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EDITORIAL NOTES.

We have to thank the *Engineering and Mining Journal* for its readily acceded permission to reprint its "Monthly Average Prices of Metals" which will hereafter appear regularly in the *MINING RECORD*.

The proposed visit of members of the American Institute of Mining Engineers to British Columbia and Yukon Territory in June and July next appears likely to be made, arrangements to that end being now in progress. Some notes of the intended itinerary are printed elsewhere in this issue.

The mining and shipment of tungsten ore from a property situated in north-eastern Washington has been commenced, according to the *Roseland Miner*. As the occurrence of similar mineral in British Columbia has been reported, it would appear that there is in this province a similar opening for enterprise.

Among the notes recently sent out from the General Press Bureau of the Lewis and Clark Exposition is one intimating that a single piece of native copper, weighing 1,000 lb., will be part of the mining display from Josephine county, Oregon, at the forthcoming exposition. This chunk of copper, so it is stated, was taken from the Golden Standard ledge.

Navigation between Whitehorse and Dawson has opened earlier this year than usual. The first gold of the season has already been received at Dawson. While the weather has been too cold for sluicing to be general, it has been practicable in places. The beneficial results of the gold coming in are evident, the miners paying their winter scores and many men finding employment early in the season.

The *Canadian Mining Review* last month announced that with its May issue Mr. H. Mortimer Lamb would assume the editorial chair. From a British Columbian point of view this change is an excellent one. However dependable the *Mining Review* may have been in its comments on mining in Eastern Canada, it has frequently been quite astray when dealing with the mines of this province. We sincerely wish increased success to both the new editor and the journal he now takes editorial charge of.

The new surface works the Crow's Nest Pass Coal Co. has arranged to have installed at its Coal Creek colliery, to replace those destroyed by fire last March, are described on another page. An expenditure of \$200,000 on modern coal-handling plant, supplementing the large outlay of previous years, indicates unmistakably the permanent nature of coal mining in the Crow's Nest Pass region, of which that distinguished Canadian geologist, the late Dr. George M. Dawson, said: "It is manifest that we have here one of the most remarkable coal basins known."

The Denver, Colorado, special correspondent of the *Engineering and Mining Journal* has informed that journal that "the larger mining companies are gradually adjusting their work to the 8-hour law, and by May 1, when a number of contracts expire, matters will be running satisfactorily everywhere." On the other hand, in Pennsylvania, when a labour committee representing the miners appeared before the committee on mines and mining in the legislature, and pleaded for a favourable report on the 8-hour law bill, the miners' relief bill, and various other bills of a similar character, it received no satisfaction, the committee of the legislature giving out that it would not act upon those bills.

The publication of the MINING RECORD has this month been purposely delayed so that official mineral production statistics and reviews of the progress and development of the mining industry of the province during 1904, might be presented to our readers simultaneously with the publication of the Annual Report of the Minister of Mines of British Columbia for the year 1904. We have been enabled to do this by the courtesy of the provincial mineralogist, whom we have to thank as well for the loan of most of the blocks used to illustrate this issue. While our present experience of the readiness of the Bureau of Mines to facilitate the publication of information relating to the mining and metallurgical industries of the province is but a repetition of that of former like occasions, we appreciate the renewed courtesy none the less, and take much pleasure in thus making grateful acknowledgement of it.

The important development work being done by the Rambler-Cariboo Mines, Ltd., with the object of cutting the ore vein in its mine in the Slocan at a depth of 1,400 ft. is being steadily advanced. The first contract for driving the long adit has been completed at a distance of 2,125 ft. from the portal. A second contract has been let to drive the additional length estimated to be required to reach the lode—about 2,300 ft. By now half the total distance will have been driven. This enterprise stands out in strong contrast to the do-nothing policy of some of the mining companies owning mines in the Slocan believed to be well worth extensive development, and it is to be hoped that it will be abundantly rewarded, as, indeed, there is ample reason to believe it will be.

THE CRITICISM OF A MINING JOURNAL.

