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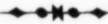
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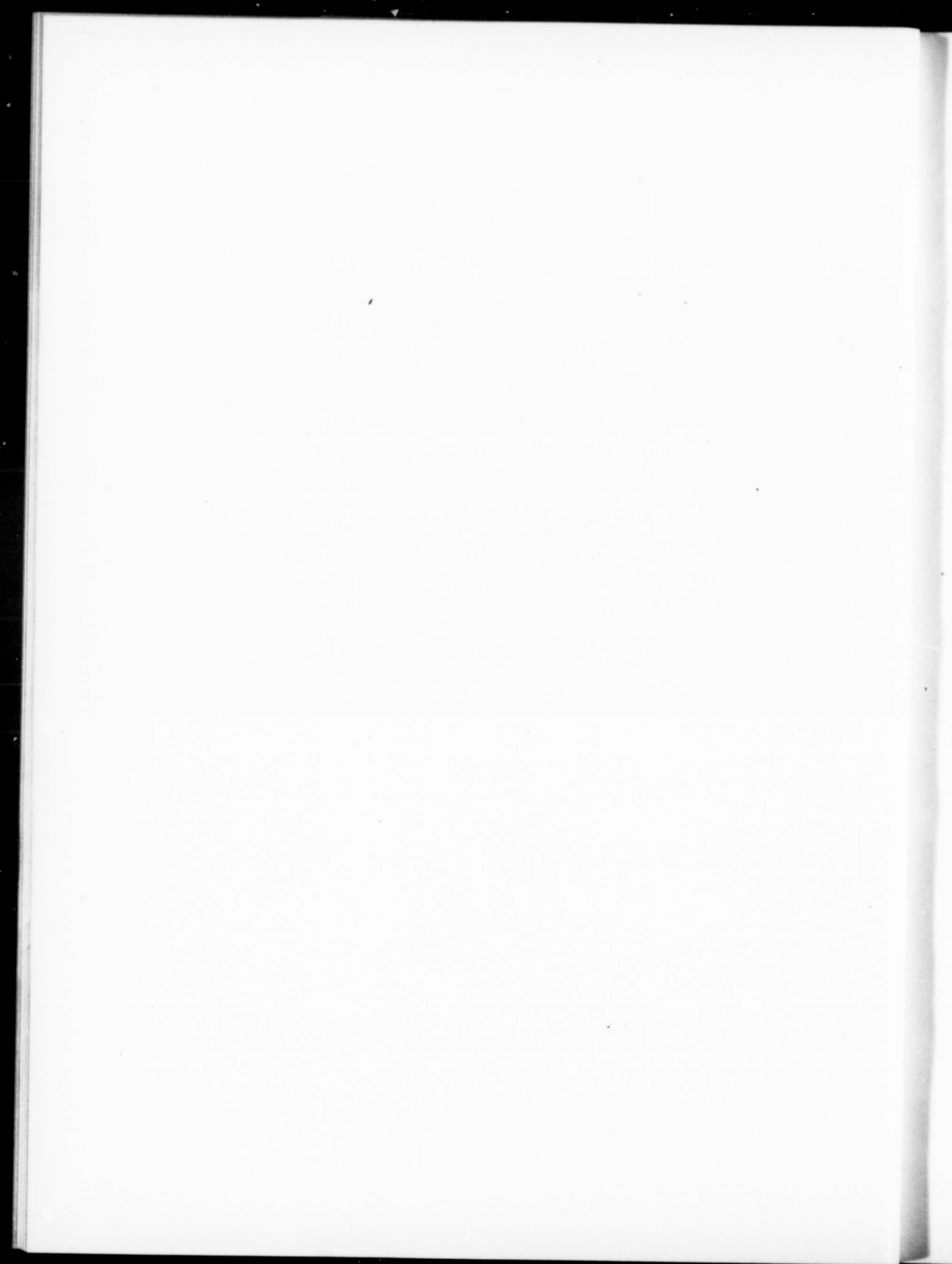
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1904.

We take this opportunity of wishing the readers of the MINING RECORD, the number of whom we note with satisfaction, has considerably increased of late, a very prosperous and happy New Year. We begin with this volume (XI.) our ninth year of publication, and can therefore lay claim to being as old as metalliferous mining in the Province, whose history and progress we have chronicled accurately, we think, conscientiously, we know, since it first came to be established on an industrial footing. The publishers of the MINING RECORD aim to keep pace with the progress of the industry with whose interests it is identified, and whose advancement it humbly endeavours to promote.

MINING PROGRESS IN 1903 AND THE FUTURE OUTLOOK.

AS we have devoted this month much space to summarizing in detail the work of the year in the chief productive districts, it is hardly necessary to do more here than take a hasty survey of recent events with a view to arriving at some idea of the present position of the mining industry in British Columbia and of thus forming a more or less clear idea of the outlook ahead. Those who have in any way kept in touch with industrial developments in 1903, must have been impressed with the extraordinary im-

provement in the general situation, which took place shortly after mid-summer, and the great revival in mining throughout the Province that has since become manifest. Previous to that time, the conditions appeared almost intolerably inimical to progress; depression over-shadowed nearly every branch of industry; the removal of one difficulty or obstacle seemed but the signal anticipating trouble in another direction; the relations between capital and labour were strained; strikes threatening the paralyzation of the coal and copper industries in the Kootenays, of the coal industry on Vancouver Island, were declared; the silver-lead industry already badly handicapped felt the effect of the almost unprecedented decline in the market price of these metals; the placer mining districts suffered from a shortage of water; in short, the faith of the most sanguine was shocked, the most confident lost confidence, and for a period it actually seemed that the pessimist who had derided the country and declared that no good could come out of it was right. Quite suddenly, and without warning, the atmosphere cleared, changing entirely the aspect of affairs. Labour troubles were settled on permanent lines. Government aid of a substantial character was accorded the silver-lead industry. Rich and promising new quartz discoveries were made. Mining generally seemed to take on a new lease of energy and life. Heavy rains in September and October, although arriving too late in the season to immediately benefit the larger hydraulic undertakings, enabled the smaller mines to resume operations and augment the output, while, too in Cariboo assuring an adequate water supply for next season's workings. In Rossland a method of economically and profitably treating the silicious ores of that district by oil concentration was successfully introduced and adopted. In the Boundary the value of the high-grade ore bodies in the neighbourhood of Greenwood was demonstrated, and a little later, a proof was afforded of the success attending the operation of the enormous low-grade mines of that district in the distribution of very substantial profits among the shareholders in one of these large undertakings. In Nelson, in Ymir, in the Lardeau the greatest activity has prevailed, numerous stamp-mills have been erected, capital has been freely invested, a great addition has been made to the number of productive properties, and by the adoption of the leasehold system or otherwise many mines on which operations have been long suspended, have been rehabilitated and re-launched on a profit-earning career. The year that opened so inauspiciously has therefore proved the most important in actual achievement since the inception of the industry in British Columbia. In the production of lode gold and copper a great increase has been made, for which the Boundary, the Rossland and the Coast

mines are proportionately responsible. Despite the miners' strikes at Fernie and on Vancouver Island, the coal output is greater than ever before and in respect only of silver-lead and in a lesser degree, placer gold yield do returns show depreciation.

Regarding the outlook for 1904, it is well, in view of past disappointments, that expectations should not be over-sanguine. Nevertheless, it is impossible not to experience a thrill of hope and pleasure at the vastly improved prospect that is now opening out. Not this year, nor perhaps, that following, will progress be sufficiently great to wholly restore that confidence among outside investors, which a long series of failures, the results of ill-directed effort and wild-cat methods, have helped to dissipate; but the way has been made clear; conditions are better understood and it has at length become realized that the only road to ultimate success lies in the direction of economy and the application to mining of those principles, a disregard of which in the conduct of any other business would be deemed fatal. At present copper mining is the most important branch of our industry and is the most capable of expansion. The early recognition of British Columbia's claims to industrial pre-eminence, in fact depends, to our mind, on the development of the low-grade gold-copper ore bodies of which the known occurrences are numerous and the deposits generally of generous extent. The only possibility of profitable working in these cases is by concentration of effort, the exercise of great economy and the conduct of operations on a large scale. Already these are recognized fundamental principles, and the tendency in the Boundary is in the direction of the combination and co-operation of interests. The results so far achieved have been the reduction of production costs to a level that is absolutely remarkable in view of the price labour commands in the West. There is every reason to believe, therefore, that in the Boundary district, at any rate, the future may be faced without fearful anticipation. In the Rossland district the conditions are not entirely similar. Here, too, are large bodies of low-grade ores, divided into two classes, silicious and ferruginous. How to turn these ores to commercial use has long been a problem engaging alike the attention of the engineer and metallurgist. Only quite recently a solution in one direction has been with reasonable certainty found, and the Elmore oil process is about to play a significant part in Rossland's industrial evolution. That metallurgical research and skill will not long be baffled in the attempt to apply a method sufficiently economical to save at a profit the values contained in the ferruginous ores of the district, cannot be doubted, for already success has partially crowned experimental effort. Even under prevailing conditions the district has made wonderful forward strides, but recent progress is of little relative account to what may, and doubtless will, be accomplished in the early future. Copper mining on the Coast is also assuming very important proportions and from developments in 1903 it may be confidently assumed that the industry has been established on a permanent basis. Apart from the high-grade deposits at Mount Sicker and at Texada Island, there are at Howe Sound and in other localities ore bodies advantageously situ-

ated as regards facilities for marketing, quite equal in size and value to those of the Boundary, and the opening up and operation of which is now but a matter of a short while. In the Big Bend, the Similkameen, the Windermere districts of East Kootenay, and other, at present, unproductive areas, are also partially developed and most promising deposits of copper ores; but from these localities little may be expected in 1904 or until the means of communication are more adequate than at present provided.

We have already referred to the impetus given to the silver-lead industry by the Government grant, in the form of a bounty of fifteen dollars a ton on lead mined and smelted in Canada. The immediate effect of this concession was seen in the resumption of development operations on a large scale at a number of mines at which work had been partially or entirely suspended, but the 1903 output was little if at all affected by the improved conditions. A very marked difference in this latter respect will, however, appear in 1904, when production from both West and East Kootenay should at least equal the record achievement of 1900, active preparations to this end having been in progress. It was also recently announced that from one mine in East Kootenay which is capable of producing a tonnage equal to the normal aggregate output from the Slocan, shipping operations will be commenced early in March. In conjunction with silver-lead mining an important industry has sprung up, by which galena ores carrying a high percentage of zinc previously considered a serious detriment, have become of value, in 1903 two thousand tons of zinc having been mined and produced at a profit. In consequence of the higher price and increased demand for spelter, attention in the Slocan is being directed to the further development of this industry and this year it is at several mines proposed to erect mills and install special machinery for the treatment of this, at one time, waste product.

All signs point to an expansion of the Province's coal trade in 1904. In East Kootenay a large addition has been made to the number of coke ovens in use, while others in course of construction will be completed in the early spring. The Crow's Nest Company has also largely increased the productive capacity of the mines, which have been most thoroughly equipped with machinery and appliances of the most modern design. Already a new and large undertaking is proposed in this field and it is announced that the extensive coal areas at Fording River are to be developed without delay. Prospecting for coal, which has been actively followed in 1903, is not likely to flag, as it is expected that the Government will ere long cancel the reserve on large areas of coal lands. The prospects of railway construction from Spence's Bridge on the main line of the C. P. R. into the Nicola Valley should result in the development of the valuable known coal resources of that region, while in other localities, Princeton in the Similkameen and at Kamloops development operations will be in progress. On the Coast labour conditions are now stable, and 1904 should witness much activity at and a large production from the Vancouver Island collieries—the more so

provided the United States Government allows the present regulations permitting the free entry of coal into that country to remain in force. The new discovery and location of anthracite at Cumberland, is also a matter of much commercial importance, of which this year account will be made.

The prospects for a successful placer mining season in 1904 are furthermore exceedingly good. In Atlin, in 1903, the equipment was completed of all the important undertakings on the principal creeks—a work commenced in 1900,—and profitable production is expected to commence forthwith. The conditions in Atlin are, too, peculiarly favourable to dredging enterprise, and the first application of this method of gold-recovery will be made this year, a large dredge having been built and placed on the ground in readiness for operation in the spring. Hence Atlin, which in 1903 again occupied the first position in point of productive importance among the placer mining districts of the Province, promises in 1904 to make an exceptionally good showing. In Cariboo much depends on weather conditions and the water supply available when the season opens, but we are informed on very dependable authority that the heavy precipitation in the recent fall practically insures for this year a fair supply of water for mine purposes, whether or not the winter and spring rain and snow falls occasion a large accumulation. It is satisfactory in the meantime to learn that at a recent meeting of shareholders of the largest undertaking in this district or, for that matter in the world, provision was made to render this mine quite independent of weather caprices in the future, by augmenting the present water system and obtaining a further and constant supply from natural reservoirs some seventeen miles distant from the property. As modern methods are adopted and gold-saving devices of suitable construction introduced and applied dredging on the Fraser and Thompson rivers is coming to be regarded with greater favour and undertakings are meeting with better success. Results in 1903 were by no means discouraging, and new and very powerful dredges are now being built for operation during the season of 1904.

It is to be noted that the free milling quartz area of the Province was considerably extended last year, and production from this source increased by the gold yield from both Nelson and Camborne. There is every reason to expect, moreover, that in the next few months stamp mills will be erected in the Poplar district, where in 1903 the most remarkably rich discoveries were made of this class of ore.

We begin the new year, therefore, under auspices altogether favourable; with our faith in the future of the mining industry in British Columbia unimpaired and strengthened, and we look forward to mining developments in 1904 with a great deal of hope and confidence.

THE GREAT NORTHERN MINES, LTD., AND EXAGGERATED CLAIMS.

THE strictures we thought fit to utter in last month's issue of the *MINING RECORD* dealing with the grossly exaggerated statements which were quoted and printed anent certain properties owned by the Great Northern Mines, Ltd., with the object, apparently of inducing investment in the shares of that company, have, we think, served the purpose for which they were intended, by bringing home to the directors the responsibility they were shouldering in accepting subscriptions from the public upon the inducements, in large part, over-stated or misleading, contained in the prospectus as issued, and at a meeting of the board held at Revelstoke in December it was decided in the circumstances to withdraw the offer to the public and refund such monies as had already been subscribed. We can thoroughly commend the prudence and wisdom of this course, which merely confirms our previous opinion that a majority of the directorate were neither cognizant of nor in any way responsible for, the very foolish attempt to "boom" the company's property. Lest our attitude last month should be misconstrued we desire to state very emphatically that in criticizing the prospectus, and questioning the reliability of the statements contained therein, it was not our aim to injure the company or to express an opinion unfavourable to its interests. On the contrary, we have a strong belief in the value and prospective value of the properties, and are quite prepared to admit that they are sufficiently meritorious not to require "booming" at all. It is here that the idiocy of the proceeding comes in. Instead of being as might readily have been believed from the clap-trap and rubbishy fairy tales everywhere published, a "wild-cat" of the rankest kind, the Great Northern Mines was and is a perfectly legitimate undertaking and its shares are an exceedingly promising speculation. It was merely necessary to stick to the truth; but the truth good as it was in this instance, was not thought sufficient, and it must needs be garlanded and embellished by the most impossible—well; rhetorical imageries and flights, until it was perfectly unrecognizable. Now, if you induce a man to invest in an undertaking in which you are interested by telling him something that is not true, you are obtaining money under false pretenses; and it was that indiscretion of which when we wrote we held the Great Northern Mines guilty. Having, from information since placed at our disposal, absolved the directors of intentional wrong-doing in this regard, we at first experienced some difficulty in attempting to fathom the cause and discover the reason of the extraordinary course pursued, and if possible attach the responsibility where it belonged, money, that root of most evil, not being, it was shown, at the bottom of this mischief. At length our patient investigations have been rewarded, and our curiosity satisfied. There resides in the Lardeau a certain gentleman, a citizen of the Great Republic—with whom by-the-way the flowers of language are not infrequently preferably used to common plainness of speech—who is so firmly convinced of the richness of the Lardeau mines and

the great future awaiting that district, that he cannot speak of it without praising it, and unwittingly makes statements, which while they may correctly describe conditions, one, two or three years hence, do not bear close examination in the light of present fact. This gentleman, we very willingly concede, is not aware that this inclination of his is dangerous; he may hardly realize that he gives way to exaggeration; he is responsible more than any man for the development of the Lardeau; he is not a trained mining engineer, but he has a natural instinct for finding ore, and has found it in cases where mining engineers have despairingly failed; he is generous to his friends and mining associates; and we believe he is strictly honorable in his personal dealings. Yet, at the best, mining is a risky business, and no man, whatever his personal faith may be, whatever his belief in his own luck and his own powers of making his or his friends' fortune, has the right to obtain a backing by means that are subject to rebuke. The Great Northern Mines, Ltd., has, we are informed, sufficient ore in sight to provide all the capital necessary to bring the undertaking to a successful issue, and now that our reasons for objection are removed we take much pleasure in congratulating Mr. Pool on the good work he has done in the Lardeau, and wish him and the undertaking with which his name is associated, the Great Northern Mines, Limited, the greatest possible measure of success.

Elsewhere we publish an open letter addressed by Mr. Leslie Hill, a member of the Executive Committee of the Provincial Mining Association, to Mr. J. B. Hobson, first vice-president of that organization, in which the former suggests certain reasons why, in his opinion, several of the leading mine operators and engineers in the country have stood aloof from the Association and refused as yet to give it the benefit of their advice and support. In the main we believe Mr. Hill is correct in his conclusion that the Executive at its meetings should confine discussion to matters of direct and practical import, instead of, as was the case recently at Kamloops, attempting to deal with economic and abstruse questions with which the mining industry has little immediate concern, or in introducing votes of censure against civil service officials. But Mr. Hill is only right so far as he goes. The gentlemen, whom he has in mind, have not, we imagine, been so much influenced by the manner in which the business of the Association has been conducted of late as by other considerations. Were Mr. Hill absolutely correct in his assumption, then surely the objection did not hold so long ago as immediately after the Mining Convention. Several rather foolish mistakes were made, it is true, in convention, the result of the limited opportunity for full discussion, but these errors were trifling and weigh not at all in the balance against the good work there accomplished. No; since reasons are required, is it not nearer the truth to say that a certain class of mining men are exceedingly sceptical on the possibility of successfully mixing oil and water. Also they are mindful of another

old saw, that suggests that culinary operations are not always facilitated by an unnecessary number of assistants. They believe, in fact, that labour and capital cannot tread the same paths in company, and they further doubt the wisdom of including in their organization interests not directly in touch with those mainly affected. It is for the Association to overcome by its works these prejudices; and, as Mr. Hill points out, these prejudices are not likely to be overcome by the introduction of foreign matters at Executive meetings. Meanwhile both Mr. Leslie Hill and the *MINING RECORD* are strong friends of the Mining Association and both believe that it is capable of serving very useful ends. But, despite the efforts of the President, who has done more for the organization than could possibly have been asked or expected of him, the Association, so far as most of the branch organizations are concerned, is a slack institution and sadly wants rousing into activity. It is an unfortunate admission, but this is the way matters mostly go in British Columbia.

Here is a very gently-administered rebuke evidently intended for the *MINING RECORD* contained in a leading article recently published in the *Lardeau Eagle*. Our contemporary referring to another alleged rich strike at Poplar Creek, writes, and surely its remarks are worth quoting:

"Another rich strike has been made on the Swede group at Poplar, the ore showing tremendously high values. One piece of ore was picked up weighing four ounces, of which three-fourths were gold. About 150 pounds of rock were brought down, which ran as high as \$100,000 to the ton. The value per ton of the whole ledge will not, of course, reach that high figure, but it is estimated that the average will be at least \$2,000 per ton. (The italics are ours.) It seems incredible that, notwithstanding the succession of magnificent strikes of ore in the Lardeau, and of whose genuineness there can be no question, that there are those who persist in ignoring these convincing evidences of the riches of the Lardeau country; and others who go still further, and endeavour by all the means in their power to discount the importance of these discoveries, and throw suspicion on the efforts of the promoters of this great gold belt. Surely it is time that common sense prevailed, by showing the futility of the campaign carried on in certain quarters against the Lardeau when week by week fresh evidence of the inexhaustible wealth of this country is brought to light."

Well, we know from personal experience how exasperating it is when filled with enthusiasm and a confident belief one holds forth volubly to the man with his tongue in his cheek. Did not the present scribe when editing a weekly newspaper in the *Boundary* in its early days meet with scepticism enough to turn his hair grey? But then he was more careful to deal in generalities and did not discourse of "whole" ledges of an estimated value "of at least \$2,000 per ton." We have never wished nor attempted to throw cold water on the prospective importance of the rich new dis-

coveries in the Lardeau; indeed, there is every reason to believe that very remarkable developments will take place in that district in the next year or so. But stupid exaggeration never yet served any good purpose. Again, although we trust the rule will not hold good in this case, it is well to recall the fact that all the very phenomenal discoveries of rich gold quartz so far made in British Columbia have never yet amounted to anything. Just as rich ore was taken from the Golden Cache as has come out of Poplar Creek, and extraordinarily rich gold quartz discoveries of free-milling character have twice been made on Texada Island. Then what a noise and commotion there was a year or so ago about the wonderful new placer gold diggings on Eureka Creek, in Cariboo. One doesn't hear anything about them now. The Poplar Creek finds are the most promising yet, but before going into rhapsodies and in our excitement cutting all sorts of ridiculous capers, would it not be more sensible, not to say dignified, to let the future take care of itself? So far as Poplar is concerned it is quite capable of doing so if but half the reports are true.

