent of the Mining Record paid a visit to the mine this week, and was shown over the workings by Mr. R. Roberts, the company's engineer. The aerial tramway was first inspected and found to be working splendidly. This tramway, which was constructed by B. C. Riblet, of Nelson, B. C., is one of the most perfect of its kind, and is almost entirely automatic in its action. After the ore has been dumped from the ore cars from the mine into the upper bins, it requires no further handling until it reaches the railroad cars at the lower end of the tramway, 6,000 feet away. The tramway buckets, of which there are 14, have each a capacity of half a ton, and the tramway can easily handle 100 tons of ore per day. The mine itself is looking very well under later developments. The principal entry is by means of an adit level which runs on the vein, exposing ore for fully 500 feet. The ore extracted to date has been taken from three small stopes, in each of which the ore has proved wider than previously anticipated. In one stope there is fully 14 feet of almost solid ore, and in another nine feet, all of which will average from \$10 to \$14 per ton. At a point 100 feet from the mouth of the adit, a winze has been sunk 200 feet, following the dip of the vein, which is here about 45 degrees.

The British Columbia & Cleveland Gold Mining Co., with headquarters at Cleveland, Ohio, are doing considerable work on the Ocean Wave group, which lies near the Porto Rico railroad siding, about four miles north of Ymir. The group is traversed by a fine vein, which has been tapped at 100 feet deep by means of a crosscut tunnel of 168 feet. The vein at this depth is found to be seven feet wide, and up to date drifts have been run along it for about 60 feet in either direction. The ore, which much resembles the rich ore of the Porto Rico mine, is said to average about \$11 per ton.

The Lucky Boy Company, of Cincinnati, Ohio, are developing the Lucky Boy group, adjoining the Ocean Wave, and have just crosscut an immense vein at the 50-foot level. Some remarkably fine looking ore is being sent up the shaft, and as the ledge is nearly 20 feet wide, the company are considerably encouraged, and are contemplating developments on a more extensive scale than heretofore.

A contract has just been let for 200 feet of work on the Commodore group, which lies near the Ymir mine, on Wild Horse creek. A tunnel has already been driven 124 feet on a ledge of almost solid ore, which varies in width from five to ten feet. The ore consists principally of iron sulphides and galena, and some high assays have been obtained from it. The new tunnel will be over 100 feet below the present one.

The snow has now disappeared from all but the higher mountains in this vicinity, and there seems every indication that a large amount of prospecting and development of new properties will be done here this summer.

SLOCAN CITY MINING DIVISION.

(From Our Own Correspondent.)

This has been a very quiet month, as the spring has opened slowly, and roads are only now getting into passable condition. The properties near the lake shore have been fairly busy, the Viking and the V. & M. having each shipped a carload—20 tons—as test shipments. The Arlington ore began to come down regularly, about 15 tons a day, on the 16th, but wet roads are bound to trouble them for the next month.

The Enterprise is working a small crew underground, shipping about 15 tons of high-grade ore per month. Work is fairly under way on the concentrator. The development

TEN-MILE CREEK.

work on the Iron Horse, under Mr. McLean, is being pushed on steadily, and the improvements in the ore showing seem continuous. The owners of the bond are expected in to inspect the property by the last of the month, and their visit will probably inaugurate work on a larger scale. Assessment work has shown promising ore on several of the lower claims.

The V. & M. people are now comfortably housed and busy on their summer's development work. The difference in the cost of their packing and of rawhiding is so great that they will probably hold all shipments until next snow season. The Bachelor group, the Paystreak and other

TWELVE-MILE CREEK. prospects are all at work, so that this little creek is "just humming."

The Viking, or Phoenix-Viking, rather, is in trouble over title to part of their claims; work has shut down, and will remain so till the matter is threshed out. Work on the Republic is now promised to begin June 1. The

SPRINGER CREEK. Arlington keeps steadily on its way towards making a most satisfactory mine. The Speculator has been troubled with surface water, and is now working a small crew in consequence. The work done during the winter warrants extensive development and the introduction of machinery on this group. Work on the Black Prince is again fairly under way. The lessee is taking another car load of ore out of the west drift and is driving No. 2 tunnel 100 feet lower down the hill.

The snow is still on the ground at most of the properties on this creek. Nothing definite is known as to the intentions of either of the two big mining companies operating here, the Chapleau and the Slocan Kilo. Rumors of consolidation are rife. At all events, the subject is being discussed. A lot of assessment work is going on at present, with generally satisfactory results. The summer is opening well, with the probability of new mines on each of our creeks for 1901; also a great falling off in the demand for "wild" prospects. The prospector is finding out that one or two good showings, with a reasonable amount of work applied with common sense, is worth more to him than a whole sheaf of certificates of location, and alas! relocation.

