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BOARDS OF TRADE AND THE MINERAL INDUSTRY.

THE annual convention of the Associated Boards of Trade of Eastern British Columbia, a body fairly representative of business and mining interests in the Kootenays and Yale, was held recently in Kaslo. The convention debated a number of very important matters affecting the mining industry of the Province, and among others, the following resolutions were introduced and passed.

(1). That the Associated Boards of Trade of Eastern British Columbia do petition the Provincial government that legislation be enacted providing for the creation of local road boards, to be elected in the same manner as rural school boards and possessed of administrative powers only, to which shall be entrusted the administration of all funds appropriated by the legislature for roads, trails and bridges in the particular districts for which such boards shall have been created. To this resolution the following was added in amendment:

That the local board of commissioners should have power to allow claim owners to perform on roads and trails under their supervision, and that claim owners should have the right to record work so performed as assessment work upon their claims to an amount not to exceed \$200 for any one claim.

(2). That whereas, Canada is becoming a large producer of pig lead, and its product is being sold to a very limited extent in Canada, while the bulk of it is being disposed of in China, Japan, Germany and other foreign countries, and whereas, Eastern Canada is to-day importing from Germany practically all of the white lead it consumes: Be it resolved, that the Dominion government be again requested to so increase its duties as to make the manufacture of white lead and other manufac-

tured lead possible in Canada, and so allow the producer of pig lead in Canada, an additional market in his own country for his product, and that a committee be appointed to go to Ottawa to place this resolution before the house.

(3). That whereas, the Dominion government has issued a bounty for the production of pig lead in Canada, amounting to \$100,000 per annum at the rate of \$5 the first year, \$4 the second, \$3 the third, \$2 the fourth and \$1 the fifth, and whereas, there is not being produced at the present time sufficient lead bullion to enable a refinery to earn the full amount of the bounty; and whereas, a refinery for the production of pig lead is at present under construction; therefore, be it resolved, that the Dominion government be asked to so modify this bounty for the first year so that the full amount thereof amounting to \$100,000 be disbursed, providing 15,000 tons of pig lead be produced during the first year, and should there be less than 15,000 tons produced during such year, then the rate allowed during the first year shall be \$7 per ton instead of \$5 as at present provided; furthermore, that the bounty for each of the succeeding years shall be at the rate of \$5 a ton, but such bounty shall not exceed \$100,000 per annum as at present.

(4). That whereas, the welfare of a large portion of Southern British Columbia depends upon the extensive development of large bodies of low grade ores, and whereas, the treatment of such ore to be done successfully must be done economically; and whereas, the cost of fuel represents a large percentage of the total cost of treatment; and whereas, the present cost of fuel appears excessive and should, if possible, be reduced; and whereas, we believe that such a reduction in the cost of fuel could be best brought about by the opening of competitive coal fields; and whereas, the only available coking coal fields not already occupied by the Crow's Nest Coal Company are those situated on the south side of Morrissey creek; and whereas, the Dominion government has the statutory right to select 50,000 acres of these coal lands; therefore be it resolved, that the Associated Boards of Trade of Eastern British Columbia, in convention assembled, hereby urge upon the Dominion government the necessity of at once making its selection of those lands and leasing them with such safeguards as will absolutely preclude now and in the future, the possibility of their amalgamation with, or control by the Crow's Nest Coal Company or any allied corporation, and that the maximum price to be charged for coke be \$3.50 per ton, f. o. b., and the maximum price for three-quartered inch screened coal be \$1.75 per ton f. o. b.

(5). That whereas, there is now imposed by the government of British Columbia a tax of two per cent. on the gross value of all ores after deducting the charges paid for transportation and smelting. Whereas, the prosperity and growth of the mining industry of this Province largely depends upon the possibility of profitably working the low-grade ore deposits of the country; and whereas, the incidence of the tax as at present levied is considered to be unjust, bearing unequally upon mines having different conditions as to value of ore and cost of production, and taxing all the labour and supplies expended in ore production. Whereas, it is believed that a considerable portion of the revenue which it may be deemed equitable to levy upon the mining industry could be levied: First, from the tax already legally collectible upon the Crown Granted claims upon which less than work to the value of \$200 annually is done if such tax were systematically and promptly collected, or in default thereof, if the said Crown Granted mineral claims were to be sold by the government to the highest bidder; and second, by changing the conditions in regard to such Crown Granted claims so that work to the value of \$400 annually should be required, or failing, that a tax of 50 cents per acre be imposed; and third, by requiring that instead of work to the value of \$100 being the annual assessment conditions on non Crown Granted claims, work to the value of \$80 be accepted with an increase of the fee for recording assessment work to \$12.50 with no increase in the number of assessments before the issuance of Crown Grants, and by these means the development of the resources of the country be stimulated;

Be it resolved, that the government be asked to look to the means herein suggested for a portion of the revenue from the mining industry and to reduce by so much the amount to be derived from the tax on mineral produced and to change the incidence of the tax by deducting from the taxable value of the ore the cost of mining exclusive of capital, expenditure and head-office expenses, such deduction to be subject to the jurisdiction of such official as the government may designate.

We propose to briefly discuss the subjects of these resolutions in the order named. The suggestion that

municipalities and rural districts should be in a position to control the monies voted by the legislature for the construction and maintenance of public highways within their boundaries by the appointment of local administrative boards, has much to recommend it, especially in view of the abuses attaching to the present system. It is not too much to say that the greater proportion of the money appropriated by the government for roads and trails in the mining districts, is now wasted as a consequence of ill-directed effort and for the want of proper supervision. Whether, however, the remedy suggested would meet the difficulty is another matter. If, as in the case of school trustees, road commissioners were expected to give gratuitous service, it is questionable whether properly qualified men could be found willing to assume the heavy responsibilities of the position, or able to devote the time and constant attention necessary to the performance of duties such as would be required to render the service really efficient from commissioners in a large district.

Mining development in many parts of British Columbia is largely dependent upon the opening up of territory by good roads and trails, and the fact that during the past six months over half a million has been expended by the government in public works of this character, indicates that the importance of such requirements is fully recognised. But while expenditure in this direction is, under existing circumstances, sufficiently generous, there can be no doubt but that it could be made to go a great deal further under a better system of distribution and supervision. This the Associated Boards of Trade realise, but their suggested remedy, as we have already shown, would be only doubtfully effectual. The appointment of Boards of Commissioners, however, is undoubtedly a wise proposal, but officials thus appointed, whether receiving their commission direct from the government or by election from the constituencies they serve, should assuredly be liberally paid for their services, and their entire time should be devoted to the execution of their duties. By the appointment of efficient men, under a civil engineering specialist as chief commissioner for the Province, a large initial economy would be effected, for road building would then be conducted on scientific principles, and both the original costs of construction and subsequent costs of maintenance would be very much less than now. If municipal control is considered, the only really feasible scheme on these lines is the adoption of the British plan of apportioning the country into counties, and the introduction of methods of county council administration. This would necessitate legislation to constitute these councils, and to give them the power to levy taxes within limits in the county over which they had control. The suggestion contained in the amendment to the same resolution is also an excellent one. In new districts it is of the utmost importance that every possible assistance and inducement should be afforded to the prospector, and many men of this class would no doubt take advantage of the opportunity of employment in the building of roads or trails,

which would add to the value of their own locations by rendering them easily accessible, as an alternative to the ordinary assessment work; though, of course, some provision is already made by law in this respect. Here, too, however, there is need for regulation and system. A prospector or claim owner should only be permitted to accept the alternative proposed, on the understanding that he is for the time being an employee of the government, under the commissioner for the district, equally liable to dismissal on sufficient grounds as any other workman so employed. In the case of such dismissal the prospector should be paid in cash for the time he has been employed, at the ordinary rate of wage paid for unskilled manual labour; but otherwise he should receive credit for his work to the extent of the two hundred dollars mentioned at the rate of three-and-a-half dollars, or the wages paid to skilled miners by the day.

The subject of the third resolution, to which we direct attention, has, on previous occasions, received consideration in the columns of the MINING RECORD. The question of securing a favourable market for our pig lead is of paramount importance at this juncture. The establishment of a small refinery at Trail is a first effort in the scheme of localising an industry, which reasonably fostered and aided gives every promise of large expansion, and if, without placing an unduly heavy burden on the consumer, sufficient encouragement can be given by increasing the duties, to admit of the manufacture of white lead and other manufactured forms of lead in Canada from the product of Canadian mines, lead miners in British Columbia would be assured of a good market for at least one half of their present output, and the exceptionally high price thus realised would offset in a very large measure the excessive charges necessarily ruling in the exportation of pig lead to so distant a market as London. The request to be made to the Federal government to modify the terms upon which the subsidy on lead locally refined may be earned, is also not unreasonable in some respects, but surely with the ordinary profits on the process and with some added advantage in the matter of freights the refiner in British Columbia should rest satisfied with a subsidy of five dollars a ton, and not demand an additional premium of two dollars if his output falls below the moderate tonnage specially mentioned in the resolution.

In last month's issue we gave our views on the fuel supply question, but the recommendation made by the Associated Boards of Trade is one, the fairness of which it will be difficult for either the Crow's Nest Pass Coal Company or the Canadian Pacific Railway Company to combat. If the present prices of coal and coke are as low as they well can be, the Crow's Nest Company need not fear competition by advantage being taken of the government's offer to lease coal lands in the same neighbourhood, with the suggested conditions as to the maximum prices to be charged consumers of coal and coke produced from such leased lands. If, on the other hand, coal and coke can be profitably supplied at the proposed

prices, then it is to the interest of the country that the Crow's Nest Company should no longer be allowed to retain a monopoly. From the point of view of the Canadian Pacific Railway, if the statements which have been made in support of this company's contention are correct, namely, that coal can be mined at Fernie, at \$1.25 per ton, and coke manufactured at \$3.25 on a liberal margin of profit, the railway corporation itself cannot feel aggrieved at being tied down to supplying coal at \$1.75 and coke at \$3.50, or the maximum prices specifically mentioned in the resolution.

The last resolution of those having reference to mining, and passed at the convention, deals with the incidence of the tax on metalliferous mines, and suggests a remedy which would have the effect of largely relieving corporations and individual mine operators of taxation at the expense of the prospector and less well-to-do claim owner. This proposal has since been repudiated by the Nelson Board of Trade. Nevertheless the incidence of the existing tax is admittedly unfair and inequitable. The relation between ore values and tonnage accommodates itself by a series of gradations to a general principle, that as the value of ore decreases, profitable operation depends on a constant increase of tonnage produced. In a previous issue of the *MINING RECORD* the action of this principle was illustrated, and it is hardly necessary to again elaborate upon the subject, except to say that the inequality of the impost lies in the circumstance that part of the fixed cost per ton of ore is not exempted from taxation, and therefore low-grade mines where the tonnage produced is large, are taxed at a proportionately higher rate than high grade mines whose yield is of equal value but of far less bulk. The recommendations of the Associated Boards of Trade, it is true, suggests the removal of the inconsistencies as indicated, and it is earnestly to be desired that the government will recognise the justice of the contention here put forward. While it is worse than undesirable to place any restrictions on prospecting, the present system of taxing claims might perhaps be so changed as to so give increased benefit to the Province without deterring legitimate prospectors from following their calling. Before a Crown Granted title can be obtained to a mineral location, the locator is required to pay in fees to the government a sum aggregating fifteen dollars, distributed over a period of generally five years; that is to say, a recording fee of two dollars and fifty cents is first charged and in addition, five other payments of equal amount are required for the rendering of annual assessments. It would doubtless be a wise innovation to require a preliminary fee of (say) ten dollars, charging subsequently one dollar for each assessment recorded. By this plan revenue from this source would probably be greater, while the system would tend to discourage and prevent the indiscriminate location of property and the tying up of large areas by men, who might be more fittingly described as speculative "land grabbers" rather than legitimate prospectors. The regulations governing the holding of mineral ground

after Crown Grant has been obtained might also be advantageously amended. The present tax on unworked Crown Granted property is absurdly inadequate, and the impost of twenty-five cents per acre should be increased to at least a dollar per acre; but instead of requiring the owner of such a claim to do the equivalent of two hundred dollars in work upon it to earn exemption from taxation, the ordinary assessment requirements might be substituted, and a merely nominal fee of twenty-five cents imposed for registration. The owners of Crown Granted claims are divisible into two classes; (1) speculators or investors, including syndicates and corporations, who have acquired property by purchase, and (2) the original locators and discoverers of the ground. It is in the interests of the country that those coming under the first-named classification should not be allowed to retard the development of our natural resources by holding unimproved property indefinitely for speculative purposes, without being heavily taxed for the privilege; while on the other hand prospectors would in the great majority of cases prefer to devote a month's time, which is practically the equivalent of a hundred dollars in cash, to the further development of their property, rather than pay fifty dollars in cash into the Provincial treasury. The tax as it now stands is futile as a source of revenue, and the amount is so insignificant that the alternative proposal is nullified in its most valuable feature.

THE NEW MINISTER OF MINES.

EVERY cloud has a silver lining and in that resembles most of the hills of Slokan, and we cannot help thinking that dark as the political cloud has been which has hung so long over British Columbia, that, too, has a bright side for the mining industry. We, as a journal, know nothing of politics except that they seem sometimes to be the curse of Canada, and the especial curse of her most western province. Trade has no sentiment, the mining industry has no politics. What the mining industry wants, however, is peace and a settled government; an assured quiet and a man to administer its affairs who knows something about mining, for the rest it can take care of itself. We cannot believe that the recent utterance of a distinguished member of the local opposition to the effect that a government not composed of lawyers is a government of fools, can possibly be defended. In our simplicity we should prefer to see the different departments administered by men specially trained in those matters with which they are supposed to deal, a banker or successful business man, if you like, for Finance Minister; a lawyer for Attorney-General; a farmer or land owner for Lands and Works; but above all a mining man for Minister of Mines. And this last it appears we have, at last, secured. Too often we elect a man because he is a jolly good fellow. We have heard it whispered that the new minister is that. If so, it will do him no harm. Did we elect him because he is conservative or liberal. We cannot find an

explanation of these words in our dictionary of mining terms, so we pass them by as having no significance for us. Very seldom we elect a man and give him a portfolio because he knows something of the work which we expect him to do. This is what we have done at last either out of intent or pure good luck, and as a mining journal we are inclined to rejoice. The new Minister of Mines, Col. the Hon. E. G. Prior, privy councillor, late member in the Dominion house for the City of Victoria, and some time Controller of Inland Revenue, is a many-sided man, but he is essentially an authority on mining. In his youth he was articled to one of the foremost British mining engineers of that day, Mr. J. Tolson White, of Wakefield, who, as agent for the Duke of Leeds and other notable mine owners, had no less than sixty-two large collieries under his supervision. Beginning at the bottom of the ladder and working as an ordinary miner in the Barnsley & Normanton pits, Col. Prior gradually acquired the thoroughly practical knowledge of mining which won him in competition with forty other applicants his first important appointment, that of assistant manager and engineer with the Vancouver Coal Company, under Mr. John Bryden, and five years later that of Inspector of Mines for the Province.

For two years, 1886 to 1888, he sat as a private member in the local legislature of British Columbia. This should have given him some insight into the workings of that particular body of which he is now a leader. Since then he has represented Victoria in the House of Commons and as a member of that body, as a prominent militia man, acting as A. D. C. to the Governor-General and more than once representative of the militia of Canada in the old country, he should have gained a wide experience of men and rubbed shoulders with many who might possibly be eminently useful in developing the resources of British Columbia. As a speaker Col. Prior takes no mean rank in the Dominion house, long experience having given him an ease of manner denied to most men, and Nature a voice which is not only ab-

normally powerful but exceedingly mellow as well. During the whole of his career in the House of Commons Col. Prior has been a staunch Conservative, and yet if anyone had a fault to find with him it was that he was too much of a *persona grata* to his political enemies.

No one on the Conservative side seemed to be on as friendly terms with the leaders of the government at the time, (say), of the Yukon scandals as the member for Victoria.

After making a telling speech against the government as he did, for instance, upon the importation of cheap Galician and Doukhobour labour, he would swagger over into the enemies camp and all would apparently be peace and good will between the attackee and the attacked. As a matter of fact he is not fool enough to treat political opponents as personal enemies. Whilst he has the gloves on he hits hard. When he takes them off he shakes hands. Men argue sometimes that we should have a Liberal in power when Liberals are in power at Ottawa. We have not got that, but we have got the Conservative who was most popular personally with the individual members of the government party. This should be some advantage to us.

We have said much so far and yet the point is to come. In his record you will find Col. Prior

is a mining and civil engineer by profession, and that as such he came to this country, and was for years employed as mining engineer by the Vancouver Coal Mining Company, *not* the Dunsmuir Company, as is so frequently alleged, and his character is summed up by the public press of his adopted country in one short sentence of the "Star"—"a good business man."

The miners of Nanaimo love the man because he worked with them in his shirt sleeves, as practical a man as themselves, and because after he had left the company's service, when a ghastly accident had occurred in the mine, Col. Prior came at the miners' first call and led a forlorn hope underground at imminent risk to himself, to rescue the men who were still below. Whilst the people probably returned him lately in great mea-



LT.-COL. THE HON. E. G. PRIOR, MINISTER OF MINES.

sure because they believe that he is a straight man, and they see that he fights his fights fairly and only laughs when you hit him, but we, as men interested only in the great industry of this country, can afford to ignore his politics, forget his military record, overlook his genial goodfellowship and yet rejoice in his appointment to the portfolio of mines, because he is a man of wide political experience; well known in centres from which the money necessary for our development is most likely to come; well liked by those in power at Ottawa; a man with large interests in this Province, NOT centred in Victoria but spread over the whole Province, and above all because he is a professional and practical mining man and "a good business man."

Outside Victoria, where naturally some heat still lingers after the recent contest, it seems to us that most men would condone many offences, if they be offences, of the present government and try to think well even of politicians as a whole, if they would only stop their endless squabbles, give the country rest and let the new Minister of Mines do something to promote the interests of that industry upon which the prosperity of the whole Province depends. If they won't do that we might as well throw up the sponge. It is useless for mining men to develop and advertise the country, if the politicians who produce nothing insist on damming it.

BOUNDARY ORES AND THE PRICE OF COPPER.