In a letter recently communicated to the *Nelson News*, Mr. G. Alexander, the general manager of several important mining undertakings in the Slocan, directs attention to the very great opportunities there afforded for successful zinc mining developments, if the question of marketing the product should be satisfactorily settled. He points out that in all the silver-lead mines, with hardly an exception, the bodies of silver-lead ore are closely associated with large bodies of zinc; that in the development of the silver-lead ore it is inevitable that large bodies of zinc should be encountered; that if it pays to mine and develop the zinc, this work will almost certainly lead to the exposure of further bodies of lead. But on the other hand, if there is no market for zinc, many of the mines would be compelled to suspend operations when running out of silver-lead ore into zinc. Mr. Alexander therefore suggests that the press should endeavour to impress on the transportation companies the importance to the country and the advantage to themselves of reducing freight charges on this class of ore, the result of which would be a greatly increased production of zinc, exceeding largely in quantity the lead output, and the advancement in general prosperity in the district. Hitherto, it is stated, the railway companies have made no effort to differentiate their rates as between a class of ore which nets the producer \$150 per ton on an aggregate tonnage of (say) 20,000 tons per annum, and an ore which would have a net value of perhaps \$5 a ton, but on a tonnage five times as great or over. It is to be hoped, meanwhile, that the Dominion Government, acting on the recommendation of the Associated Silver-Lead Mines, an organization effectively representing the interests of this industry, that an authority on zinc of the highest standing in the United States will be engaged during the summer months to examine, sample and report upon the zinc ore deposits at present available in the Kootenays. Mr. Alexander thus concludes a very sensible

letter: "If these deposits are as we believe them to be, a report from such a man would induce investments of capital in the development of this neglected source of wealth, which would be sufficient to stimulate into activity the whole district and awaken the transportation companies to a sense of the situation. I firmly believe that with proper attention given to the development of zinc mining in this district, and with the effect of the lead bounty act in operation, the Kootenays will be the most active mining camp on this continent."

The confidence shown by the shareholders of the Consolidated Cariboo Hydraulic in the value of their property and the ability of their manager to make it pay, is truly admirable and, we think, also justifiable. A great deal has been said of the enormous sums of money spent in the endeavour to place this undertaking on a profitable footing, but after all, most of the expenditure so made has not come out of the pockets of shareholders. The mine, as a matter of fact, has practically developed itself. That it will ultimately prove a successful venture we do not doubt for a moment, despite the handicap of an absurdly inflated capital. Those chiefly interested in this enterprise are exceedingly shrewd men of affairs, and hence the decision at the recent meeting of the company to provide for further considerable expenditure of, it is estimated, not less than a quarter of a million dollars, to admit of the extension of the present water system and thus ensure the continuous operation of the mine independent of rainfall and favourable weather conditions upon which a reliance has now to be placed, is, as we have said, a very emphatic and practical "Confession of Faith."

An attempt has been made by the Associated Boards of Trade of the Interior to estimate the value of the mineral produced from the mining districts of South Kootenay and Yale during the past year. The figures should be very approximately accurate as follows: Gold, 204,147 ozs., value \$4,819,718.49; silver, 3,471,421 ozs., value \$1,839,953.13; copper, 241,866,977 pounds, value \$3,382,174.93; lead, 10,168 tons, value \$489,792.56; or a total value of \$9,881,639.10. Tonnage is given as 1,034,830 tons, of which 42,867 tons was shipped to the Hall Mines smelter, 330,000 tons to the Granby smelter; 170,000 tons to the B. C. Copper Co.'s smelter, 134,217 tons to the Montreal & Boston Copper Company's smelter; 168,000 tons to the Canadian Smelting Works; 186,951 to the Northport smelter, and 2,795 tons to smelters in the United States. Assuming the accuracy of these computations, the value of mineral and coal production from British Columbia in 1903, should fall not very far short of \$20,000,000, and the tonnage output from the metalliferous mines alone, exceed considerably a million and a quarter tons.

Negotiations which have been in progress for some time for the consolidation of the interests of the B. C. Copper Company and the Snowshoe Gold and Copper Mines Limited, two of the largest mining enterprises in the Boundary district, appear now to be nearing a successful conclusion, and the former company has, in a circular addressed to shareholders outlined the arrangement which it is now proposed to adopt. This scheme involves the promotion of a new British joint stock company undertaking, capitalized at a million pounds sterling to absorb both interests in question, new stock being issued in the proportion of £615,000 to the B. C. Copper and of £226,000 to Snowshoe shareholders, the balance of £160,000 remaining being set apart for working capital purposes. On the board of the new company for the first year it is proposed that the Snowshoe shall be represented by three representatives, the B. C. Company by three representatives, a seventh director being appointed to serve by mutual agreement. Thereafter the election of directors will be at the instance of shareholders. In respect to the advantages likely to result from the arrangement as proposed the circular issued by the B. C. Copper Company contains the following remark:

"The consolidation will bring your property up to the maximum of operating efficiency and economy, by providing a greatly increased and certain daily supply of ore and distributing the fixed expenses over this tonnage; it will raise the average value of the ore treated, as the Snowshoe ore is of a higher grade, chiefly in gold, it should thus increase the revenues more than in proportion for the increase of capital; it will distribute and so diminish the risk of stoppage by accident; by its provision for ample working capital it will pay not only for the present improvements, but not using earnings for these purposes, leaving them free for dividends; it will at once afford a wider market for the company's shares, both in London and New York, and the new company should occupy, at once, a commanding position in the copper field of British Columbia."

In the interests of the Province, it is to be hoped, meanwhile, that the consolidation will be effected, for it will assist materially in strengthening the position of the B. C. section of the London Stock Market by the listing of the shares of a company, that will have more than a mere speculative value. But the B. C. Copper and the Snowshoe are thoroughly sound and legitimate undertakings in the promotion and development of which honesty and sound business judgment have played no small part.

It is announced, apparently on good authority, that another large coal company has been organized in Montreal to proceed at once to develop the great coal areas at Fording River, in East Kootenay. It is stated that in this area there are ten known seams of bituminous coal of workable size, extending north and south for a distance of twenty-five miles, the natural advantage for efficient and economic working being exceptionally good. Should this report be true the

Crow's Nest Coal Company, which has heretofore enjoyed a monopoly in this field, is likely to be confronted with a formidable competitor. Yet it is a little difficult to understand how the British Columbian consumer is to gain by the change. The major part of the coal produced at Fernie is exported to the United States, the requirements of the local market being chiefly in the matter of coke which is now supplied to the smelters at a cost that could hardly be reduced. There is no longer, as at one period, any complaint as to the adequacy of this supply, and the largest consumer of coke, the Granby Company, is about to supply its own needs by the operation of coal measures near Blairmore. As a question of increased production, it is a well known fact that market limitations and not any other reasons, prohibit any very considerable extension of the export trade in connection with the operation of the Crow's Nest collieries.

THE FORMULA USED IN RULES FOR THE INSPECTION OF STEAM BOILERS IN BRITISH COLUMBIA.

(By J. A. Crawford, Greenwood, B.C.)

THE Board of Inspectors in drawing up these rules have adopted largely the formulæ of the British Board of Trade, with some alterations, evidently with the intention of making them more applicable to conditions obtaining in British Columbia. These alterations have not only made the formulæ more complicated, but in some cases have made them absolutely unreliable.

The factor of safety adopted for steam boilers in these rules is a graduated one. Where the best material is used, and the boiler being well designed and constructed, and open for inspection during the whole period of construction, a factor of safety of 4 may be used, but this may be increased to 5.5 or even more where the workmanship or design is bad or material faulty.

Referring to formulæ for riveted joints, where

p = Pitch of rivets in inches.
 d = Diameter of rivets in inches.
 A = Area of rivets in square inches.
 n = Number of rivets in one pitch.
 T = Thickness of plate in inches.
 F = Factor of safety.
 y = 8 for iron rivets and steel plates.
 y = 23 for steel rivets and steel plates.
 y' = 13 for iron rivets and steel plates.
 y' = 28 for steel rivets and steel plates.

- (1) $\frac{100 \times (p-d)}{p} = \% \text{ for iron or steel plates.}$
- (2) $\frac{100 \times A \times n \times x \times F}{4 \times p \times T} = \% \text{ for iron plates with iron rivets.}$
- (3) $\frac{100 \times A \times n \times y \times x \times F}{4 \times y' \times p \times T} = \% \text{ for steel plates with steel or iron rivets.}$

The lowest of the values thus found is the percentage strength of the joint to be taken.

In formula (2) the shearing strength of iron rivets is assumed to be equal to the tensile strength of iron plate, although the shearing strength is generally

taken in practice as 38,000 lbs. to 40,000 lbs. per square inch, and the tensile strength of iron plate may be any where between 45,000 and 55,000 lbs per square inch.

In formula (3) the shearing strength of iron rivets is taken as eight-thirteenths, and of steel rivets as twenty-three-twenty-eighths of the tensile strength of steel plate, which, if the tensile strength of steel is taken as 62,000 lbs. per square inch, gives a shearing strength of 38,000 lbs. per square inch for iron and 50,000 lbs. for steel rivets, which agrees very closely with those generally adopted.

In both these two formulæ we have the factor of safety introduced, making the strength of a joint proportional to the factor of safety divided by 4. Giving us the extraordinary result, that where first class material and workmanship is used, it does not affect the result, as the factor of safety will be 4 and be divided by 4, but where the workmanship is bad or the material faulty, necessitating the use of a greater factor of safety, will give a greater percentage of strength in the joint. We come to the erroneous conclusion that where we use the worst material and workmanship the stronger will be the joint.

The correct formula to use instead of (2) and (3) is

$$(A) \frac{100 \times \text{area of rivet hole} \times \text{No. of rivets in one pitch} \times \text{shearing strength of rivet.}}{\text{Pitch of rivets} \times \text{thickness of plate} \times \text{tensile strength of plate.}} = \text{percentage of strength of rivets in joint.}$$

The smaller of the two values found by formula (1) and (A) to be used as the percentage of strength of joint.

For finding the pitch, or distance of rivets from centre to centre.

$$(4) \frac{A \times n \times c}{T} + d = p \text{ for iron plates and iron rivets.}$$

$$(5) \frac{A \times n \times y \times c \times P}{4 \times y' \times T} + d = p \text{ for steel plates with iron or steel rivets.}$$

In formula (5) we again have the factor of safety introduced. Why it is necessary to use a factor of safety when designing a riveted joint between steel plates, and is not necessary for iron plates is not explained. It is incorrect to use a factor of safety in any of the preceding formulæ. The factor of safety, as the term itself implies, is a number used, to divide the breaking strength of any material or structure by, to give the safe working strength. And to use it in any other manner, as in the formulæ (2), (3) and (5) where it is used as a multiplier shows an entire misapprehension of the functions of the factor of safety.

It is impossible to give in one formula the best proportions for different kinds of riveted joints in various thicknesses of plate. And although all the formulæ given in these rules (4) to (13) inclusive are dependent on the diameter of the rivets used, there is no information or rule for the diameter of rivet to be used in any given thickness of plate.

For the maximum pitches for riveted joints:

$$(14) (C \times T) + 1\frac{1}{8} = p \text{ m.}$$

- Where C = 1.31 for single riveted lap joints.
 = 2.62 for double riveted lap joints.
 = 3.47 for triple riveted lap joints.
 = 1.75 for single riveted butt joints (double strap).
 = 3.50 for double riveted butt joints (double strap).
 = 4.63 for triple riveted butt joints (double strap).

To illustrate these formulæ, let us find the pitch for a double riveted lap joint between 3-8 steel plates using 13-16 inch iron rivets driven in 7-8 inch holes. By (14) we get 2.607 inches as the maximum pitch allowed, and by (5) we get a pitch of 3.342 in which is nearly 3-4 of an inch greater than the maximum pitch. Or take a triple riveted, double strapped butt joint, between half-inch steel plates, using 15-16 inch steel rivets driven in one inch holes, the outer row of rivets having half as many rivets as inner rows. (By (14) we get a maximum pitch of 3.94 inches, and by (5) we get a pitch of 7.931 inches, or more than twice the maximum pitch.

A very simple rule is given by Prof. Kennedy in the proceedings of the Institute of Mining Engineers, April, 1885, for the proportions of riveted lap joints in steam boilers. T is the thickness of plates in inches.

- Single riveted joints—Diameter of rivets = T x 2.25.
 Pitch of rivets = T x 5.
 Overlap of plates = T x .
 Double riveted joints—Diameter of rivets = T x 2.25.
 Pitch of rivets = T x 8.
 Space between lines of rivets = T x 4.5.
 Overlap of plates = T x 10.5.

Kennedy's rules give very good proportions, and may be safely used by engineers having work to do on plates up to 7-16 inch in thickness. For plates half-inch or more in thickness, the proportions must be taken smaller as rivets over one and a quarter inches in diameter are seldom used in boiler work.

To understand the effect of these formulæ, take a boiler shell 60 inches in diameter, made of 3-8 inch steel plate having a tensile strength of 60,000 lbs., and having longitudinal lap joints double riveted with iron rivets driven in 7-8 holes, the rivet iron having a shearing strength of 40,000 lbs., and using a factor of safety of 5. The pitch of rivets, percentage of strength of joint and working pressure is given in the following table for the different rules:

	Kennedy's Rule.	Formula (5).	Formula (14).
Pitch in inches	3	3.342	2.607
Tensile strength of plate bet. rivets	47,800	55,507	38,745
Shearing strength of rivets	48,104	48,104	48,104
Percentage of strength of joint	70.8	63.9	66
Safe working pressure in lbs	106	96	99
Percentage of strength by formula (3)		73.8	
Working pressure when using formula 3		110	

It will be seen that the pitch by formula (5) is too big, as the plate between rivets holes is 7,400 lbs, stronger than rivets, and the pitch by (14) is too small as the plate is 9,300 lbs. weaker than the rivets. Formula (3) is absolutely useless as it gives percentages of strength much greater than the actual strength.

In formula (21) for tops of fire-boxes and combustion chambers when supported by rectangular girders, is the same as used by British Board of Trade and Lloyds, with the exception that 30,000 is used as a constant instead of 11,880 used by Lloyds and 11,220 by the Board of Trade, thereby allowing a much greater pressure. I give in full sections relating to convex and concave heads, as well as the formula.

(Sec. 29). Convex and concave heads do not need to be stayed when they are truly hemispherical; provided that the plate is thick enough to make it theoretically equal in strength to that of the cylindrical shell sheets.

(Sec. 30). Dished heads must be stayed if they are theoretically equal to the pressure required, when considered as portions of spheres; the stays, however, if of iron, and not welded or worked in the fire, may be allowed a stress of 14,000 lbs. per square inch, or 10,000 lbs. when the stays have been welded or worked in the fire. If dished heads are not theoretically equal to the pressure required they must be stayed the same as flat surfaces.

The pressure allowable on convex heads, when they are truly hemispherical, may be found by the following formula:

$$(24) \quad \frac{ts \times r \times 4}{D \times F} T = B$$

$$(25) \quad \frac{ts \times r \times 4 \times T \times .6}{D \times F} = B \text{ for concave heads.}$$

As these formulæ only apply to heads made of several pieces of plate and are truly hemispherical, and if (Sec. 30) is to be enforced it will have the effect of declaring nearly all makes of water tube boilers unsafe, as well as the steam drums on horizontal tubular boilers, and air receivers, all of which have bumped, or dished heads and are not stayed except in the large sizes. But bumped or dished heads become as strong as the shell when bumped to a radius equal to the diameter of the shell. Providing that the head is made of plate of the same tensile strength as the shell, and after being bumped is of a thickness equal to the shell.

The safe working pressure for a convex head is found by the formula:—

$$\frac{t \times T}{3.6 \times r} = P$$

Where t = tensile strength of plate.
 T = thickness of plate in inches.
 r = radius to which head is bumped.
 P = working pressure.

The pressure allowable on concave heads is six-tenths that of convex heads.

In making this criticism of the formulæ in these rules, it is not my intention to attack the Boiler Inspection Act, but to point out the inaccuracies in the rules for inspection—some of which may be misprints—so that objections to it may be removed. I have taken a great interest in this law and have already seen many instances of beneficial results from the inspectors pointing out weak places, or advising alterations neces-

sary for the safety of a steam plant. I think it of great advantage to the owners of steam machinery, as it not only protects them from incompetent men who claim to be engineers, but ensures them greater economy and safety in their steam plants, and the better care of their boilers and engines, thereby prolonging their usefulness. This law ought to be a protection to the owners, from damage suits arising from any explosion or accident, as by having complied with the law, and employing none but licensed engineers, they have done all in their power to keep their plants in a safe condition. The inspections of boilers ought to be made sufficiently often to guard against any violation of the law, and to ensure that the boilers are kept in a clean and safe condition at all times, and not merely fixed up and washed out when the inspector is expected on his annual visit. It is in the interest not only of the owners and engineers, but of the general public who work or live near where steam power is used, to make this law as effective as possible.

THE PROVINCIAL MINING ASSOCIATION AND ITS WORK.

MR. LESLIE HILL has addressed the following communication to Mr. J. B. Hobson in the form of an open letter, which he desires us to publish in the MINING RECORD. We do so all the more readily, as we are quite in accord with many of the conclusions arrived at by Mr. Hill:—

"NELSON, B. C., December 18, 1903.

"John B. Hobson, Esq., Vice-President, the Provincial Mining Association, Victoria.

"DEAR SIR: As you were the originator of the Provincial Mining Association and are so deeply interested in its success, I would like to write to you as to the causes of the present unsatisfactory position of the Association, with a view to the correction of the mistaken course into which we have fallen, and if possible, the adoption of a better course for the future. That the Association is in an unfortunate position you, more than any one else, must recognize; our treasury is empty and we are in debt, our membership is much smaller than it ought to be, our recommendations are neglected or ignored by the Government, and we have not the confidence of the people.

"What has brought us to this unfortunate position? I venture to suggest the following as the principal factors that have brought about this result:

"One of the principal objects of the Association was to obtain the removal of the two-per cent. tax; not because the aggregate sum collected was an unfair burden on the mining industry as a whole, but that by the incidence of the tax it was an unfair burden on those mines that produce low-grade ore. We were asked by the late Government to suggest some alternative tax on mines which would be acceptable to the mining industry. This has been met by our executive by recommending to the Government a tax on land. The Executive Committee has passed many resolutions asking relief from payments in one form or another in addition to the removal of the two-per cent.

tax, but not one word as to any alternative tax on mines that would give the Government the revenue required. You, sir, advocated a fair taxation on all the resources of the Province alike, *including mines*, but this could not be entertained by the Committee, nothing would do but to shift the whole burden on to some other shoulders, and that by means of an admittedly unfair taxation, the one great recommendation of which that it *would not cost votes*.

"The Executive Committee of the Provincial Mining Association asks for the removal of an *unjust* tax on mines, and asks that it be replaced by an *unjust* tax on lands. The recommendation to the Government to place a fair tax on mines, though advocated by some of the most prominent mining men of the Province, comes from outside sources, and not from the Provincial Mining Association.

"Another important question which the Provincial Mining Association has taken up is the obtaining of better security for those engaged in placer and hydraulic mining. You have found in your practice in the Cariboo district that in order to give confidence to capital, and to secure the large sums necessary for the development of hydraulic enterprises, it is necessary that greater security of title should be given. The Provincial Mining Association has asked the Government to grant such additional security by giving Crown grants to, instead of leases of, placer and hydraulic claims. On the other hand, the Executive Committee, by a resolution passed at Rossland, asks the Government not to give Crown grants to coal and petroleum lands, but to give leases. The meaning of this resolution, if it has any practical meaning, is that the title to coal and petroleum lands shall be made less secure; which will increase the difficulty of obtaining the large sums necessary for the development of coal mines.

"Again, at the meeting of the Executive Committee resolutions were brought forward, I fear, largely for personal reasons and not wholly in the interests of the mining industry, making personal attacks on gentlemen connected with the Government; which resolutions were not carried owing to your influence.

"At the banquet given in Kamloops to the Committee of the Association one member of the Committee is reported to have said:—

"The universal verdict of mining men is that British Columbia has the finest mineral resources, and the worst mining laws, on the face of the earth."

"Another member of the Executive Committee stated on the same occasion that some years ago there were a large number of prospectors in Rossland, and now there were none, and he said that these prospectors were driven away by the bad mining laws. These remarks were made in after-dinner speeches and must therefore receive some allowance, but such statements coming from members of the Executive Committee, which, if correctly reported are so manifestly untrue and absurd as not to merit serious consideration, are calculated to injure the mining industry which we are supposed to assist.

"The principal object of the Mining Association is to improve the condition of the mining industry,

and to inspire the confidence necessary in order to obtain the capital required, for the development of mines, to enable the prospector to sell his claims, and to provide work for the miner. I submit to you, sir, that the proceedings of the Executive Committee, and the speeches of its members, which are reported in the press and disseminated over the continent, are calculated not to increase the confidence of capitalists in the mining industry of this Province, but to hold it up to the world as something to be carefully avoided and shunned.

"My object in calling attention to these matters is that mistakes may be corrected, and that the Association may become the powerful body that it ought to be, and do the useful work for the assistance of the mining industry of the Province which it ought to do. Until we cease to discuss "Socialism," "Herbert Spencer," "the unearned increment," to bring forward personal attacks, to pass resolutions on subjects that are not connected with our business, and confine our discussions to practical business questions affecting the mining industry, we shall remain as we are now, a body without influence, whose resolutions are ignored, and which is treated with good-natured indifference.

"I remain, sir, yours faithfully,

(Sgd.) "LESLIE HILL."

REVIEW OF MARKET CONDITIONS IN LONDON DURING 1903.

THE HEAVY FALL IN B. C. SHARES.

(From a Special Correspondent.)