LEMON CREEK.

SLOCAN DISTRICT.

Recent development work on the Noble Five has encountered the Last Chance vein, which is known to traverse the Noble Five property for its entire length. This new strike promises much for the future of the Noble Five property.

NOBLE FIVE. The Black Prince group is under lease to Mr. George Gormely and others, who are pushing development work. Considerable shipping ore is being extracted daily, and it is expected that a carload will be shipped in June.

BLACK PRINCE. At the Wonderful, near New Denver, another vein two feet wide has been found. Assay shows values of 115 ozs. silver and 70 per cent. lead.

WONDERFUL. Owing to the influx of surface water, the American Boy has discontinued work in some parts of the mine. Active development work is, however, being pushed in other parts of the mine. It is reported that ore shipments will be increased in the near future.

AMERICAN BOY. A strike of clean ore has just been made in a crosscut from the upper tunnel on the Donnelly claim, near Sandou

LARDEAU DISTRICT.

(From Our Own Correspondent.)

A rich strike of free-milling gold ore has just been made on the Lucky Jim group, on Lexington Mountain.

Extensive preparations are being made to thoroughly develop the celebrated Triune group, near TRIUNE. Ferguson. An aerial tramway will probably be installed during the summer, and preparations made for conducting work the year round.

The Eva group, on Lexington Mountain, is being actively developed by the Imperial Development Syndicate, of Nelson. Recent development work has exposed large bodies of high-grade free-milling gold ore.

EVA GROUP. This property promises to make one of the largest gold mines of the Northwest.

EAST KOOTENAY.

(From Our Own Correspondent.)

The St. Eugene mine at Moxie has resumed operations, giving employment to over 200 men.

The North Star has resumed shipping.

CORRESPONDENCE.

(The Editor does not hold himself responsible for opinions expressed by correspondents.)

AN APPRECIATIVE REFERENCE.

To the Editor B. C. MINING RECORD.

SIR:—I should like to speak a word in appreciation of the MINING RECORD. From time to time I have been more than pleased with many of the articles that have appeared and without mentioning any particular ones, I feel very strongly that the matter that has appeared in the RECORD (as well as its editorial policy) is such as cannot fail to be of great service to the mining industry of British Columbia. It is often said that every reader thinks he is capable of conducting a paper better than its editor, but in the case of the MINING RECORD, I, as a reader, would be entirely at a loss to suggest one particular in which the periodical might be improved. As a B. C. mining journal it is really a valuable production and I trust that its financial success will be such that you will be able to maintain its present efficiency and keep pace with the growing needs and importance of British Columbia's foremost industry.

Yours sincerely,

JOHN REDMAN,

Queen's Prizeman in Geology S. K. London.

Kamloops, B.C., May 4, 1901.

THE MINING INDUSTRY AND TAXATION.

To the Editor B. C. MINING RECORD.

SIR:—In your May number you take occasion to criticize a letter published by me in the *Rossland Miner* in March last, in which I endeavoured to point out that the mining industry was suffering from certain oppressive burdens and that, as a consequence, the industry was retrograding.

In my letter I ventured to lay down four different propositions.

You agree with the first two, namely, that British Columbia is a great mining country, and that the mining industry depends on foreign capital.

The third proposition, as stated by you, was that foreign capital has ceased to flow into British Columbia, and this, you say, is only partially true.

My statement was that "foreign capital has almost ceased to flow into the mines of British Columbia," so that we are practically agreed on this proposition also. I am glad to notice that you also agree with me that the hampering of joint stock companies by excessive registration and license fees is a real grievance and should be redressed.

But you emphatically deny my fourth proposition that the mining industry is retrograding.

This, of course, is a question of fact, and I took some pains to establish the conclusion I had come to by reference to the only statistics at hand and to facts which are, unfortunately, too palpable throughout the mining districts to require any proof. They all point in the direction of retrogression.

You object to making any comparison of the mining industry and it is to-day with the same industry as it

was in 1896, because, you say, that the latter year was distinguished by a purely speculative boom. Will you allow me to give you another, and I believe the true reason, namely, unwise legislation.

In 1896 our mining laws were the admiration of all mining men, and the industry worked harmoniously.