OUR Boundary District correspondent, Mr. E. Jacobs, writes us as follows: An article which appeared in the January issue of the *B. C. Mining Exchange and Investors Guide* (which, by the way, did not come under my notice in time for me to call attention to it in your February issue), contains an absurd assumption relative to the value of "our low grade Boundary ores," to which it may be well to take objection as misleading and harmful. The paragraph referred to read thus: "As a matter of business economy, we will take our low grade Boundary ores, treated by the smelters there. Assuming they put through 500 tons per diem of 3 per cent. ore, which would be 15 tons of copper, and supposing by way of illustration, copper to be at ten cents per pound, the gross returns would be \$3,000. Deduct say two-thirds for working expenses, refining, etc., or roughly, seven cents per pound, leaves a net margin of \$1,000 per diem." Now it is the publication and reiteration of just such rubbish as this that adds to the difficulties of the district mining and smelting companies in their endeavours to secure lower rates for fuel and freight and a remission of the taxes that burden so heavily these low grade mines. Of course "comparisons are odious" in such a case as this, but in contrast to the ignorant vapourings of such mis-named "Guides" as that under notice, let me quote from a recent number of the *New York Engineering and Mining Journal*, which in the course of some editorial comment on this

district, said: "The copper ores throughout the district yield on an average about one-third per cent. of copper, and the decline in price of that metal meant at least \$1.50 per ton. The margin at best is small and this decline was a serious blow." The difference between the two statements is simply that the former is the utterance of (in this connection) an ignoramus; the latter of a writer who does know something of the subject he is dealing with. Between the stuff the *Canadian Mining Review* has published relative to values of the Boundary ores and the equally unreliable nonsense in the opposite direction of the *B. C. Mining Exchange*, this district has nothing to choose, since both tend to do it more harm than good.

Is American enterprise to repeat in the Boundary its profitable experiences in the Rossland district, where it opened up the leading mines and afterwards sold them for big prices to British companies? The Granby Company, certainly, is an eastern Canadian organization, but much of its stock is owned in the States. The British Columbia Copper Company is a New York company, with very little, if any, of its stock held in Canada, the capital for the development of the Mother Lode mine and its equipment with the biggest power plant in the district and for the building and equipment of the smelter at Greenwood having come from New York. The Montreal and Boston Copper Company, which lately purchased the smelter erected near Boundary Falls, has been placing much of its stock in New York, Boston, Philadelphia and other United States cities. The Morrison company is controlled in Spokane. Turning to recent sales of undeveloped properties, the Ruby was acquired by capitalists from Detroit, Michigan, and now the Arlington-Burns group has been sold to men from Duluth, Minnesota. True, there are as well several British-owned companies operating in the Boundary, but American owners are by no means the least enterprising and successful in the district.

The Granby Company now has four blast furnaces in running order at its smelter at Grand Forks, and the B. C. Copper Company two at its Greenwood smelter. Allowing a daily average tonnage of 350 tons for each furnace at the first-named smelter and of 400 tons at the latter, this would give a daily treatment capacity of 2,200 tons. But both the averages named are lower than those reached by the furnaces running during recent months, so that, should it be found practicable, as it is expected it will be, to operate all of these furnaces, the total here given above will likely be less than the actual tonnage that will be treated. Then it is claimed that the Montreal and Boston Copper Company's smelter at Boundary Falls will be in operation this month, so that with the addition of say 300 tons more at those works, which figures will also prove to be too low, the Boundary should shortly be reducing at least 2,500 tons of its own ores per diem. This will give a monthly total of 75,000 to 80,000 tons. There is good reason to conclude that this anticipated result will be reached, which means that the output of ore mined

and treated in the Boundary district will, during 1902, aggregate not less than 800,000 tons, whilst it is not unreasonable, should no contingency unforeseen arise to check progress at the present rate, to estimate that the total may reach the 1,000,000 tons mark. With such figures, which no one familiar with the situation in the Boundary is likely to successfully challenge, to suggest the increasing development of the mineral resources of the Province—and it must be kept in mind that these relate to only three of the numerous Boundary mining properties, and leave altogether out of consideration the Snowshoe, Brooklyn and Stemwinder group, and half a dozen other properties in the district that can easily be made to appreciably increase the total output—why should we heed the croakings of the pessimist? And if one comparatively small section of the mineral bearing area of the Province is developing so rapidly and extensively, what is there to prevent a dozen other sections of it from adding proportionately to the value of our mineral output should similar confidence induce capital to exhibit a corresponding spirit of enterprise?

IMPORTANT DISCOVERIES OF ORE AT ROSSLAND.

THE recent discovery of a large body of high-grade ore on the Le Roi No. 2, west of what is known as the big fault, must be very encouraging to all those who are interested in the progress and prosperity of the Rossland district. The Le Roi No. 2 covers the Josie, No. 1 and West Le Roi and Josie. It has been mainly dependent on an ore chute of which the outcrop is on the No. 1 ground and which is presumably an extension of the War Eagle vein. Although numerous bunches and deposits of ore belonging apparently to the Le Roi vein system, have been found and worked on the Le Roi No. 2 ground, there have been no developments there at all comparable to those which have made the Le Roi itself and the Centre Star such famous mines, until this discovery made recently. Those familiar with the topography of Red mountain, know that west of the Le Roi boundary line, the mountain sinks rapidly in the direction of the hog back between Trail and Sheep creeks, and that there is a sufficient surface disturbance to render prospecting for the extension of the Le Roi vein system an impossibility upon the surface and a work of difficulty at depth. That difficulty appears to have been overcome and ore in a large solid body definitely located. This means a great extension of the productive area of the Rossland camp and leads to the reasonable expectation that the ore zone has a horizontal expansion much greater than that foreshadowed by mere surface indications. The experience through which Rossland is passing at the present time has been common to most other great mining camps. Those which have begun with a large number of high-grade surface croppings have not been always those of the widest eventually productive area. There was not much said at the annual meeting of the Le Roi No. 2

company of an encouraging nature to its shareholders. But this recent discovery must have relieved their doubts and improved their prospects very materially.

ECONOMIC MINING IN BOUNDARY DISTRICT.

THE paper entitled "A Method of Mining Low-grade Ores in the Boundary Creek District, of British Columbia," prepared by Mr. Frederic Keffer, M. E., of Anaconda, B. C., and read at the recent annual meeting of the Canadian Mining Institute, serves as an effective reminder that the two mining and smelting companies that are operating on a comparatively large scale in the Boundary district, are doing the mining industry valuable service in demonstrating that the low-grade ores prevalent in that district can be mined and their values extracted at a cost leaving a margin of profit, albeit that profit with copper at its present price can only be a small one. When Mr. Keffer, who is general manager for the British Columbia Copper Co., owning the Mother Lode mine in Deadwood camp, and the smelter at Greenwood, commenced in 1896 to open up the Mother Lode there was not on that claim a prospect shaft 25 feet in depth nor a tunnel of that length. Now the extent of work done in underground development of that mine aggregates about 6,000 lineal feet, besides which a quarry has been opened from which, to date, between 60,000 and 70,000 tons of ore have been taken out, this being supplementary to the output from the extensive underground stopes of the mine. Mr. Keffer's Boundary experience, therefore, extending as it has done over nearly half a dozen years and embracing the transformation under his management of a mere prospect into a mine, which last year sent to the smelter about 100,000 tons of ore and which, by the time this comment shall be published, will be maintaining a daily average output of at least 800 tons, is both fairly lengthy and eminently practical; consequently his conclusions carry much more weight than they would do were they based simply on theoretical deductions. Mr. Keffer describes the methods of mining that experience has proved to be best adapted to the economical working of the Mother Lode mine, and states the reasons that led to their adoption. The "pillar and stope" system that was eventually adopted in the mine can only be followed to advantage where, as here, the ore bodies are large. Its use in this instance is, however, an object lesson that will doubtless prove instructive to some of the numerous visitors to the mine, and what is of more importance to the district generally, and to the owning company particularly, be an important factor in solving the question of how best to profitably work the low-grade ores occurring there. In thus giving prominence to the work, the Mother Lode mine is doing, no invidious comparison is intended to be made with that of the Granby Company's mines in the same district, which are, as well, mining at a low cost, though their extensive underground op-

erations are conducted on a different system. It would be interesting to have a description of the methods Mr. Tyolen Williams has adopted in the Old Ironsides and Victoria mines, where he has opened very large stopes which, together with the big quarries of the adjoining Knob Hill mine, are now sending out a daily average of about 1,500 tons of ore to the Granby Company's smelter at Grand Forks. The results achieved by the smelters of both companies here mentioned are indeed remarkable, constituting, as it is claimed they do, a record in copper smelting not previously made anywhere in the world.

THE COMPANIES' ACT.

THE Companies' Act has been subjected to a certain amount of criticism of late, much of which is well deserved, although some of it is certainly due to a lack of knowledge. That the Act is capable of improvement must be readily admitted. The regulations, too, which are already provided are in many respects not sufficiently enforced. We have personal knowledge of the existence of a company which has had no meeting of the board of directors for years, which has no officers save one, and which complies in no respect with the provisions of the Act. This is a condition of affairs which ought to be rendered impossible.

The Provincial Act has, as a matter of fact, been adopted largely from the English Companies' Act, with certain alterations and additions having reference to local conditions. These differ especially in respect to mining and it is precisely as concerning mining companies that certain deficiencies in the Act have become apparent. This is, of course, the phase of the subject which especially interests us. In a recent issue of the *Nelson Miner* the question is discussed. While we agree in some respects with our contemporary's remarks, many of its suggestions are not practicable. Touching the protection of shareholders, the fault we have to find is not so much in the Act itself as in the fact that the provisions are not rigidly enforced. Shareholders have a right to certain information and regulations for the filing of this information are made. But it is notorious that at present a very small percentage of companies ever file the particulars as required by the Act. The shareholder may with little expense, obtain a summary conviction against the directors for non-compliance with the Act and a fine is imposed upon the company; this is his present remedy. But conviction does not necessarily gain the information to which the shareholder is entitled. It should be possible to make additional and more stringent regulations in this connection.

The late regrettable occurrence at Van Anda has directed attention to the question of the protection of workmen in metalliferous mines. Employees are, of course, preferred creditors, and have large remedies under the Companies' Winding-Up Act, but the incident referred to indicates the need of some further legislation on behalf of employees. This legislation might take the form of giving the workmen a lien or preferred

charge upon the ore on the dump, or upon the matte produced, in the case of mining companies working under a bond. Some suggestion has been made that directors should be rendered personally liable; but this, we submit, would be impracticable. That the miner or the merchant should give credit to a company financially unsound is doubtless very regrettable, but to make certain officials, whose duty it was to conduct the negotiations for labour or the supply of goods, suffer, would be unreasonable. We are of the opinion, however, that more stringent regulations with regard to the liability of directors might be introduced into the Act with advantage.

It has further been suggested that a distinction should be made between so-called "close corporations," the stock of which is not for sale, and joint stock companies whose shares are quoted on the stock market. But "close corporations" are as often as not incorporated with the intention of taking advantage of the limitation of individual liability conferred by the Act. Why then, if the benefits of the Act are received, should not all the provisions be complied with? Even in close companies an endeavour is often made to "freeze out" one shareholder. It might not, however, be undesirable to make the regulations for mining companies more stringent than those for ordinary commercial enterprises.

The object of the sections of the Act limiting the liability of shareholders in mining companies to the actual purchase price paid for shares, and to insure that no liability beyond the sum actually paid attaches to the purchase of the stock, and we cannot agree with the *Miner* that these are the work of a "clumsy amateur." Such a clause is decidedly beneficial. Nor can we agree that the filing of a list of shareholders is unnecessary. A clause has recently been incorporated into the English Act to the effect that shares shall not be allotted till a certain percentage of the capital stock of a company has been *bona fide* subscribed for. This is an eminently wise provision and its adoption in British Columbia would do much to remedy certain existing evils. We refer, primarily, to the leakage of funds which too often takes place to an alarming extent before the legitimate work for which the money is subscribed is even approached.

These suggestions are merely tentatively made, and may or may not be of value. It is perhaps more important that the laws already enacted regulating company business should be rendered effective rather than that new regulations, however necessary, should be placed on the statute books and thereafter ignored.

REPORTED TIN DISCOVERIES IN THE YUKON.

IF the reports concerning the discovery of cassiterite or tin oxide in the Yukon prove, on further investigation, to be well founded, the circumstance may have a most important bearing on the industrial development and future of that region. It is stated that tin ore has been found over an extensive area, occurring in the form of dust and lumps of large size, on French

hill, in the vicinity of Hunker creek, but on the supposition that these finds are actual and important, it is in the highest degree probable that other localities within the present known alluvial field within a thirty mile radius of Dawson will also be found to be stanniferous. On the other hand it is well to remember, as a reason for accepting the report with caution that foundationless rumours of similar discoveries of tin by placer miners in the States have not been uncommon in the past. Should, however, tin in payable quantities be found in the Yukon, a very important industry may result therefrom. At the present time the price of the metal is high, and production of late years has considerably fallen off, while consumption is on the increase, and is bound to continue year by year, as commerce spreads, so long as prices do not rise above the point that would render the metal too expensive to be commercially utilised, and so long as no cheaper metal or alloy is found to take its place. The chief source of the world's tin supply is the Federated Malay States, but it is a significant fact that during the past seven years the productive area in that country has not been added to, notwithstanding that large and previously inaccessible tracts of land have been opened up by roads and railways. In Great Britain but twenty tin mines are now in operation, and in other important tin producing countries, such as the Dutch West Indies, New South Wales, Queensland and Tasmania, indications do not point towards an early considerable increase of output. The tin miner in the Yukon, however, would have many difficulties against which to contend. The high cost of labour, supplies and transport, the distance from markets and the intemperate climate would probably prevent him from working for five or six months in the year and would place him at a serious disadvantage in competing in the world's market. But most of these disabilities might and doubtless will disappear or be overcome in the course of time, for already conditions are very different from what they were even a year ago.

B. C. IRON AND A POSSIBLE AUSTRALIAN MARKET.

THERE is a saying to the effect that he who aims at the moon may hit the tree top. Without indulging in extravagant speculation, there is a practical way of considering possibilities which, by the exercise of a little determination and a great deal of refusal to be discouraged, may transform some at least of what "might be" into what "can be," and of what "can be" into what "is."

The meeting of colonial premiers which is to take place in London this summer, should be fraught with important results to British Columbia. The first and most obvious thing that the interests of the Province require is the establishing of relations with the Australian Commonwealth. In Australia there should be one of the best of our future markets and here, it has already been pointed out, the product of our iron mines would find a ready sale, since the imports of iron in all its forms were, as long ago as 1898, about \$43,000,000. The best steel manufactured in the world at present is made from the magnetite ores of Sweden. In Sweden practically no coal deposits exist; in British

Columbia not only are there excellent and extensive deposits of magnetite, but coal and fluxes are abundant. An English engineer has been investigating the possibilities of a steel shipbuilding industry for Canada and states that the Dominion, with its wonderful resources, will in future be able to beat the world in the manufacture of steel, and there are no economic reasons, why, in the future, iron should not be manufactured as cheaply on the British Pacific as on the Atlantic sea-board. American capitalists, as usual the first in the field, have been for sometime past developing the magnetite deposits on the West Coast of Vancouver Island and ore from this locality is shortly to be sent to Washington to be converted into pig iron. The operations of this syndicate consequently are, under existing circumstances, of little, if any, benefit to the country, more especially as the workmen employed are Chinese. The establishment of blast furnaces in British Columbia at the present time is, however, rightly enough regarded as impracticable, as the local consumption of iron is quite insignificant, and with a limited production it would not be possible to produce iron cheaply enough to successfully compete even for the relatively small Puget Sound trade; the bonus granted by the Dominion government on iron manufactured in Canada, hardly offsetting the duty imposed on manufactured iron entering the United States. There is, nevertheless, an undoubted future for British Columbia iron, but this future is entirely dependent on the development of markets and the building up of an ocean-carrying trade.

The circumstances leading to the closing down of the Van Anda mines and smelter appear to be sufficiently disgraceful. It seems that the mine was acquired under bond from the trustees of the proprietary company by an American syndicate. This syndicate may or may not have entered into the arrangement in good faith, but at any rate in consideration of a small initial payment permission was granted them to operate the mines for a certain length of time on the understanding that the second payment on the bond would fall due in March. The trustees of the Van Anda company, however, in entering into this arrangement seemingly neglected to ascertain the financial standing of the syndicate, or to take steps to guard against damage to the property. The syndicate, untrammelled by restrictions of any kind, commenced operations by stoping out all the available ore in the Cornell mine, which they very effectually "guttled." For a time, while this work was in progress, the employees at the mine and smelter received their pay, although not punctually; but during the past two months no wages have been paid, and the miners becoming alarmed when the second payment on the bond was not met at maturity, seized the matte at the smelter in satisfaction of their claim. The proceeds from the sale of this matte, however, will not be sufficient to pay the men the full amount owing them, and it is doubtful whether the balance of the claim will be collectible. As a result, therefore, of dealing with these irresponsible persons, the trustees of the Van Anda company have now the satisfaction of knowing that the mines, which have been gutted of ore, are several thousands of dollars less valuable, and consequently less saleable, than before the arrangement with the syndicate was entered into, while they are also morally, if not legally, responsible for the loss suffered by the miners in the affair. The history of the Van Anda company is one continuous record of maladministration, and the sooner the mines, which are really valuable, pass into more capable hands the better for everyone concerned.

THE ORE DEPOSITS OF THE SIMILKAMEEN.

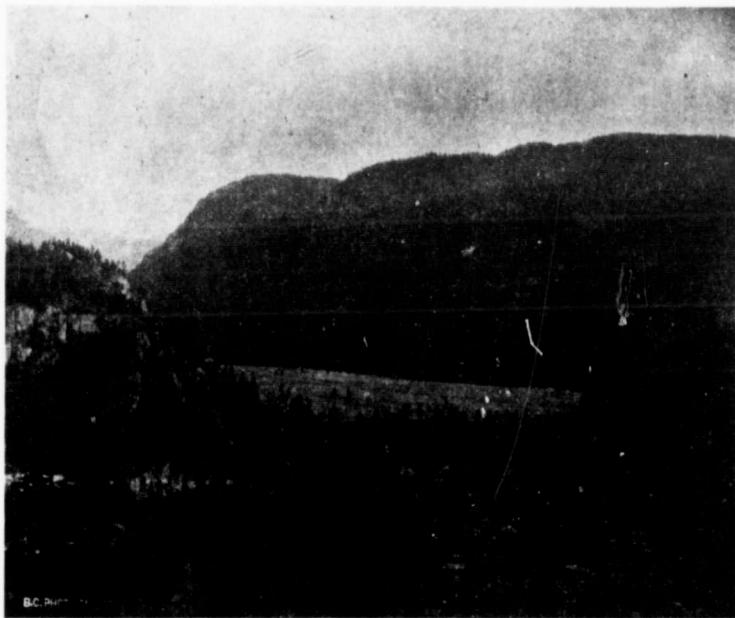
BY CHAS. E. OLIVER,
(Camborne and South Wales School of Mines).

THE Similkameen country is bounded on the north by the Trout creek and Nicola divides, on the south by the International boundary line, on the east by the ridge forming the divide between the Okanagan and Similkameen rivers, and on the west by the Hope mountains.