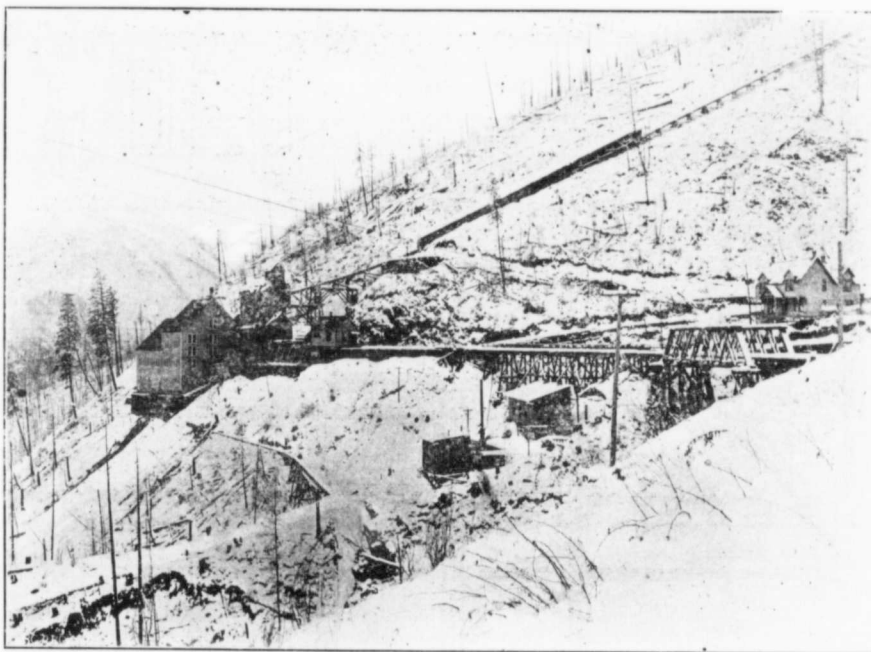
LOOKING backward over the course of events during the past year it must be admitted that the British Columbian market has been as dead as a door nail, and that the values of the shares of even the leading companies have steadily declined in but a natural result of such an unsatisfactory conditions of affairs. Having allowed this much it is quite easy to produce evidence in justification of the market position, and the decline in values. This may be but poor comfort to those who have seen their shares crumbling away fraction by fraction month by month, but it is at least comforting to hope that the fall in prices is not due so much to mining developments as to market conditions. These latter have been generally unsatisfactory throughout the year. That there has been an entire absence of public interest in stocks and shares in this country it is, I suppose, quite unnecessary to remind your readers. In previous letters this apathy of the public has been dealt with, and the causes of it explained, but in even a brief review of the mining market it is necessary to refer to these to make the position intelligible to those who may not have read my previous letters. Briefly, then, it may be stated that public securities have been almost entirely unsupported during the past year. The heavy outlay incidental to the prolonged Boer war sapped the resources of the country to their utmost capacity. Enormous sums were raised between the beginning of 1900 and 1903,

and these creations in time quite exceeded the absorbent capacity of the capitalist, so that huge quantities of stock remained undigested. These new issues were not wholly for the Imperial Government; quite a large proportion were on behalf of British municipal authorities and our colonies. The borrowing fever reached such a height that the leading financial houses were compelled during the early part of the year to apply the most drastic measures for its reduction. Those in London responsible for the last British Columbia loan are to be congratulated upon having managed to place this so satisfactorily as they did, for had they waited only a little longer, the success of the issue would have undoubtedly been imperilled. This glut of gilt-edged investments was, of course, reflected in market quotations, and as you will remember, consols at one time fell to as low as 86½, a price not previously recorded for practically half a century. Colonial issues were correspondingly weak; and the whole market was depressed by this enormous weight of high-class stocks. The railway markets, the foreign government section, the industrial area, all felt the effect of the excessive creation of stocks which in normal times are in well high every instance accorded a hearty welcome. The money market has at times occasioned a good deal of anxiety, whilst in regard to politics the chief features were the nervousness caused by the Balkan developments, and the possibility of a conflict between Russia and Japan. Really, of course, there have been no active disturbing factors—nothing in the nature of a financial crisis, simply a tired feeling amongst investors—an entire apathy with regard to markets and securities. What we have been doing is, of course, paying for the war. Probably not since the Crimea has the country been so dejected. Few of us can speak from experience of the condition of trade and finance at that period, but the present financial depression is undoubtedly largely due to the elongated struggle in South Africa. Unfortunately the settlement of the strife was followed by the commencement of the labour question, a problem which is still with us, and will apparently only be ended by the introduction of the much dreaded Asiatic. As you are probably well aware, the South African department is the principal section of the mining market, and when this is depressed other areas are also depressed. There are occasional exceptions to the rule, as when the West Australian department recently managed to separate itself from the general weakness which had off and on characterized the mining market for many months, but they do not often happen. The British Columbian market is such a limited one that it is not able to disengage itself from its environment so easily, and it has remained, as I have already remarked, under the cloud which has so long obscured it. Unfortunately although it is recognized that the mining industry is progressing satisfactorily as a whole, there have been no sufficiently exhilarating developments to create any revival of public enthusiasm in British Columbia mining shares as a whole. Even in ordinary times the year's happenings would have failed to stimulate activity in British Columbian Issues; in a year like that which is now terminating the news that has come to hand has passed

unnoticed. It is, of course, most cheering to observe the rapid strides which are being made by the Boundary district, but the developments in that region have received little or no public recognition, and certainly no market appreciation. Prices for British Columbian mining shares have fallen steadily, and although there was a sensible recovery from the lowest points reached during the year, a glance at the table published elsewhere of the monthly quotations of the principal issues, and their extreme variations during the period under review—and for which, by the way, I am indebted to the invaluable mining hand books published by Messrs. Straker Brothers, Limited, the well-known London financial statistical publishers—the losses on the year are serious enough. The Le Roi group have been especially weak. At one time the \$25 share of the Le Roi Company fell to \$1.50, and at the close is no higher than \$3. Le Roi No. 2 (\$25) have fluctuated between \$6 and \$2.50, whilst Rossland Kootenay once changed hands at 50 cents, and even the shares of such a concern as the B. C. Development Association were reported to have been done at even less than that. The London & B. C. Goldfields group have furnished one of the keenest disappointments, the parent company having been compelled to undergo the mortifying process of reconstruction. This group is quite disregarded by the market owing to the wretched show made by its two creations, the Ymir and the Whitewater. Ymirs are said to have been sold at as low as 25 cents for the \$5 share, and Whitewaters at an even lower figure. The New Goldfields of B. C. and its offspring have quite fallen into the rear, and at their worst Velvets were no better than 25 cents, whilst the parent company were marked at the same low figure, these quotations in each case representing about one-twentieth of the nominal value. Neither the London & B. C. Goldfields, nor the New Goldfields of B. C. have in any way justified the expectations which were indulged in at their inception. Giants, after having been very heavy at one time, recovered towards the close, but Hall Mining have shown invariable weakness, and Enterprise, although not at the worst of the year, are now at only one-third of their best quotation. The various Klondike companies which are dealt in in the B. C. market have been entirely discredited by their general failure to fulfil prospectus promises, and one of them, the Alaska Goldfields (nominal value \$5) are said to have been quoted as low as 12 cents. One of the most sensational collapses of the year in this market was that of Nimrod Syndicates, which in a few days fell from as many pounds to shillings. This, however, I dealt with fully at the time, and the facts will be fresh in the minds of your readers; but it is one of the movements which needs reference *en passant*. The outstanding favourable feature of the year has undoubtedly been the steady advance in public favour of Tye Copper shares, which were at one time carried up to over \$14 for the \$5 share owing to the satisfactory developments reported in connection with this concern, and finish at about \$11 with a good tendency. Snowshoes have also been in favour with the public for the greater part of the year at over par, but slumped in the last month owing to the latest devel-

opments not apparently being relished by holders of the shares. On the whole it is a cheerless record I have to present, but let us hope that the actual mining conditions are more healthy, and that Mr. Turner's optimistic views, which I have given you in my interview with him, will soon be realized. What the British Columbia market wants to help it are a few more dividends, and those of a sufficiently satisfactory character to convince the public on this side that the investment of capital in the mines of the Province will be eventually productive of good results. Hitherto unfortunately dividends have been conspicuous by their absence.

ing machine. The feature of this machine is to take hold of the iron, while the zinc being non-magnetic, is left alone as a fine product. The arrangement of the plant is automatic, and the cost of hand labour is very low. The plant has now been in successful operation for the last few weeks, and has proved a most valuable addition to the present silver-lead concentrator, being the first one of its kind in Canada and one of the few in the world. We have at the mill from 1,300 to 1,500 tons of zinc ore on hand ready for separation, besides a large tonnage at the mine, which will keep the plant going for a long time."



Concentrator Building at Payne Mine, near Sandon.

THE NEW ZINC SEPARATOR AT THE PAYNE MINE.

MR. A. C. GARDE, general manager of the Payne mine near Sandon, kindly sends us the following brief particulars of the new plant recently installed there for the concentration of the zinc products. He writes: "I will say that the plant is an absolute success, and that we are raising the grade of our 42-43 per cent. zinc to 57-58 per cent. and are making a very desirable product for the spelter market. The system we are following out is briefly this: We charge our 42 per cent. material after it has been concentrated in the wet way into a combination drying and roasting furnace, whereby the spathic (siderite) iron associated with the zinc is changed into a magnetic product. After cooling, the roasted ore is sized in vibrating screens, and passed over a Knowles magnetic separ-

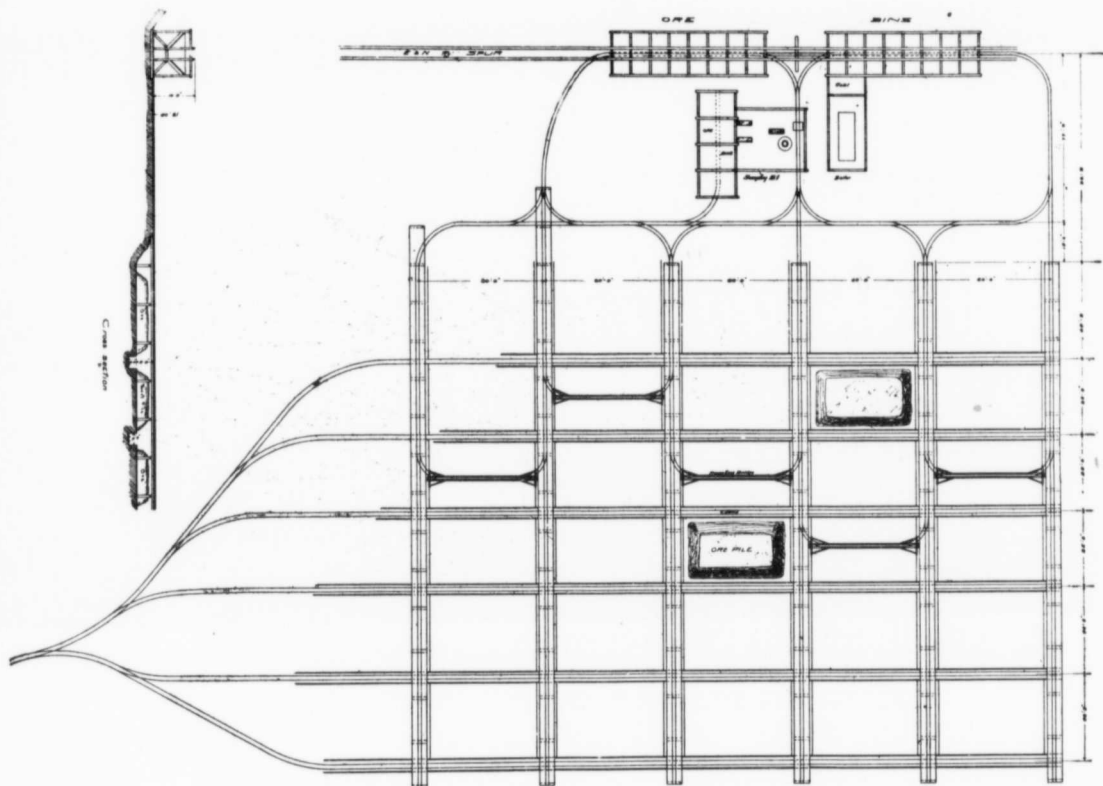
THE YEAR'S DEVELOPMENT AT MT. SICKER

(By a Special Correspondent.)

TYEE COPPER COMPANY, LIMITED.—The capital of this company is £180,000, in 180,000 shares of £1 each. These shares are freely dealt in on the London market, the present price being about £2.5.0. Since the completion of the smelter about one year ago, a large monthly tonnage has been smelted, which has given exceedingly good returns and yielded a handsome profit. The property of the Tye Copper Company consists of about 250 acres of mineral lands on the run of the lode, (the mineral zone being traceable through over 8,000 feet of ground), 600 acres of timber lands, 60 acres of freehold land at Tye Station, on the E. & N. Ry., and 45 acres at the smelter site at Ladysmith. About two miles of underground workings have been done at the Tye mine and the

ore bodies proved to exist right through, a distance of 1,500 feet. There is no doubt now, but that the immense lenses of copper-gold ore are persistent in depth, as a large body has been encountered in upraising from the 300-foot level, and the recent work on the Richard III. claim, which lies on the eastern boundary of the Tye property, has proved rich ore at a depth of 500 feet from their surface, and at the present time the owners of the property are driving west on this ore, and are now within about 100 feet of the eastern line of the Tye. The above remarks only apply to the main ore body, which is situated near the south wall, and in

south wall is now being run from the 165 level, to traverse the entire claim. The rise of the hill gives the actual depth of this cross-cut from the surface at about 350 feet. This cross-cut has passed through the main, or south, ore body, showing a width of 30 feet of solid ore. At 150 feet in, the north ore body was intersected, giving four feet of ore, and beyond this again, lode material has been struck, giving values in the precious metals, and with strong indications of other ore bodies still further north. The capacity of the aerial tram, connecting the mine with Tye Station on the E. & N. Railway, has been doubled, and there will be no diffi-



Plan of Roast Yard, showing arrangement and system of tram tracks at the Tye Smelter.

several of the stopes attains a width of over 40 feet of solid ore. Beyond this to the north, and at about 150 feet from the wall, there is the northern ore body, which is a parallel ledge of great persistency, having been proved by cross-cuts at intervals, extending over many hundreds of feet. This ore body is about four feet wide and portions of it have given exceedingly high assays. No development work or stoping has been done on this lode, as the amount of ore yielded by the large southern ore bodies, has kept the mine fully employed in stoping, shipping and developing, so the exploration of the north ore body has been left for some future time. A cross-cut north from the

culty from now on in shipping continuously from 5,000 to 6,000 tons monthly from the mine.

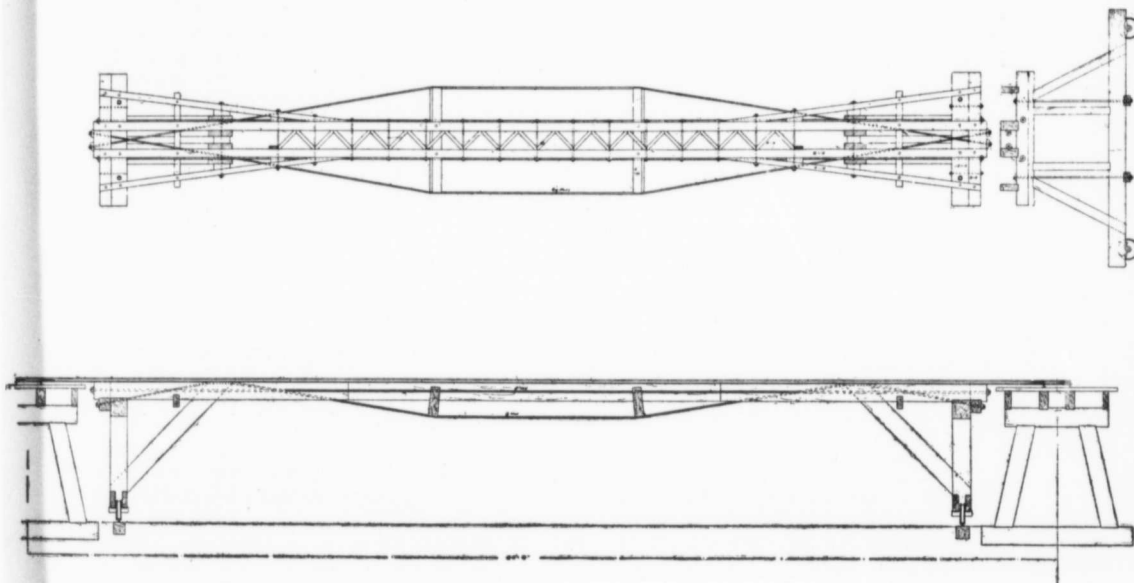
The smelter belonging to the Tye Copper Company is situated at Ladysmith, and is one of the best and most up-to-date smelters in this Province. Construction work on the Tye smelter was commenced on April 17th, 1902, a gravity system being arranged from the receiving bins at the roast yard down to the beach at salt water, so the handling of the ore was reduced to a minimum. Much delay was experienced in the delivery of the smelting machinery owing to strikes in the East, but the plant was started up on December 16th, 1902. The site is to the north of the town of Lady-

smith, and contains 45 acres of ground. At the roast yard (which is furthest removed from the town) are the receiving bins, capable of holding 1,600 tons of ore. A spur from the main line of the E. & N. Railway leads to the top of the bins, into which the ore from the mine is dumped from the cars. From the bins the ore is distributed over the roast beds by a series of trestles and travelling bridges where it is roasted before being taken to the smelter. The roast yard consists of 32 roast beds, each capable of roasting 300 tons of ore. The roast yard is connected with the smelter by means of a tramway 2,000 feet in length, with five switches running into the roast beds, each

house ample room for future addition or extension.

The assay office and plant of the latest designs and contain all the appliances necessary for a plant like the Tye. The general office has recently been completed, which completes the construction work as originally designed. Since the furnace was blown in on December 16th, 1902, there has been smelted over 50,000 tons of ore, producing 4,700 tons of matte, valued at about \$590,000. In addition to the ore of the Tye mine, the company has several contracts for custom ores, extending over several years.

RICHARD III. DEVELOPMENT CO., LTD.—This mine is being operated by a local company, with the very mod-



TRAVELLING BRIDGE
FOR
TYEE COPPER CO.
LADYSMITH, B.C.
26-11-02

Plan of Moveable Bridge at Roast Yard, Tye Smelter.

500 feet long. At the smelter building is another set of ore bins, where the roasted ore is dumped on being brought from the roast yard, and from there is taken to the furnace. To the east of the roasted ore bins is the sampling mill, where all custom ores are sampled before going to the smelter. The furnace is 120 inches by 42 inches, made by the Allis-Chalmers Company of Chicago, and everything is in readiness for the installation of another, 160 inches by 42 inches, whenever the management deem it advisable. The slag is "shotted" as it comes from the furnace and carried off in a flume 250 feet long. In the power house is a No. 7 Connorsville blower and a 125-horsepower Allis-Chalmers Corliss engine, for driving the same and the electric light plant. There is also in the power

house ample room for future addition or extension. The assay office and plant of the latest designs and contain all the appliances necessary for a plant like the Tye. The general office has recently been completed, which completes the construction work as originally designed. Since the furnace was blown in on December 16th, 1902, there has been smelted over 50,000 tons of ore, producing 4,700 tons of matte, valued at about \$590,000. In addition to the ore of the Tye mine, the company has several contracts for custom ores, extending over several years. RICHARD III. DEVELOPMENT CO., LTD.—This mine is being operated by a local company, with the very mod-

erate capitalization of \$35,000, in 35,000 shares of \$1 each. A shaft has been sunk to a depth of 500 feet and numerous drifts and cross-cuts run from the various levels. Altogether about 2,000 feet of development work has been done on this property. The Richard III immediately adjoins the Tye ground on the eastern line of the Tye, and the same class of ore bodies has been encountered. At the 500-foot level exceedingly rich ore has recently been discovered and a sample shipment made to the Tye Company's smelter at Ladysmith, but returns are not yet to hand. Two samples of this ore have assayed as follows: No. 1—copper, 10.20 per cent.; silver, 34.36 ozs.; gold, 1.38 ozs. No. 2—copper, 6.63 per cent.; silver, 121.34 ozs.; gold, .74 ozs. Five dollars is freely bid for the \$1 shares

of this company, which bids fair to develop into a valuable mine.

VANCOUVER ISLAND MINING AND DEVELOPMENT CO., LTD., with a capital of £50,000, in 50,000 shares of £1 each, has been formed in London to develop the mineral resources of this Island. This company has secured a two years' option on a large group of claims to the east of the Richard III. and work has already been started. A 25-horsepower hoisting engine by Messrs. Joshua Hendy & Co. of San Francisco; a compressor plant by the Ingersoll-Sargeant Co., of three-drill capacity, and 30-horsepower boiler from the Albion Iron Works, of Victoria, have been purchased and will quickly be installed. It is the intention of the company to sink a shaft to a depth of at least 500 feet, and to thoroughly explore the ground.

LENORA MINE.—This mine, which became involved in financial difficulties, has been re-opened and operated in the interests of creditors. The result of recent development work has been very gratifying and shipments to the Crofton smelter have been steadily maintained.

REVELSTOKE MINING DIVISION IN 1903.

(By E. A. Haggren.)

THE past year has seen greater mining activity in this section than for some years, and that activity has extended from the extreme north of the Revelstoke Mining Division to the southern end. Beginning at the north by way of review of the year's progress, I shall first deal with recent conditions in Big Bend.

BIG BEND.

In this section the owners of the mica claims have done a good deal of development work on these prospects with encouraging results and they look for as good results as have been obtained in the Tete Jaune Cache section. The pegmatite deposits in which the mica occurs have been proved to extend south from Tete Jaune Cache to the northern portion of the Selkirk range. As there is no means of transportation into that country as yet the locators of the mica claims had to carry on their work under the greatest of difficulties. A plan is projected to build a tramway past Death and Priest Rapids on the Columbia River and navigate a steamer between the upper extremity of these rapids and Canoe River in connection with the steamer *Revelstoke* which now runs as far as La Porte. The owners of the Tete Jaune Cache mica claims are in communication with the Revelstoke Navigation Company with a view to assisting this scheme, as it would enable them to ship mica from their already developed claims at Tete Jaune Cache. There is no doubt about the high quality of the mica and it appears to occur in quantity. The experimental shipments made by Mr. J. F. Smith, of Kamloops, showed that a good market exists for the quality of mica obtained at Tete Jaune Cache.