1. In 1897 the legislature passed the Companies Act, imposing excessive fees on companies and thereby wiped out numbers of companies which were assisting in the development of the country, and discouraged the formation of new ones.

2. In the same year the cost of a Free Miner's Certificate when held by a company, was increased from \$5 to \$100.

3. In 1898 the Truck Act was passed, imposing a number of new burdens on mine owners and prohibiting under severe penalties, arrangements for boarding and lodging employees such as had always been customary in mining camps.

4. In 1899 the Eight-Hour Law was passed, without any notice to mine owners who had purchased their properties on the faith of existing conditions, and the result was the closing down of many mines to the great injury of both the owners and the employees. In certain districts, the Slocan for instance, the mining industry has not yet recovered from the blow. Another result was a widespread distrust of a legislature which would pass such a law without giving those concerned an opportunity to show its injustice.

5. In 1900 the present government was returned to power and it was supposed that stability and encouragement of our great industry would result. At their very first session, notwithstanding the earnest protest of representatives from most of our leading mines, the government doubled the tax on the mineral output and more than doubled the fee payable for Crown grants of mineral claims.

Is it any wonder that people, both here and abroad, are holding aloof from investment when our statutes disclose such an injurious policy?

The above list of grievances, long as it is, by no means includes them all, for the acts of this present year, enforcing an eight-hour day on engineers, exacting minute monthly returns from mine owners, introducing a new and complicated system of code signals and otherwise hampering the industry, have not yet come to hand.

But you say, "There is only one fair method of estimating the progress of any industry, and that is by the amount of wealth produced in that industry." In support of your theory you point out that the value of our production of metals from lode mines increased last year from \$6,751,604 to \$10,062,052, or 49 per cent.

Be it so, and suppose for the sake of argument that you, Mr. Editor, were the sole owner of the mines in question, and that in producing your \$10,062,052 you failed to realize any profit. The country would doubtless benefit by your expenditure, but would you care to continue this kind of "progress" from year to year, or advise your friends in similar enterprises?

Now this is precisely the position into which the mine owners of this Province are being forced by the burdens imposed upon them, and from which they must be relieved if our magnificent mineral resources are to be utilized at a profit.

If they cannot be utilized at a profit, that is, a profit

to those whose money is required for development, they will not be utilized at all.

"Oh, we all know that," you may say, "but what is the use of telling foreign capitalists all about our hardships and unfavourable circumstances?"

The answer to this is that they know all about our conditions already, a great deal better than most of us know them.

Our local press, from a pardonable desire to make things look their best, dilates upon all the favourable features of the situation, and studiously avoids commenting on unfavourable features.

But do you suppose that men who are thinking of investing largely in the country are satisfied with such information as the local press affords? Such men usually take the pains to ascertain the actual facts which will surround their investment, including the laws of the country, which they must submit to, and chances of failure, which they will incur, in case they decide to open up a mine. These facts can be obtained readily enough, from mining experts and other experienced agents whose business it is to know just how the laws in force affect the mining industry, and to ascertain by personal examination, just what the showings are on any given property. It is simply folly to suppose that by concealing our disadvantages we can keep the capitalists, as a class, in ignorance of our true position.

They are well aware of it, just as the mine owners are.

But there are two important sections of our community who do appear to be ignorant of, or not to realize, the burdens under which the mining industry is suffering, namely, the legislature and the general public. The former cannot plead ignorance, for the facts have been laid before the executive and many influential members of the house, by several deputations of men who represent the principal mines of the Province; but they have failed to realize those facts, otherwise they would have removed the burdens or many of them. The latter are probably quite ignorant of the baneful effect of these burdens upon the industry, or they would insist upon their removal.

You throw out a hope that when the country becomes more developed the taxes may be largely reduced.

Do you not think that the weight should be lifted from the shoulders of an industry while still in its infancy, rather than from one which has been fully developed?

Have you considered the effects of the two per cent. tax levied by the government upon the output of our mines, a tax not upon the profits realized by the mine owner, but upon the gross value of his ore realized from the smelter, without any deduction for the costs of mining? If not, you will be surprised to learn that this tax alone appropriates fully six per cent. of the profits of medium-grade ore, and from six to twelve per cent. of the profits of low-grade ore.

How many industries could stand this kind of taxation?

One of the effects of the tax is to take from the mine owner a ruinously large percentage of his profits. Another effect is to prohibit the mining of vast bodies of low-grade ore which otherwise might be mined at a profit.