Early History.—Considerable placer mining was carried on here in the later fifties, principally at Granite creek, and this branch of the industry is still being conducted by several hydraulic companies. It is interesting to note these gravels carried platinum which, relatively speaking, quite recently was discarded as "black sand" being afterwards gathered up by later and wiser fortune

The Maurice Bros. made, in '99, an exceedingly rich strike on the east side of the Similkameen, opposite Shuswap creek. A bond was obtained last summer on these claims by an eastern syndicate whose manager, Mr. Bristol, has been operating all this winter. They have sacked and are now shipping their first batch. The ore is very rich gold, appearing at times in coarse grains in the quartz and carrying quite a heavy percentage of copper pyrites in some samples.

(2). The arsenical-pyrite belt lies between 15-mile creek and Stirling creek. This arsenical ore is usually high-grade specimens, running \$2,000 and upward being not uncommon. The principal property on this belt is the Nickel Plate, which is being worked under the management of M. R. Rogers, and has had a force of 30 or 40 men employed for the last two years. A compressor was installed on this property last winter



HEDLEY CITY SITE.

seekers. The first year that any real interest was taken in the ore deposits of this district was '97. In this year the Nickel Plate mine was staked and bonded and the Sunset, of Copper mountain, came into prominence. In the spring of '98 the country was overrun with prospectors and mining men, and since this period the work of improvement has been steadily progressing.

Characteristic Ore Bodies and their Localities.—The mineral deposits of this district may be classified into four: (1) The free-milling properties; (2) Arsenical pyrites having high values in gold; (3) Copper; (4) Coal.

(1). The free-milling properties are chiefly situated on the Lower Similkameen. On the summit, at the head of 15-mile and Olalla creek, some quartz very rich in both silver and gold has been discovered on the Savage group, and on the group adjoining belonging to E. Bullock-Webster & Co. About 1,000 feet of drifting was done on this group last summer and operations will no doubt be resumed in the spring.

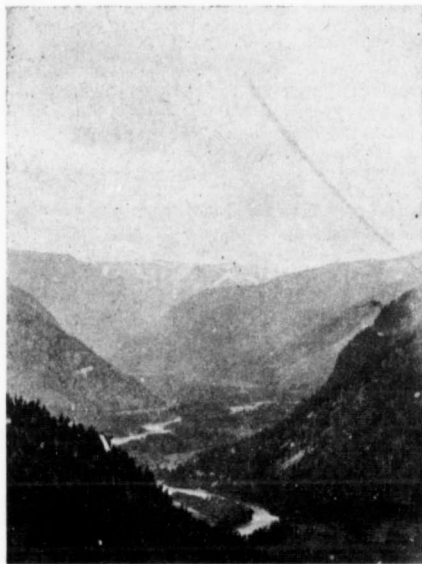
and a dozen or more cabins erected for the married employees. Numerous tunnels have been driven on the property. Their main tunnel is in a distance of 400 feet and raising has been in progress for the last few months. The richest ore is carefully guarded and the natural disposition on the part of the management to reticence forbids close observation as regards the nature of the deposit. Let it suffice to say they have a very high-grade body of ore, whether ledge or deposit.

The claims adjoining this property have very promising showing but farther than 100 feet none of them have been explored, though deals are now in course of completion whereby some of them will be opened up shortly.

On 16-mile creek, on the Two Brothers claim, a lead of high-grade arsenical pyrites has been worked for the last three seasons by the Scrapelli Bros. About 2,000 feet of drifting has been done on this claim. The lead is very well defined. On Stirling and Henry creeks

similar ore has been exposed, associated with quartz and lying conformably with the stratification. These arsenical deposits lie in a lime formation and carry their gold, partly the major part, as free and partly associated. In some cases porphyry is intimately mixed with

creek, at a distance of one mile from Hedley, and an altitude of 1,000 feet above it, is the Kingston mine which is under bond to F. M. Wills, of Republic, and is owned by P. Scott. The ore consists of copper pyrites and a 70-foot tunnel has been driven into the ledge



LOOKING DOWN THE SIMILKAMEEN FROM CAMP HEDLEY.



SIMILKAMEEN VALLEY AT HEDLEY.

the pyrites and in such cases this porphyry is itself a carrier of the precious metal. This lime belt is bounded by granite on the west and north and quartzite on the east.

(3). [a]. *Copper on the Lower Similkameen.*—On Shuswap creek an ore consisting of quartz carrying high

on solid ore. There are showings of equal promise on the Toronto and Galena groups adjoining the Kingston, and mention could be made of a number of other claims but as this article is intended to give a general description I must withhold them.

[c]. *Copper of the Upper Similkameen.*—The copper



HOTEL HEDLEY, HEDLEY CITY.



NICKEL PLATE MINE.

grade copper pyrites is to be seen on the King Edward claim. This ore carries varying quantities molybdenite.

At Olalla the Keremeos Mining syndicate have, for the past three years, been working steadily on their property.

[b]. *Copper of the Middle Similkameen.*—At 20-mile

ore in this section may be put down as bornite, though a number of claims show pyrites as the predominant variety. This bornite occurs on Copper and Kennedy mountains and Friday creek, in a matrix of diorite. The deposits are of considerable extent and development should show some valuable properties.

At Aspen Grove, at the head waters of 1-mile creek, the predominating ore is copper glance. A group of claims have latterly been bonded here and active operations will no doubt soon follow.

At 10-mile creek, above Nicola, bornite occurs again this time in a talcose formation. On the Aberdeen several tons of this ore has been sacked for transport to the smelter.

(4). *Coal*.—Coal occurs both at Princeton and White lake. Until lately little has been done towards this section of the industry. A diamond drill and a calyon drill, both of which have lately started boring operations at Princeton, will find out the extent and nature in depth of the seams in this district.

Access to the country—Different Routes.—The approach to the Similkameen can be made: (1) From the north from Spence's Bridge on the C. P. R. main line via Nicola to Princeton at the west end of the valley, or from Sicamous junction on the C. P. R. main line via



TWENTY-MILE CREEK CANYON.

Okanagan lake steamer to Princeton, and thence by stage to Keremeos and Hedley.

(3). From Hope on the west, 60 miles by trail to Princeton.

(4). From Wenatchee on Great Northern, by steamer and stage to Amoville and thence up Similkameen.

Transportation.—Two railroad surveys have been made through this valley by the C. P. R., one route direct over the Hope Pass, another via One-mile creek joins their present main line at Spence's Bridge. The V. V. & E. were granted a charter also and their surveyors reached Amoville last December. A third project, in embryo, decides to run a spur from the Great Northern up the valley. The topography of the valley is an ideal one from a railroad engineer's point of view. With transportation this will be one of the busiest and richest mining sections in British Columbia and there is a very good chance of the railroad dream being fulfilled in the near future.

MICA MINING.

ATENTION has lately been directed to the extensive occurrences of mica in different sections of British Columbia, notably those at the head waters of the Thompson and Canoe rivers, in the vicinity of Tete Jaune Cache, in the Big Bend of the Columbia river, and elsewhere. Last winter a considerable consignment of mica from mines near Golden was sent to Great Britain, and this year efforts are to be made to systematically develop these and other properties. It is, of course, too early yet to determine whether the mining of mica in this country may be profitably undertaken, in fact, as a writer, Mr. G. W. Colles, in the *Engineering Magazine* points out, "experience shows that in only a few regions of the earth occur dikes which contain mica in paying quantities, and even in these regions no certain indications of the presence of mica in a dike have yet been discovered. For the most expert miner, it is still substantially a mere guess whether paying mica is present or not. When present there is often a distinct lead which the mica blocks follow, strung out along either the hanging or foot wall of the dike, and in this case the excavations may be made through the somewhat softer country rock instead of in the hard pegmatite. But this lead is often discontinuous, petering out into worthless trash or scrap; and it may, or may not, start afresh farther on in remunerative quantities. Thus days may be lost in groping about for a new lead, and it has happened that the entire profits of a rich haul of mica have been consumed in this manner. Mines have been abandoned as exhausted, and yet when again worked by a subsequent owner have yielded plentiful returns. Nor are leads always present, for the mica often occurs bunched together in pockets, in great agglomerations of crystals, or even single crystals of large size."

The difficulties and losses of mica mining are very numerous, and even when the substance occurs in blocks of commercial size it is, to quote the same authority, rendered valueless or comparatively so by one or more of a series of defects which may be classed as follows: "Colour, specks, ruling, ribbing, and wedge-formation. Colour, is a defect only for certain uses, as for stove glazing, and, in ground mica, for decorative purposes. The colour of mica may be anything from black, dark green or wine colour, to yellow and pure white or, rather, colourless; the former kind being useful principally for electric and the latter for glazing purposes. The colour of mica is dependent on its composition, and both together are the main guides to its value, independently of other defects.

"A great variety of minerals known to the geologist, all of more or less indefinite composition, are classed as mica. Physically, all have the well-known micaceous lustre and cleavage; and chemically, all are substantially compound silicates of aluminum and of some other base or bases, such as soda, potash, lithia, lime, magnesia, iron, manganese, etc. For present purposes, we may roughly classify the three main commercial varieties as white or potash mica ("muscovite"); yellow or magnesia mica (phlogopite); and black or iron mica ("biotite"); but it is not to be understood that these form hard and fast lines, for they shade insensibly into each other. The last is much the commonest of the three, and indeed most coloured micas owe their tints to iron, which is the all but universal colouring agent, and biotite is found in all colours between light yellow green, smoky brown, and black. The potash mica is too hard and brittle for most electrical uses, but well adapted for glazing and flour. The yellow mica (which includes the "amber mica" of the trade) is fairly well

adapted and much used for both purposes. The black mica is unavailable for glazing and flour, but is generally excellent for electric purposes, when not marred by specks and streaks, to which it is peculiarly subject, and which absolutely destroy its usefulness. That which is most in repute for the last-named use, however, is a dark wine-colored or ruby variety from India, called by the trade name "India mica," though the colour is not confined to India, and India produces other mica. The green micas, on the contrary are rather too hard for electrical uses and a bad colour for glazing, as it happens that a greenish tinge sticks to them and is perceptible even in thin sheets; and again, it has been found unfortunately that when ground they give a flour deficient in lustre, so as to be unfitted for this purpose; they are therefore, of inferior value.

"Coming now to the defects properly so called, that of specks and streaks is one to which biotite is peculiarly subject. It sometimes occurs literally pied with black dots, consisting in general of black oxide of iron or garnet, and when even a few of these are present its commercial value is destroyed, because such mica when used as an insulator is peculiarly liable to puncture, the specks forming practically short circuits for the electric current. The same is true of streaks, which are sometimes turned to red rust. Strange freaks in the arrangement of the streaks have been observed, as for instance where a block was half white and half black, the margins being sharply defined by a straight line running through the middle of each sheet; or again where the streaks ran parallel to one or both edges of the block, marking off the sheets like a checkerboard. The causes for these strange formations, as well as for the following similar ones, are entirely problematic.

"Some otherwise excellent mica is found to be ruled or cut, as it were, with a series of perfectly straight lines, parallel to one side of the crystal, so that on being split the mica falls immediately into strips. The defect may be confined to the sides of the block, or extend entirely across, and sometimes the block is "double-ruled" so as to break up into small lozenges. Such mica is of course perfectly good as scrap, though its value as sheet mica be destroyed. Or again, instead of being striped or ruled, the mica is often deeply ribbed or corrugated parallel to the adjacent edges of the crystal, so as to give the appearance of the letter A (or rather V) whence it is termed "A-mica." As the ribbed portion has to be but away in sheets, such mica is also unprofitable, unless the blocks be large. Wedge-mica is that in which the block is thicker at one end than the other, the laminae partaking in the unevenness. Such blocks are wholly worthless except as scrap.

"The reader will doubtless now begin to understand why mica is high-priced. It is not at all that it is a rare mineral, like gold, silver, uranium, etc., but because of the hazards and uncertainties of mining it, and the extraordinary proportion of waste between the rough block and the finished product. But all is not yet told, for even after all else is allowed for, the somewhat irregular sheet of good material must be further diminished in size by cutting or trimming. Electric mica is now generally "thumb-trimmed," but nearly all mica mined in the United States for glazing purposes is still cut into rectangular shape before leaving the mine; and thus nearly one-half of the good portion goes to the scrap heap. Finally, if, as often happens, the square plates of cut mica are again cut up into other shapes, another large fraction of the material is wasted at the point of use."

Speaking of production from this county Mr. Colles remarks that "The Canada mica comes principally

from Ottawa county in Quebec, though some is also mined in Perth and Renfrew counties in Ontario, and the mines are chiefly the outcome and the legacy of the "phosphate boom" of the 80's, during which many valuable deposits of mica were discovered in the soft apatite. Here lies at least part of the secret of the cheapness of Canadian mica, for apatite is far more easily mined than the flinty matrices of the pegmatite dikes. The increasing demand of recent years for mica for electrical purposes has caused great development of the mines, modern machinery has been installed, and the production of Canada now equals in value and exceeds in quantity that of the United States. This mica is deficient in transparency and in size, but is considered very good for electrical purposes."

The value of sheet mica produced annually by India is, however, far in excess of that produced either by the United States or Canada, and the quantity would bear a still greater proportion, and moreover the production is on the increase. By values we may reckon the production at the present time about as follows: India one-half, and the United States and Canada each about one-fourth. Of this world's production it is interesting to note that the United States consumes more than one-half, including all its own product, the bulk of that from Canada, and a large fraction of the Indian mica, the amounts of Canadian and India mica imported each being about equal to the home product. The remaining portion of the Indian mica goes almost all to England, and is there partially reshipped to Germany and France, the only other users of consequence.

METALLURGICAL PROGRESS IN BOUNDARY DISTRICT.

THE GRANBY WORKS—THE LARGEST COPPER SMELTING WORKS IN CANADA.

By W. A. HARRIN.

THE development of the mining industry in the Boundary country is very largely a record of the progress of the Granby Consolidated Mining, Smelting and Power Co. This will become apparent from an analysis of the production of the various mines, and the volume of tonnage treated at the two existing district smelters. Out of a total tonnage of 410,880 tons in 1900 and 1901 the Granby plant is credited with 293,315 tons. Smelting operations in Grand Forks were not commenced until August 21, 1900, and from a period of two weeks thereafter two furnaces have practically been in full blast ever since. Including the year 1902, up to February 15, the Granby record forms a gross total of 314,000 tons. It must be remembered that the smelter of the British Columbia Copper Co., at Greenwood (one furnace) did not begin the treatment of ore until February, 1901, since which period it has handled a tonnage approximating 130,000 tons.

A gratifying feature is the increased effectiveness of treatment as compared with the showing during the first year. For instance, in November and December of 1900, the plant treated 36,517 tons of ore, giving a daily average for those two months of 598 $\frac{2}{3}$ tons. During the corresponding months of 1901, the same two furnaces reduced 42,677 tons, or a daily average for those two months of 699 $\frac{2}{3}$ tons,—an increase of 101 tons daily. These figures refer to ore alone—no coke consumed in smelting is included, and no barren fluxes are used, owing to the self-fluxing character of the ores.

The following is a summary of the operations of the Granby plant (two furnaces) from August, 1900, to December, 1901:—

Month—1900.	Tons.	Daily Average. Tons.
August, 11 days	2,902	
September	8,753	291 2-3
October	14,215	468 1-4
November	18,050	601 2-3
December	18,467	595 2-3
Total for 1900	62,387	
1901.		
January	17,640	569
February	17,708	632 1-5
March	19,713	636
April	18,995	633 1-6
May	19,075	615 1-3
June	18,510	617
July	18,176	586 1-3
August	18,028	581 1-2
September	20,059	668 2-3
October	20,347	656 1-3
November	20,706	690 1-5
December	21,971	708 3-4
Total for 1901	230,928	

The plant has recently been enlarged by the addition of two furnaces and two sets of converters, the function of the latter being the conversion of matte into blister copper. The converter has been in operation since January 14 last, and is working satisfactorily. The new furnaces will be "blown in" within the next few weeks when the smelter will be in a position to treat an average of 1,500 tons of ore daily, and will make it the largest reduction works in Canada. Before giving a detailed description of the recent enlargement it will be well to briefly describe the original plant.

The water power developed on the north fork of Kettle river gives 1,200 h. p. at extreme low water under an actual head of forty-five feet. The dam gives about thirty feet of this head, the rest being made up between the dam and the power-house. The dam is 175 feet across the top, seventy-five feet from heel to toe on the bottom, built out of 12x12 inch sawn timbers, filled in with rock and gravel. The flume is 12x9 feet, and a mile long.

The power house is within 1,000 feet of the smelter buildings and 100 feet below them. The power with which the blowers, sampling works, converter, etc., are driven, is created by three double sixteen-inch turbine water-wheels, operating under an effective head of forty-five feet. These wheels are connected with the flume by steel intake pipes four feet seven inches in diameter. Each is directly connected with one Westinghouse rotating arm, alternating current generator. Another wheel is belted to two pumps each with a daily capacity of 750,000 gallons. These pumps furnish water and pressure to granulate the slag as it runs continuously from the furnaces.

The power-house, as originally planned, was 100 feet long by 30 feet wide, all the batteries being set in line, on one long concrete foundation.

The smelter proper consisted of two double-decked, steel-jacketed furnaces, 160 x 44 inches at the tuyeres, made by the Gates Works, of Chicago. The gases pass off from the top in a four-foot diameter downtake pipe, which is connected with the big flue dust chamber leading to the stack, the flue chamber being 10 x 10 feet on the inside and 300 feet in length. The stack 11 x 11 feet inside measurement, and 152½ feet high. The blower room is 50 x 58 feet, and is 42 feet from the furnace building. It contains three blowers, one for each furnace and one in reserve. These are connected with the furnaces by a 54-inch diameter blast pipe, all blow-

ers being connected with the one main pipe. Each of these blowers is driven by a 75 h. p. Westinghouse induction motor, which is belted directly to the blower.

The original sampler building is 64 x 70 feet, and is surrounded on three sides by ore bins. The ore train as it comes into the smelter, is carried on a trestle to a series of receiving bins, parallel to the front of the sampling works, twenty-three feet above the floor of the same and thirty-three feet distant. The bins are filled directly from the cars, which have a bottom dump. The ore is taken from the receiving bins by small iron cars, which dump into a No. 5 Gates gyratory crusher. This crusher has its opening a little below the floor of the sampling works and has a capacity of 1,000 tons daily. After the ore is crushed to the size of a four-inch ring it is elevated to the top of the building by a continuous steel bucket elevator. It is next sampled by a 60-inch Snyder automatic sampler. The bulk of the ore is distributed to the bins on three sides of the sampling works by a special cast-iron revolving spout.

Behind the smelter and at an elevation of about 100 feet above the works is a 100,000-gallon tank, which is supplied with water through an eight-inch steel-rieveted pipe extending from the pump to the power-house, a distance of about 2,000 feet from the tank. This water is used principally for granulating the slag as it runs continuously from the settler in front of the furnaces. All the machinery is run by Westinghouse induction motors. There is a 75 h. p. motor for the sampling works, a 30 h. p. motor for matte sampler, a 25 h. p. motor for the machine shops, and a 10 h. p. motor for the elevator in the main furnace building. This embraces a brief description of the old plant.