The placer gold fields of the Bend are also receiving considerable attention. Although Mr. E. A. Bradley has for the present suspended work on the old channel

of Smith Creek, he has put in a first-class winter camp at French Creek and is following up the old channel with encouraging results and has brought in a large quantity of gold, which is of a coarse character.

On McCullough Creek the Revelstoke and McCullough Creek Hydraulic Company, organized by Mr. J. D. Sibbald last fall, an hydraulic plant has been installed, some gold being recovered this year. The company is making arrangements for active operations in the spring by adding another giant, making two in all, extending the pipe line and erecting a derrick for handling the boulders. There is no doubt there is considerable gold in the creek, and profitable working merely depends on the application of economic methods. Camp buildings are meanwhile being erected, a sawmill has been put in, and 60,000 feet of lumber are already cut in readiness for extended operations. An electric light plant is also being purchased and it is intended to operate the plant night and day during the open season. The company paid a dividend of one and a quarter per cent. from the gold taken out during the season. Duluth capital is mainly interested.

It is believed that the old channel at Camp Creek, for which Raymond Allen has prospected for some years past, has at length been located and a local syndicate has been formed to exploit the ground. The writer made an examination of the property last spring and found it to run from 10 to 20 cents a yard where the test pits had been put in. This is an ideal property for hydraulicing, having apparently wash averaging 150 to 200 feet in depth and between 600 and 700 feet in width. The wash is of a light character, easily handled and a head of water can be obtained anywhere from 300 to 500 feet.

On the old Chicago hydraulic property at the mouth of Smith Creek Mr. Howard has been working steadily and is reported to have obtained fair results. He had two giants running and the gold obtained is coarser than usual, the nuggets running up to \$12 in value.

In lode mining there has been very little doing in the Bend this season. Mr. J. O. Bradley is reported to have made a good strike of gold-bearing quartz on Ground Hog Basin. He brought in samples showing free gold and claims to have a lead eight feet wide. An endeavour is being made in Seattle to organize a company to develop the property.

Mr. Gus Lund has further developed his gold quartz holdings in Ground Hog Basin and shows certificates of high assays obtained from the Trail smelter on samples of the graphitic schist forming the walls of the leads.

The Downie Creek mineral deposits are being opened up. These ores are copper and galena, and are more or less associated with auriferous arseno-pyrite. The ore bodies are large, but are not sufficiently developed to admit of a fair estimate of their value, being formed with the exception of Standard Basin, where an ore body has been proved to a depth of 80 feet carrying about 7 per cent. copper, with high silver and some gold values. On the north side of the creek the ore bodies occur in the schists between granite and lime, and on the south side the ores are found associated with dioritic dykes. Standard Basin has some of the

finest surface showings of copper ores I have seen in the province and would appear to fully warrant development. The Prince Mining and Development Company reduced their force this spring and have only two or three men at work on their property following up the proved ore bodies. This company has now spent a large sum of money in developing this section.

F. McBean and J. P. Kelly have about ten feet of auriferous arseno-pyritic ore on Carnes Creek and have done further development work this season.

LARDEAU DISTRICT IN 1903.

(By E. Jacobs.)

THE Lardeau district embraces so large an area of mineralized country that it would indeed have been disappointing had there not been substantial progress in parts of it during the year under review. In three sections though, a decided advance was made. In the Fish River portion the erection of two stamp mills at Camborne gave an impetus to mining, the fact that the two properties directly affected were by the provision of facilities for the extraction of the precious metal contents of their ores, placed in a position to earn money to pay the cost of operating rather than to continue to draw upon their respective treasuries, encouraged the development of other properties with a view to their being established on a similarly favourable footing. In the vicinity of Ferguson the further development of the mines of the Great Western and Silver Cup companies, and the extensive provision for the reduction of their ores, and, in smaller degree, the working of the Triune mine, prevented retrogression in this part of the Lardeau; while the discoveries of rich surface showings of gold at Poplar Creek caused an influx of population and a general prospecting of the surrounding country with results that appear to justify the expectation of permanent mines being developed there.

EVA GROUP.—The Calumet & B. C. Gold Mines, Ltd., continued the development of the Eva group, situate near Camborne, on Lexington Mountain, practically throughout the year, the only intermission having been necessitated by the bad state of the trail from the town to the mine last spring, when for a short time supplies could not be taken up. Even then the working force was retained, the men having been put to work on the site for the stamp mill, near the town, until it was practicable to resume operations at the mine. Altogether some 4,000 feet of work have been done in development of this property, mostly on the veins. The principal work done last year was the driving of No. 7 tunnel, the purpose of which is to tap at a depth of 800 feet the veins constituting the uppermost showings on these claims. This tunnel is about 200 feet vertically below that known as No. 3, which has also had attention, having been extended at least 300 feet during the year. Both these tunnels are for the development of the ore shoots on No. 2 vein, from which supplies for the stamp mill are being drawn. There is now an ore supply equal to the requirements of the mill for a period of five months, and after No.

7 shall have been driven far enough to cut the vein calculated to be about 80 feet ahead there will be at least a year's supply for the ten stamps available. Developments proposed will, if carried out, make a connection between workings and facilitate the economical extraction of ore from the mine.

The mill erected at Camborne last year by this company is a Fraser & Chalmers 10-stamp section of a 40-stamp mill, with stamps weighing 1,050 lbs. each. The mill building is of lumber with a shingle roof. It stands on a graded site with the foundations of the battery frame resting on solid rock. The main building including battery and vanner rooms, is 32 feet by 80 feet, and the height from the lowest floor to peak of tower, in which is situate the lower terminal of the tramway, is 85 feet. The stamp mill is well finished and is equipped with automatic feeders. In the vanner room there are four 6-foot Frue vanners, one having a corrugated belt. These are fed from a cone sizer. The machinery is driven by three Pelton water motors, one 65-h.p. operating a Comet B rock crusher, one of 135-h.p. driving the stamps, and one of 20-h.p. the vanners and a dynamo for a 200-light electric plant. A 25-h.p. boiler, of locomotive fire-box type, heats the mill building. The Peltons are impulse working under a head of 400 feet. The water is brought from Pool Creek about 4,000 feet to a penstock above the mill in a 24-inch by 36-inch covered flume. A rivetted steel pipe 1,000 feet long, diameter 18 inches and 12 inches, conveys the water from the penstock to the Pelton wheels. The Riblet aerial tramway is 4,200 feet between terminals. It has one span of 1,000 feet and passes over a high ridge before dropping 200 feet at a 45-degree slope to the upper terminal. The fixed cable on the loaded side is 1 inch and on the return side $\frac{7}{8}$ -inch, whilst the traction rope is $\frac{3}{4}$ -inch. The capacity of the tramway is 150 tons every ten hours and it has run satisfactorily and proved very serviceable from the time a commencement was made to use it.

The stamp mill has been running since October. During a run of forty-eight 24-hour days, to December 1st 1,400 tons of ore were put through it and this yielded 490.8 ozs. fine gold, value \$10,146.25; 220.38 ozs. silver, value \$110.19, and 16 tons concentrates, value \$552; total \$10,608.44. This represented a recovery of \$7.57 per ton and an extraction of 87 per cent. of all values. One-half of this tonnage came from the dumps. The December returns promise to give a higher average value, the ore put through having been more free from waste than that taken off the dumps. A partial clean-up after a run of a little less than thirteen days gave 320 ozs. bullion of an approximate value of \$5,000. The month's crushing will total about 950 tons and the yield is estimated at between \$10,000 and \$11,000—an average of say \$11 per ton and a total recovery of a little better than 90 per cent. of the battery sample assays. A reduction in all costs as well as a higher extraction of values has been effected. The details of costs per ton of ore mined before this improvement was practicable were as follows: Mining (hand drilling), \$3.11; development (hand drilling), \$1.13; transportation (aerial

tram), \$0.23; milling, \$1.04; maintenance, \$0.70; office and general expenses, including management, \$0.42 total, \$6.10.

FERGUSON.

THE SILVER CUP.—The Silver Cup group, previously owned by an English company known as the Sunshine, Limited, consists of nine mineral claims which were acquired by the Silver Cup Mines, Ltd., in the early part of 1902. The property is situated about eight miles southeast from Ferguson and at an elevation above sea level of 6,500 to 7,000 feet. Two parallel systems of lenticular ore deposits occur here. The ore is argentiferous galena, zinc blende and grey copper, average values being gold 0.6 oz., silver 172.76 ozs., and lead 25.9 per cent. The net tonnage of ore shipped from these mines during eleven months of 1903 ended November 30 was 920,537 tons and the net cash received for same, \$77,094.52. Shipments during December increased the year's output to about 1,000 tons, but returns for that month's shipments are not yet obtainable. Most of the work on this group has been done on the Silver Cup claim, on which the upper cross-cut tunnel encountered, at 293 feet in, what is called the "blind lead," this not showing on the surface. About 500 feet of drifting has been done on this lead at this level rather more than half to the southward and the remainder in the opposite direction. At 56 feet farther in the cross-cut tapped the Silver Cup lead, which has also been drifted on north and south at this level, in all between 300 and 400 feet. The lower workings are 93 feet below the upper, and these give a depth of 243 feet from the surface. The "blind lead" was cut by the lower cross-cut at 226 feet in, and the Silver Cup lead at 282 feet. A drift runs south 755 feet, part of the way on the blind lead, and another on the Cup lead north and south, together about 300 feet. Nearly all the ore has been stope out from these lower workings up to the surface. On the Sunshine the upper workings consist of a drift 290 feet in length at a level about 140 feet lower than the lower workings of the Silver Cup. Another tunnel is being driven at a level 100 feet below that of the upper Sunshine tunnel. This is now in rather more than 1,400 feet, and it is estimated that about 200 feet more will have to be driven to bring it under the shoots of ore occurring in the Silver Cup workings above. A winze is being sunk on the blind lead from the lower level of the Silver Cup and eventually this will connect with the long tunnel just mentioned.

A Riblet aerial tramway, about 8,000 feet in length, connects the Silver Cup mine with the waggon road at Eight-Mile, which place is about eight miles from Trout Lake City. The difference in elevation between the upper and lower terminals is about 3,000 feet. The tram has been in operation since last July and it has been found very serviceable. During the fall Mr. B. C. Riblet had in hand the construction of a short tram from the entrance to the upper workings of the Silver Cup down to the upper terminal to the tram first constructed, and another between the existing tram down to the company's reduction works now being put in at Five-Mile, the distance between these

two points being about 17,000 feet. Last summer a 50-h.p. horizontal return tubular boiler, a 14 by 18 McKiernan air compressor, and a 5 by 7 Lidgerwood pneumatic hoist were sent up by the tramway to the mine. The boiler and air compressor were made in sections to admit of their being thus handled. The compressor, which is probably the only one installed in the province at so high an altitude, is nominally a 5-drill engine. At the elevation it is here working its capacity is 350 cubic feet of free air per minute. Other recent improvements include the erection of new buildings for the accommodation of the men employed at the mine.

SILVER CUP MILL.—At Five-Mile, on the South Fork of Lardo Creek and rather more than a mile above Ferguson, the Silver Cup Company is erecting a 20-stamp combination silver mill, the combination consisting of milling, concentrating, roasting and pan-amalgamating. This mill is intended to treat the ores of both the Silver Cup and Nettie L. mines, and is so designed that these may be put through it simultaneously if required. Separate aerial tramways from mines to mill, grizzlies, crushers, units of ten stamps, buddles, vanners, pulp elevators, furnaces, and all other plant right through to the retorts, are so arranged that the respective products of the two mines may be kept separate from first to last. The main mill building is 68 feet wide by 216 feet 6 inches long, and its total height from the lowest floor up to where the ore is received from the aerial tram buckets is 92 feet. It is of lumber and is roofed with corrugated galvanized iron. Its several terraces are supported by substantial walls. The rock crushers and stamps will be operated by a 75-h.p. induction motor. The battery frame is a 20-stamp frame of a back-knee type, with the stamps arranged in two units of ten 1,000-lb. stamps each, these again being in sections of five stamps. The buddles, vanners, furnaces, etc., will be operated by a 150-h.p. induction motor. The retort room contains a smelting furnace, and the boiler room a 10-h.p. vertical boiler for heating the building.

Electric current for power and lighting purposes will be generated in a power house alongside the South Fork of Lardo Creek running close by. The building is of similar construction to that of the mill and its dimensions are, width 36 feet and length 40 feet. Water is brought from the creek in 4 foot by 2 foot 6 inch lumber flume to a 10 foot by 10 foot by 9 foot penstock, whence it is conveyed through 460 feet of 30-inch rivetted steel pipe to the power house. The power is derived from two water wheel units operating under an effective head of 138 feet. Each unit consists of two 48-inch Pelton water wheels governed by a Lombard water pressure governor. Two 120-kilowatt alternating-current, two-phase, Westinghouse generators, running 729 r.p.m. under full load, and a 562-kilowatt, 125-volt, direct current, multipolar, compound-wound exciter, are belted direct to the water wheels. The transformer station is a separate building situated near the mill and in it are four 50-kilowatt oil-cooled transformers for reducing the voltage to that required for the motors and for lighting purposes. The electrical equipment also includes

switchboard, lightning arresters, and other customary apparatus.

At the mill camp there are as well a sawmill (with horizontal tubular boiler, 10 by 10 engine, 50-inch circular saw, swing saw, planer, etc), blacksmith's shop, bunk houses, boarding house and kitchen, laboratory, assayer's residence and other buildings. It is expected that the mill will be running in the spring, by which time the Silver Cup and Nettie L. mines will have plenty of ore to keep it supplied for a long run.

NETTIE L.—The Nettie L. group is situate on a mountain across the North Fork of Lardo Creek and immediately east from Ferguson. The mine is at an elevation of 2,100 feet above the town, from which it is only about a mile distant in a direct line, but four miles by waggon road. The output of the Nettie L. during 1903 was 1,000,375 tons net, this ore having returned \$55,391.39 net cash from the smelters. The mine was closed down early in the winter pending the completion of the Silver Cup reduction works, to which its ore will be sent hereafter. There are seven mineral claims, some of them fractions, in the group, but the greater part of the total of (approximately) 6,000 lineal feet of work done in underground development has been done on the Nettie L. claim, though latterly the Ajax has had a deal of development done on it. Four levels have been opened on the Nettie L. and three cross-cut tunnels driven on the Ajax, No. 3 on the latter being on the same level as No. 1 on the former. There is a small power plant on the property, consisting of a 60-h.p. steam boiler, 14 by 18 Ingersoll-Sergeant air compressor, machine drills, and a 7 by 9 double-cylinder, single-drum, Lidgerwood hoist. A Riblet aerial tramway, some 8,000 feet in length, connects the mine with the mill at Five-Mile camp.

TRIUNE.—The Triune group of six claims is owned by the Metropolitan Gold & Silver Mining Company, of Minneapolis, Minnesota, which company also owns the Metropolitan group, situate about eight miles from Ferguson up the North Fork of Lardo Creek. Lack of road communication prevents the development of the latter, but work has been in progress at the Triune, distant some nine miles southeast from Ferguson, the past year. No response was received to a recent application for information relative to this property, but it is known that it has been shipping ore during the year, and recently a district newspaper published the statement that work would be continued at the mine through the winter. Last summer it was ascertained that the aggregate value of ore shipped to that time was about \$110,000 and it was estimated by the resident manager that by the end of the year the total value would reach \$140,000. The ore is silver-lead, carrying from \$12 to \$18 in gold, about 250 ozs. silver, and 35 per cent. lead, to the ton. It is sent to Trail and that treated during 1902 averaged about \$132 per ton after deduction of freight and treatment charges.

OTHER PROPERTIES. — The Ophir-Lade Syndicate, Ltd., has for some time past owned a group of seven crown-granted claims upon which, owing to their alti-

tude and the absence of transportation facilities, little development has latterly been done. These are among the mining properties the Great Northern Mines, Ltd., was organized to acquire. The Badshot group, another well-known property, situate at the head of Gainer Creek, has similarly had to lie idle, chiefly for the reason of its outlying location. The Alpha group, on Great Northern Mountain, in the vicinity of Ferguson, on which in earlier years the Lillooet, Fraser River & Cariboo Goldfields, Ltd., (one of the Horne-Payne organizations) did a deal of work, was a few months since sold by the liquidator of that company to some moneyed men resident in England and the announcement has been made that they intend to work some of the claims this year. In the Kootenay Consolidated Mining Company, a consolidation of five or six other companies was effected last summer. This company has a capitalization of \$5,000,000 and it is stated that it will shortly work some of its claims, most of which are situate on the Duncan slope, put in an electric railway to navigable waters on the Duncan River, and later erect a smelter.

TROUT LAKE.

The most important properties in the neighbourhood of Trout Lake are the Lucky Boy group and the Ethel, which are owned by Philadelphia men. An application for recent information was not responded to, so no particulars of development work done and ore shipped to date can now be given. The latest reliable information obtained is that during last spring and summer some 3,000 sacks of silver ore were shipped from the Lucky Boy group, and it is known that shipments were continued later in the year. The ore contains a deal of tetrahedrite and carbonates, with high silver values, and the ore shoots vary from a few inches to about four feet in width. The mine is situate at an elevation of 1,700 to 1,800 feet above Trout Lake. The Ethel lies farther southward and at a greater altitude. This property has been under development for some time but no details of work or output are at present available.

Few, if any, of the numerous claims on the seven or eight creeks flowing into Trout Lake from either the east or west, had any important development work done on them during the year. A reported rich strike of free gold to the southeast, towards Silver Cup Mountain, caused a deal of excitement in the neighbourhood of the lake for a short time, and many prospectors went out, but nothing was heard of the find after a few weeks had elapsed.

South of Trout Lake from Gerrard to Lardo, at the head of Kootenay Lake the country along the Lardeau River received more attention from prospectors during the latter half of the year than at any previous time in its history. All the creeks—Canyon, Tenderfoot, Rapid, Poplar, Cascade, Meadow and Cooper creeks, flowing in from the Lardeau Mountains, on the west, and Healey, Camp, Hope and Lake creeks, from the Duncan Mountains, on the east,—have been more or less prospected during this period. Good showings had previously been found on several creeks, other than the now widely-known Poplar Creek, notably on

Tenderfoot Creek, where the Lardeau Valley Mines, Ltd., had been developing a group of claims; on the Handy group, on Healey Creek, sold by H. Magnusson and partners to a syndicate represented by Col. W. M. Bayton, of Kaslo; on Nesbit and Munroe's, Chisholm's and Gordon and Ferguson's respective claims, on Rapid Creek, and on J. Winquist's Spyglass claim and Marquis and Gilbert's group, both on Poplar Creek. But it was not until the discovery first of rich gold on Marquis and Gilbert's Gold Park claim and next of extraordinarily rich surface showings of coarse gold on the Lucky Jack claim that Poplar Creek attracted the large numbers of gold-seekers that in the summer and fall flocked to it. The reports of such rich finds were at first received with caution, but when the owners of claims exhibited quantities of quartz specimens with gold so freely distributed through them as to demonstrate their unusual richness, the rush to Poplar Creek increased until the surrounding country became pretty well alive with prospectors.

POPLAR CREEK.

So much has been published regarding several of the Poplar Creek properties that it is superfluous to go into any considerable detail here about them. Those in particular upon which rich strikes have been reported are the Marquis and Gilbert, Lucky Jack, Swede group, Walker and Olsen, Pete Kelly, and Winquist properties.

MARQUIS AND GILBERT'S GROUP.—The Gold Park group is owned by Frank Marquis and George Gilbert, who have been prospecting off and on in this district each year from 1898 on. In the prospecting season of 1902 they located the Ochre, Ophir, and Gold Park claims, but although they found some good showings of ore on them it was not until last June that they "struck it rich," which they did on the Gold Park. Their first rich find was of course gold in quartz and, near by, of gold showing freely in a decomposed ore described as an oxidized sulphide and known locally as "carbonates." Later they put down a prospecting shaft and then drifted, taking out about seven tons of ore mineralized with galena and showing free gold. This they shipped to Trail during December, but at the time of writing the returns, if received, have not been made public. This was the first ore shipped in bulk from Poplar Creek. From a 20-foot lead lately discovered on their Ophir claim the same owners sent four sacks of ore to the Trail smelter as a test shipment along with their Gold Park ore, but the value of this has not yet been made known. These men have shown their *bona fides* by declining all overtures for purchase of their claims. They have confidence in their property and before entertaining any offer they are opening it up themselves to prove its value.

LUCKY JACK GROUP.—This is the group the surface showings on which caused such a sensation last summer and largely influenced the rush to the camp that took place after its discovery. There are three claims in the group, the Lucky Jack, Lucky Three and Little Phil, together giving an area of about 130 acres. The main lead runs almost north and south and on the abrupt descent of the hillside it stands out distinctly,

the country rock having been eroded away and the quartz left in place projecting above the rock through which it cuts, and coarse gold showed freely wherever the preliminary prospecting work exposed the vein, which higher up the hill was covered in parts. To prove it, a tunnel is being run on this vein, starting from the lowest level obtainable above ground. This is now in well on towards 300 feet and it is stated that the vein continues to show gold freely, maintaining a high value throughout. The group has been acquired by the Great Northern Mines, Ltd., and the management has announced its intention to pursue a continuous policy of development. It is proposed to put a stamp mill on the property; meanwhile a quantity of rich ore is being shipped to the Oyster-Criterion stamp mill at Camborne. High returns are expected, the ore showing an excellent prospect of gold when crushed and panned. The Lucky Jack group is described as having a network of veins, some of them appearing to cross the main lead at right angles. Gold quartz from this property was shown at several exhibitions—at Nelson, Spokane, and on the Coast—and, besides being the most conspicuous gold exhibit among the minerals displayed at these exhibitions, was awarded a first prize at each of them. So rich were the specimens shown that it was not deemed safe to leave them unguarded, so all the time they were on exhibition they were carefully watched to prevent their being stolen. The outcome of the development of this property is being awarded with more than ordinary interest, for if the phenomenal values found on the surface are maintained with depth the property will be exceedingly rich and productive.