You are quite right, Mr. Editor, in assuming that my previous letter was an article intended for home consumption; but, for the reasons given above, we are not likely to suffer anything by its circulation in London. On the contrary I think our friends over there will wel-

come any effort we can make here to expose and remedy defects which are fully recognized by everyone except the legislature and the general public.

The crucial question which foreign capitalists ask, regarding our mining industry, is not what is your output, but what dividends are you paying? If we can so amend our laws as to enable a few mines to pay handsome dividends, we shall secure a better advertisement in London and elsewhere than can possibly be effected by Agents-General or government statistics.

Men who are justly pessimists to-day will speedily become optimists, when the splendid mineral resources of this Province are relieved of the burdens which at present discourage capital from flowing into the Province.

A. C. GALT.

Dated, Rossland May 14th, 1901.

TRADE NOTICES, CIRCULARS AND CATALOGUES.

THE McCloud River Electrical Company of San Francisco, Cal., are now installing four units of Victor Turbines with "Cylinder Gate" mounted on horizontal shafts; each unit to develop 790 h. p. under 36 ft. working head of water, and running 270 revolutions per minute. Each unit consists of two 30-in. Victor Turbines mounted in a steel flume and discharging into one central draft tube. The flumes are 15 ft. 9 in., 9 ft. 6 in. diameter, constructed with heavy steel plate with cast-iron heads and covers. The gate work is the "patented draw-rod" type which places all gears on the outside of the flume where they can have attention and where they can work in oil, doing away with the old style of gate work where the gears run in water and where they were continually causing trouble. The patents on this style of gate work are completely controlled by the builders of the Turbines, The Stillwell-Bierce & Smith-Vaile Co., Dayton, Ohio. The plant is being installed in the northern part of California. The wheels are set on top of concrete arches, the draft tubes reaching through to the tail water below. Each unit is equipped with a large rope pulley, and the dynamos are driven by means of rope drive, the dynamos being located at a higher elevation than the water wheels. The feeder pipes come through the foundations upon which the generators set, and the whole is a very substantial and complete plant. There are also two exciter wheels which will develop about 40 h. p. each under 36 ft. head; and the exciters are also driven by means of rope pulleys. The large units are each equipped with a Giesler Electro-Mechanical Governor for regulating the speed of the same.

THE ALLIS-CHALMERS AMALGAMATION.

The London Mining Journal publishes the following account of an interview with Mr. William McDermott, managing director of Fraser & Chalmers, Limited, on the subject of the recent important amalgamation of great machinery manufacturing interests in the United States. To the leading question whether the cabled statement was true in its main features, Mr. McDermott gave an unhesitating affirmative.

"As the American papers have stated," he said, "a new company has been formed over there, called the Allis-Chalmers Engine Building Company, which takes over the works of E. P. Allis and Co., Fraser and Chalmers, the Dickinson Manufacturing Company, and the Gages' Iron Company, Chicago. The London company, Fraser and Chalmers, is untouched, in so far as its English business is concerned, but the Chicago business, which it has hitherto controlled, has been absorbed."

"And the compensation?"

"Will be shares in the amalgamated company. Fraser and Chalmers, Limited, was formed to work the Chicago business, and the English business has been built up and is in possession of very large works at Erieh."

"Fraser and Chalmers is only interested then in the combination to the extent of its Chicago business?"

"Exactly. The capital of the new company will consist of \$50,000,000, divided into equal amounts of 7 per cent. preference shares and common stock. In all probability the head office will be at New York, because some of the most important members of the board of the company are residents in that city."

"Who took the lead in the amalgamation?"

"It is simply the result of negotiations between Mr. Chalmers and Mr. Allis, and it has been under consideration for a long time. Our own business will remain absolutely unaffected. It is entirely outside America, and we supply from our English works."

"Is all the capital issued?"

"Not all; but a large cash working capital is provided for."

"Do you think, Mr. McDermott, that any of the shares will be offered for public subscription?"

"I believe I am right in saying that the preferred shares have been offered for subscription in New York, and that they have been taken up at \$105, or a premium of \$5."

THE JEANESVILLE TRIPLEX ELECTRIC PUMP.

We are in receipt of advance sheet, No. 10, published by the Jeanesville Iron Works Company, of Denver, Colorado, and Jeanesville, Pennsylvania, descriptive of a triplex electric pump manufactured by this firm. The advantages claimed for this make of pump are several, one of which is that since the pump delivers water from one level to a higher one without variation in pressure, it follows that the power necessary to operate it must be uniform, thus making a "triplex" an ideal form of power pump for electric pumping. A triplex pump consists of three acting plungers, operated from a crank shaft, whose crank bearings are placed 120 degrees apart. The resultant action being to produce a discharge within 11% continuous. By means of a suitable sized air vessel upon the suction and discharge pipes, this 11% variation is compensated, and the pump delivers equal volume in equal time. The circular gives much interesting data regarding the scope of this application.