The work of enlargement was started in May last. The power plant has been increased by a 250 h. p. horizontal turbine water-wheel and a 250 h. p. electric generator directly connected with the water-wheel, making a total of 250 h. p. developed for the use of the city of Grand Forks, the total water power thus developed on the Kettle river being 1,100 h. p. There has also been added two additional triplex power pumps which will each supply another 750,000 gallons of water daily for granulating the slag and for the water jackets. The new pump was furnished by the Stilwell-Bierce-Smith-Vaile Co. of Dayton, Ohio. The Dayton Globe Works furnished the 250 h. p. water-wheel.

The blower room has been increased by one No. 8 Connorsville blower, making four in all or one for each furnace. Two hundred feet have also been added to the dust flue. All the contracts for the supply of the motors and electrical plant were executed by the Westinghouse Electric & Manufacturing Co. of Pittsburgh.

The main furnace room has been enlarged an additional 84x82 feet. The two new furnaces, like the old ones, were built by the Gates Iron Works, Chicago. They are set 39 feet apart, centre to centre, and room is left for two more, which the company is likely to add sometime during the current year. Their actual capacity, in consequence of the self-fluxing character of the ores treated, has been found to be about 380 tons each daily.

A new sampling and crushing plant has been built. It is 70x70 feet, and at its highest part it has a height of 65 feet. An additional No. 5 Gates crusher with automatic sampler, rolls, etc., has been installed. These additions will crush and sample 1,000 tons daily, making the total daily capacity of the crushing and sampling plant 2,000 tons daily. Additional ore bins have also been built. They will have a carrying capacity of 5,000 tons, and, with the existing bins, provide a total capacity of 10,000 tons.

A briquetting plant of 100 tons daily capacity is being

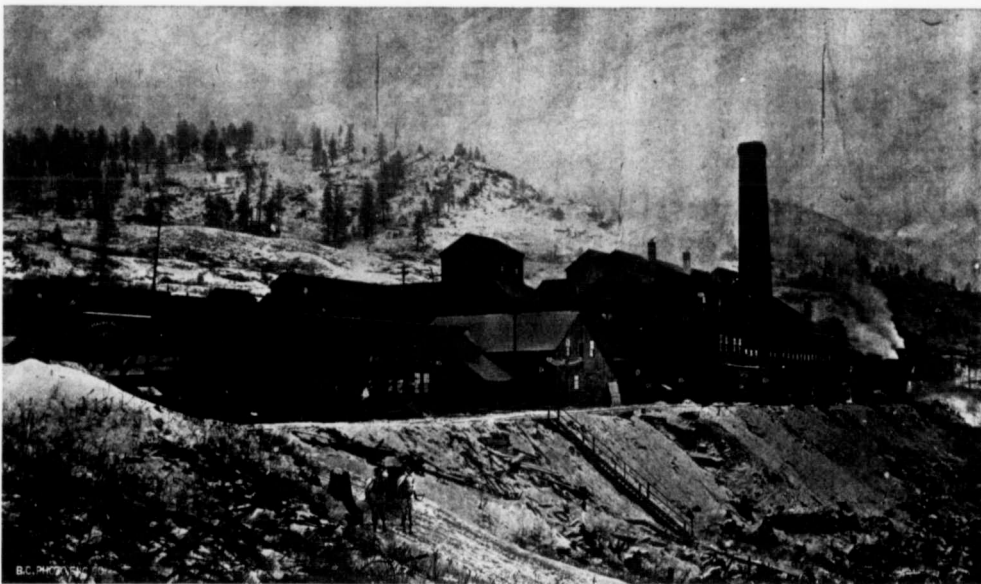
installed. Its function is to compress the flue dust into bricks, which, will afterwards be re-smelted. The plant was built by the Henry Mould Co., of Pittsburg.

The converter building is on the same level as the furnace house containing the four blast furnaces and 100 feet therefrom. It is a steel fire-proof structure 160x68 feet, its height in the main portion being 45 ft. The contract for its construction was executed by the Hamilton Bridge Co. of Hamilton, Ont. This building contains two stands of converters of the horizontal barrel type supplied by the Gates Iron Works of Chicago. The shells are 72 inches in diameter by 100 inches in length. Each stand will have a capacity of from 50 to 70 tons of matte daily, and each is provided with three shells. This building also contains a forty-ton electric travelling crane, forty-foot span, for handling the shells and matte. In another portion of the building is a twenty-five ton reverberatory tilting furnace also supplied by the Gates Iron Works.

The converter building is connected with the furnace house by a ten-ton electric crane, 24-foot span. The matte from the furnaces is first settled in receivers, which in turn are tapped out into the matte ladles.

The small electric crane takes the ladle of molten matte to the end of the converter building and there pours the hot metal into the tilting reverberatory. When the converter is ready for a charge the 40-ton crane in the converter building places a large matte ladle in front of this furnace, and by hydraulic power the furnace is slowly tilted until there is enough for a charge. The large crane transfers this molten matte to the converter into which it is poured. The converter is then turned into an upright position and the blast turned on.

The pressure blast is 10 pounds per square inch. The blast is maintained until such time as sufficient slag has formed. Then the blast is turned off and the slag skimmed into a large ladle. This ladle is then carried by a



LATEST PHOTOGRAPH OF GRANBY WORKS SHOWING RECENT ADDITIONS.

In the same structure there is the quartz crushing plant and grinding pan for mixing the converter linings. Under each converter stand are three mould carriers operated back and forth by a hydraulic ram. The converters are also tilted by hydraulic power as well as the reverberatory furnace. Near the converter building is the engine room, in which is the blowing engine for blowing the converters; also the hydraulic pump which furnishes the pressure to operate the various machines in the converter building.

The blowing engine is run by a belt from a 200 h. p. alternating motor. It is of the power type, has an air cylinder 36 x 36 inches and has a special unloading device attached, so that when the pressure reaches a maximum of twelve pounds the valves are so arranged that they remain open and no power is consumed while the converter is not using air. This unloading device was specially built for the Granby Co., and has hitherto been used on any low-pressure blowing engine for converter purposes.

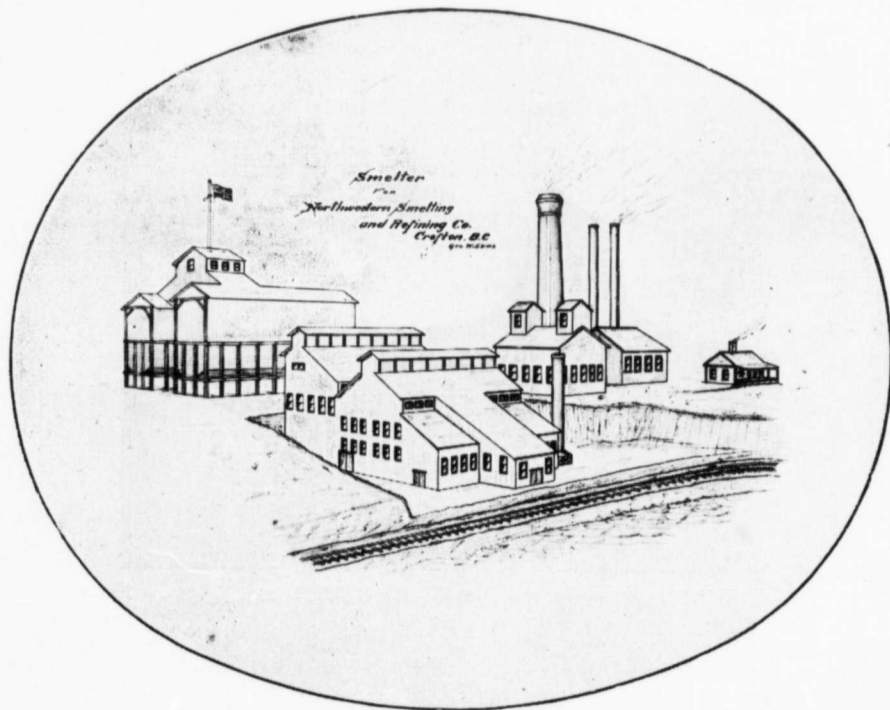
crane and the slag is poured hot into the tilting furnace. The converter is then blown for a short time when the matte is all converted into metallic or blister copper, still retaining the gold and silver values. The moulds on the carriages are now brought into position by the hydraulic ram and the copper is slowly poured out of the converter into these moulds. The copper, which is 98½ per cent. pure, is then moulded into cakes weighing about three hundred pounds each. The converter is now ready for another charge. It takes from two to four hours to convert one charge into metallic copper. By converting the matte at the smelter, a saving of fifty per cent. in freights is effected.

The converter began operations on January 15 last. Besides converting its own product, the Granby company has closed contracts and is now treating matte from the smelters of the British Columbia Copper Co., Greenwood, B.C., the Hall Mines, Nelson, B.C., and the Van Anda Co., Texada Island, B.C. Within a few weeks when the Granby plant will have four furnaces,

the converter will be producing approximately about 1,000 tons of blister copper besides the gold and silver values, monthly. This will be at the rate of two million pounds monthly, or 24,000,000 pounds per annum. Although no official returns are available, it is generally understood that the gold and silver values constitute an important feature of the product of the Keob Hill-Old Ironsides-Victoria group, owned by the Granby company.

Mr. Hodges, the superintendent of the works, has been connected with the smelting industry since 1886. His first position was that of assistant superintendent of the Philadelphia Smelting & Refining Co., at Pueblo, Col. From there he went to Socorro, N. M., to take the management of the Rio Grande Smelting Works, belonging to the National Lead Co. Later he became

ing in the hands of such capable metallurgists as Messrs. Breen & Bellinger, while Mr. Thomas Kiddie, formerly connected with the Orford Copper Co., and lately in charge of the Van Anda mines and smelter, at Texada Island, has been entrusted with the superintendence of the Ladysmith smelter. The appointment is an admirable one in every way, and the Yee Copper Co. is to be congratulated upon making so wise a choice. At Crofton Mr. Joseph Bye, under whose supervision the Northport smelter was constructed, is superintending the construction of the present works which bid fair to be the most complete on the Pacific coast. Mr. Fred Young, of Butte, is the resident engineer. The contract for the excavations has been given to the Victoria Transfer Co. who have fifty or sixty men at work. The amount of earth to be removed is 12,000 cubic yards



superintendent of the Compania Metallurgica Mexicana at San Luis Potosi, Mexico. Subsequently he accepted the management of the St. Louis Smelting & Refining Works, at St. Louis, owned by the National Lead Co., and was later promoted to the management of the manufacturing department of the same company in New York. In addition to this experience, Mr. Hodges has done much valuable special mining and metallurgical work.

SMELTING ON VANCOUVER ISLAND.

THE satisfactory progress and development of mining on Vancouver Island is indicated by the industrial activity now apparent. Preparations have already begun for the erection of two extensive smelting works on the East Coast, the work at Crofton be-

The contract for the boilers has been secured by the Victoria Machinery Depot Co. and that for the building, masonry and carpentering, by the very capable and energetic firm of Sherbourne & Smith. Mr. Haggerty is supplying the stone from quarries near Vesuvius Bay on Salt Spring Island. The transport will thus be only five or six miles by water. Granite will be used for facing the structure and sandstone for the backing. Such of the machinery as can be purchased locally has been so obtained, but a large quantity of special and very perfect machinery is en route from Denver, Col. With all due allowances for unavoidable delays the smelter will be ready to treat ores on the 1st of June.

Two blast furnaces are in the first instance to be installed, the largest with a calculated capacity of 400 tons per day. The furnace room will be built large enough to accommodate three of these stacks and in addition to the above mentioned stack another is being

put in with not so great a capacity. Besides these two furnaces a modern bessemerising plant is being put in; this will be a great benefit to mine owners of Vancouver Island and the coast of British Columbia, and the freight on the matte to New York will be saved to a great extent, as the output of the Crofton smelter will consist of blister copper instead of ordinary matte.

The power plant will consist of one compound condensing engine of 500 h.p., of which one side, that is the high pressure one, will be erected and at present will have a capacity of 275 h.p.

In addition a large blowing engine will be erected to supply the converters, whilst two Connorsville blowers will supply the air for the furnaces. The boiler-room will contain three boilers of 200 h.p. each. The main stack is 12 feet in diameter and 125 feet high.

The plant will be fully supplied with electric power and lighting. The works will not only smelt ores purchased by the company operating at Crofton, but will also treat the matte from other smelters sent to these works, reducing it to blister copper, and thus effecting a considerable saving in freightage to the Eastern refineries.

steamboats ply between Golden and the towns near the head of navigation in the Windermere district. Supplies to the mines are thus sent up the river, and ore brought down to the Canadian Pacific railway for transmission to the smelters. Although a charter has been granted for the purpose of building a railway from Fort Steele to Golden, the matter seems to end there, and over one hundred and fifty miles of mineral-bearing country lying between two of the principal ranges of mountains in British Columbia, is almost cut off from the outside world. The situation is theoretically perfect for the occurrence of rich ore bodies from a geological point of view, and practical work has proven theory to be correct in this case. Railway magnates in search of an outlet for capital would do well to carefully investigate the potentialities lying almost dormant in the Columbia valley. When mines can be worked and ore shipped under existing conditions, surely no further proof is needed of the value of the ore awaiting cheap transportation facilities.

A traveller up the Columbia river on the deck of a steamboat, cannot fail to notice the white cut banks on each side of the river after passing Steamboat mountain as he approaches the Lower Columbia lake. The tops



THE NEW TOWN OF CROFTON, V. I.—FIRST BUILDINGS ON MAIN STREET.

UNUSUAL OCCURRENCES IN THE WINDERMERE DISTRICT.

BY H. E. NEAVE, M. I. M. E.

MINES in the district of Northeast Kootenay have been the subject of several comprehensive articles and the public have read full particulars of the ore bodies so far discovered in the mountain ranges flanking this district. The richness of the ore enabling extraordinary disabilities in transportation to be overcome and yet realise a profit to the shipping mines has been fully discussed upon. It is therefore rather difficult to obtain material of popular interest sufficient to write a paper on and at the same time avoid tiresome repetition. The present article will be confined to a description of a few peculiarities noted by the writer during a short residence in that part. The Columbia river valley lies between the Rocky mountains on the east and the Selkirk range on the west. From Golden on the C. P. Railway, a comfortable stage coach is regularly run to Windermere about 90 miles south and from there to Fort Steele, 60 miles farther, where a railway is again met with. During the summer small

of these banks present uniform and comparatively level benches clothed in the greenest of grass and numerous fir trees, giving the country a park-like appearance. On closely examining the material of which these banks are composed, it is found to be a fine, white powder, generally devoid of pebbles or grit of any description. This is usually attributed to the action of glaciers and called "glacial mud," but the entire absence of the usual boulders found at the base and sides of glaciers, seem to point to some other source. The uniformity of level found on these benches indicate that this "mud" was slowly deposited in water. If so, the Columbia valley from Steamboat mountain looking south was one vast lake, the same "mud" being found, similarly situated, for many miles south. Steamboat mountain, a solitary, isolated mass, rising up in the centre of the Columbia valley, was apparently the barrier to the north and this barrier must have broken suddenly and allowed a rapid subsidence of the water to account for these banks being left as they are. A gradual subsidence would have resulted in sloping or terraced banks, as this "mud" quickly liquifies on the bottom of a lake. A microscopic examination and analysis of this sub-

stance made by the well-known analytical chemist, Mr. Holdich, revealed the fact that it is principally composed of minute *angular* fragments of iron-stained silica.

The analysis is :

Silica	55.00	per cent.
Alumina	8.60	"
Lime Carbonate	23.00	"
Magnesia Carb.	6.95	"
Iron Peroxide	5.00	"
Combined water not estimated.		

Angular fragments, again, seem to be contrary to what would naturally be expected to be found in a substance formed by glacial action, where the smallest grains would be exposed to prolonged attrition not conducive to the retention of sharp angles. As an abrasive this "mud" is valuable, as it rapidly polishes metal to a very fine surface. A volcanic "mud" flow from some extensive fissure or vent, is one hypothesis advanced to account for this occurrence. Igneous action is still apparent in the immediate vicinity in the form of hot springs, the two principal of which are situated at Fairmont and Sinclair, many miles apart. Here very hot water is being discharged, constantly depositing calcareous sinter on the Rocky Mountain slopes. These springs are said to possess medicinal virtue and are much patronized by both white settlers and Indians. Up Toby Creek is to be found a "soda" spring now easily accessible by the fine wagon road lately built by the government for the mines. This water is clear, cold, and sparkling and makes a delightful drink, preferable to most manufactured mineral waters. It is highly effervescent, and according to the analysis made by the Mines Department, Victoria, contains:

Sulphate of Calcium	Quantities not given
Sulphate of Magnesium	Solids 205 grs. per gallon
Carbonate of Sodium	Chlorine 1.25 grs. per gallon
Carbonate of Iron	
Chloride of Sodium	

The amount of sulphate of calcium is said to preclude its use as a marketable commodity. It is a luxury to travellers up Toby Creek nevertheless. The whole district is rich in salts, resulting in numerous small "alkali" lakes, these being formed by sulphur water leaching out the salts from the soil and conveying them in solution to depressions, where, fully exposed to the sun, a natural concentration takes place. In Toby and Horse Thief creeks can be seen highly decomposed shales, their planes of cleavage almost vertical and rich in sulphate of magnesia. Other shales contain nodules of pure anhydrous sulphate of alumina. Should there ever be a demand for this substance, there is no lack of it here. Some shales sent to the Mines Department, Victoria, contained, according to report obtained, aluminite. One part of Toby Creek canyon only accessible in mid-winter on the frozen creek, beautiful specimens of selenite are found in the shale. This selenite exhibits the usual characteristic arrow-headed crystals.

Both Toby and Horse Thief creeks contain placer gold, but judging from its appearance it is evidently there as a result of natural concentration from a more ancient channel. The gold is smooth and rolled flat by the passage of boulders over the bed rock upon which it lies. Further south at the well-known Wild Horse creek near Fort Steele, gold has been profitably obtained from the placer for many years.

The ancient channel will one day be found in the Windermere district, its existence is placed almost beyond doubt by discoveries that have already been made. Along the base of the Selkirk range west of Canterbury is to be seen a remarkable and extensive dyke of that form of felsite known as keratophyre (Keras, Gr., a horn)

owing to the excess of soda it contains. This is identical with the famous rock in the Tokotea district, New Zealand, from which so much gold has been taken. The keratophyre is composed of :

Silicia, Si O ₂	59.35
Alumina, Al ₂ O ₃	21.30
Ferrous oxide FeO	10.06
Lime CaO	1.58
Magnesia MgO	0.48
Potassium Oxide K ₂ O	0.34
Sodium Oxide Na ₂ O	7.08

100.79

This dyke in the Windermere district contains ledges rich in copper, associated with extensive bodies of barytes. Samples of the dyke are to be seen in the Museum, Victoria. Through one of the passes in the Rocky mountains into the Kootenay valley, many square miles of country, practically untrdden by man, is open for the adventurous traveller to explore, making the Windermere district his headquarters for supplies. Beautiful specimens of ore have been brought out of this unknown part. At the Museum, Victoria, can be seen specimens of sodalite brought over the Rockies by prospectors under the impression it was some form of copper, its fine blue colour being the cause of the excusable mistake.