SWEDE GROUP.—The property known as the Swede group consists of the Gold Hill and Goldsmith claims, situate at a higher elevation than that of the Lucky Jack group. These are among the claims the Great Northern Mines, Ltd., has acquired, and is now developing. Before they were sold to that company the original owners stated that there were at least six veins occurring on them. Surface showings of coarse gold in quartz were rich and late reports from Poplar Creek are to the effect that equally rich quartz has been met with in the course of development. It has also been claimed that the average value of the ore being taken out of the workings is high. No returns from any appreciable quantity of the ore have yet been obtained, so far as made known to the public, but it is confidently anticipated by the management of the property that they will be unusually satisfactory.

SPYGLASS GROUP.—This group consists of three claims situate about eleven miles up Poplar Creek from its junction with the Lardeau River. These were located in 1901 by John Winquist, who has been prospecting in this part of the Lardeau for about six years. The ore met with in the course of prospecting up to a recent date was described as quartz mineralized with grey copper, some of it carrying high values in native silver and gold. A few weeks ago a strike of rich gold and silver ore was reported and the property was placed under option. No particulars have been obtained as to nature and footage of work done lately, but Winquist has been a most persistent believer in the

value of his claims, and he held on to them and prospected them before public attention was drawn to the district, so that he deserves the success he is stated to have lately met with.

OTHER CLAIMS.—There are many other claims on or near Poplar Creek. Among those that brief information of has been received are Walker and Olsen's, on which ore mineralized with galena and iron and showing free gold has been found; that belonging to Pete Kelly, who just before the snow came uncovered some quartz from which he obtained high assays, and the Home Run, to acquire which a Rossland company known as the B. C. Consolidated Gold Mining Company is being stocked.

The reason for the small output is hard to tell, but presumably the very low price of silver and lead which prevailed the fore part of the year have had a great deal to do with it, coupled with the fact that four of the largest shippers have been curtailing their output on account of lawsuits. The production of zinc this year has marked a new industry; it is practically in its infancy, but will most assuredly grow, as large deposits have been found, which promise to make it a very profitable by-product. This year about 2,000 tons have been shipped and as many more tons are at the various mines awaiting treatment and shipment. Mr. Garde, manager of the Payne Mine, has the proud distinction of building the first zinc magnetic separ-



General View at the Ruth Mine, Star Mountain, Sandon, B. C.

PLACER GOLD.—An attempt was made last fall to recover gold from the bed of the Lardeau River, below Poplar Creek, by means of a portable engine and suction pump, but it did not appear that the venture succeeded, for operations have been suspended.

SLOCAN MINES IN 1903.

(By E. M. Sandilands.)

THE output of the "Silvery Slocan" this year is unfortunately the lowest of any year yet, being about 14,000 tons of galena and 2,000 tons of zinc—about 50 per cent, only of its normal shipment.

ator and roaster. It handles about twenty tons per day, raising the percentage of the zinc to about 60 per cent, after it has been concentrated. It is more than likely that the coming year other plants of like nature will be erected to treat the zinc, now that it has been found that it can be treated profitably. What is needed in the Province is a zinc smelter which would save the freight of \$11 per ton now paid into the United States. The Provincial Government could do worse than to subsidize in some manner a zinc smelter. Considerable interest in the coming exhibition is being taken and St. Louis will have some very fine and rich samples of galena from the Slocan. There have been

all summer about 500 men working in the mines adjacent to Sandon. Considerable leasing in a small way has been done this summer, mostly by men with small capital, but who are chiefly practical working men, and this should result in the finding of new ore bodies. When new capital ceases to come into a camp the lessee comes along and if the system is as successful in this camp as others it should be quite a help to the Slocan. Next year we may look for a great many more leases being taken. The owners of claims are growing tired of having their property lying idle, waiting for capital, and are only too glad to lease them.

What with silver at a fair price, and the chance of it still going higher, coupled with the lead bounty, next year should see a good season in the district. Below will be found a short description of the doings of the various mines in the Slocan.

RAMBLER CARIBOO.—This property has been working an average force of about 65 men and has shipped about 1,500 tons of rich galena ore and concentrates. It is unnecessary to give the values, as everyone knows that its ore is some of the richest in the Slocan. The concentrator has worked steadily all summer, starting in June and closing in the middle of November, when it was closed for the winter for shortage of water. Improvements have been made and much development has been done this summer. A flume has been built and the compressor moved down the hill which will be run by water power and furnish power and air for the mine, at the same time doing away with the costly hauling of coal. The company have paid no dividends this year, thinking it more advisable to put the money into improvements. The mine is looking very well and recently a new strike of 200-ounce ore, two and a half feet wide was encountered in the 700-foot level. Another very fine showing was also made on the surface which may prove another mine. The mill will start again in the spring to treat the dumps. A long tunnel of 4,000 feet will be started this winter to tap the shoot at depth.

SLOCAN STAR.—From this property over 2,000 tons of ore has been shipped this year and a force of about 35 men have been continuously at work. The mill did not run this year on account of the ore being hard to treat. In spite of the fact that the ore shipped was taken out almost entirely in the course of development, hardly any stoping being done, the Star still holds the lead among the producing mines. The Silversmith vein has proved in depth to carry large bodies of very rich ore and already several thousand tons have been blocked out. Mr. White contemplates engaging in the zinc business the coming year, and will in all probability erect a plant to treat the large bodies of rich zinc he has in sight. Mr. White, like others, has not crowded his shipments the past year on account of low prices. He could, however employ 150 men when working full handed. In all probability during the coming year large shipments will be made from this property.

PAYNE.—About 75 men have been regularly employed at this property during the past year. It has shipped about 2,000 tons of concentrates and 1,000

tons of zinc ore. The concentrator has been running steadily all the year, turning out about five tons of lead concentrates and fifteen tons of zinc per day, the latter being treated again in the roaster and magnetic separator which has been recently built and adjoins the mill. Considerable development work has been done in the No. 8 tunnel, where large bodies of ore have been opened up. A shaft has also been started in No. 8 to test the depth of the ore further.

RUTH.—The first six months of the year very little work save development was done on this property. In June the mill and mine was started up with a force of about 35 men. The mill has been running steadily ever since, making about 120 tons concentrates per month and about 100 tons of zinc. On an adjoining claim called the Hope development work has been progressing steadily. A very fine showing of ore is now in sight, there being seven feet of rich carbonates. The future of this property is exceedingly promising. The Ruth has shipped about 900 tons the past year.

IVANHOE.—The Minnesota Silver Company owning this property have been doing mostly development work the past year. Towards fall the mill was overhauled and everything in readiness for a steady run, but unfortunately the travelling rope of the tramway broke, which will cause a delay of nearly two months. The mine is in good condition and large bodies of good milling ore blocked out. The company has shipped about 1,000 tons of galena and 300 tons of zinc. The average number of men employed has been about 30 and this number will be increased to 75 when the tram is repaired and shipping resumed.

IDAHO AND ALAMO.—During the year very little beyond development work has been done, a force of about ten men having been kept constantly at work. The Scottish Colonial Gold Fields, owning the property, have in erection an aerial tramway, of the Riblet type, in two sections, altogether about 9,000 feet long. The company are also repairing and remodelling the concentrator at Alamo and expect to start milling about the middle of January. The Idaho has shipped the past year about 500 tons. When the mill and tram are running the shipments will be large, as the company have large bodies ready for treatment. Heretofore there has been great difficulty and danger in transporting the ore to the railway on account of snow slides, but this will now be overcome by the new aerial tramway.

AMERICAN BOY.—Shipments in the neighbourhood of 900 tons have been made from this property during the year, a force of about 15 men having been employed. The ore during the summer was transported over the Noble Five tramway to Cody. The mine is looking well and has several cars of ore ready for shipment. The company should soon be in a position to pay a dividend.

LAST CHANCE.—During the summer nothing but development was done by this company, most of the time being occupied in sinking a shaft. This shaft is now down about 90 feet and is in ore practically all the way. Three cars of ore have already been

taken out in sinking and stoping will very soon commence. The ore is of high grade, going 170 ounces in silver and 70 per cent. lead. Drifting on the Galena vein in the big tunnel is also being carried on. It being such a wet summer on this mountain, both this property and the American Boy were delayed by the surface water, as were also a great many more in the camp.

MONITOR.—This rich property situate at Three Forks and on the line of the C. P. R., has shipped 800 tons of galena and has worked about 20 men the past year. Considerable development has been done this year and in all probability the company will erect a plant of some description next summer to treat the low-grade and zinc ores. The ore in this property carries \$8 per ton in gold besides very rich silver values and heavy lead. The property is owned by an English syndicate and is managed by Mr. M. Gintzburger.

RECO.—The Reco has not, since shipping ceased last March, done anything beyond development work, the production being as a rule confined to the winter months. This summer a small force of men was employed on dead work but much trouble with the surface water was experienced. About two months ago the force was increased and now about 25 men are working and stoping ore. A shipment of about 500 tons will be made, it is expected, this winter, and already about five cars are out and sacked. Mr. Harris has this year started again work on the big parallel vein, nothing having been done on this since 1896. He expects to obtain a considerable amount of ore from these workings. Work is progressing as usual on the Reco-Goodenough vein, from which has been taken a fine specimen for the St. Louis exhibition.

SUNSET.—On this property, owned by Mr. G. Hughes and partners, very little work has been done since production ceased in March last. Now about 15 men are employed stoping ore and it is the intention to rawhide 500 tons to Cody this winter. The ore in this property is very rich and uniform in grade. It averages by the car 145 ounces in silver and 78 per cent in lead. The mine has already paid the owners nearly \$60,000 in dividends.

WAKEFIELD.—Mr. Lane, who has this property under lease and bond, repaired the mill this summer and made a short run. The zinc in the ore caused some trouble, the mill not being in a position to handle it, and this coupled with the poor market for the zinc, was the cause of the mill closing down as early as it did. Nothing beyond development work will be done this winter. With a force of 15 men 200 tons of galena and 300 tons of zinc were shipped this fall, the result of about three months' run. Next spring the mill will be again operated and a good run made with the ore developed this winter.

BOSUN.—In the neighbourhood of 1,100 tons have been shipped from this property the past year, mostly, however, zinc. The property is looking well, but the company have practically closed it down until spring, when they will devise some means of treating the zinc on the premises, thereby making it a more marketable

product. The claims are situated very favourably for cheap transportation on the banks of Slocan Lake.

BLUE BIRD.—Messrs. Potter and McBroom, both of Spokane, have worked this property for the past 20 months with a small force of eight men. They have shipped a couple of cars and expect to continue production this winter. The property is looking well and a nice showing of ore is now in sight. It lies between the Reco and Sunset on the summit of Jackson Basin.

MERCURY.—About 150 tons of very rich ore have been shipped this year from the property, which is situate on the Payne waggon road, less than two miles from Sandon; it is very easy of transportation. It is owned by Messrs. Twigge, Cunning and David. The ore is reported to have realized \$2,000 per car. It is generally believed that this is the Payne vein. Work has been suspended for the winter, but operations are to be resumed in spring.

On several of the smaller properties considerable work was done last summer. In the vicinity of Silverton a small force has been employed at the Comstock by Mr. W. Hunter and about 100 tons of ore are now ready for shipment. Also on the Hewitt and Lorna Doone work has been done and ore taken out. In the neighbourhood of Sandon some smaller properties have done a fair amount of work, namely, the Conductor, Democrat, Chicago and Mountain Con., the latter is situate at the head of the South Fork of Carpenter Creek and contains some of the richest ore in the Slocan. The lessees have taken out 50 tons but have had to shut down for the winter, as the property is almost inaccessible in the winter.

YMIR DISTRICT IN 1903.

(By Percy J. Gleazer.)

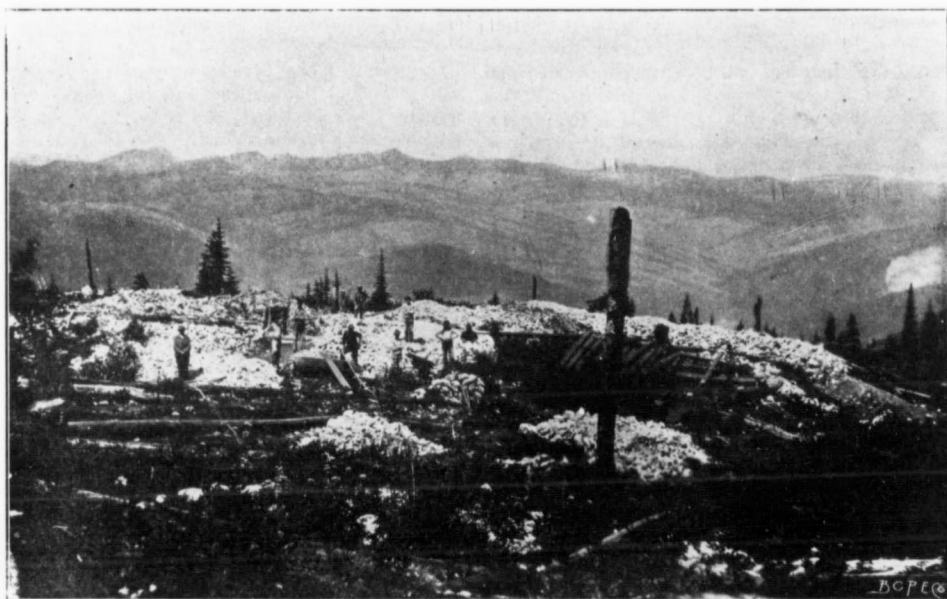
DURING the year 1903 the mining industry in the Ymir district has made more substantial progress than in any previous corresponding period. While the actual output does not largely exceed that of 1902, several of the more important mines have now large bodies of high grade ore blocked out, and are making preparations for the early commencement of production on a large scale. Heretofore the product of the Ymir mine has always represented by far the greater portion of the total output of the camp, but preparations for production have now been made on a scale which will increase the camp's output to a figure two or three times that of any previous year.

The principal addition to the tonnage shipped will be made by the Hunter V. mine. During the year a company known as the British Columbia Standard Mining Co. was formed to operate this property with a capital of \$200,000. Half of the stock has been sold at par, while the other half is in the hands of mining and smelter men of the highest repute in this Province. An aerial tramway over 13,000 feet long, with a capacity of 600 tons per diem, is now almost completed, connecting the mine with the new siding on the Nelson & Fort Sheppard Company's line at the mouth of Porcupine Creek.

The formation of the ore deposits on the Hunter V. group is a somewhat unusual one. Positively the whole area of the Hunter V. and Double Standard claims is covered with a calcite formation carrying everywhere a sufficient value in gold and silver to make mining it a profitable operation when conducted on a large scale. In addition to this, whilst there is no regular vein formation on the Hunter V., immense bodies of richer material are found in the lime and can easily be quarried and chambered out at comparatively small expense. A general average of these immense bodies of the better grade of ore would be about twenty ounces in silver and \$3 in gold. The lime in which these values are found forms a very valuable smelter flux, and therefore commands a very cheap

crude ore was resumed, and several cars were shipped monthly, each of which netted the company about \$1,000 after paying freight and treatment. In November last the control of the Broken Hill Company passed into the hands of American capitalists, who are now working on a plan of development which will open up the mine at greater depth than heretofore.

The only dark spot on the record of the Ymir camp for 1903 is made by the Ymir mine. Up to date the workings below the 700-foot level have failed to show up any considerable quantity of pay ore. The truth of the hypothesis which deems that the payshoot has taken an eastern trend away from the deep workings, is still unproved, and the future history of the mine depends largely upon the results of investigations in



Surface Workings on the Hunter V. Mine, Ymir.

rate of treatment, whilst the low cost of mining by the quarry method and cheap transportation to the railroad by means of the aerial tramway make the total cost delivered at the smelter remarkably small, leaving a large margin of profit on a practically inexhaustible body of ore. Mr. A. Wheeler, late of the Whitewater mine, who is now in charge of the property, anticipates starting the tramway next month at the rate of 100 tons per day, which will be gradually increased to 400 tons per day by June next.

Outside of the Ymir mine, the most regular producer in 1903 was the Wilcox mine, operated by the Broken Hill Company. This property worked steadily throughout the year, producing in its stamp mill each month, a brick varying in value from \$2,500 to \$4,000 and concentrates to the value of about \$1,000 per month. During the later part of the year the shipment of

this direction. At the present time of writing the mine is being closely examined by Mr. E. Hooper, the well known expert, who has travelled from England for that purpose. His report will probably determine whether prospecting for the payshoot is to be continued in the 1,000-foot level, or whether work is to be confined to getting out the ore in sight in the upper levels. Pending the result of his examination the working force has been largely cut down lately.

As a set-off to this somewhat dark prospect, comes the news of the re-opening of the Dundee mine after a shut-down lasting over five years. The Dundee mine has a permanent reputation among mining men of the Province, as a property of great possibilities and great things have been repeatedly predicted for it. In September last the Royal Bank of Canada foreclosed on its mortgage over the property, and two months later

turned the mine over to a syndicate headed by A. E. Rand, of New Westminster. This syndicate is understood to have the financial backing of several well-known Eastern Canadian firms, and is in a position to develop the property on its merits. Mr. A. H. Gracey has been appointed superintendent and is starting work this week.

The Dundee at present is developed by a shaft down 265 feet with some 600 feet of drifting both ways on the vein from the 200 and 250-foot levels. The vein averages about eighteen feet in width and principally consists of a heavy iron sulphide ore averaging \$6 to \$7 per ton. Throughout this concentrating ore, however, are found large seams or payshoots of high-grade galena ore sometimes running as high as \$100 per ton, but of a general average of about \$40 per ton. During the present winter attention will be confined to mining and shipping this grade of ore. Next spring, however, when the surface is free from snow, the question of opening up the mine at greater depth by means of a tunnel will be considered, as will also the construction of a new concentrating plant to replace the one destroyed by fire three years ago.

One of the most important strikes of the year was that made on the Foghorn mine on Wild Horse Creek. Three years ago the Golden Monarch Company, of Spokane, commenced to run a cross-cut tunnel to tap the Foghorn vein at depth, calculating to strike it after running about 800 feet. In the face of many difficulties and hindrances this tunnel was driven through hard country rock by hand drilling, only, but the expected vein was not reached until November last, and that after running 1,200 feet. At this distance and 900 feet below the outcrop of the vein on the surface, a body of fine ore was encountered three feet wide, eighteen inches of which is very high grade. The highest kind of praise is due the Golden Monarch Company and its indefatigable manager, Mr. Con. Wolfe, for the persistence and untiring faith with which they have stayed with the proposition, and now that they have attained their due reward, not only themselves but the whole district is greatly benefited. The Foghorn is surrounded on all sides by other properties with exactly similar surface showings, and the owners of these have for the most part been avowedly lying back and watching the result of the Golden Monarch company's enterprise. Now that the ore is proved to a great depth, their confidence, and indeed the intrinsic value of their properties, is greatly enhanced. The Golden Monarch company has now a large body of high-grade ore to draw from, besides a width of forty-six feet of concentrating ore passed through at about 700 feet from the tunnel mouth. A large treating plant is in contemplation for erection next spring.

What is undoubtedly the richest strike of ore made during the year was made on the Gold Cup mine. This property is under bond to Messrs. Con. Wolfe and Dawault Brothers, who have erected a small stamp mill on it. A shaft is down 85 feet on a vein which widens in that distance from four feet to five feet. A tunnel which was being run to get below this shaft encountered five feet of ore at a point 75 feet distant

from another point 45 feet below the bottom of the shaft. The general average of the ordinary mill stuff in this tunnel is about \$20 per ton, but included in it are large bodies and seams of exceptionally rich telluride ore which are of sufficient size to make their presence of more vital importance than the whole of the rest of the vein. Some idea of the value of these bunches of ore may be gathered from the following assays, which were taken from different parts of the vein: \$220, \$164, \$644, and \$121, all in gold only. The present mill is only temporary and a larger plant is to be installed next spring together with an aerial tramway to connect the mine and mill.

The Porto Rico mine has also been in operation during 1903 after a shut-down of three years. This property, together with its ten-stamp mill, are under lease to Mr. G. H. Barnhardt, late superintendent of the Ymir mine. During the first run of the mill some six hundred tons of ore were crushed at considerable profit to the lessee.

Other local shippers during the year were the Atlin, Spotted Horse, Queen, Ore Hill, Arlington, Keystone and Second Relief mines.

In looking forward to 1904 the output of the Ymir camp may confidently be expected to be more than double that of any previous year. The Hunter V. mine alone will, in the course of a few months, be producing at a rate more than equal that of the whole camp hitherto, whilst in addition to the regular shipments of the Ymir, Wilcox, Arlington and Porto Rico there will be added those of the Gold Cup and Dundee mines with later on the Foghorn and Pilot mines. In addition to the mining output there are two large sawmills in operation and another one for which logs are already being cut, to be erected next spring.

NELSON SMELTER RETURNS IN 1903.

ORE receipts at this company's smelter, Nelson, for the eleven months to November 30th, 1903, were as follows: From Nelson and Kootenay lake, 3,418 tons; Rossland, 180 tons; Slocan, 4,720 tons; Boundary, 93 tons; East Kootenay, 804 tons; Ymir, 2,610 tons; Lardeau, 173 tons, and Republic (Washington), 5,300 tons; total, 17,406 tons. Of these ores 8,155 tons were dry, and 9,251 tons were lead ores. The metal contents were 762,494 ozs. silver, 7,572 ozs. gold, 2,925 lbs. copper, and 8,629,432 lbs. lead. The foregoing tonnage and metal contents do not include Silver King or Emma (Boundary) ores. Probably total receipts for December from all sources excepting the two mines just mentioned were 1,820 tons.