MINING AND ENGINEERING INSTRUMENTS.

Messrs. John Davis & Son (Derby) Limited, represented in Canada by Mr. F. T. Peacock, M. E., Montreal, issue a well-printed, illustrated catalogue and price list of mining, surveying, engineering and mathematical instruments, copies of which we shall be glad to forward upon application. Judging from the list before us well-made English instruments can be purchased from this firm, at very moderate prices, which compare more than favourably with those charged by American manufacturers.

THE SMART-EBY COMPANY.

The Smart-Eby Company, a Canadian firm of machinery manufacturers, commenced business in a very small way some two years ago, by the employment of two hands. It is now considered a very important concern and is deservedly receiving a large share of orders from British Columbia. The firm is represented in this Province by S. S. Hayllar, of Vancouver, who informs us the Smart-Eby Company have recently received a special order to supply to the corporation of Kamloops a million-gallon, high-duty pumping engine, of the vertical cross compound condensing Corliss type.

GOLD AND SILVER MILLING.

Messrs. Fraser & Chalmers have issued the tenth edition of their catalogue No. 4, under the above heading. The work, however, might more fitly be described as a text book than a trade catalogue. It is a well-bound volume of three hundred pages or more, well illustrated, well printed on excellent paper and scientifically indexed. In this catalogue the customary list of machines sold and testimonials received by the firm have been omitted, owing to the exigencies of space. But Messrs. Fraser & Chalmers no longer require anything more than their name to recommend them to the mining public. The catalogue itself contains more valuable and practical information than is contained in half the so-called text books on gold and silver metallurgy.

MINING STATISTICS AND RETURNS.

THE COAST.

THE shipments from the Lenora mine, Mount Sicker, during April were 1,336 tons.

BOUNDARY DISTRICT.

The tonnage of ore shipped by Boundary District mines during May to 16th instant, inclusive, so far as has been ascertained from the mines, is as under:

Mine.	Tons.
Old Ironsides and Knob Hill Group.....	9,656
Mother Lode	4,590
B. C.	2,105
Winnipeg	50

Total16,401

Shipments during 1900 and for four months of the current year ended April 30 were as follows:

Mine.	1900. Tons.	1901 Tons.
Old Ironsides and Knob Hill Group..	64,535	73,522
B. C.	19,494	15,544
Mother Lode	5,564	19,020
City of Paris	2,000	.....
Golden Crown	1,800	.....
Athelstan	1,200	550
Winnipeg	1,100	.....
Carmi .....	.....	1,000
Snowshoe	338	110
Brooklyn	150	.....
Jewel	150	.....
Sundry small shipments.....	1,000	500
Total	97,331	110,246

The aggregate tonnage of ore shipped to the end of May is estimated at 240,839 tons.

ROSSLAND.

	1901.	1900.	Inc.
Shipments for January (revised).....	30,894	24,933	5,961
Shipments for February (revised).....	26,778	6,960	19,818
Shipments for March (revised).....	34,172	279	33,893
Shipments for April.....	.....	6,834	.....
Shipments for May (estimated).....	40,000	15,704	24,296

Rossland Great Western.—The following figures are reported: "Returns from ore shipped during developments to date, namely, 3,461 tons, yielding 1,701 ozs. gold, 2,706 ozs. silver, 54 tons copper; value, £11,138."

Le Roi No. 2.—The following figures are to hand: "Returns from ore shipped during developments to 31st March, namely, 8,592 tons, yielding 4,390 ozs. gold, 15,778 ozs. silver, 206 tons copper; value, £34,262. Return for month of April, 4,469 tons, yielding 1,798 ozs. gold, 6,389 ozs. silver, 98 tons copper; value, £14,934."

Le Roi.—Shipped to the smelters during the month of April 21,066 tons, yielding 8,252 ozs. gold, 14,205 ozs. silver, and 261 tons copper, of a total estimated value of £53,766.

YMR DISTRICT.

Returns from the Ymir mine for the month of April are as follows: During last month 80 stamps ran 684 hours (28 days, 12 hours). The estimated profit on operating is \$24,800 (£5,100).

THE SLOCAN.