Perhaps enough has been said to impress those having mineralogical knowledge and leisure with the fact that the Windermere district possesses many attractions, enough to warrant a visit at least and a few months investigation. Botanists also would find a rich field to explore in this fertile valley, medicinal plants being especially prominent, such as digitalis, aconite, pulsatilla, etc. In the mountains just below the line of perpetual ice and snow, can be seen the most lovely flowers during the summer, at an elevation of 8,000 to 9,000 feet. Here hunters can find the ptarmigan, wild goats and sheep, deer and the different kinds of bear.

The government has recognized the importance of the Windermere district and has spent unusually large sums of money on roads during the past two years. The leading mines have also contributed heavily toward the expense of road making.

A METHOD OF MINING LOW-GRADE ORES IN THE BOUNDARY CREEK DISTRICT.†

BY FREDERIC KEEFER, M.A., ANACONDA, B. C.

IT is usually the case in new districts presenting a variety of new conditions, that a good deal of preliminary work must be done to determine the best methods of mining and treating ores. This has been true in the Boundary District, the ores of which, as a rule, are of very low grade, occurring in deposits of great extent without well-defined walls.

It is the purpose of this paper to describe the methods of mining at the Mother Lode mine in Deadwood Camp, near Greenwood, and the reasons which have led up to their adoption.

The ore deposit here outcrops at intervals for a distance of about 2,000 feet, the width in explored portion averaging perhaps 140 feet, although the absence of any defined walls prevents exact measures being given. The dip is about 70 degrees easterly, and pitch toward the south at an angle yet undetermined. Only the ground to the north of the shaft, which is located centrally, has been explored as yet. At the beginning of stoping operations, the ore body had been developed by

†From a paper read before the March meeting of the Canadian Institute of Mining Engineers.

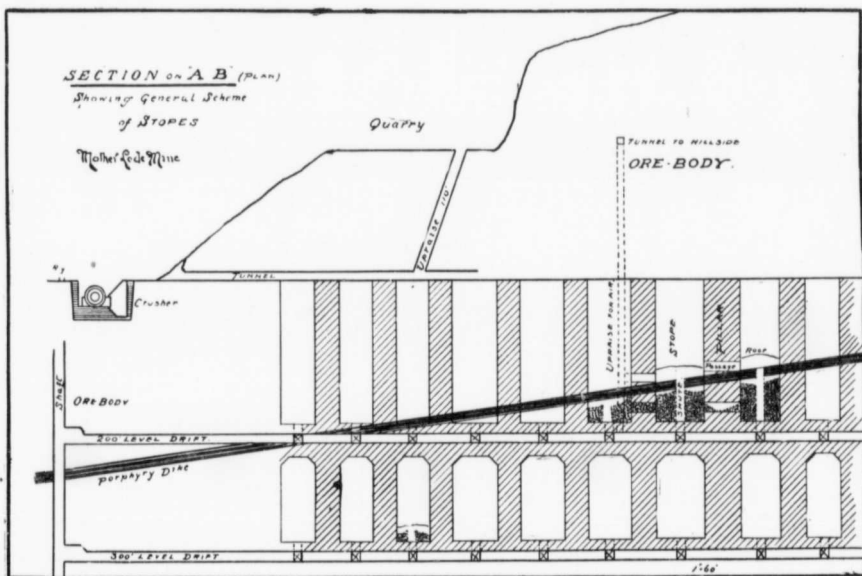
a northerly drift from shaft on the 200 level, the drift extending to apparent end of ore. The deposit was crosscut at intervals of about 100 feet. Similar work was also done on the 300 level. A winze to surface, about 500 feet north of shaft, afforded good ventilation.

It was the original intention to sort all the ore from the mine, filling the stopes with the waste, and with other rock blasted from walls or elsewhere obtained. To this end a system of belt conveyors was arranged whereby the ore from shaft was dumped into a No. 5 Gates crusher, thence passing over a 3-foot wide picking belt to the ore bins. The waste was dropped into side pockets falling upon another belt system, whereby it was conveyed to a bin at top of winze, whence it was to be dropped into the stopes.

It may be said here that the term "waste" is, generally speaking, merely comparative, for the whole of the ore body (with exception noted below) contains copper, gold and silver in varying degree, and waste is merely rock with lesser quantities of these metals. The sort-

that of timbering the whole of the floor of stope heavily, only the excess of ore from above being dropped through chutes conveniently placed. This plan was going nicely until the roof of stope was some 20 feet over timbers, when a mass of ore became detached from roof, which mass weighed some hundreds of tons. Everything in its path was crushed and the stope wrecked. Luckily no one was hurt.

A further, and final plan, was then adopted. The ore body was divided into stopes 30 to 40 feet wide, the length of stopes being the distance across the ore body. The crosscuts already existing were used, and others cut where needed under the centre of each stope. From these crosscuts, upraises were made 30 feet apart. These were made 10 to 12 feet high, and were then connected by second and parallel crosscuts. From these latter crosscuts the stopes were opened out the proposed width, and then carried vertically upward, the short upraises being cribbed and furnished with gates for loading. Between the stopes, pillars 20 to 25 feet



ing and conveying belts worked to a nicety, but the smelter had been in operation but a short time when it became apparent that its capacity for these self-fluxing ores was much greater than had been thought possible, and consequently smelting costs were lower than had been figured. A direct result of this was that the definition of "waste" was altered, and its quantity greatly diminished. And further, that the cost of sorting out this diminished waste was approximately equal to the cost of smelting it; for even the poorest of the rock contains some values to offset in part the smelting charges. These conditions necessitated the abandonment of the filling plan for stopes. Also the sorting of ores was suspended, save for certain ores from the 300 level, where the waste happens to be totally barren and easily sorted out.

The filling system having been dropped, it was then planned to timber the stopes in the ordinary fashion, but this plan was abandoned on account of high cost of timber compared with ore contents.

A third alternative was next adopted in one stope—

in thickness were left, these being frequently pierced to allow intercommunication and ventilation.

In the stope where the wreck occurred a very heavily timbered passage corresponding to a crosscut was built, chutes being placed at 30 ft. intervals.

The empty space was filled with porphyry blasted from a blanket dyke, which extends through all the ground yet explored. The accompanying plans and sections illustrate the general arrangement of the workings.

These stopes will be carried up to a point 160 feet above the 200 level, where they will meet with the surface workings to be described. After this occurs, the ore remaining in stopes above the porphyry will be sent through the chutes, and as much of the pillars removed at same time as safety may dictate.

The ore below porphyry may be removed at will, as this dyke is very thick and solid and will stand any pressure. In this method of working, nearly 50 per cent. of broken ore must be left in the stopes for a considerable period, but to offset this, the interest on

capital so tied up is but a fraction of the cost of timbering these great stopes. Moreover, the system is as safe as mining can be made, the roof of stopes always being near the men, and there can be no wrecks occasioned by a cave. Further, there being no danger from timbers giving way, tremendous blasts can be employed and the ore broken down in great quantities at a time. One drill will frequently break down 75 to 80 tons in 24 hours.

On the 300 level, the pillars come directly below those on the 200, but in future levels the distance will be increased from 100 feet to nearly 175 to allow of less rock being left between levels, and less development having to be done.

SURFACE MINING.

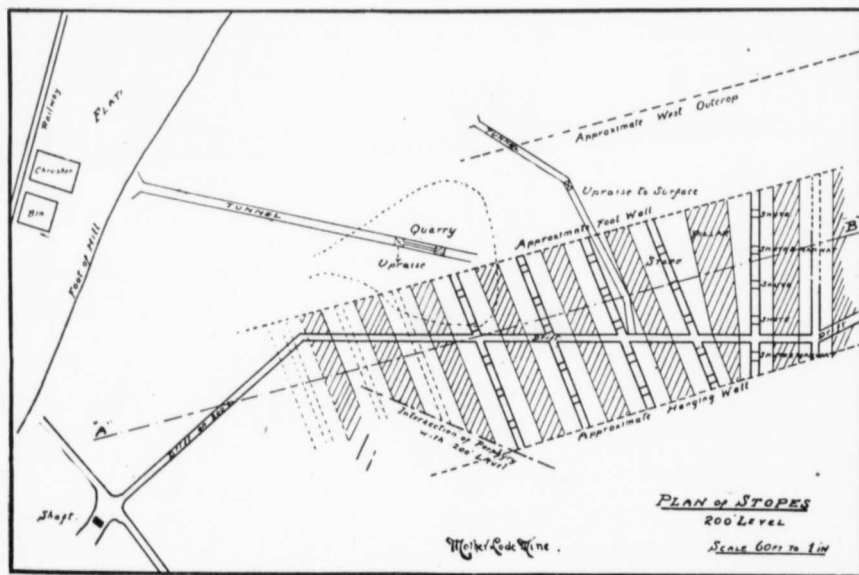
To supplement the output from underground, a great amount of ore is now obtained by quarrying. In the hill which rises some 260 feet over the surrounding flat, a quarry (or "Glory Hole," as it is locally styled,) is in

As quarrying proceeds, other raises will be made, and the level of quarry floor at the same time be lowered until the flat level is reached and the tops of stopes encountered, when these latter may be emptied. The present Gates crusher will take care of all ore from shaft as at present, its capacity being from 400 to 500 tons per 24 hours when fed with ore properly broken.

THE CYANIDE-ASSAY FOR COPPER.†

By HARRY HUNTINGTON MILLER.

IN spite of its recognised irregularities, the cyanide-assay for copper has always been popular among volumetric methods, being easy and rapid, and reasonably accurate when the solution tested contains nothing but pure copper and ammonium salts. In order to secure this condition, however, especially in operat-



operation, this quarry being 110 feet above the flat and 50 feet above collar of shaft. Ore is at present run down a gravity tram to Gates crusher, and thence over conveying belts to bins on the flat. This No. 5 crusher experience has shown to be far too small to admit of economical work, the ore having to be reduced to 10 inch size in order to pass into crusher. This reduction has mainly to be effected by "bulldozing" with high per cent. dynamite, the rock being too hard for hammer breaking. To obviate this difficulty, and to permit of cheaper handling, a tunnel has been driven into the hill from level of flat. This connects by a 12 x 12 upraise with the quarry. In a pit on flat next the railway an immense Farrell crusher, with jaw opening 2 x 3 feet, is now being installed.

Ore will be dropped down the upraise, and there loaded into cars having a capacity of four tons. Trains of these will be drawn by mules to the crusher pit, where they will be dumped, by compressed air, over a grizzly leading to crusher. The screenings and crushed ore will be elevated to a bin beside the railway.

ing on low-grade ores, tailings and slags of complex composition, it is the practice to precipitate the copper from the ore solution,—usually by means of metallic zinc or aluminum. The copper thus precipitated in the metallic form must be dissolved again; and the separation is never, in practice, complete, since an appreciable amount of the copper remains behind in the first solution, and the second solution always contains some of the other metals of the gangue; so that the result is at best but partially satisfactory.

On the other hand, if this course is not pursued, but (as is the practice in many laboratories) the first solution, with or without previous filtration, is treated with an excess of ammonia and the resulting precipitate of Fe, Al, etc., is filtered off, the difficulties in the way of an accurate assay are still greater. A portion of the copper remains behind in the precipitate, necessitating a second and sometimes a third solution and re-precipi-

† From a paper read before the American Institute of Mining Engineers.

tation to secure a precipitate free from copper. Even with this additional manipulation (and consequent loss of time) the results obtained are incorrect. The amount of the standard KCN required to decolorise the solution is affected by varying temperature, varying amount of free and combined ammonia, and volume of solution. The presence of other metals also affects the process. Silver, zinc and nickel, if present, react with KCN like copper, while manganese retains copper in the precipitate to a greater extent than iron, besides obscuring the end reaction.

Having had occasion recently to make a large number of determinations of very low-grade materials, where it was necessary to know the copper contents accurately to within one or two hundredths per cent., I have employed the cyanide-assay with complete success notwithstanding the difficulties above cited. Careful attention to details and the introduction of a system of comparative standardization have resulted in a method which leaves little to be desired as regards speed of working, combined with a very fair degree of accuracy. The principles involved are: (1) The greatest possible uniformity in every stage of the assay; (2) the adoption for each particular class of material of a value for the KCN solution obtained by standardizing in the presence of that material.

DETAILS OF WORKING.

The details of an assay or set of assays of material containing from 0.1 to 0.5 per cent. of copper are as follows: 10 grammes of the ore are weighed into a No. 4 porcelain casserole and digested on the hot plate until complete solution is effected. The acids used, degree of concentration, time of heating, etc., will depend on the nature of the ore; and each operator will determine these features for himself, bearing in mind, however, that in this, as well as in all subsequent operations, what is once adopted must be strictly adhered to in every assay of the same class. When solution has been effected, the sides of the dish are rinsed down with a stream of hot water and the proper amount of dilute ammonia is added, the contents of the casserole being well stirred before and after the addition of the ammonia. The assay is then returned to the hot plate, heated moderately for five minutes, and then filtered hot through a 7-in. filter into a narrow beaker of 250 c. c. capacity. Nearly the entire contents of the dish can be poured out at once onto the filter, and the balance is sluiced out with a stream of cold water. The mass on the filter is washed twice with cold water, the jet being forced with the full power of the lungs, so as to stir up and wash the precipitate thoroughly with the minimum quantity of water. The liquid filters rapidly, and the clear blue filtrate, after two washings, should now be almost cold (not over 70 degrees F.); and if the washing has been properly performed the bulk should not be over 180 c. c. If it be less than this, more water should be added. It is convenient to have a strip of white cardboard bearing the 180 c. c. mark for the size of beaker used. By standing this strip alongside of the beaker the volume of the solution can easily be measured.

The solution, if cool and of the proper volume, is now ready for assay. Place the beaker under the burette on a square of white filter paper. Run in the KCN solution rapidly, stirring vigorously meanwhile. As the color fades, proceed more slowly and cautiously, adding the standard solution in drops, instead of a continuous stream, as at first. If the ore solution contains manganese, a precipitate will begin to form as the colour fades from blue to violet. This precipitate, which appears in the form of a dirty bluish-green or

brown discoloration, obscures the end-reaction, and must be removed by filtration before the finishing point is reached.

Keep the attention fixed on the side of the beaker, near the bottom, look down transversely through the cloudy solution. As long as a decided tint of violet can be seen on the mirror-like surface of the glass, the cautious addition of KCN can be continued, drop by drop. Stop before this colour becomes too faint, and filter rapidly through a thin filter-paper. Washing is unnecessary, as the solution is now too close to the finishing point for the trace of copper absorbed by the filter to affect the result appreciably. The filtered solution, which should be very light blue or pale violet in tint, can now be easily brought to a delicate, hardly perceptible rose pink, which should be the finishing point for weak solutions. For solutions containing much copper, it is necessary to finish with a more decided pink, since it takes a little longer for the last color to fade from a solution which was rich in copper at the start. Where no manganese is present, re-filtering will usually be unnecessary, the solution remaining clear to the finishing point. A considerable excess of manganese may cause trouble in the assay, especially in the presence of ammoniac chloride, as the precipitated hydroxide then forms very slowly, and keeps making its appearance as a milky discoloration in successive filtrates. This can be very largely prevented, however, by the presence of sufficient iron, as the iron precipitate seems to carry with it all but a trace of the manganese.

A little longer heating after addition of the ammonia also aids in securing a filtrate free from disturbing quantities of manganese.

STANDARDISING THE POTASSIUM CYANIDE SOLUTION.

From what has already been pointed out, it will be clear that the amount of KCN necessary to decolorize the solution does not give the true amount of copper present in the ore, when the latter contains other bases which interfere with the assay. When the acid solution is precipitated with excess of ammonia, Ag, Ni, and Zn, if present in the ore, go into the solution, and react like copper with the KCN; while Fe, Mn and Al are precipitated as hydroxides. This precipitate invariably contains a small proportion of the copper which, in the case of iron, is probably mechanically retained; but where manganese is present there is a further retention, possibly as a manganate.

Arsenic may also form in insoluble arsenate; and Cr also interferes.

In looking for a way to obviate these difficulties, I began by assuming that the amount of copper retained by these causes combined, varied directly as the ratio of the total copper to the disturbing elements presents. Experiment proved this assumption to be a true one, at least to a very close approximation; and, this fact once established, the course of procedure became clear.

In standardizing the KCN solution for any particular ore or class of ores of the same composition, two portions of 10 grammes each are weighed out for separate assays. To one of them is added a weighed amount of pure copper, and the two are run through together, being treated in all respects like regular assays. The difference in the number of c.c. of KCN used in the two assays represents an amount equivalent to the weighed excess of copper taken, and from this the true value of the ore is readily ascertained. Operating on the same weight of identical gangues, this figure (with frequent checking) is used. For a different gangue, or a different weight of the same gangue, another test must be made; and whenever an accurate determination of a new ore is required, the assay is run in duplicate as described.

If due attention be paid to the above details, I believe the cyanide method will prove itself superior to the iodide volumetric method. The latter is certainly no quicker, and consumes much larger quantities of chemicals, besides being subject to many sources of error. The colorimetric assay, an improved application of which has been described by Mr. J. D. Audley Smith in a recent paper before this Institute, is adapted to low-grade ores only, and for these does not seem to possess any advantages over the cyanide method, either in point of time or accuracy of results.

By effecting the solution in acid on a thick asbestos pad, heated by gas or gasoline burners, a number of assays can be run through at once, requiring little or no attention from the time they are placed on the fire until they are ready for the addition of ammonia. The "mixed acid" used is kept prepared in quantity, and so is the dilute ammonia. For measuring out the portions of acid and ammonia for each assay, the most convenient vessel is a graduated cylinder of 100 c.c. capacity, with a foot.

The same method can be applied with equal success to richer ores, as well as to concentrates and mattes. For low-grade ores, containing not over 1 per cent. of copper, the KCN solution should not be stronger than 1 c.c. = 0.005 grammes of copper. For richer material, a solution of twice this strength can be used to advantage.

MINERAL PRODUCTION OF CANADA, 1901.