The company shipped to the Selby Smelting & Lead Co., San Francisco, 3,443 tons lead bullion, containing 655,270 ozs. silver, 6,324 ozs. gold, and 6,607,946 lbs. lead, total value \$574,387; and to the Granby Consolidated Mining, Smelting & Power Co., Grand Forks, 383 tons copper matte, containing 119,804 ozs. silver, 144 ozs. gold, 372,003 lbs. copper, total value \$102,054. Probable shipments of bullion during December, 400 tons.

The company purchased 4,600 tons Silver King ore, containing 119,885 ozs. silver and 347,333 lbs. copper, and the lessee of the mine, Mr. Davys, estimates that the tonnage for December will be 300 tons. Receipts of ore from the Emma mine totalled 18,681 tons. Lead ores shipped to the United States by the company during the year amounted to 2,946 tons.

THE YEAR'S MINING OPERATIONS BY THE WELLINGTON COLLIERY COMPANY AT THE COMOX COLLIERIES AT CUMBERLAND, B. C.

(By John Matthews, M.E.)

THIS has been a most eventful year for this mining centre. With the New Year of 1903 was introduced the brightest prospects for the continued development of the mines with a correspondingly sanguine feeling of the people here, whose interests are so intimately associated with the continued prosperity of the mining operations. Unfortunately, however, for all, a branch of the Western Federation of Miners was



The Coke Works at Union Bay.

organized, and almost immediately made certain demands which the management declined to entertain. Work was at once suspended and a strike was declared by the miners on the 2nd day of May. The mines, however, were continued in partial operation during the strike, about one-half of the ordinary output being maintained. The Royal Commission visited here during the strike for the ostensible purpose of inquiring into its cause, but having the interests of the Province at heart, and being desirous of effecting a settlement gave their good offices to that end, by bringing the contending parties together; but unfortunately their efforts were unavailing and the strike was continued until the men, finding themselves in an impossible position, owing to the want of financial support, on the fifth of August declared the strike off, and what redounds to their credit, there was practically no violence and little of that acrimony of feeling which is incidental

and unfortunately inseparable from strikes. The development work in and about the mines was unavoidably delayed while the strike was pending, but immediately on its conclusion was resumed and pushed with all possible vigour.

The work of pumping the water out of and repairing No. 4 mine—this mine was flooded two years ago for



No. 4 Shaft, Cumberland, B. C.

the purpose of extinguishing a mine fire—is progressing apace, but as the mine is very extensive much time is required to complete the work. There are eight electric pumps ranging from 20 to 50-horsepower and two large steam pumps kept continually working. This is a very extensive mine, and previous to its being flooded over four hundred men were employed within its workings. It will meanwhile take at least another year to pump all the water out and place it in its previous condition. At present, in its many levels, about three hundred and thirty men are employed, and its output will be steadily augmented.

Nos. 5 and 6 shafts which are both located near the town of Cumberland, are both in very good condition; the improvement in the latter during the last few months is particularly noticeable. The former em-

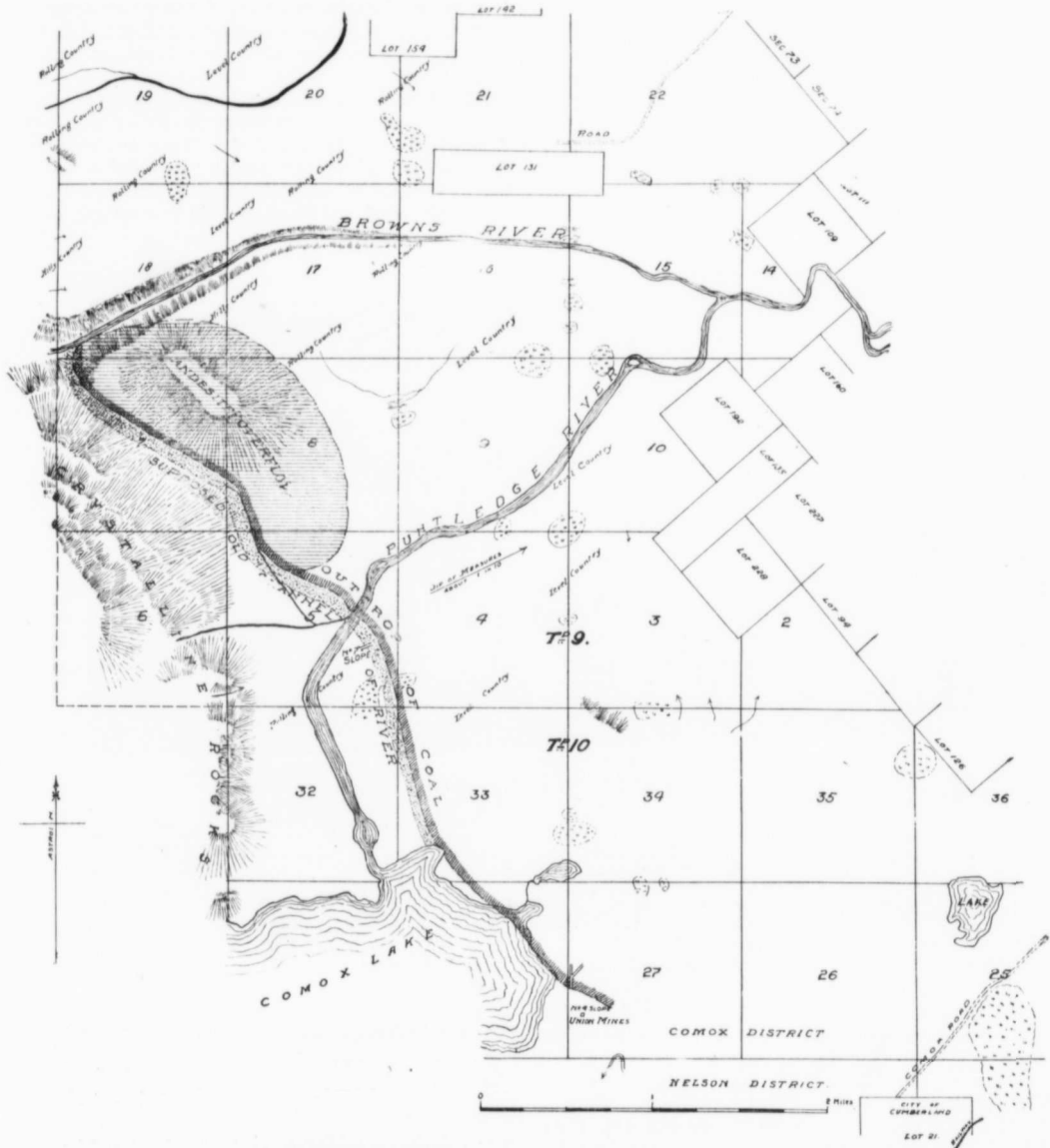


No. 6 Shaft, Cumberland, B. C.

ploys about two hundred and thirty, and the latter one hundred men.

No. 8 slope (now No. 7) at which as stated in my previous article of a year ago, we had just began the work of driving the slopes, has this week "struck" and exposed a fine seam of anthracite coal about four

encountered in the slopes, the driving of which was rendered very difficult and their progress as a consequence much retarded. An air shaft is also being sunk contiguous to the slopes, which is expected to reach



Map showing former course of Courtenay River, the extent and nature of the overflow and the large area of coal-bearing measures.

feet in thickness, and which assays 82 per cent fixed carbon, at a vertical depth of 80 feet. The slopes have been driven a distance of 650 feet at a pitch 1 in 8. It was expected that coal would be reached here last July, but running sand and gravel with water were

the coal at a depth of 100 feet in about three weeks' time. The placing of this coal on the market, which will be about New Year, in small quantities, will fill a long felt want on this coast. This coal has been formed in a most peculiar manner and is found under un-

usual conditions. It is the same seam as that from which the Comox seam of coal is mined, in fact, the anthracite and the bituminous coals merge, the former having been metamorphosed from the latter by the application of heat. The heating has been effected by an overflow of andisite (a volcanic rock similar to diorite) which has been ejected from the adjacent mountain range during a period of volcanic action, and has covered about one thousand acres of coal measures to an average depth of two hundred feet. There are about 100 feet of coal measures, sandstone and shale, between the coal and the overflow which protected the coal from being consumed by the intense heat, which must have prevailed during the period of activity. The application of this large body of heated matter to

or coal-bearing measures. The ground lies at an easy angle, and shows little indication of faulting so common to this district, and as the coal usually conforms to the contour of the surface, we can reasonably expect a coal field comparatively free from faults and dislocations, those nightmares of owners and managers, and as the area is so extensive it is quite safe to say that it is the most valuable coal field yet discovered on the Island.

The dawn of 1904 will therefore be introduced with every promise of being a most prosperous year for Cumberland. The most cordial feeling exists between the company and the men, and a two years' contract having been signed, prohibits any interruption of work for a long period, and more men will be constantly em-



No. 5 Shaft, Looking North, Cumberland.

the measures immediately overlying the coal, distilled therefrom the lighter gases, such as oxygen and nitrogen, and converted the underlying coal from a soft to a hard coal. The overflow also, in the writer's opinion, changed the course of the Puntledge or Courtenay River; the river formerly, no doubt, issued from the north end of the lake, followed the outcrop of the coal directly through to Brown's River, and flowed to the sea by that river's present course. The banks of Brown's River are from 100 to 150 feet high, while those of the Courtenay are comparatively shallow.

I herewith submit a plan showing what I believe to be the former course of Courtenay River and the extent and nature of the overflow, and the large area

employed developing and mining the new find. Therefore, the business men as well as the miners are looking to the incoming year as being one of great promise.

THE EAST KOOTENAY COAL TRADE IN 1903

Not the least important evidence of industrial progress in British Columbia in 1903 is afforded in the remarkable development and growth of coal mining in East Kootenay. Despite the miners' strike early in the year, the Crow's Nest Pass Coal Company has been able to increase its output from 442,049 tons of coal and 121,000 tons of coke in 1902, to 650,000 tons of coal and 166,000 tons of coke in 1903, the collieries

responsible for this grand total were Coal Creek, whose contribution was 240,000 tons; Michel, 262,000 tons, and Morrissey, 150,000 tons, while at Fernie, 96,000 tons of coke were manufactured and 70,000 tons at the coke ovens at Michel. During the year a sum of approximately two million dollars has been paid out in wages and for supplies, and about one million dollars in improvements and development. At Coal Creek three new mines have been opened this year, and a tramway and other plant installed there, while in addition three high pressure Mumofrd boilers are now being put in place. At Michel two new mines became productive in 1903, and a third has been prospected. A ventilating fan of a capacity of 200,000 cubic feet per minute was installed at Nos. 8 and 9 mines and 252 coke ovens have been added, there being now 464 ovens at this colliery. At Morrissey four mines have been productive and two are in course of development. Here new slack storage bins having a combined holding capacity of 6,000 tons were built, a water-works system, and an endless rope haulage system established, 140 coke ovens built and 100 others under construction comprise some of the improvements effected. The outlook for a further increase in the East Kootenay coal trade in 1904 is most promising, and that the output will reach a million tons before the close of this year is a far from unlikely contingency in view of the settled and stable conditions now prevailing.

Wellington.....	271,305 tons.
Comox	309,708 tons.
Total	581,013 tons.

ROSSLAND IN 1903.

(By E. Jacobs.)

THOROUGHLY reliable information relative to some of the larger mines of the Rossland camp is difficult to obtain. The general managers of the Le Roi, Le Roi No. 2 and the Centre Star and War Eagle companies, respectively, were very courteous when applied to, but stated frankly that, outside of giving the tonnage of ore shipped and a few generalities regarding work in progress, they were not at liberty to make public details connected with work and development in their mines. Whilst, from a newspaper point of view, this is much to be regretted, the position has to be accepted, and there is no course open but to await the publication of reports by the several head offices of the companies directly concerned. The space-filling stuff sometimes published as mining news of this camp, is, like as not, untrustworthy, so may not be depended on for the purposes of this review.

Taking first the year's ore output, the tonnage figures are as under:

	Tons.
Le Roi	162,333
Centre Star	82,770
War Eagle	62,130
Le Roi No. 2	21,600
Le Roi No. 2 (milled)	1,700
Kootenay	7,303
Jumbo	4,283
Velvet	3,376
I. X. L. (milled)	1,060
White Bear	897
Giant	830
Spitzee	560
Homestake	90
Iron Horse	40
O. K.	25
Total	349,897

NOTE.—The tonnage of the first-named four companies was obtained from their respective offices at Rossland. The other figures have not been verified.

LE ROI.—All the information regarding development work in this mine that could be obtained was that contained in the manager's monthly report recently published in London, as follows: "The cross-cut has been driven during the past month 123 feet on the 1350-foot level, and we have drifted 123 feet on the south vein. The ground through which we are now driving is somewhat encouraging, being well mineralized, but the grade of the ore is very variable. We have already shipped a few tons of ore from this level." A cable sent by the manager, S. F. Parrish, from Rossland to London on September 9th outlined the plan of work that was afterwards followed out. This cable stated: "Have commenced to drive on the

COAL MINING ON VANCOUVER ISLAND.

Production during the year shows a considerable decrease when compared with 1902 returns, this being attributed to suspension or curtailment of mine work, occasioned by labour strikes, at all three collieries in the spring and early summer. Since these disputes were settled in August, operations have been most actively prosecuted. The Western Fuel Company has also carried on much development work, while large additions to plant have been made. The following returns for 1903 have been received:

WESTERN FUEL COMPANY'S PRODUCTION.

	Local.	Foreign.	Total.
January	7,510	20,322	27,832
February	7,296	5,571	12,867
March	6,835	16,222	23,057
April	8,782	22,902	31,684
May	9,794	15,726	25,520
June	9,485	16,803	26,288
July	8,908	12,693	21,601
August	9,256	15,209	24,465
September	9,658	12,323	21,981
October	13,455	10,641	24,096
November	9,997	15,728	25,725
December	9,200	14,820	24,020
Total	110,176	178,960	289,136

WELLINGTON COLLIERY COMPANY, LIMITED.

Following are the gross totals of coal raised in 1902 from the mines of the Wellington Colliery Company, Limited:

line of diamond drill hole No. 7 (previously reported as indicating high grade ore) and south 1,350-foot level cross-cut, prospecting for ledge over 100 feet in width. Will occupy at least 60 days' time, so as to prove the value of these ore bodies." The position a few weeks ago was therefore that the workings at the 1,350-foot level were in ore of variable grade, and that some ore from this deep level, the deepest of any lode mine in the Province, had been shipped to the smelter. It is gratifying to have the important information that ore has been met with at (for British Columbia) so great a depth. There were no additions other than necessary renewals made to the mine plant and machinery during the year. The output of ore was 162,333.495 tons (dry weight) which was all shipped to the Northport smelter. The smelter treated during the year 208,141.514 tons of ore. Custom ores were received at the works from the following Rossland mines: Rossland-Kootenay, Velvet-Rossland, Jumbo and Le Roi No. 2 (the last mentioned from January to August only), and from the Minorca and Le Fleur-Comstock, Republic district, Washington, and the Cracker Jack and Jumbo, Buffalo Hump, Idaho. It was learned from a disinterested source in Rossland that the manager of the smelter, E. J. Wilson, made some important and cost-reducing improvements at the smelter since he assumed charge some months since. Besides effecting material economies in other directions he has been smelting most of the ore raw, thereby largely stopping heap roasting, and, to a considerable extent, avoiding the consequent locking up of a considerable amount of capital that heap roasting necessitates, being unproductive for weeks at a time.

Le Roi No. 2.—This company shipped from its mines about 21,600 tons of ore during the year, some 6,700 tons of this quantity going to Greenwood. Whilst it is expected that the Elmore oil concentrating plant installed on this property will eventually treat about 350 tons of ore per week, the quantity put through during the two months it has been running is only between 1,600 and 1,700 tons.

Two departures from previously existing conditions were made by the management of this company during the latter part of the year. Both are of much moment, to the Le Roi No. 2 first, and generally to the Rossland camp. The successful inauguration of ore shipping to the Boundary district, in this case for reduction at the B. C. Copper Company's smelter at Greenwood, a distance by rail of more than 120 miles, besides providing Rossland mines with another outlet for their ores, is a testimony to the advantageous smelting conditions obtaining in the Boundary. It was planned to ship about 2,000 tons per month, but at first there were difficulties attendant upon making the necessary new traffic arrangements and these prevented this intention from being fully carried out.

The technical success of the Elmore oil concentration process, as demonstrated by the 50-ton plant installed for the Le Roi No. 2 company, is absolutely assured. The commercial aspect can not be fairly gauged by the results from so small a plant, the cost of operating which is undoubtedly higher per ton of

ore put through than it would be with a big plant. Yet whilst the manager of the Le Roi No. 2 company, Paul Couldrey, was careful not to commit himself respecting the commercial results of the process, it was gathered that they were good and that the prospects were bright for the future of this industry. The fact that two more companies had decided to put in Elmore plants, with others giving the matter serious consideration, must be taken to indicate that commercial success seems to be also assured.

Le Roi No. 2 has shipped several carload lots, about 120 tons in all, of its concentrates, one car each to four smelters, to afford opportunity for testing furnace results with them and so ascertaining their suitability or otherwise for treatment in the Province. As to future operations in its mines, the company has a large undeveloped area to the westward of its present workings which it is proposed to develop during the ensuing year.

CENTRE STAR AND WAR EAGLE.—The development work done in the Centre Star mine during 1903 consisted of drifting 2,000 feet; raising 350 feet, and sinking, 80 feet; total, 2,430 lineal feet. Ore shipments totalled 82,770 tons (dry), all to the Trail smelter. There were no important additions to plant. In his annual report for the year ended September 30th, the manager, E. B. Kirby, stated that the ore shipped had averaged \$10.58 smelter's assay value. The net profit in excess of all expenditures was in round figures \$265,000, which covered the indebtedness of the company and left about \$70,000 in the treasury. The reserves of smelting ore were at that time not large, and were of such shape that their dimensions could not be accurately estimated. The development work of the year continued to add great masses of ore too low in grade for smelting, but rich enough to return a profit if successfully milled. A satisfactory method of treatment of this ore has, after long continued experimenting, been devised, and a preliminary mill of 200 tons daily capacity, but designed for prompt enlargement to 400 tons, is now being built at Trail by the Rossland Power Company. This will afford an outlet for the milling ores of the Centre Star and War Eagle mines, and it is expected that operations will be commenced in the early spring. It is stated that a 50-ton Elmore oil plant is to be added to the mill equipment.

The War Eagle did 1,125 feet of drifting and 125 feet of raising during the year and shipped 62,130 tons of ore to the Trail smelter. No recent information as to work done in the mine was received.

OTHER PROPERTIES.—Particulars of the operations and output of the Rossland-Kootenay, Velvet, Giant, White Bear and other mines were not available. The last-named was reported to have been doing important exploratory work at the 1,000-foot level. The Spitzee shipped 560 tons of ore, deepened its shaft to 220 feet, cut a station and commenced drifting at the 200-foot level, did some stoping on a four-foot vein at the 100-foot level, and prospected other veins. Old buildings were pulled down and three new ones erected. The power plant on this mine consists of a

five-drill Rand air compressor and an electric hoist operated by two electric motors.

TRAIL SMELTER.

The ore receipts at the Canadian Smelting Works, Trail, during 11 months ended November 30th last were 157,736 tons, as follows: From Rossland, 135,516 tons; Boundary, 6,900 tons; Slocan, 5,178 tons; Lardeau, 2,047 tons; Nelson and Fort Sheppard, 1,515 tons; Republic (Washington), 4,638 tons; Windermere, 806 tons; east Kootenay, 366 tons, and miscellaneous, 770 tons. The approximate tonnage from Rossland for December was placed at 12,000 tons, and from all other parts, possibly 1,000 tons. This would give a total of 170,736 tons as the year's receipts. The total tonnage smelted in 1903 was about 175,000 tons, producing 8,500,000 lbs. lead, 2,900,000 lbs. copper, 82,500 ozs. gold, and 1,650,000 ozs. silver.

During the year the daily capacity of the refining of lead by electricity was increased from 6½ tons to 20 tons, and a plant was erected for handling the slimes. The refinery turned out some 150,000 ozs. silver of the fineness of .999, several thousand ounces of mint gold, and a quantity of copper sulphate. The antimony will be recovered later and will be used in making babbitt metals.

The copper matte from these works was refined at Tacoma, and the lead bullion, other than that refined at Trail, was shipped to San Francisco, California. The lead produced was sold chiefly in Eastern Canada, China and Japan. The silver refined was sold for coinage for the Philippines. The gold went to the United States Government assay office, Seattle, Washington.

It is stated that the gold and silver shipped, as above stated, were the first shipments ever made of these precious metals, the product of smelting and refining in Canada.

BOUNDARY IN 1903.

(By E. Jacobs.)