We are indebted to the New Denver Ledger for the following returns of ore shipments from the Slocan District:

The total amount of ore shipped from the Slocan and Slocan City mining divisions for the year 1900 was, approximately, 35,000 tons. Since January 1 to May 18, 1901, the shipments have been as follows:

Mine.	Week.	Total.
Payne	1,486
Last Chance	20	878
Slocan Star	126	471
Ruth	264
Bosun	240
Hewett	546
American Boy	20	688
Ivanhoe	896
Trade Dollar	140
Sovereign	117
Wonderful	4
Arlington	1,355
Two Friends	49
Enterprise	20	180
Hartney	140
Black Prince	100
Goodenough	145
Miller Creek	20
Reco	165
Sunset (Jackson Basin).....	320
Sunset (Can. Gold Fields).....	53
Silver King	14
Red Fox	64
Antoine	16
Queen Bess	155	526
Monitor	345
Corinth	66
Rondholder	23
Rambler	518
Surprise	20
Kaslo Group	10
Chapleau	15
Speculator	10
Ajax	10
Soho	39
Emily Edith	40
Phoenix	20
Alpha	40
V. & M.	20
Colonial	20	20
Total tons	361	10,105

THE METAL MARKET—MAY.

SILVER.

SILVER has shown no special feature during the month, though slightly firmer. Futures are well maintained, and forward deliveries command a small premium. Prices remain unchanged from 59 $\frac{1}{2}$ ¢/50 $\frac{1}{2}$ ¢. The average price last month was 59.20, which is considerably lower than the average during February and March.

COPPER.

The market is quiet and inactive. American manufacturers being well covered for the moment, prospects for the summer months are considered favourable. European demand, however, has somewhat improved, and some fair orders have been received in New York. The latest quotations are: Lake Copper, 167½@17; electrolytic, 16.45; cathodes, 16.10@16.20; casting copper, 16¼@16¾.

LEAD.

No change has taken place this month. St. Louis, 4.22½@4.32½; New York, 4.32½@4.37½. London prices range from £12 3s. 9d. @ £12 6s. 3d. for Spanish lead, and 2s. 6d. higher for English lead.

SPELTER.

Business in this market is very fair. Prices, however, remain unchanged at 3.85@3.87½ St. Louis, 4.05 New York.

THE LOCAL STOCK MARKET—MAY.

WESTERN business has been decidedly more active this month, which has witnessed a marked recovery in the better class of securities. Thus, Centre Star has advanced from 28 asked, 26 bid, to 51, 48, the upward tendency having been regularly manifested for the past two weeks. At last month's prices the shares were quoted far below the intrinsic value, as is evident from the report of Mr. Wayne Darlington, who recently examined the mine. The slump in this stock is apparently now ended, and a recurrence on the same scale is not likely. Rambler-Cariboo has again showed much activity, and prices have advanced from 20, 24, to 29, 31. War Eagle has also advanced several points. Cariboo-McKinney, in consequence of satisfactory reports

from the mine, is firmer, and transactions are reported at 40@41. Crow's Nest has sold at \$80@883 during the month. St. Eugene is offered at from 86@90. Mollie Gibson has weakened considerably, some blocks being offered as low as 15. Iron Mask is also weaker, possibly in sympathy with the decline of War Eagle and Centre Star, and also as a result of the publication of certain particulars relating to the decision of the courts in the recent legislation in which the mine was involved. The Waterloo company, it is announced, is to be reconstructed, with a view to rendering the stock assessable, a meeting of shareholders being called for July 2 next to consider a resolution to this effect. In consequence prices have fallen to 1½@1½. Several dividends have been declared this month, including the Ymir of a shilling a share; the Arlington (Slocan), \$20,000; and the Bosum its first dividend of \$12,500. The recent strike in the Tyee mine, Mount Sicker, has had the effect of advancing the prices of this stock.

All things considered, the outlook is decidedly brighter, and if the present rate of ore production is maintained, it should not be long before Eastern confidence in British Columbia mines is restored.

ERRATUM.

In Mr. R. C. Campbell-Johnston's article, entitled "Notes on Zinc Smelters in Conjunction With the Refining of Lead and Silver," published on page 158 of last month's issue, a reference is made to a process of salt-caking invented by Mr. A. S. Merry, managing director of Messrs. H. H. Vivian & Co., Ltd., Haford Isha Works, Swansea. Mr. Merry's name was misspelled by the substitution of the letter "u" for "e."

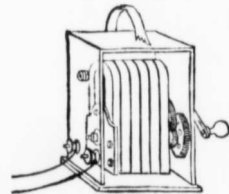
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