THE following annual preliminary statistical statement of the mineral production of Canada, for 1901, has been prepared by the Section of Mines of the Geological Survey of Canada. Although the figures given are, as stated, "subject to revision," they may still be taken as a very close approximation to those which will be given in the final report:

Product.	Quantity. (a)	Value. (a) \$
METALLIC.		
Copper (b)..... Lbs.	40,951,196	6,600,104
Gold, Yukon..... \$18,000,000		
" all other.....	6,462,222	
		24,462,222
Iron ore (exports)..... Tons.	306,199	762,284
+Pig iron from Canadian ore..... "	83,100	1,212,113
Lead (c)..... Lbs.	50,756,440	2,199,784
Nickel (d)..... "	9,189,047	4,594,523
Silver (e)..... Oz.	5,078,318	2,993,668
Total metallic.....		42,824,698
NON-METALLIC.		
Actinolite..... Tons.	531	3,126
Arsenic..... "	695	41,676
Asbestos and asbestic..... "	38,079	1,186,434
Chromite (exports)..... "	1,759	25,444
Coal..... "	6,186,286	14,671,122
Coke (f)..... "	373,625	1,264,360
Corundum..... "	435	53,115
Felspar..... "	5,226	4,710
Fire clay..... "	3,979	5,020
Graphites..... "	1,440	28,880
Grindstones..... "	5,701	55,690
Gypsum..... Tons.	293,799	340,148
Limestone for flux..... "	169,399	183,162
Manganese ore (exports)..... "	440	4,820
Mica..... "		160,000
Mineral pigments—		
Baryta..... "	653	3,842
Ochres..... "	2,233	16,735
Mineral water.....		100,000
Moulding sand..... Tons.	14,620	29,240
Natural gas (g).....		312,359
Peat..... Tons.	220	660
Petroleum (h)..... Bbls.	588,528	953,415

Pyrites..... Tons.	28,261	113,044
Salt..... "	59,428	262,328
Talc..... "	259	842

STRUCTURAL MATERIALS AND CLAY PRODUCTS.

Product.	Quantity. (a)	Value.
Cement, natural rock..... Brls.	133,328	\$ 94,415
Cement, Portland..... "	297,066	535,615
Granite.....		155,000
Pottery.....		200,000
Sands and gravels (exports)..... Tons.	197,302	117,465
Sewer pipe.....		250,115
Slate.....		9,980
Terra-cotta, pressed brick, etc.....		278,671
Building material, including bricks, building stone, lime, tiles, etc.....		4,820,000
Total structural materials and clay products.....		6,461,261
Total all other non-metallic.....		19,821,072
Total non-metallic.....		26,282,333
" metallic.....		42,824,698
Estimated value of mineral products not returned.....		300,000
Total, 1901.....		69,407,031
1900, total.....		64,488,037
1899 ".....		49,584,027
1898 ".....		38,697,021
1897 ".....		28,661,430
1896 ".....		22,584,513
1895 ".....		20,648,964
1894 ".....		19,931,158
1893 ".....		20,035,082
1892 ".....		16,628,417
1891 ".....		18,076,616
1890 ".....		16,763,353
1889 ".....		14,013,913
1888 ".....		12,518,894
1887 ".....		11,321,331
1886 ".....		10,221,255

REMARKS.

It is gratifying to note that the value of the mineral production of the country still increases, notwithstanding a considerable falling off in the gold output. The growth shown is equivalent to nearly 8 p. c. addition to the total value for 1900. This is of course a much smaller proportional increase than those shown during the previous few years, but it is encouraging to find that it is due to the large expansion of the more permanent mineral industries, such as the metallic, including iron smelting, with coal, coke, asbestos, etc., amongst the non-metallic. All along the line the evidence of this vote has been quite marked, giving great promise for the future, so that the inevitable falling off which must occur from time to time in the output of gold from shallow placer workings, bids fair to be made up by the growth of those mineral industries that are now becoming such a factor in the commercial life of the country. Leaving the Yukon district out of consideration, the permanent metal mining industries shew an increase of nearly 37 p. c. notwithstanding a falling

†The total production of pig iron into Canada in 1901 from Canadian and foreign ores amounted to 274,376 tons, valued at \$1,512,223, of which it is estimated that 83,100 tons, valued at \$1,212,113 should be attributed to Canadian ore and 191,276 tons, valued at \$2,300,810, to the ore imported.

(a) Quantity or value of product marketed. The ton used is that of 2,000 lbs.

(b) Copper contents of ore, matte, etc., at 16 1/2 cents per lb.

(c) Lead contents of ore, etc., at 4 3/4 cents per lb.

(d) Nickel contents of ore, matte, etc., at 50 cents per lb.

(e) Silver contents of ore at \$8.95 cents p. r. oz.

(f) Oven coke, all the production of Nova Scotia and Br. Columbia.

(g) Gross return from sale of gas.

(h) Calculated from inspection returns at 100 galls. crude to 54 refined oil, and computed at \$1.62 per brl. of 35 imp. galls.

away of over 20 p. c. in the value of the lead production. The above, taken in connection with the enlarged value of the output of coal and coke of over 14 p. c. gives an average increase of over 27 p. c. for the more important industries of the country. The total value of the non-metallic products shows an increase of 10 p. c. over last year, that of the whole metallic group nearly 6 p. c., while the structural materials remain about the same. The total value of the mineral production of Canada since 1886, when the statistics were first officially compiled, was but a little over one-seventh what it is to-day, although the population has only increased 17 p. c. in that time. The per capita value is now \$12.92 as compared with \$2.23 in 1886.

In regard to their relative importance the metal mining industries led, contributing 61.70 p. c., the non-metallic following with 28.86 p. c., the structural class being credited with 9.31 p. c. Grouping the metalliferous class with coal and coke, over 80 p. c. of the value is accounted for.

The following table gives the relative contributions to the grand total of the different mineral industries. A comparison of the two years given will show many interesting features.

Product.	1901.	Per cent. of total Production.
1 Gold.....	43.28
2 Coal and coke.....	21.62
3 Building material.....	7.48
4 Nickel.....	5.16
5 Copper.....	4.75
6 Lead.....	4.28
7 Silver.....	4.25
8 Petroleum.....	1.78
9 Asbestos.....	1.16
10 Cement.....	1.00
11 Pig iron (from Canadian ore).....	0.90
12 Natural gas.....	0.65
13 Salt.....	0.43

Product.	1901.	Per cent. of total Production.
1 Gold.....	35.24
2 Coal and coke.....	22.96
3 Copper.....	9.51
4 Building material.....	6.94
5 Nickel.....	6.62
6 Silver.....	4.31
7 Lead.....	3.17
8 Pig iron (from Canadian ore).....	1.75
9 Asbestos.....	1.71
10 Petroleum.....	1.37
11 Iron ore (export).....	1.10
12 Cement.....	0.91
13 Gypsum.....	0.49

The figures tabulated below, give the growth of the various industries for 1901 as compared with 1900:

Product.	Quantity.		Value.	
	Increase.	Decrease.	Increase.	Decrease.
Metallic—				
Copper.....	116.25	.....	115.27	.....
Gold.....	.....	.....	.....	.....
Pig iron (from Canadian ore only).....	134.83	.....	107.85	.....
Pig iron (from both home and imported ores).....	184.11	.....	133.93	.....
Lead.....	.....	19.65	.....	20.31
Nickel.....	29.78	.....	38.07	.....
Silver.....	13.65	.....	9.24	.....
Non-metallic—				
Asbestos.....	30.67	.....	58.52	.....
Coal.....	10.30	.....	10.39	.....
Coke.....	37.77	.....	94.77	.....
Cement.....	29.82	.....	.....	2.44
Gypsum.....	16.54	.....	31.33	.....
Petroleum.....	.....	17.17	.....	17.17

In Gold, according to the figures kindly furnished by the United States mints of purchases of gold from the

Canadian Yukon, there was a considerable falling off of over 12 per cent. this year's yield being less by \$4,275,000. This was partly offset, however, by an increase of almost \$1,000,000 in the output of British Columbia gold. In the other provinces there were no considerable changes.

In Silver, whilst the proportional increase in quantity is fair, there is less to record for the value, on account of the lower prices.

In Lead the decrease is to be attributed to the difficulties encountered by the operators of the British Columbia mines, which produced all but a very small quantity of the output. Not only were the prices for the year lower, but the industry was seriously crippled by the difficulties encountered in profitably marketing the ores with the smelters in the United States.

Copper.—Commencing as they did in the latter part of December, 1901, the low prices for this metal hardly affected the figures of production. The output showed a very large increase over that of 1900. In the Sudbury district of Ontario, the amount of the copper contained in the shipments of matte was greater by over 25 per cent. British Columbia produced over three times the amount credited to it during last year, due chiefly to the large output of the mines of the Boundary Creek district.

Nickel.—An increase of nearly 30 per cent. in production is recorded. The price of nickel, which, from 1895 to 1898, ranged from 33 to 36 cents per lb. was quoted in the New York market throughout the year 1901, at from 50 to 60 cents per lb. The better prices and increased demand has stimulated production at the Sudbury mines. The output in 1901 was 4,595 tons of nickel as compared with 2,872 tons in 1899 and 1,998 tons in 1897.

Iron ore.—Owing to the exploitation of the large deposit of ore of the Helen mine at Michipicoten, in Ontario, a considerable growth is evident in the country's production of this mineral. Part of the product goes to furnaces in Ontario, but the larger part is exported. Only the exports are credited in the table under this heading, the rest appearing under the item 'pig iron.' Adding to the exports the 156,613 tons of Canadian ore, etc., charged to Canadian furnaces, we arrive at a total production of 462,812 tons. In the returns of ore charged, however, a small proportion of mill cinder is included.

Pig Iron.—In the production of pig iron in Canadian furnaces an increase of over 184 per cent. in quantity is recorded, while the estimated production from Canadian ore alone increased nearly 135 per cent. These increases are due in a large measure to the successful completion and operation of the furnaces of the Dominion Iron and Steel Company at Sydney, N.S. The Midland furnace of the Canada Iron Furnace Co. is also to be credited with a considerable portion of the increase, since they only commenced operations in the latter part of 1900. The various other furnaces continued operations on about the same scale.

Steel.—For obvious reasons the value of the steel product is not included in the general table. There was made, however, in steel furnaces in Canada during the year, 41,948 tons (of 2,000 lbs.) of steel ingots, etc., all of which was worked up into bars, etc. Work was continued on the steel-rail plant at Sault Ste. Marie, and the manufacture of steel is said to have commenced during the present year (1902).

Cement.—The figures of production for cement represent the sales and shipments only. A large amount, some 70,000 barrels remained in stock, however, at the close of the year.

COMPANY MEETINGS AND REPORTS.

THE NEW FAIRVIEW CORPORATION.

THE following report by the superintendent, Mr. Chas. Ostenburg, has been submitted to shareholders:

Gentlemen,—I herewith submit for your consideration the following report of the corporation's operations at the Stenwinder mine, Fairview, B.C., for the past six months, ending 31st January, 1902:

The construction operations, occupying the first four months, have been as follows:

Taking down, moving and erecting the 16-stamp mill, formerly on the Tin Horn mine.

Taking down, moving and erecting the 10-stamp mill, formerly on the Okanagan river, purchased by you from the Fairview Mining Co.

Taking down, moving and erecting your saw mill at the same mine.

Taking down, moving and erecting the hoisting works, formerly on the property of the Fairview Mining Co.

Taking down, moving and erecting bunk houses, assay and superintendent's offices, boarding house, etc. which amounted to about 600 tons of material. In addition, about two miles of pipe line was taken up and relaid, this work being in charge of another party.

Exploration and development work consists of making stations at the three levels; crosscutting the vein at the third level; extracting the ore on the first level for the full width of the vein, in order to put in loading chutes, etc.

Extracting the ore on the second level for a sufficient height to put in loading chutes, which are now in for 260 feet, which work will be continued to the end lines of the claim, after which the ore can be extracted at very low cost.

Loading chutes have also been erected on the north ledge.

All this work in the mine has been done within the past three months, and it will take a considerable time to finish the timbering referred to, but as the ore taken out in the widening of the drifts is nearly sufficient to supply the present mill, the mine is practically paying for its own development.

At the present time there are over 3,000 tons of broken ore in the stopes of the second level, which has been broken down in addition to the 1,400 tons sent to the mill during the past month, and we have used only two machine drills to accomplish this work.

I have carefully examined the reports given the following engineers who have examined the mine, viz.: W. A. Carlyle, J. H. G. Riley, J. F. Bledsoe, Joseph J. Taylor, John H. Campbell and E. S. Thurston, all of which agree as to the large quantity of ore available.

Mr. Taylor's report, which I am informed was obtained by the Bank of Montreal, is particularly valuable, inasmuch as he spent several weeks carefully sampling the mine in every portion opened up at the time, being to the second or 200-foot level.

His samples to the number of 134, taken every eight feet in the drifts, gave an average assay value of \$4.07 per ton of 2,000 lbs.

In his report Mr. Taylor states that by taking some care in the extraction, that is, rejecting poor ore in the stoping and using it for filling back, an average of nearly \$5.00 might be expected.

On taking charge of your property, after a month's daily examination, as the work of arranging the stopes progressed, I concluded that as all the ore had sufficient value to pay milling charges, and as the values are so

unevenly distributed throughout the veins, that it would pay better to extract the whole ledge matter than pay sorting charges.

By breaking down the ore as it comes we are now able to supply the mill with only twelve men in the mine, and after the timbers and loading chutes are in, we could supply 200 tons per day, and keep the development work ahead with not more than 20 men in the mine.

This would be an impossibility except for the very favorable conditions, some of which are as follows:

- 1st. The great width of the veins.
- 2nd. The walls enclosing the ore being extremely hard and solid, thus reducing the amount of timber required to a minimum.
- 3rd. The dip of the veins being such that no shoveling is necessary, after the chutes are in, as all the ore falls into them by gravity.
- 4th. The ore is of such a friable nature that we find it possible to operate 2¼ inch (Baby) drills in the stopes. These machines are operated by one man instead of two (which the larger machines require), and three of them which we now have will keep the mill supplied with ore.
- 5th. This characteristic is also valuable in the mill as we can crush 25% more than the average. Two and a half tons per stamp is fair work. We are doing over 3 tons at the present time and using fine screens. By using 30-mesh screens, which I would recommend, provided you erect a small cyanide plant to treat the concentrates, the present mill will crush over 100 tons per day of 24 hours.

With 20 stamps added there should be no difficulty in crushing 170 tons per day, using the screens mentioned.

The object of using the fine screens at the present time was finer concentration in case of shipping the product. This means a greater loss in the tailings, as the lighter portion of the mineral goes over with the heavy sand. If you cyanide the concentrates we can catch all this lighter mineral as well as the heavy sand, which contains some values, allowing only the light sand to escape, thus reducing losses in concentration.

This will reduce the value of the concentrates about half, but will give you three times the quantity we are saving at present.

In testing the concentrates I find that we will be able to obtain a high extraction by using cyanide.

The expense of such a plant as you would require would not be over \$1,000.

The quantity of ore available for the mill from the second level to the surface on the main vein, taking 16 feet as an average width (although at no point on the second level where it is opened is it less than 18 feet), and only taking the length of the present drift (840 ft.) is 147,000 tons.

As there is good ore in both faces of the drift and the surface showings continue through the claim, it is only reasonable to expect that it will be the same as what has been opened, and we could therefore count on having 250,000 tons above the second level of the main vein.

Taking the width of the average from the third to the second level as 20 feet, the distance between levels being 104 feet, this level would supply 230,000 tons, for the length of the claim.

The north ledge is 7 feet wide, and opened on both levels, and could be counted on for 50,000 tons.

We could thus reasonably depend on having an ore supply sufficient to take 200 tons per day for many years.

A pleasing feature of the main vein is, the gradual increase in width as depth is reached.

On the surface it is 6 feet wide, on the first level 8 to 10 feet, on the second level 18 to 24 feet, and on the third level 31 feet.

The value of the ore on the 3rd level so far as we have been able to prove it, is greater than on the other levels, as 77 assays taken every two feet as the work of drifting was continued, give an average of \$6.33 per ton.

Until more drifting is done on this level, and chutes put in, as well as the necessary timbers, which must be large on account of the great width, it will be impossible to extract this ore economically.

The work being done on the second level shows the ore to be increasing in value as well as in width, as we go westward the last average samples taken three days ago being \$5.76 and \$6.27 per ton.

In an active experience extending over 38 years, I have never seen a quartz mine with the possibilities of the Stewminder, coupled with so little risk. It is simply a question of quarrying and mining the ore cheaply, and I venture to say that nowhere in Canada can this work be done for so little money.

I have no hesitation in stating, that with a mill capable of handling 300 tons per day, and with a small plant to treat the concentrates, that the total cost of producing the bullion would not exceed \$1.75 per ton of ore, using steam, and if water or electric power is utilized, this can be reduced to \$1.50 per ton.

The increase of cost to furnish the ore for an additional 20 stamps would not be over 50 cents per ton, as the only additional labor required would be one extra man in the mill and three more men in the mine.

In the present mill run we have been retarded in several ways.

We had no snow until three weeks ago, and as our wood supply is taken from the hills above the mine, which are very steep, and the ground became frozen and icy, it was impossible to get it down, and we were compelled to fire the boilers with green wood, obtained where we could get it. At times it was impossible to obtain a supply, and we had to close the mill down on several occasions.

Our chief difficulty, however, has been with the water supply. The dams were poorly constructed and leaked and we could not get enough to supply the mill. To overcome this difficulty, which was irreparable in the frozen condition of the ground, we caught the water in a small basin below the mill, after it had run through with the tailings, and pumped it back, using it a second time.

This enabled us to run the mill, but at a certain loss of our values, as the water was not clean and would clog up the small spots on the vanners. When we had clean water the extraction went over 85%, but with this water the average extraction was only 73% of our values.

By increasing the present water supply, which can be easily done by the addition of the water from Reed creek, of which your company have the water rights, and which will give you ample water for all requirements, as well as a considerable amount of power, I believe the extraction will reach 90% of the values.

The mill returns are as follows: 26 stamps ran 30 days to 31st December; crushed 1,936 tons of ore taken from the dumps, which had to be removed for foundation to erect large rock breaker, etc., at the mine hoist, and which contained at least 40 per cent. of waste and wall rock taken out during development, and gave the following results:

63 ozs. Bullion at \$12 03	\$ 757 89	39 per ton.
70 tons Sulphurets, at \$46.75	3,272 50	\$1 67 "
Total yield saved	\$4,030 39	\$2 06 "
Average loss in tailings	1,486 56	76 "
Total value of dump ore	\$5,516 95	\$2 82 "
Extraction, 73 per cent.		

Twenty-six stamps ran 23 days in January; crushed 1,802 tons (402 from the dumps and 1,400 from the mine, 1,100 being from the second level). Results:

101 ozs. Bullion at \$14.53	\$1,467 53	81 per ton.
61 tons Sulphurets, at \$74.60	4,550 61	\$2 53 "
Total yield saved	\$6,017 04	\$3 34 "
Average loss in tailings	1,333 48	74 "
Total value of ore	\$7,350 52	\$4 08 "
Extraction, 82 per cent.		

To sum up:

2,358 tons from dump	\$6,650 59	\$2 82 per ton.	Value dump ore.
1,400 tons from mine	6,216 88	4 44 "	Value mine ore.

In conclusion I would recommend that, as soon as the weather permits, you construct a flume or pipe line from Reed creek, install a small electric light plant, erect a small plant for the treatment of the concentrates, increase the number of stamps, at the same time continuing the development work, especially deeper, where the values are greater, and with careful management this property should pay very large profits.