THE mines of the Boundary district showed a considerable increase in ore production in the year 1903. The Granby Company's mines came first with a production of 393,860 tons, this total being an increase of 84,000 tons on that of 1902. The British Columbia Copper Company's Mother Lode mine shipped only a few hundred tons more than in 1902, yet, leaving out of consideration the two months during which shipments were necessarily suspended whilst the company's smelter was closed down owing to the unfortunate strike of the miners at the Crow's Nest Pass coal mines, this cutting off the supply of coke and coal for the time, the mine maintained an average monthly output of about 14,000 tons. It is easily capable of producing 25,000 tons per month, but so long as custom ores are available these will be given preference as far as practicable, leaving the ore from the company own mine for later treatment at its smelter. The Snowshoe mine made a substantial gain in output, producing 74,872 tons as against 20,800 tons in 1902. This mine can now main-

tain an output of 18,000 tons per month, and will steadily increase its producing capacity as it becomes more extensively opened up, so that it may be expected to ship more than twice as much ore during the ensuing year. The Sunset was 8,000 tons higher in 1903 than in 1902, the figures for the two years being 22,681 tons and 13,380 tons, respectively. The B. C. produced before closing down in the summer nearly 4,000 tons more than in 1902, but the output of both these years combined did not nearly reach its production of 47,517 tons in 1901. The total of 22,681 tons from the Emma mine is nearly three times as large as that of the year immediately preceding. The ore this mine shipped during the eleven months ended November 30 was distributed as follows: To Nelson 7,722 tons, Trail 6,245 tons, Grand Forks 2,924 tons, Greenwood, 1,702 tons and Boundary Falls 88 tons, the smelters of these several places finding the ore a desirable one for fluxing purposes. The Oro Denoro made an excellent showing during the latter part of the year, shipping between 13,000 and 14,000 tons of ore from two quarries opened immediately above the Phoenix branch of the Columbia & Western Railway. The Athelstan and Jackpot fraction, both acquired in 1903 by local men, added well on towards 5,000 tons of ore to the year's total production, the greater part coming from the former property. The Winnipeg and the Morrison each produced between 2,000 and 3,000 tons, but their financial circumstances were not such as admitted of their continuing operations. The most prominent feature of the year, or rather that attracting most notice, was the profitable results attending the working of several properties situate close to Greenwood and having quartz veins yielding gold and silver. Three in particular did well, viz., the Providence, the Elkhorn and the E. P. U. mines, the last including the Goldfinch claim—as well as the E. P. U. group. These properties are dealt with individually in the following review of the mining camps of the district, but in passing it may be remarked that a distinctly beneficial effect has resulted from their demonstrating that quartz veins containing high average values occur in the neighbourhood of Greenwood.

Before noticing the operations of the district smelters several past of the district that did not contribute to last year's production will be referred to. In the neighbourhood of Grand Forks the Betts and Hesperus claims had a considerable amount of development work done on them during the latter half of the year. They were acquired by Chicago men whose intention it is to continue prospecting them until they shall have been thoroughly proved. On the North Fork of Kettle River the Seattle was worked for several months until winter set in, when operations were suspended. The well-known Volcanic property situate on Volcanic Mountain, which is a prominent landmark, is under bond to Michigan men who are prospecting it with a diamond drill. Up the East Fork of the North Fork little was done during the year, transportation difficulties still being too great to allow of the mineral claims of Franklin camp being developed, so that work in that part of the district was confined entirely to the doing of assessments. The lands

up the Main Fork of the North Fork taken up for coal are now practically abandoned, the comparatively small amount of prospecting done on them not having resulted in the discovery of seams of coal of large enough size to attract capital for their opening up. West of the main producing area of the Boundary district there is little improvement in conditions to chronicle. The West Fork of Kettle River is still without a good waggon road, although the distance to the end of the finished part of the road is not now so great as it was at the beginning of the year. Preparations have been made recently for hauling ore out from two or three properties when the snow shall be deep enough for good sleighing, so there is a prospect of the claim owners concerned obtaining some return for their work, the ore from this locality carrying values ranging between \$50 and \$100 per ton in car-load lots. Camp McKinney lately had a setback in the closing down of the Cariboo-McKinney mines, which for years had been practically the sole support of the camp. The reported reason is that values are now too low to leave a margin of profit above mining and milling costs. It is not unlikely that more attention will now be given to improved gold-saving methods, so that work may be resumed with an assurance of returns being once again payable. The Waterloo mine, in the same camp, has more than justified the confidence placed in it by those who rescued it from the muddle into which it had drifted. Not only has it more than paid its way, but it is being equipped with gold-saving appliances that promise to ensure its having a prosperous future.

south of the international boundary line. The production of metals at the Granby Company's works was, approximately, as follows: Copper, 16,932,056 lbs.; gold, 47,500 ozs.; and silver, 356,900 ozs. As this output includes the valuable contents of the copper matte made at the Greenwood and Boundary Falls smelters and converted at Grand Forks, and of 383 tons of copper matte from the Hall Mining Company's smelter at Nelson, it is the total recovery of the district (less, of course, the proportion contributed by the outside places mentioned). Additions to plant, machinery, buildings, etc., during the year were considerable. These are stated in detail in their proper place in this review.

Other features of the year were the application of electricity for power purposes at some of the mines and its more extensive use for driving smelting plant. The Cascade Water Power & Light Company is finding an enlarged demand for the electric current it is generating at Cascade. The Crow's Nest Pass Coal Company succeeded, except when not prevented by labour troubles, in generally keeping the district smelters well supplied with coke. Occasionally a shortage of railway cars interfered with the shipment of fuel from the collieries, but on the whole there was little room for similar complaints to those the smelter managers were justified in making at times during 1902.

On the whole the year's progress in the Boundary district was satisfactory and encouraging. The value (at New York prices) of the metals extracted from district ores was between \$3,000,000 and \$3,250,000, which is certainly an appreciably large contribution to

	1900, Tons.	1901, Tons.	1902, Tons.	1903, Tons.	Total Tons.
Granby Mines	64,531	231,762	309,858	393,860	1,000,011
Mother Lode	5,564	99,548	138,997	139,279	383,388
B. C.	19,618	47,517	14,443	18,002	99,580
Snowshoe	297	1,731	20,800	74,872	97,700
Emma .....	.....	.....	8,530	22,681	31,211
Sunset .....	.....	800	7,455	13,380	21,635
Oro Denoro .....	.....	.....	.....	13,759	13,759
Athelstan Group	1,200	550	.....	4,693	6,443
Winnipeg	1,076	977	785	2,144	4,982
Morrison .....	.....	443	.....	2,526	2,969
Golden Crown	2,241	.....	625	.....	2,866
Jewel	100	325	2,060	.....	2,545
City of Paris	2,000	.....	.....	.....	2,000
No. 7 .....	.....	665	532	.....	1,197
Carmi .....	.....	885	.....	.....	885
King Solomon .....	.....	850	.....	.....	850
Providence .....	.....	.....	117	702	819
R. Bell .....	.....	480	.....	.....	480
Elkhorn .....	.....	.....	.....	317	317
E. P. U. Mines .....	.....	.....	.....	180	180
Brooklyn	150	.....	.....	.....	150
Goldfinch .....	.....	.....	43	27	70
Sundry small shipments	1,000	142	115	192	1,449
Total	97,837	386,675	504,360	686,614	1,675,486

The smelters of the Boundary district now have a combined treatment capacity of between 3,000 and 3,500 tons of ore per diem. This takes into account the six furnaces running at the Granby Company's works at Grand Forks, and the two each at the B. C. Copper Company's smelter at Greenwood and that of the Montreal & Boston Copper Company at Boundary Falls. The aggregate tonnage of ore treated in 1903 was nearly 700,000 tons, this including a few thousand tons of ore from the Republic and other mining camps

the value of the realized natural wealth of the Province. The outlook for 1904 is favourable to increased production, and as a result, the material progress of the district, which is now not only one of the most important sections of the Province, but is as well the largest copper producing district in Canada.

The above table shows the quantity of ore produced by individual mines during the four years over which the aggregate production of 1,675,486 tons has extended.

NOTE.—As the production of the mines shipping in December had to be estimated, the tonnage for 1903 is subject to revision, but it is unlikely that the total output for that year will be affected to the extent of more than 10,000 tons either way by such revision after the actual tonnage shall have been ascertained.

PHOENIX CAMP.

GRANBY MINES.—At the Granby Company's mines the principal development done during the year was the extension of tunnels Nos. 2 and 3, and the driving of No. 4 tunnel. All these tunnels have their portals on the Old Ironsides claim, passing thence into the Knob Hill, on which latter was the big outcrop of the enormous mass of ore that contributed the larger proportion of the one million tons these mines have to date shipped to the smelter. No. 1 tunnel, the first driven on the Knob Hill, is on the level of the big ore quarry now known as No. 3 pit. This tunnel is, approximately, 1,500 feet in length, and where it is immediately under the highest point of the hill is about 325 feet, vertical depth, below the surface. No. 2 tunnel is of a similar length and at a level 100 feet lower. No. 3 tunnel is 1,200 feet long and 525 feet under the top of the hill. No. 4 tunnel is being driven from both ends—that is, from the surface low down the slope of the Old Ironsides hill and from the 300-foot level of that mine. Being run at a level 200 feet lower than that of No. 3, its maximum depth will be 725 feet. When connected this tunnel will be nearly 2,000 feet in length. About 1,300 feet has been driven, so that the distance between the respective headings is now about 700 feet. The total amount of development work done during the year is 4,193 lineal feet; added to that of previous years it makes the grand total 20,868 lineal feet of work done in underground development of this group of mines, and this in addition to the immense amount of work done in the ore quarries.

The new machinery installed during the year includes two Rand Class D 2 T compound duplex air compressors, electrically driven and connected to motors by rope drives, high-pressure cylinders 16 by 36 inches, low pressure cylinders 28 by 36 inches, rated capacity together, 8,228 feet of free air per minute, or 60 3¼ inch machine drills; two 700-h.p type C Westinghouse induction motors, to operate compressors; one type No. 1 Thew automatic, single-truck steam shovel, rated capacity 500 to 750 cubic yards in ten hours; one type No. 3 Thew automatic, single-truck steam shovel, rated capacity 1,000 to 1,500 cubic yards in ten hours, and two 9 by 14 saddle tank locomotives, built by the Davenport Machine Works, Davenport, Iowa, for handling the mine ore cars.

Ore production for the year was about 394,000 tons; shipments to December 1st totalled 340,561 tons, and the output of December was estimated at between 53,000 and 54,000 tons. Added to the production of previous years this brings the aggregate ore output of these mines up to about 1,000,000 tons, all treated at the company's smelter at Grand Forks. Recently shipments have been at the rate of between 60 and 70 railway cars (each about 30 tons) per day. The mines

are, however, now equal to producing more than twice this tonnage daily.

The more prominent features of the year in connection with the working of these mines were the considerable extension of the quarrying system; the introduction of steam shovels for more economic handling of the ore in the quarries; the almost entire substitution of electricity for steam power for the operation of the machinery; the effective working of the style B Farrell ore crusher, which has jaws opening 42 inches by 32 inches and a capacity for crushing rock to a size of 7 or eight inches at the rate of 150 tons per hour, and the provision of the adequate power the two 30-drill air compressors supply for mine purposes. The company is steadily working in the direction of obtaining the larger proportion of its ore by quarrying and tramming through the tunnels rather than by hoisting from the lower levels, thus reducing mining costs. At the present time the three steam shovels (a third steam shovel rented from the C. P. R. is also in use in the quarries) are handling about one-half of the ore output, and the question of their use in the underground workings is now under consideration, with a view to determining its practicability to advantage or otherwise.

SNOWSHOE.—The Snowshoe Gold & Copper Mines, Ltd., nearly quadrupled the production of its Snowshoe mine during 1903 as compared with its output for 1902. The tonnage of ore shipped to the smelters at Greenwood and Boundary Falls during the year under review was 74,872 tons, as against 20,800 tons in 1902, 17,311 tons in 1901, and 297 tons in 1900. The total output to date is 97,7000 tons. No ore was shipped last March and April, the smelters having been shut down during those months on account of a strike among the miners at the Crow's Nest Pass Coal Company's coal mines, and the consequent shortage of coke.

Development work during 1903 included about 700 lineal feet of driving, cross-cutting and raising, and the sinking of the main three-compartment shaft another 50 feet, making its depth 350 feet. The total of development work is now 7,010 lineal feet. A considerable amount of surface stripping was done during the year, and slopes were opened up and timbered on the different levels. Ore was extracted from what is known as the Tunnel or No. 1 level, the 200-foot and 300-foot levels, and from several ore quarries opened from the surface. The mine is now in excellent condition, with numerous ore faces accessible, workings conveniently arranged, power equipment adequate, and ore bins and trackage provided, so that a daily output of 600 tons can be maintained. Some 60 men have been regularly employed at this mine.

The improvements and additions to machinery, plant and buildings during the year included the completion of ore bins with a capacity of 2,500 tons, building of head frame and skipways, and the installation of a 150-h.p. double conical-drum electric hoist with motor to operate it, and another steam boiler—150-h.p. high pressure. The hoist has been run since last June by electricity, the current having been supplied

by the Cascade Water Power & Light Company, which also supplies power to the Granby Company's mines.

The Snowshoe mine was shut down on December 16th pending the completion of smelting arrangements that will admit of the ore output being enlarged. These were then under consideration and it was expected that negotiations would be completed within a month, and that production would be resumed early in the New Year.

BROOKLYN AND STEMWINDER GROUP.—These mines, owned by the Dominion Copper Company, were idle throughout 1903, but recently men were put to work to complete the railway spurs. It is stated that negotiations with the Montreal & Boston Copper Company, owning the smelter at Boundary Falls, are in progress, but nothing definite is yet known as to the position of affairs. Development work approximating between 3,000 and 4,000 lineal feet has been done on the Brooklyn, which has a shaft 268 feet in depth from which levels have been run at 150 and 250 feet, respectively, whilst the adjoining Stemwinder has a shaft 374 feet in depth, but only a comparatively small footage of drifting and cross-cutting. One shoot of ore in the Brooklyn has been proved to be at least 1,000 feet in length and 20 feet in width at the 250-foot level. The Stemwinder has ore of similar character to that of the Brooklyn, but it has not yet been found in such great quantity as on the latter. The Idaho, adjoining the Brooklyn, has had some development work done on it, and the Rawhide, another of the group, situate near the Snowshoe, has had a shaft sunk 184 feet at which depth it connects with a cross-cut tunnel run between 400 and 500 feet into a high hill.

OTHER PROPERTIES.—The Bank of England, a promising claim adjoining the Rawhide, was bonded late in the year, and development work was started afresh. The Nellie Cotton group was also bonded recently. There are numerous other claims in the camp, but little or no work is being done on them.

DEADWOOD CAMP.

MOTHER LODGE.—The principal work done in the B. C. Copper Company's Mother Lode mine during the year was the enlargement of the ore quarries, of which there are now four, and the extension of the main tunnel, known on the mine as the Mule Tunnel. The four quarries are well defined excavations, but the separating masses of rock are being gradually removed, so that the divisions between them will disappear as the ore is broken down and shipped to the company's smelter at Greenwood. These quarries extend over a length of 807 feet, and have a maximum width of 145 feet, the average width being about 110 feet. The greatest depth is 140 feet, this being at one of the raises from the Mule Tunnel, and the shallowest is 30 feet from surface slope of hill to floor of quarry. The average depth is between 60 and 75 feet. The Mule Tunnel runs 833 feet into the hill, and several branch tunnels aggregate about 660 feet in length. There has been some deadwork in driving these tunnels, but as a rule they are in ore. There are four

large raises from the main tunnel to the quarries above, these widening out at the top, forming big funnels into which the ore is broken down, passing thence through hoppers into the 5,000-lb. cars which convey it to the Farrell crusher for crushing to a size not exceeding five inches. Two other raises are being made, to facilitate the handling of the ore.

The output for eleven months ended November 30 was 126,279 tons. The estimated production for December was 13,000 tons, making the total tonnage for the year 139,279 tons. Added to the output of the three years 1900-2 this makes a grand total of 383,388 tons of Mother Lode ore the company has mined and smelted. With about 90 men employed a monthly output of 16,000 to 17,000 tons can be readily maintained. The production of a larger tonnage is simply a question of employing more men, the mine being equal to whatever additional output the company's smelter requires.

There have not been any important additions to plant or machinery during the year, the power equipment, in anticipation of developments since made having been much in advance of the needs of the mine at its earlier stages. Two 80-h.p. steam boilers were removed from a boiler house near the mine surface workings down to a gulch in which the 30-drill compressor, with its complement of boilers had been placed. The main boiler equipment has thus been concentrated, but two 60-h.p. boilers remain in the old boiler house connected up and ready for use in case of emergency. A dam was built across the creek, to provide an ample supply of cold water for the condensing plant. The old coal trestles were removed and a railway spur run to the edge of the gulch, with a gravity tramway connecting with the boiler house. The boiler house was lengthened to make room for the boilers brought down the hill. Half a dozen more 2½ ton ore cars, for use in the Mule Tunnel, were made in the mine shops, new machine drills were purchased, and the plant added to generally as occasion demanded.

A second 24 inch by 36 inch Farrel ore-crusher has been ordered from the Jenckes Machine Company for delivery early in the new year. In the main this will be of similar construction to the one in use and which has done a deal of heavy work since its installation early in 1902. The new crusher will be placed near the main shaft of the mine. After it shall have been installed the crusher now in use will be removed and set up alongside from its present location at the entrance to the Mule Tunnel, the object being to have both crushers in permanent position for use when mining shall be resumed underground as well as whilst quarrying methods are followed. This will involve the driving of another tunnel and connection of the Mule Tunnel with same, the cutting out of large pockets alongside the shaft, the placing of conveying belts between the crushed-ore hopper and the shipping bins, and other improvements, but there will be a considerable advantage in this concentration of operations, both now and in the future.

SUNSET AND CROWN SILVER.—The Montreal & Boston Copper Company did but little development work on its Sunset group during the year. Neither was ore production regularly maintained, the company not drawing on the Sunset mine for ore excepting when custom ore supplies were insufficient to meet the requirements of its smelter at Boundary Falls.

MORRISON.—The Morrison Mines, Ltd., made persistent efforts during several months to keep the Morrison mine in operation, but the cost of the wagon haul of the ore from the mine to the railway was greater than ore of the grade there obtained could bear, so the suspension of work until a railway spur shall reach the mine became compulsory. Shipments of ore to the smelter at Greenwood totalled 2,526 tons. In the course of development shoots of nice ore were met with, encouraging the hope that when transportation difficulties shall have been overcome there will be a margin of profit in mining the ore.

OTHER PROPERTIES.—Work was done on the Ah There claim and a small shipment of ore made to the smelter. Developments here, too, were encouraging, but the conditions were not favourable for continuous working. Aside from assessment work there was little done on other Deadwood properties, notwithstanding that some of them have promising surface showings.

SUMMIT CAMP.

EMMA.—The Hall Mining & Smelting Company, of Nelson, continued throughout the year working the Emma mine. From the 80-foot-deep face of the incline open cut a drift was run, also on the incline, until at a distance of about 100 feet in from the face of the quarry a connection was made with the surface by a raise, the depth here being about 100 feet. Some 210 feet farther away a shaft has been sunk, and the drift has been continued to connect with this shaft at about 175 feet depth. The ore taken out of these workings together with that from a second quarry on another part of the property, amounted to 18,681 tons during eleven months ended November 30. The estimated output for December was 4,000 tons, so the year's production was about 22,861 tons. The Emma ore is of a character very desirable for fluxing purposes, for which reason it is shipped to the smelters at Greenwood, Grand Forks, Trail and Nelson. A second small power plant was put in during the year, this one for use at the more recent workings opened alongside the railway spur to the B. C. mine.

ORO DENORO.—The Denoro Mines, Ltd., having acquired the Oro Denoro from the King Mining Company, commenced early in the summer opening up the ore bodies cropping on the surface. Two quarries of considerable proportions were made in ore and 13,409 tons were shipped to the Boundary Falls smelter, and 350 tons to other smelters, making the total output 13,759 tons. A power plant consisting of an 80-horsepower horizontal return tubular steam boiler, seven-drill air compressor, 10 horsepower steam hoist, and thmchine drills, was obtained, and put in at the mine, where a 30 by 40 foot compressor building was erected. About 120 feet of cross-

cutting from the main tunnel was done. Of the two quarries that on what is known as No. 1 vein is about 120 feet wide, 90 feet long, and 30 feet deep at the face, while that on the magnetic vein is 75 feet wide, 40 feet long, and 40 feet deep at the face. The mine was worked with much vigor until about the middle of December, when the shutting down of the Boundary Falls smelter compelled a suspension of operations until such time as suitable arrangements shall be made for smelting the ore.

B. C.—The B. C. Chartered Company's B. C. mine was closed down last summer after having shipped an aggregate of 99,580 tons of ore during the four years it ranked as one of the important producing mines of the Boundary. For eight months during 1902 this mine stopped work on account of the low price of copper, its owners not caring to sell their product at so low a price. The last shut-down, though, was understood to have resulted from the exhaustion of the ore in sight and the unwillingness of the company to spend a lot of money in prospecting for other ore bodies. The average value of the ore produced by this mine was throughout higher than that of the larger mines of the district. To the end of 1901 the production was 67,135 tons, having an average assay value of .015 oz. gold, 2.45 ozs. silver and 5.8 per cent. copper. In 1902 a considerable reduction in the freight and smelting charges was made, so the sorting of the ore at the mine was discontinued, with the result that the average value of the ore shipped during that year fell to 1.75 oz. silver and 4.1 per cent. copper. No information has been received as to the average value of the 1903 product. The B. C. group consists of eleven adjoining mineral claims, with but little of the total area of 268 acres thoroughly prospected, so that it is quite reasonable to look for new discoveries of ore to result from systematic and extensive prospecting whenever this shall be carried out, especially as good showings of ore have been found on neighbouring claims.

OTHER PROPERTIES.—As in other Boundary camps, there are in Summit camp numbers of promising claims lying unworked. Ore is being shipped from the Senator to the Granby smelter, but it is yet early to determine whether or not this claim will be found worth development. It is reported that work is to be resumed shortly on one or other of the Rathmullen group. A claim situate near Eholt and having a big surface showing has been having the attention of Mr. Tebo, but a large expenditure will likely be necessary to prove its value.

WELLINGTON CAMP.

WINNIPEG.—Last fall a determined effort was made to get the Winnipeg, owned by the Winnipeg Mines, Ltd., on a paying footing but its inability to discharge a comparatively large old-standing liability as well as provide for current expenses compelled a suspension of operations when the bank took action to enforce payment of its claim. During the short time it was running last year the mine shipped 2,144 tons of ore to the Boundary Falls smelter, and gave promise of justifying the faith shown by Mr. Richard Plewman,

the managing director, in its eventual success had sufficient time been allowed for the working out of his plans. His was one of the pluckiest endeavours to save a mine for the benefit of its shareholders yet seen in the district and it merited a reward that unfortunately it did not obtain. The winding up of the company appears to be inevitable, unless financial aid be forthcoming to tide it over its difficulties.