THE WAR EAGLE.

The following is excerpted from the annual report of the directors submitted at a meeting of the shareholders held recently.

As explained in the last annual report the pay ore of the main chute changes to low grade in the block between the 6th and 7th levels at a depth of about 800 feet. There was no evidence to indicate that this change was permanent, or anything but one of the usual low-grade stretches found in ore chutes, and every effort has been made to push exploration work at high pressure. A plan of deep and large scale development is being carried out, in the course of which the branching of the vein, together with complications caused by a system of heavy faults and dykes has greatly increased the delay and expense of exploring the vein.

The closure of the War Eagle mine by a general labour strike has restricted the mining of the past year to a period of about seven months. This further loss of time leaves us still short of decisive results from the great depth of vein made accessible by the rapid shaft sinking. The shaft, 1,499 feet deep on December 31st, will reach the 11th level point at 1,580 feet by the end of February, and sinking will then be suspended until decisive results are secured from the vein area then accessible. The levels are as follows:—

6th level	754 feet in depth.
7th "	881 " "
8th "	1,057 " "
9th "	1,228 " "
10th "	1,378 " "
11th "	1,580 " "

The 7th level is sufficiently developed for the present, showing the ore to be low grade.

The 8th level exploration is not yet completed. The vein exposed by it so far is low grade or barren, but the work has not progressed far enough to be decisive, and there are still fair chances of finding pay.

The 9th level is well under way, but has not yet reached the positions where ore is expected.

The 10th and 11th levels have not yet been started.

Thus from the 7th to the 11th levels a new depth of

700 feet on the vein is now accessible, and its exploration by levels is fairly under way. What its contents may be is yet unknown and is a matter of luck. That its possibilities are great is evident from the fact that the main chute down to the 6th level, a depth of 754 feet, has contained about 165,000 tons with a smelter's gross assay value of \$3,100,000. From the nature of the ground it is impossible to see ahead or to make any prediction as to the chances of success or failure. That these chances justify the cost of exploring it to a decisive point is beyond question. Its contents, whatever they may be, will be reached as promptly and as cheaply as possible.

Ore shipments began January 3rd, 1901, continuing until the strike July 12th, and were restricted to a rate sufficient to meet current expenses; on resuming work in December, the Canadian Smelting Works found that its sampling plant, which was being reconstructed, had been so delayed by the failure of manufacturers to deliver machinery that it would be necessary to postpone the receipt of ore for several months.

The ore shipments for the year amount to 19,864 tons, averaging \$15.64 smelter's gross assay value. The average contents were 0.633 oz. gold, 1.08 oz. silver and 2.1 per cent. of copper.

The ore reserves now on hand in the mine are estimated at about 25,000 tons of about \$14 smelter's gross assay value (valuing copper at the price of 16.25 cents, which it has hitherto maintained).

The following is excerpted from the accounts for the year ended 31st December:

ASSETS.	
Mines and mineral claims	\$1,690,329 39
Cash on hand and in bank	2,579 72
Stores on hand as per inventory	18,122 44
Machinery, buildings and equipment	224,300 91
Furniture of offices	1,882 04
Monita Gold Mining Co's stock	89,589 94
Mugwump Gold Mining Co's stock	28,275 68
Rosland Red Mountain Gold Mining Co's stock	50,190 20
War Eagle Hotel Co's stock	12,500 00
Accounts receivable	25,734 12
Profit and loss	242,730 54
	\$2,401,235 00
LIABILITIES.	
Capital stock paid up	\$1,750,000 00
Bank of Toronto, Rosland	256,171 07
George Gooderham	385,347 37
Accounts payable	9,716 50
	\$2,401,235 00

PROFIT AND LOSS ACCOUNT.	
<i>Dr.</i>	
To Balance brought forward	\$197,514 93
" Cost of mining and developing War Eagle	143,051 50
" Fixed and general expenses while mine closed down	19,445 63
" Rental paid Centre Star Co. for use of power plant for year	3,989 34
" Loss of value, defective hoist and compressor, replaced or reconstructed	26,424 64
" Diamond drill prospecting	13,757 04
" Interest and exchange	16,786 95
" Managing Director's salary (2 years)	5,000 00
" Toronto office expenses	1,166 43
" Auditor's fees	300 00
" Travelling expenses	200 00
" Legal expenses	176 91
" Trail smelter, examination expenses	1,335 40
" Crown Point expense	528 95
" Richmond Group expense	34 18
" Sundry expenses	875 50
	233,072 79
	\$430,587 72
<i>Cr.</i>	
By Net proceeds from ore sales	\$191,579 99
" Less Provincial ore tax	3,840 95
	\$187,738 93
" Transfer fees	118 25
" Balance	242,730 54
	\$430,587 72

It will be noticed that the small tonnage of 19,864 tons shipped this year in comparison with the development work necessary, has made the development cost per ton heavy. It has also made each ton bear more of the general expenses than would be the case with a larger production. The results nevertheless show the improvement effected in cost of mining.

EXPENSE PER TON OF ORE BROKEN.			
(Excluding Storage Ore).			
	Tons.	Expenditure.	Expense per ton.
Ore from development work	1,501	.....	.....
Ore stopped	17,910	\$50,336 10	\$2 81
Expense of production	19,411	\$50,336 10	\$2 59
Expense of development	19,411	92,019 83	4 74
Total cost of mining	19,411	\$142,355 93	\$7 33

CROW'S NEST PASS COAL CO.

The fifth general meeting of shareholders of the Crow's Nest Pass Coal Co., Ltd., was held in Toronto, on March 7th, and the following report of operations for the year ending Dec. 31st, 1901, was submitted:

The net profits for the year, after paying all operating expenses, and all charges of every kind at head office and mines, amounted to \$270,848.39.

This amount has been derived from the various departments of the company's business, viz.: the sale of coal and coke, from waterworks, house rents, electric light, etc. After paying dividends at the rate of ten per cent. per annum a balance of \$28,142.89 has been carried forward to credit of profit and loss.

During the year the company has issued \$500,000 new stock (under the authority of supplementary letters patent, dated 19th February, 1901), at a premium of 60 per cent., and \$300,000 premium paid in was also added to profit and loss account, making a total sum at credit of that account (including the amount already there from the earnings of 1900) of \$517,017.41.

The directors are pleased to state that the company's operations are progressing most satisfactorily under the management of an efficient staff, and they have reason to expect that still more satisfactory results will be shown at the end of the present year.

Financial statement, 31st December, 1901.

ASSETS.	
Mines, real estate, plant, development, etc.	\$3,086,415 61
Cash in bank	\$115,000 00
Accounts receivable	245,285 06
	360,285 60
	\$3,446,700 67
LIABILITIES.	
Capital stock, paid up	\$2,500,000 00
Bills payable	\$219,032 04
Accounts payable	148,151 22
	367,183 26
Dividend accrued, No. 4	62,500 00
Profit and loss:	
Balance at December 31, 1900	188,874 52
Added in 1901	328,142 89
	517,017 41
	\$3,446,700 67
PROFIT AND LOSS ACCOUNT.	
Balance at credit Dec. 31, 1900	\$188,874 52
Net Profits for 1901, after deducting charges of management	270,848 39
Premium from sale of new stock	300,000 00
	\$759,722 91
APPROPRIATED AS FOLLOWS:	
Dividends, at the rate of ten per cent. per annum.	
No. 1	\$55,205 00
No. 2	62,500 00
No. 3	62,500 00
No. 4	62,500 00
	\$242,705 50
Balance carried forward to 1902	517,017 41
	\$759,722 91

In his address, the President, the Hon. Senator Cox said:

Gentlemen,—The coal produced during the year 1901 amounted to 425,457 tons, as compared with 220,458 tons in 1900. Of this tonnage 203,061 tons were sent to the company's coke ovens at Fernie, and produced 125,085 tons of coke, as against 73,496 tons made in 1900, while the balance of 222,396 tons was disposed of as merchantable coal, an increase over the previous year of 116,000 tons.

During the year the company expended the sum of \$2,265,548.06, of which sum the pay rolls amounted to \$911,407.15, as against \$419,037.09 in 1900. The additions to plant, new coke ovens, and for development work at Coal creek, Fernie, Michel and Morrissey, amounted to \$830,165.57, including machinery and supplies; expenditure for freight was \$346,992.41.

The number of men actively employed at the company's works at the end of the year was 1,312, and it is expected that this number will steadily increase in proportion to the extension of operations.

At Fernie 112 new coke ovens were built in 1901, making in all 424 at that point; the rate of progression being as follows:

Ovens erected in 1868	50
Ovens erected in 1899	152
Ovens erected in 1900	110
Ovens erected in 1901	112
	424
While at Michel there were erected in 1901	212
	212

Making a total of 636 ovens at the present time, with a capacity of about 1,000 tons of coke per day.

The material for additional ovens is already on the ground, so that no time may be lost when the building season commences, should the demand for this part of the company's product so warrant.

The sales of coal for the year were.....\$ 644,253 44
And of coke..... 551,639 26

Total\$1,215,892 70

while for the preceding year they were:

Coal.....\$ 392,207 40
Coke..... 310,840 64

Total\$ 703,012 04

A comparison of deliveries to Canadian smelters and of exportations since the beginning of operations may be interesting:

Deliveries to Canadian smelters.			Exported to the United States.		
Year.	Coal.	Coke.	Year.	Coal.	Coke.
1868	1,164	323	1899	118	21,580
1899	9,724	21,800	1900	8,925	28,051
1900	18,760	29,041	1901	81,597	35,497
1901	42,036	85,928			
Totals	71,684	137,728	Totals	90,640	85,047

Aside from the fuel supply for railways, the requirements for British Columbia, the Territories, and Manitoba—smelters and domestic use included—were: for coal, 174 tons, and for coke, 277 tons daily during the year.

As has already been stated, our present capacity for coke is about 1,000 tons per day, or nearly four times the present requirements of British Columbia. Our present output or capacity for coal is also very largely in excess of any requirements that have been made upon us in British Columbia, and we are still expending large sums of money in the opening up and development of new mines at Michel and Morrissey creek.

I have briefly referred to the above facts to show you

the absurdity and untruthfulness of the statements that are being persistently circulated in an endeavour to convey the impression that the interests of the mining companies, the smelting companies, and others in British Columbia are being neglected or prejudiced by the sale of the company's product to American consumers and the opening up of railway communication to that important market. It must be quite clear to every fair-minded man, to every well-informed board of trade, and to every honest newspaper, that our present capacity being largely in excess of the requirements for Canada, a large proportion of the two and one-half million dollars expended last year, and the largely increased expenditure proposed for the current year, would be unnecessary, and would have to be abandoned but for the railway that is being constructed and the markets that are being opened to the south of us. I wish to give an unqualified denial to the untruthful statements that have been persistently circulated, that British Columbia interests have been discriminated against, either in the price of the article, quality, or in the supply required, as such statements are entirely without foundation in fact, and are without doubt the work of interested parties.

The following gentlemen were elected directors for the ensuing year: President, Senator Geo. A. Cox; vice-presidents, Robert Jaffray, Esq., Col. H. M. Pellatt, Elias Rogers, Thomas Walmsley, E. R. Wood, Wm. Hanson, David Morrice, Samuel Finley, J. D. Chipman, J. A. Gemmill, William Fernie.

CONSOLIDATED CARIBOO HYDRAULIC.

In the report of last season's operations, the manager Mr. Hobson summarizes the work accomplished as follows: Total time occupied in washing in pit No. 1, 104 days, 1½ hours; total quantity of water used, 258,250 miner's inches. Quantity of gravel washed—top deposits from upper bench, 2,417,162 cubic yards; gravel from lower bench 3,126 cubic yards; total quantity of gravel washed, 2,420,288 cubic yards; average duty of water per miner's inch, 9, 37-100 cubic yards; gold product for season, 8,351 78-100 oz. (Troy); value of gold \$142,275.51.

The average yield of the upper bench, clay, gravel, and slide-rock, from which 1,687 78-100 ounces of gold were recovered, was 14 33-100, while the lower-bench gravel showed an average return of \$1.27 per cubic yard of gravel washed. As previously stated, owing to the short water supply, only a small quantity of the available bed-rock gravels were treated, in all about 3,126 cubic yards, from which was recovered coarse gold amalgam and nuggets to the value of \$3,978, giving a very high return. As this water shortage left the balance of this high-grade bed rock to be treated during the coming season, the product is expected to reach a high figure this year.

An attempt is being made to sell shares of the Similkameen Valley Coal Company in Eastern Canada and also, we believe, in Great Britain. We would strongly recommend prospective purchasers to exercise the utmost caution and to make very full enquiries before investing money in this concern. The coal so far discovered on the property is lignite, and therefore only relatively valuable for commercial purposes, while the mines have hardly entered even the prospect stage. Under the circumstances the shares have little intrinsic value and the scheme is an entirely speculative one.

B. C. IN LONDON.

A FEW developments there are to report in connection with British Columbia matters. The most important perhaps was the meeting held at the offices of the agent-general with the object of arranging a British Columbian dinner in London. This, which was a very representative gathering, was held on Tuesday, 4th of March, and a committee was formed composed of the following gentlemen:—Mr. Geo. S. Waterlow, D. L., J. P.; Mr. A. J. McMillan, Mr. K. N. McFee, Mr. C. G. Kekewich, Mr. Wm. Walter, Mr. C. H. Wilkinson, Mr. Robert Ward, Mr. Hewitt Bostock, Mr. Cecil Ward, Mr. W. Pellew-Harvey, Mr. C. K. Milbourne, Mr. O. Hickling, Mr. Oliver Wethered, Mr. C. V. Paull, the Hon. C. H. Mackintosh, the Hon. J. Turner being elected chairman of the committee. The dinner took place at the Whitehall rooms, on Tuesday, March 18th, the Right Hon. Lord Strathcona and Mount Royal, G. C. M. G., high commissioner for Canada, presiding. The agent-general and those associated with him were well supported in their efforts to make the dinner thoroughly representative, and I understand it was businesslike in character.

In addition to the work entailed in connection with the British Columbian dinner in London, the new agent-general has found time to lecture upon the Province before the members of the Royal Colonial Institute and the Imperial Institute. On both occasions he met with a very hearty reception and made very interesting statements regarding the Province. I was present at the former lecture and was much gratified to note the very large attendance. Added interest was lent to the occasion by a number of splendid views of British Columbia which were thrown upon a screen, and which certainly helped to assist the agent-general in his efforts to describe the physical characteristics of the Province. At the lecture before the Royal Colonial Institute, Lord Strathcona presided, and, in introducing the new agent-general referred to the important steps which were being taken to reduce the time occupied in covering the distance between this country and the capital of the Province. He also stated that as a result of Mr. Turner's very interesting lecture, his information regarding the Province had been materially increased, and he highly complimented the lecturer on the very able way in which he had dealt with a subject of such paramount importance.

Developments in the stock markets have been few and far between. Le Rois has been very heavy and at the lowest point on record, at all events, since the company passed into the hands of a British proprietor. The wrangle in connection with the past management of the company has continued, and Mr. Macdonald circulated the statement which he had said he would publish, giving his version of this many-sided story. It is satisfactory to find that on the whole Mr. Macdonald is hopeful regarding the future of the property, but it is significant that notwithstanding his statements the shares have hung about in the neighbourhood of 4. The efforts to re-organize the Rossland Great Western and Kootenay Mining Cos. have made material progress, and it is evident that the shareholders now they have started will insist upon the properties being conducted on quite different lines in the future.

At the meeting of the Rossland Great Western mine, Mr. J. A. Fower explained the position taken up by his firm in the matter, and after Mr. Macdonald had made his statement upon the property and the chairman had stated that the present board were quite at the disposal of the shareholders, a committee was appointed to consider the proposal to re-constitute the board with an instruction to report the result to a further meeting of the shareholders to be held March 17th. The meeting of the Kootenay Mining Co. was practically a replica of the Rossland Great Western gathering, the shareholders in the result appointing a committee, and adjourning the meeting also until the 17th March, on which date the committee reported to the shareholders. During the meeting the chairman stated that he and his colleagues were in this case also quite at the disposal of the proprietors. The movements in prices have been unimportant as a rule. One of the most noticeable changes has been the sharp decline in Alaska Goldfields, whilst Hall Mines have been irregular. Another feature was the sharp recovery in the Le Roi No. 2, owing to the belief that this property will ultimately give a good result of itself. London and British Columbia Goldfields have remained steady. In connection with this group much regret was expressed at Mr. Robertson's tragic death. The question of the appointment of his successor is still, I believe, engaging the attention of the board. The Ymir continues to steadily pay quarterly dividends, the last one having been just announced. Despite the general dullness of the market, Ymirs are thought so highly of that they continue to maintain their quotation at over £2.

At last the enquiry into the affairs of the London & Globe Insurance Corporation is over, and another chapter in the history of this ill-starred concern is closed. The important case which has yet to engage the attention of our Law Courts is eagerly awaited both in the stock exchange and in the city generally, as it is believed that it will result in a number of further interesting revelations regarding the *modus operandi* of the group, the downfall of which has done so much to retard the development of the mineral resources of the Province.

MOUNT BAKER DISTRICT.

THIS district which is one of great promise, is beginning to attract considerable attention and several properties are being operated under company auspices. Among others the Red Mountain Mining Co. is developing a ledge of white quartz running north and

south on the two principal claims, averaging two feet or more in width, carrying free gold and tellurium. This vein can be traced without a break for over 400 feet, and outcrops occasionally for a long distance farther. The claim is situated about two miles north of the Post Lambert ledge, the first discovery in the district, made in the fall of '97. Cuts have been made at several points on this ledge for the purpose of determining whether it carries its values down, and with highly satisfactory results in each instance. A tunnel has also been run in along the ledge for 125 feet or more giving at that distance a back of about 75 feet. By extending it a short distance farther a back of several hundred feet will be obtained. Development has sufficiently progressed to justify the erection of a mill. There is a magnificent water-power and plenty of timber in the immediate vicinity. The property is accessible at all seasons of the year by the Canadian route and during the summer season by the Nooksack or American route. The Chilliwack and Silicia creek way is the one used owing to its being at all times feasible, and because there is no intervening mountain to pass over as there is on the other road and trail. The president of this company is Mr. Elmon Scott, ex-chief justice of the Washington State supreme court, and the directors are also prominent Puget Sound men. The claims were surveyed in the summer of 1900, but development operations have been greatly retarded for want of a road over which to transport machinery. The building of the road to the Chilliwack crossing this season by the Dominion government has assisted in this respect very materially, and the owners, in company with the holders of other promising properties in the vicinity hope to see it extended soon to the boundary line, which will bring it right to the foot of the Red Mountain company's property. The company have also located a mill site and water right on the American side of the line and have not fully determined yet which one will be used. The question of duties on mining machinery may have some considerable weight in determining this matter. Some of these properties, notably that belonging to the Pierce Gold Mining Company, lie on the British side of the line. It is firmly and generally believed that this district will forge rapidly to the front rank and become one of the most important mining sections in the Cascade range. If these expectations are realized it will contribute materially to the prosperity of the contributory territory on both sides of the line to the west. The great part of the district is more naturally tributary to the Canadian side. But great and determined efforts are being made in Whatcom county by building waggon roads and a railroad to attract as much of this trade as possible, and Canadians should equally bestir themselves.