ATHELSTAN AND JACKPOT FRACTION.—These claims shipped 4,173 tons of ore to Boundary Falls and 520 tons to the Greenwood smelter, nearly all from the Athelstan, which mine was re-opened last summer after having been shut down for two years. Local men have purchased these properties and are energetically trying to surmount the many difficulties attending the transforming of prospects into mines.

OTHER PROPERTIES.—No work was done on the Golden Crown last year, this mine having got into financial difficulties some time since. The Hartford has long been idle, and other claims in the vicinity, where not crown-granted, have only had the necessary assessment work done on them. Several claims in the southern part of the camp attracted a little attention during part of the year, but no important developments took place on any of them.

CENTRAL CAMP.

This camp was almost entirely neglected during 1903. A caretaker on the No. 7 mine worked single-handed the greater part of the year, but with the exception of the few men engaged in doing assessments he was left pretty much to himself. The cost of hauling the ore from such mines as the No. 7, City of Paris, Lexington and others similarly situated miles from a railway will probably prevent their being worked until the transportation difficulties shall have been overcome.

SMITH'S CAMP.

In this camp the Ruby and the Republic company's properties had work done on them, but no ore was shipped from either. A local syndicate is continuing development on the former with the object of getting under a shoot of good ore opened on the surface.

COPPER CAMP.

Neither the King Solomon nor the Copper Mine, the two best-known properties in this camp, were worked in 1903. There is a lot of high-grade copper ore on the latter awaiting shipment, but the waggon haul to the railway involves higher freight charges than the owners are disposed at present to pay. This is the only camp in the Boundary in which oxidized copper ore occurs in any considerable quantity.

LONG LAKE CAMP.

Local men have been working the Roderick Dhu with encouraging results. A lot of high-grade gold-quartz ore has been taken out ready for shipment, and now that there is sufficient snow for it to be brought down the mountain it will be sent to the smelter. It is expected to return high values, and should it do so development will be pushed still more vigorously. No work was done on the Jewel, which is generally regretted, this mine having considerable reserves of

ore similar to that shipped in 1902 to the extent of 2,060 tons. The average value of the ore is stated to be between \$10 and \$12, and it is understood that a fair margin of profit was obtained from that shipped. Late in the year work was resumed on the Ethiopia, this property having been bonded or leased by local men, who are taking out some gold-quartz ore.

GOLD AND SILVER MINES.

PROVIDENCE.—This mine shipped during the year 702 tons of gold-silver-quartz ore. The first annual statement of the Providence Mining Co., submitted to a general meeting of shareholders held at Greenwood last October, showed that during the financial year ended September 30th, 543.3 tons of ore had been mined, this having a net value—that is after deduction of freight and treatment charges—of \$54,315.24 or \$100 per ton. The cost of mining and incidental charges was \$23,122.40, so the clear profit on the year's operations was \$31,192.84. Freight and treatment charges were at the rate of \$12 per ton on the first grade ore, sent to the Trail smelter, and \$5.75 per ton on the second grade ore, sent to Boundary Falls. During the last quarter of 1903 about 250 tons of ore were shipped, but as complete returns for this are not available the exact gold and silver values can not now be given. There were as well 26 tons of first grade ore shipped by Mr. Wm. Fowler before the Providence Company acquired the property, this shipment making up the balance of the total of 819 tons shown in the foregoing Table of Ore Production as the aggregate output of the mine to the end of 1903. Mr. Fowler's returns were \$5,172.13 gross or \$4,898.33 after deduction of freight and treatment charges. It will be seen that this ore averaged nearly \$200 per ton, but it was sorted ore. However, this high return was by no means an exceptional one, for the Providence Company had one car of rather less than 22 tons return 5.40 ozs. gold, 288.50 ozs. silver, and 5.45 per cent lead, giving a gross value of \$5,323.30; another car of nearly 19 tons returned \$4,675.24; another of 20½ tons, \$4,085.80, and still another, in November, of 20 tons that went 2.44 ozs. gold, 327.80 ozs. silver and 7.60 per cent. lead, this returning rather better than \$220 per ton after deduction of freight and treatment charges. These were all sorted ore, but admitting this, the fact remains that the ore, first and second grades inclusive, has returned on an average about \$100 per ton clear of all charges after it left the mine. These particulars are given to show that the Boundary has high-grade ores as well as enormous quantities of ores of low grade.

When the Providence mine was taken over by the company there were two shafts, No. 1 down 50 feet and No. 2 down 64 feet. Since then No. 1 has been deepened to 180 feet, levels have been run at 50, 120, and 175 feet, respectively, and a raise has been made from the 120-foot level to the 50-foot near to the bottom of No. 2 shaft. Altogether about 1,098 feet of drifting and cross-cutting have been done on the three levels, besides nearly 100 feet of surface prospecting.

The mine manager, in his report to the annual meeting, stated, as an over-conservative estimate, that there

were then in sight 750 tons of ore of an average value of \$100. Since then a parallel vein showing eight to twelve inches of high grade ore has been cut and the outlook for the mine has improved by other developments. A steam boiler and hoist were installed last year, electric lighting was introduced and new buildings were erected for various mine purposes. The Providence Company enjoys the distinction of being the first company operating in the Boundary Creek district to pay dividends to its shareholders.

ELKHORN.—This mine is situate near the Providence and just outside the limits of Greenwood City on the north. It is owned and operated by Messrs. Jas. Sutherland and Phil McDonald, two local men, who have paid for the purchase of the property and are now making profits for themselves out of returns from the mine. The ore is similar in character to that of the Providence, and its average value is much the same. The vein varies in width, the pay shoot ranging from 8 to 18 inches and averaging about 12 inches, as also does that of the Providence. A shaft has been sunk about 180 feet on the incline, and levels have been run at 80 feet and 140 feet depth. At the face of the lower drift eastwards a depth from the surface of nearly 300 feet is obtained, the rise of the hill giving this greater depth than at the shaft. Details of workings and ore shipments are not now available, but assurance has been received from a reliable source that the size of vein and value of ore is as stated above.

E. P. U. MINES.—This property includes the E Pluribus Unum, Lancashire Fraction and Goldfinch claims, situate about half a mile east of Greenwood. The main shaft of the E. P. U. is down 85 feet and the vein in the bottom is quartz carrying free gold and tellurides, the estimated average value being about \$125 per ton. A drift at the 60-foot level has been run south into the hill, and the quartz is solid in the face of the drift. On the surface the vein has been stripped along a distance of about 300 feet north from the shaft. Ore of good quality shows for this distance, and a sample taken from one place where the vein is 18 inches wide assayed 7 ozs. gold. The work done thus far indicates that the shoot of pay ore is at least 350 feet in length, without having run out at either end. About 180 tons of ore have been shipped, this showing a gross value of \$105 per ton. A gravity tramway from the E. P. U. workings down to a wagon road below is nearly completed, so that hereafter the ore will be shipped with greater facility and at less cost than has been the case in the past. Some 27 tons of ore were shipped from the Goldfinch, this having been of like character and value to that the E. P. U. A fine vein of quartz of high grade is being opened up on this claim. The properties of the E. P. U. Mines are among the most promising in the neighbourhood and, now that shipping facilities have been provided, will increase their output and add materially to the gold and silver production of the camp.

OTHER CLAIMS.—Among a number of other quartz claims around Greenwood are the Defiance, Gold Bug, Strathmore and Helen. Both the Defiance and Gold

Bug look well, veins of rich gold-silver ore having been met with in the course of prospecting. The Gold Bug recently sent a small shipment of ore to the Greenwood smelter. Both will be thoroughly prospected during 1904, and there is little doubt in the minds of those who have purchased them that they will prove paying properties. A deal of tunnel work was done on the Strathmore in 1903, with the object of cutting a quartz vein on which an incline shaft was sunk several years ago. The vein has not yet been reached, but the property will be further developed in the ensuing year. The Helen, at Anaconda, south of Greenwood, was worked in 1896 and again last year. It has a quartz vein, small shipments of ore from which have given good returns. It is now under bond and promises to become one of the producers of the camp ere long.

WEST FORK OF KETTLE RIVER.

Going north from Rock Creek, well known as a placer diggings from the '60's on, no work of importance was done on any of the numerous mineral claims located along the main Kettle River and up James Creek except on the Riverside, situate on the east side of the river and about five miles above Rock Creek. There is on this property a promising vein about eight feet in width and carrying values in copper and gold. Some 200 feet of tunneling and a deal of cross-cutting and stripping have been done, and a couple of carloads of quartz ore, mineralized with galena and copper sulphides, taken from a vein about 30 inches in width, have been shipped to the smelter. Recently a parallel vein, from four to six feet in width and giving an average assay value of about \$20, was discovered. Preparations are being made to ship ore now that good sleighing is obtainable between the property and the railway at Midway. Above the confluence of the West Fork with the main river the mining camps on the several tributary creeks flowing into the river have had no attention other than that necessary to hold claims by doing the annual assessment work. A similar state of affairs has obtained in the camps on most of the creeks tributary to the West Fork until the town of Beaverdell is reached. Beyond this there are a number of claims upon which a deal of development work has been done, but owing to the non-completion of the wagon road over the last ten to fifteen miles, shipments of ore in quantity has been practically impossible, even last winter the snowfall having been too light to make the sleighing good enough for heavy hauling. The prospects for this winter are better, for the length of unmade road is shorter than last year and the snow will likely be deep enough for teams to haul heavy loads over it. Among the numerous claims in this part of the country the most prominent are the Standard, Bounty, Rambler, Washington, Idaho, Mountain Chief, Bell, Sally, Carmi, Butcher Boy and several others. Ore has been lying on two or three of these claims, sacked ready for shipment, for two years, but it could not be got out to the railway except by packing, the cost of which was prohibitory. Values in bulk range up to \$50 per ton, and even higher, but until transportation facilities shall be provided the district will not be developed.

There is a reasonable prospect of the construction of the projected Midway-Vernon railway being commenced next spring in which case the West Fork mining camps will have much attention paid to their high-grade ores.

THE SMELTERS.

GRAND FORKS SMELTER.—Extensive additions to plant and buildings were made at the Granby Consolidated Mining, Smelting & Power Company's big reduction works at Grand Forks during 1903. Two new water-jacket blast furnaces were put in (bringing the treatment capacity of the smelter, now having six furnaces, up to about 2,000 tons per day); three standard Connorsville blowers, equal in volume to No. 8, and three 100-h.p. Westinghouse electric motors to operate them; a full complement of receivers and cast steel 5-ton matte ladles; two 12 by 14 Canadian Rand Drill Company's locomotives and fifteen 6-ton Union Iron Works slag cars, for dumping the slag hot instead of granulating it; and some necessary equipment to make the copper converting part of the works equal to converting the copper matte from twelve to fourteen furnaces of the type in general use in Boundary smelters—roughly 70 to 100 tons of matte each 24 hours. A milling machine, for doing intricate small work, was added to the power appliances of the machine shop. The furnace room was extended 108 feet and the blower room about 50 feet, these additions increasing the length of the main building to about 350 feet.

Besides generating electric current equal to about 1,100 horsepower at its own power house, situate just below the smelter on the North Fork of Kettle River, the Granby Company uses electric power supplied by the Cascade Water Power & Light Company, with which it has a contract for up to 1,000 horsepower. A brick sub-station was built at the smelter early in the year and a double-circuit three-phase line was brought in three miles from the main transmission line between Cascade and Phoenix. The electrical equipment placed in the smelter sub-station includes one set of 1,000-h.p. Canadian General Electric air-cooled step-down transformers with motor and Buffalo blower, one set of 800-h.p. Westinghouse oil-cooled transformers, switchboard, lightning arresters, static interrupters and the customary other apparatus. The voltage is here reduced from 20,000, which is the pressure carried on the transmission lines, to 500 volts. Besides making this provision for extra power, more lighting facilities were added about the works.

The tonnage of ore smelted during 1903 to December 13—the date to which exact figures were obtainable—was 365,486 tons; the estimate for the unexpired portion of December was 31,230 tons; total tonnage for the year, 396,716 tons. Besides this there was, of course, a considerable tonnage of matte from other smelters, converter slag and sweepings, flue dust and other materials, the above figures representing the tonnage of ore alone. The production of copper for ten months ended October 31 was 12,988,946 lbs. With that for the months of November and December estimated the year's production of metals was ap-

proximately as follows: Copper, 16,932,056 lbs.; silver, 356,900 ozs.; and gold, 47,500 ozs. This includes the product of the matte received from the smelters at Nelson, Greenwood and Boundary Falls for converting into blister copper, as well as that from the nearly 400,000 tons of ore smelted at these works.

No information was obtainable from the company's officials as to further extensions of the smelting business here, but it is understood that necessary preliminaries are having attention so as to be prepared for eventualities should it be decided to operate on a still larger scale. There need be no hesitation regarding ore supply, for the company's mines could without difficulty double their output, but there are other important conditions that must be taken into account before the management may prudently commit itself to a policy involving a large increase in outlay on plant and buildings.

The coke supply has been a troublesome problem, either labour troubles at the collieries or a shortage of railway cars for transporting the coke during several months of last year having compelled a curtailment of smelting operations. These difficulties were removed towards the close of the year, so that latterly not only was sufficient coke for all the furnaces received but the supply was large enough to admit of a reserve of between 2,000 and 3,000 tons being accumulated. In this connection it may be mentioned that the International Coal & Coke Company is opening coal mines at Coleman, Alberta, from which the Granby Company expects next summer to obtain part of its supply of coke, and later possibly all its fuel requirements will be met by supplies from this source. It is stated that a colliery equipment for a daily production of 2,000 tons of coal has been ordered, and that the contract has been let for building an initial battery of 104 coke ovens, and a general manager engaged to report for duty on January 1st. It has been announced that the company's coal areas were inspected by a leading Pittsburg coal mining engineer and that he estimated the amount of bituminous or coking coal in sight on the company's property and located above the level of the Old Man River to exceed 64,000,000 tons. It is claimed that the coal is easily accessible and that there is good reason to believe that within twelve months a daily output of 2,000 tons will be practicable.

GREENWOOD SMELTER.—The British Columbia Copper Company's smelter at Greenwood smelted a total of about 170,000 tons of ore during 1903. The values recovered were approximately, \$13,700 ozs. gold, 52,000 ozs. silver, and 3,950,000 lbs. copper. A change was made in the management of the works early in the year, Mr. Paul Johnson having retired at the end of February, to be succeeded two months later by Mr. J. E. McAllister, who had been for some time assistant superintendent at the Tennessee Copper Company's smelter at Copperhill, Tennessee, U.S.A. The works were inoperative during the greater part of March and April, consequent on the failure of the coke supply whilst the Crow's Nest Pass coal miners were on strike. Since April, though, work has been continuous, except for occasional brief stoppages for necessary repairs.

During the latter part of the year a brick smoke-stack was built, to take the place of the steel plate stack that had been in use since the works were started in February, 1901. The new stack is 122 feet in height from its rock foundation (the level of which is about 80 feet higher than that of the feed floor of the furnaces) and 12 feet diameter inside measurement. It was built at the top of the dust chamber and connected up without any interruption whatever of the operation of the smelting works. Other building improvements were the erection of a brick sub-station for the Cascade Water Power & Light Company (with which arrangements have been made to supply electric current for power purposes, the intention being to substitute electricity for steam); the excavation of the site for a converter plant and the building of stone retaining walls, heavy masonry foundations for buildings and machinery, brick dust chamber, timber bins for re-lining materials, and other work preliminary to the raising of the steel-framed and iron-covered converter building and the converter power house. The sub-station or transformer house, which will be connected with the Cascade company's sub-station at Phoenix by a transmission pole line five miles in length and having two three-phase circuits of copper wire, is 30 feet by 40 feet and 20 feet high, the north end being closed in with wood so as to admit of extension of the building when required. The electrical equipment will have a capacity of 1,000 h.p. and will consist of oil-cooled Westinghouse step-down transformers to reduce the voltage from 20,000 to 2,000 volts, switchboard, lightning arresters, static interrupters and other necessary apparatus. The converter power house is 81 feet long by 40 feet wide, framed with wood and covered with corrugated iron. The machinery to be installed in this building includes a Nordberg blowing engine, arranged for running by either steam or electricity, steam cylinder 18 inches by 42 inches, air cylinder 40 inches by 42 inches, to deliver at an elevation of 2,500 feet 5,000 cubic feet of air per minute at 12 lbs. pressure through a blast pipe of 20 inches diameter with a branch to each converter; a 300-h.p. Canadian General Electric induction motor of variable speed (having rheostat for external resistance) 300 r.p.m., operating at 2,000 volts and connected to the 18-foot fly wheel of the blowing engine by an endless drive of 1¼ inch ropes running over a tension sheave (the other induction motors will operate at 550 volts); two sets of transformers for the step-down from 2,000 to 550 volts, and one set to reduce from 2,000 to 110 volts for lighting purposes; a 75-k.w. motor generator to convert direct current at 250 volts required for operating electric crane and trolley locomotive; a hydraulic accumulator, for tilting the converters, this having a ram of 24 inches diameter and 10-foot stroke, working at a pressure of 200 lbs. to the square inch, and fed by a Gould triplex pressure pump run by a 25-h.p. induction motor with automatic control.

In the converter room there will be two converter stands, each provided with a 2½-inch 4-way Critchlow controlling valve. For the present there will be five converter shells, 84 inch diameter and 126 inches

long, with cast steel heads, and the upper section furnished with pyramidal-shaped nose and removable cast iron tip. The riding rings are cast solid with the heads. Each shell has 14 tuyeres equipped with Dyblie ball valves. Over each converter is a movable bonnet connected with a steel dust chamber 9 feet by 12 feet by 9 feet and from these chambers a steel flue of 20 square feet cross section conducts the fumes to a brick dust chamber of 285 feet cross section and having a sloping floor, with a series of clean-out doors on the lower side. This directly connects to a steel stack of 6 feet 6 inches diameter and 90 feet height. The converter slag, after being poured in beds to cool and then broken up, is transferred to the blast furnace ore bins to be re-fed through the blast furnace.

A 40-ton 4-motor electric travelling crane handles the matte in 5-ton ladles connected by launders with the furnace forehearths. The crane is 40-foot span and has a 10-ton auxiliary hoist. The base of the runway rail is 26 feet above the floor of the converter building. The operator's cage is placed in the centre of the span.

The converter buildings are of steel resting on masonry piers and covered with corrugated iron. The main building is 45 feet wide, 90 feet long and 38 feet in clear height or 55 feet to the ridge of the ventilator which runs the full length of the building. An extension at one side is 30 feet wide and 60 feet long. The floor of the main building is closed in on two sides for a height of ten feet by the stone retaining walls.

The converter plant is so situated as to provide for a downward movement throughout of all material that has to pass through it. The silicious gold ores used for re-lining the shells are delivered into the upper ore bins of the smelter, passed down through the sampling mill, trammed directly thence and fed to a 7 by 10 inch Blake crusher and a set of 24-inch diameter rolls from which it drops into a 250-ton bin having a chute opening into the pan of a 6-foot Carlin mill. The clay for mixing is trammed from the lower ore bins to another bin also connected by a chute to the pan of the mill, whence it is taken to the shells in cars or barrows running above them.

A railroad spur has been constructed at a level 4 feet 6 inches below that of the floor of the converter building, so as to provide for the convenient loading of the blister copper turned out. Smelter supplies will be delivered from this track into a store to be built on the lower side and having its floor on a level with the floor of the railway freight cars.

Insufficient room for the granulation of the slag being continued having necessitated the substitution of hot dumping for granulation, a Baldwin steam locomotive and six side-dumping 5-ton slag cars, tilted by worby worm gearing, are now handling the slag.

BOUNDARY FALLS SMELTER.—A progressive policy was also followed during 1903 by the Montreal & Boston Copper Company, operating the smelter at Boundary Falls. At the commencement of the year only one furnace was in blast at these works. In the spring a second was blown in and later a third was obtained but this last has not yet been erected. The furnaces here are 40 inches by 176 inches inside the tuyere line

and each has a nominal capacity of 300 tons every 24 hours. Three Connersville blowers have been installed, two of them in 1903. One No. 7 and one No. 7½ have their own direct-connected 75-h.p. Erie steam engines, while the third, a No. 8, is direct-connected to a 125-h.p. Erie engine, this last-mentioned blower being large enough to provide blast for two furnaces. A Canadian Rand Drill Company's 7 by 12 locomotive and seven 5-ton Union Iron Works slag cars were also purchased, and rails were laid to provide for dumping the slag hot instead of granulating, this change having been found necessary here as well as at other district smelters. Additions to plant and machinery and to buildings, etc., involved a total outlay of about \$70,000.

The tonnage of ore treated at this smelter during 1903 was 132,570 tons, of which only 317 tons were dry ores. The 132,253 tons of wet ores produced 3,041,104 lbs. of copper, 52,278.74 ozs. silver and 7,859.005 ozs. gold. The dry ores yielded 20,474.57 ozs. silver and 150,906 ozs. gold. There were 1,661 tons of United States (Republic camp) ores treated, these producing 4,592.69 ozs. silver and 615,122 ozs. gold.

The district mines that sent ore to these works were the Sunset, Snowshoe, B. C., Winnipeg, Athelstan, Providence and Elkhorn, the two last-named sending gold-silver-quartz ores. The management of this smelter gave the smaller low-grade mines a smelting rate that enabled them to work to some advantage to themselves, which they could not well have done had the freight and treatment charges been high.

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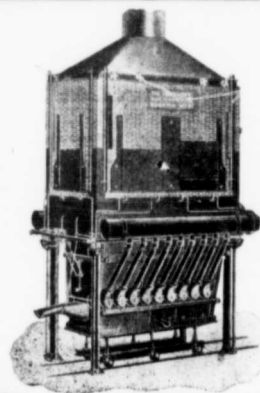
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