The Post Lambert properties above alluded to are situate on Bear mountain three or four miles south of the boundary in a direct line, but about ten miles by trail. This property is now owned by the Mt. Baker Mining Co., composed principally of Portland, Ore., capitalists, including the Hon. Henry Habn, president of the chamber of commerce, and Mr. Leo Freide. Mr. Henry Stanislawsky is supt. Until the latter part of last season supplies for the mine were taken in by the Canadian route. The trail was built by this company principally. With the extension of the B. E. & B. C. road to Hardan and the building of a waggon road to Shuksan, all supplies have gone in by the Nooksack or American route. An effort to get machinery onto the property last fall was not successful. Part of it was taken to the mine but the heavier parts were stalled at the foot of the mountain over which it had to be taken. There is no mountain to go over on the Canadian route, but the trail is a much longer one since the building of the railroad and waggon road above mentioned. The effort to get the machinery over the mountain has just now been renewed. There are many other promising properties in the vicinity. One claim called the Lincoln, owned by Mr. Thomas Lay of Chilliwack, lies just north of the Red Mountain property; also the Gold Basin claim, situate just east, and owned by Messrs. Neville Smith, J. G. Carlisle, A. D. McGhan and Robert Hatfield of Chilliwack. Considerable development work has also been done upon the Pierce group of claims, of which Mr. George Pierce, sr., of Chilliwack, is the manager and superintendent. Work is steadily progressing and the extension of the waggon road built to the Chilliwack crossing, under the supervision of Messrs. Cruickshank and Kingkum, to the boundary line, would bring these properties all within direct and easy reach of British Columbia markets.

KAMLOOPS MINING NOTES.
(From Our Own Correspondent.)

PRINCIPAL developments of the past two months has been in connection with the transfer of a large group of claims on the cinnabar-bearing formation on Hardie mountain, some 24 miles west of Kamloops to a company recently organized in London as the Hardie Mountain Cinnabar Mining Co., Ltd. This company was organized by Mr. Ward, formerly of the law firm of Fulton & Ward, Kamloops, and now at Dashwood House, London. Mr. Thos. Luce, M.E., of Utah, has been placed in charge with a well-known local man, Mr. J. Fleetwood Wells, as manager. The latter has for many years operated the Glen iron mine, as the demands for iron ore required, besides having done exploratory work on the Hardie Mountain and other properties, mainly for the Hall Mining and Smelting Co. Extensive buildings have been erected and under the capable management of the above named gentlemen it will soon be known what can be made of those cinnabar deposits, which are said to be the only extensive occurrences

in British territory. The cinnabar-bearing rocks are distinguished over some twenty miles of country.

Operations have been resumed at the Glen iron mine, and regular shipments of high-grade magnetite are being made to Kootenay smelters. It was feared that the iron deposits at Kitchener would kill the demand for Kamloops ore, but the re-starting of the Glen iron mines indicates that this may not be the case. The Kamloops ore, besides its fine quality, contains appreciable gold values, said to average \$4 per ton, which are saved when the iron is used as a flux, and which will probably enable it to hold its own with Kootenay iron as a smelter flux.

The most satisfactory progress continues to be made in the development of the Iron Mask mine, and constant additions are being made to the buildings, equipment and staff. The syndicate being a semi-private one exact information is only given out in London. Occasional car loads of high grade ore, taken out in development, are shipped to the Granby smelter.

Two smelter projects are being exploited, and the promoters of one have asked the city for a bonus. The matter is yet under consideration and nothing definite is announced.

It is uncertain when or in what place the dredger on the North Thompson river will be operated. The river is now clear of ice, but several troubles have lately developed in connection with the dredge which will probably postpone operations. This is unfortunate as neither the benches nor Jamieson creek were tested in the short run made last fall.

Y.M.I.R.

(From Our Own Correspondent.)

THERE is now every prospect that the town of Salmo, which marks one of the earliest mining camps in West Kootenay, will shortly experience a revival of the interest formerly extended to it. Two new and important sections of the country are tributary to this camp, viz., the Bayonne and Lost Creek districts, both of which will be fields of systematic prospecting during the approaching summer. What is known as the Bayonne section takes its name from the Bayonne claim which is traversed by an immense vein of free-milling ore, and is now bonded to Messrs. Finch and Campbell for \$100,000. Since its discovery last fall a number of claims have been located in immediate vicinity, of which the Run Over and Turn Over are already bonded for the sum of \$50,000 to C. P. Hill. In the Lost Creek section a number of fine copper and galena deposits are now in course of development. In addition to these new districts the Yellowstone mountain, named after the Yellowstone mine which has been crushing its ore for the last two years, is the centre of considerable activity. The Queen claim, adjoining the Yellowstone, has been leased and bonded to the Holman syndicate for \$50,000, and is being rapidly developed along three levels. The vein is fifteen feet wide and carries rich free-milling ore. Up to the present four car loads of ore have been sent to the Nelson smelter, the values obtained being reported to run over \$50 per ton. The Holmes syndicate has, however, now obtained the use of the Yellowstone mill for the treatment of its ore, and a steel tramway is being laid to connect the mine thereto. The Hideaway claim adjoining has the same vein, the width here being about twelve feet, and said to average \$24 per ton.

Another important item in the future of Salmo is the magnificent marble deposit now being exploited. Messrs. McArthur, Broadfoot, Thackleton and Simpson, have purchased 100 acres of land about six miles from Salmo, which is traversed for nearly half a mile by an immense marble deposit 600 feet wide. No less than seventeen different varieties of marble have been discovered, including the valuable pure black and pure white types. Specimens have been examined by eastern experts who have pronounced the quality to be equal to any yet discovered on the American continent.

SLOCAN CITY MINING DIVISION.

(From Our Own Correspondent.)

THE month has been marked by the bonding of the Ottawa and Black Prince groups; by the shipment of the highest grade car load from the Arlington, and unfortunately by soft weather and bad roads, which have seriously interfered with shipments.

Ten-mile creek.—The Enterprise concentrator is giving better satisfaction and the mine is shipping steadily; the Neepawa has also made two shipments this month, and it is understood that this group will be floated on the London market almost immediately.

Twelve-mile creek.—The Paystreak has been the only shipper, sending out five tons of sacked ore valued at about \$80 per ton.

Springer creek.—The syndicate formed in Pittsburg for the purpose, have bonded the Ottawa group at the price of \$40,000. The first payment of 10 per cent. has been made and supplies and material to last over the spring months are being rushed up to the mine. The Arlington is taking out about a car load of ore per diem, and during the month shipped one car—30 tons of extra ore. That ran 340 ozs. to the ton—as this means over \$5,000 above all freight and smelter charges it must be considered very satisfactory.

Prospectors who have claims on the lower levels are starting work

and the owners of the Combination, a claim on Republic mountain about a mile from Slocan, are showing up a big vein with good ore.

Lemon creek.—The Duplex, on the First North Fork, is the only shipper, though the Fourth of July and the Legal are both stacking up ore. The winter's development in this section has been most satisfactory and it is well worthy anyone's investigation who is looking for properties in this district. On the Second North Fork, the bonding of the Black Prince group to Spokane people is the only item of interest. This is one of the most developed of our prospects and should make a mine. The total shipments from the district amount to about 1,300 tons from eight properties, of which four are new on the shipping list.

SALE OF THE SILVER CUP.

(From Our Own Correspondent.)

TWO very important deals have just been made in this locality. The Silver Cup with some seven or eight adjoining claims and fractions, has passed into the hands of Messrs. W. B. Pool and J. J. Young, who are acting for the English capitalists already so deeply interested in the Nettie L. and the large group of claims owned by the Double Eagle Co. The consideration is said to have been \$500,000, and it is more than probable that the purchasers have bought it very cheaply, as the mine has been very extensively developed, has shipped and is still shipping high grade ore, and is one of the oldest and best known properties in the district.

The second deal is that of the Truine, which has been bonded to Mr. McCrossan, manager for the Vulcan smelting furnace, and will be worked for all it is worth in the coming summer. The furnace itself, though quite complete, will not be blown in for a month or two on account of the difficulty of obtaining sufficient flux. We know where there is plenty, but nothing can be done till the snow goes off the hills.

RECENT PUBLICATIONS.

The Copper Handbook. A Manual of the Copper Industry of the United States and Foreign Countries. Vol. II. Horace J. Stevens. Houghton, Michigan, 1902. Octavo, cloth, \$2; Morocco, \$3.

IN many respects this is a very useful reference work and contains much valuable information. The opening chapters discuss the history of copper mining, the "chemistry and mineralogy of copper," and the "metallurgy of copper," and are general in character, but the bulk of the volume is given up to descriptions of important copper mines in the United States and other countries, and statistical data. The information regarding Canadian mines is, however, very meagre and unsatisfactory. Under the heading, "Leading Foreign Mines," the following British Columbia mines are mentioned: Le Roi, War Eagle, Britannia, Silver King, Van Anda and Monitor. Neither the Britannia nor Monitor should be included in this classification, while it is to be noted that none of the really important British Columbia copper mines are alluded to at all.

CATALOGUES, CIRCULARS AND TRADE NOTICES.

CANADIAN GENERAL ELECTRIC CO.

THE Canadian General Electric Company at their annual meeting the other day decided to apply to the Dominion Government for an increase in their capital stock from \$2,000,000 to \$3,000,000, though the proposition is to issue at present not more than \$500,000. The directors' report stated that the volume of business transacted during the past year had been much larger than ever before in the company's history. The balance at credit of profit and loss was stated to be \$612,028.94, which is made up of \$345,000.03 profit on operating (an advance of thirty per cent. over 1900), \$195,000 premium on new shares issued, and \$71,028.91 brought forward. From this amount of dividends of ten per cent. on the common stock and six per cent. on the preferred stock, amounting to \$166,750, were paid; \$100,000 was added to reserve fund, which now stands at \$365,000; \$100,000 transferred to contingent account; the sum of \$77,680.27 remains at the credit of profit and loss, and the large sum of \$167,598.67 has been written off. The directors were re-elected as follows: W. R. Brock, M.P., president; H. P. Dwight, 1st vice-president; Frederic Nicholls, 2nd vice-president and managing director; Hon. Geo. A. Cox, J. K. Kerr, K.C., Rudolphe Forget, W. D. Matthews, Herbert S. Holt, E. B. Osler, M.P., Robert Jaffray, James Ross and Sir W. C. Van Horne.

A NEW METALLURGICAL FIRM.

Mr. W. Pellew-Harvey, F.C.S., M.I.M.M., and Mr. E. Nelson Fell, A.R.S.M., M.A.I.M.E., have entered into partnership as mining and metallurgical engineers under the style of Pellew-Harvey & Fell. Mr. Pellew-Harvey has had several years active practice as consulting engineer, etc., covering the fields of Nova Scotia, British Columbia and the Western States of American, in addition to which he held the position for some time as metallurgist in charge of the Vancouver branch of the Provincial Government assay office, and has now exceptional opportunities for obtaining information with reference to mining and ore treatment in those fields. Mr. Fell has had an experience extending over a period of 20 years in Brazil, also in the Southern States, and more especially in the Western States of America and Canada, with a special practical knowledge of and experience in the designing, erection

and care of mining plants and the management of properties.—*London Mining Journal.*

THE LONGEST AERIAL TRAMWAY IN THE WORLD.

The contract for the machinery of an Aerial Wire Rope Tramway connecting the Ferris-Haggerty group of mines with the Boston-Wyoming smelter at Grand Encampment, Wyo., has been let to the Messrs. A. Leschen & Sons Rope Co., of St. Louis, Mo. The tramway to be installed, which will be 16 miles long, is the Leschen Company's patent, which operates automatically in receiving and discharging. This will be the longest aerial tramway in the world. There are numerous tramways of the Leschen Co's patent automatic type now in successful operation throughout the mining regions

PERFORATED METALS.

The Allis-Chalmers Co., Chicago, Ill., have issued catalogue No. 7, (ninth edition) under the above designation. The firm anticipating the increasing demand for perforated metal has added to its works the latest improved machinery for the manufacture of plates of all thickness in iron, copper, brass, steel, zinc, tin and other metals, with size of perforators proportioned to thickness, and spaced if required, as close as the thickness of metal permits. Perforated metals are far superior to wire cloth, being much stronger, more uniform in size of hole or mesh, and less liable to tear or rust out. In case of breakage they are easily repaired without affecting the entire sheet, while in the case of wire cloth a break extends over the whole sheet, changing the mesh and making it unfit for use. It is often desirable to arrange screens with certain portions blank. This can easily be done when perforated metals are used, but is, of course, impossible with wire cloth. Unlike wire cloth, perforated metal presents a perfectly smooth surface, allowing the grain, ore or other material to pass over it smoothly and quickly. It is not as liable to become clogged, making it much more satisfactory for sizing, cleaning and separating. The illustrations of perforated plates in this catalogue show exact size and styles of perforation.

MINING RETURNS AND STATISTICS.

ORE shipments from the Boundary District for the year to March 21st, inclusive, aggregate 88,127 tons, were as follows:

Granby Mines, Phoenix.....	54,968
Snowshoe	660
Mother Lode, Deadwood	31,464
Winnipeg, Wellington	395
Golden Crown	390
No. 7 Mine, Central.....	250
Total tons.....	88,127
Granby smelter treatment, tons	53,328
Mother Lode smelter treatment, tons.....	31,166

LARDEAU.

The Lardeau *Eagle* publishes the following statement of production to date from this district:

Name.	Pounds.	Gross Value.
Silver Cup	2,400,000	\$180,000 00
Nettie L	1,760,000	63,380 00
Triune	649,776	82,870 27
Beatrice	442,000	32,239 39

	Pounds.	Gross Value.
Great Northern	56,000	1,344 00
Broadview	52,000	1,664 00
Ethel	34,000	1,596 00
Cromwell	23,289	1,296 79
Ophir-Lode	12,000	1,320 00
Metropolitan	17,974	726 00
St. Elmo	12,000	510 00
Ruffled Grouse	11,770	507 19
Linson View	868	63 17

COAL EXPORTATIONS.

EXPORTATIONS of coal from Vancouver Island collieries during February were distributed as follows:—

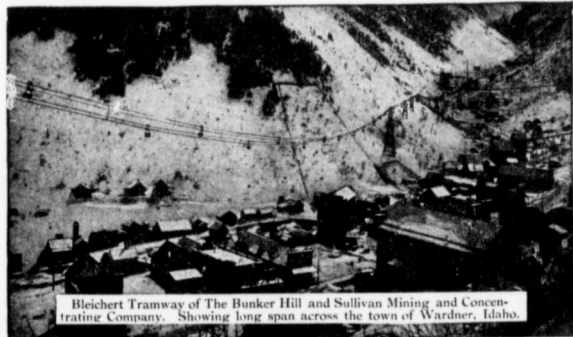
	Tons.
Ladysmith	14,996
Comox	9,395
New Vancouver Coal Co.....	66,374
Total	40,765

THE METAL MARKET.

THE market during the month has been somewhat dull and without incident. Silver quotations are stationary at 54¼, which is lower than last month's average. Copper has ruled quiet and few transactions are reported. Quotations remain unchanged at 12¼ @ 12½ for lake, 12 @ 12½ for electrolytic in cakes, wire bars and ingots, 11¼ @ 11½ in cathodes and 12 @ 12½ for basting copper. London prices greatly depressed. Lead is dull and unchanged at 48.05, St. Louis, 4.05 @ 4.10, New York. The latest London quotations are £11 10s. @ £11 12s. 6d. Spelter has been in fair demand at 4.10, St. Louis, 4.25, New York.

THE LOCAL STOCK MARKET.

BUSINESS during the month has been somewhat dull but notwithstanding a strong effort to bear certain stocks, there have been no noticeable depreciations in values. Rossland sales during March aggregate about 200,000 shares, and in Spokane about the same number of transactions are reported. In the Victoria and Vancouver markets a fine eastern business has been done. Republic stocks have been largely enquired for, and several large blocks of Republic have sold at from 10 to 11, Black Tail at 12 to 13, and Lone Pine at 7½. Among British Columbian shares, Rambler-Cariboo is firmly held at 85 to 87, and it is reported that the monthly dividend will shortly be increased for 1 to 1½ cents per share. Payne has sold from 24 to 27. Centre Star is fairly active at from 35 to 38, while White Bear has sold at 3¼ to 3½, Iron Mask at 18 and War Eagle at 11 to 12. Boundary stocks are quiet, Granby being quoted at \$3, \$1.75; Morrison 4, 2½; and Winnipeg 5, 3½. Fairview, as a result of a report that additional capital has been secured to enable the company to increase the crushing capacity of the mill and also on account of the favourable condition of the mine has been late in considerable demand, and it is difficult to find sellers at present prices. Cariboo-McKinney is weak at 22, 26. East Kootenay stocks are steady, Crow's Nest has advanced to 90 bid, and Sullivan is quoted at 10 and North Star at 24 to 25.



Bleichert Tramway of The Bunker Hill and Sullivan Mining and Concentrating Company. Showing long span across the town of Wardner, Idaho.

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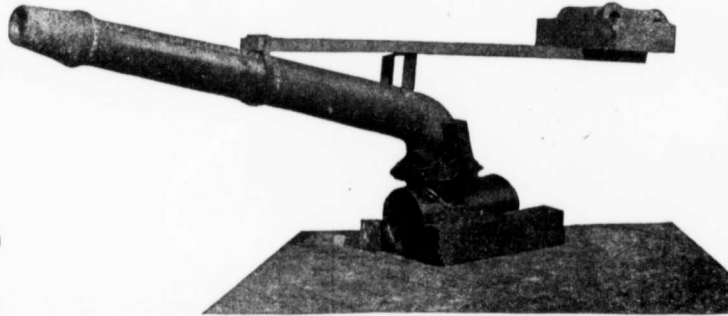
Toronto Lillooet Gold Reefs Company, Limited,

situate in the Lillooet district of British Columbia, including the Ample, Whale, Monarch, and Welland Vale mines, which are Crown granted, also the North Star, the Golden Stripe, Golden Eagle, Ruby and Jumbo mineral claims, in the same district, together with a ten-stamp mill, machine drills and other equipments. Cash tenders for the whole property are requested but offers on working options or for portions of the property will be considered. From the former group 950 tons of ore has been milled, with an assay value approximating \$10.00 to \$11.00. Wagon road from railroad to mill. The whole of the above will bear looking into and investigating, and are an exceptionally important and valuable group of claims with full working equipment. Full particulars may be had on application to EDGAR BLOOMFIELD, Liquidator. P. O. box 743, Vancouver, B. C.

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