A BUYER of mining stocks writes complaining that the *Mining Record*, of Denver, has, by an adverse criticism, destroyed the market value of his shares in his locality, and asks if there is any way to remedy the effects of the attacks. If there is any real value in the mine, if the corporation is able to finance it upon legitimate lines, all the adverse criticism in the world will not affect the intrinsic worth of the shares. We have not always agreed with the policy of the *Mining Record*, but we acknowledge that in the great majority of cases that paper is treading upon safe ground. It lives on the mining industry. Both realise that fraud in the payment of dividends or misrepresentations generally, is a drawback to mining, for the digging for metals is founded upon confidence and speculation. If confidence is destroyed very little Eastern capital will assist in digging, consequently a paper published among mines, in close touch with miners, has good reasons to watch publicly-floated propositions. The promoter's cry that the reason of criticism is because he don't advertise is not a good defence, and a weaker defence is that the corporate affairs need not be lain open to those who are not financially interested. We feel that if any paper, good, bad or indifferent, asks a company selling its stock to the public for a statement, it should be given. Bradstreet or Dun's Mercantile Agencies have no interest in our firm, yet whenever they ask for a statement, we lay bare all they want to know. They are entitled to the information, for if their clients call upon them and they speak well of us, they should have over our signature a report for a basis of their information. The leading mining papers of the West are virtually rating agencies. We advise them to be treated as such. If they injure you by misrepresentation your recourse is in the courts. Plainly speaking, there are many mining companies, the statements of which should be made under oath.—*Wall Street Recorder*.

BRITISH COLUMBIA AS THE "MINERAL PROVINCE" OF CANADA.

B RITISH Columbia's claim to be regarded as the "Mineral Province" of Canada finds strong support in the comparison made annually in the report of the Minister of Mines for the province. Table X, as published in the report just issued, exhibits the "Comparative Mineral Production for 1904 of British Columbia and Other Provinces of the Dominion," and shows the value of the total production of metallic minerals and of coal and coke, as \$47,279,740. Taking, first, the metallic minerals, gold, silver, copper and lead, the respective proportions are: British Columbia, \$13,424,335; Yukon Territory, (gold only), \$10,337,000; all other parts of the Dominion, \$1,914,063; total, \$25,675,398. Adding iron and nickel, of which British Columbia nor the Yukon last year made any production, the proportion of all other parts of the Dominion is \$7,035,096, out of a total of \$30,796,431. When coal and coke are added, the proportion of other

parts of the Dominion is increased much more than that of British Columbia, which has a total production of all the minerals mentioned above of \$18,377,359, as compared with that of \$18,565,381 for all parts of Canada east of the Rocky Mountains. Taking together the Yukon production of \$10,337,000, and the \$18,377,359 of British Columbia, it is seen that the Pacific slope portion of the Dominion last year produced a total of \$28,714,359, as the value of metallic minerals, coal and coke, as against \$18,565,381 for the remainder of Canada. To give the other provinces their just due, however, it must be pointed out that after all the numerous non-metallic mineral products and the structural materials and clay products (these being included in the total mineral production of Canada), have been taken into account, the balance is not in favour of the Pacific slope, which has a total mineral production of \$29,314,359 as against \$31,028,806 for the remainder of the Dominion. This much, however, may be maintained, that British Columbia is distinctly in the lead in the total production of metallic minerals, with a reasonably good prospect of a proportionately larger increase from year to year than that likely to be made by the provinces east of the Rocky Mountains, while its coal and coke production promises to increase in greater proportion. Under these circumstances it would appear that in steadily increasing degree British Columbia will be, without cavil, the "Mineral Province" of Canada.

PROPOSED LE ROI-CENTRE STAR AMALGAMATION.

AFTER further discussing the proposed amalgamation of the Le Roi, Centre Star, War Eagle and Snowshoe mining companies, together with other important interests, representatives of the several companies mentioned and Mr. W. H. Aldridge, chief of the Canadian Pacific Railway Company's mining and metallurgical department, proceeded to Winnipeg to there meet Professor R. W. Brock, who examined and valued the various mines proposed to be included in the consolidation. *En route* the proportions of valuations of the properties were considered. Press despatches since received state that no general agreement was arrived at as a result of the conference at Winnipeg. The intention was that after the Winnipeg meeting Messrs. Waterlow, Aldridge and Cronin should proceed to Toronto, to there further discuss matters with Mr. T. G. Blackstock, the most active member of the directorate of the Centre Star and War Eagle companies, and later to meet the president of the Canadian Pacific Railway Company at Montreal, with a view to coming to a final agreement prior to submitting the complete proposals to the stockholders of the respective companies concerned, for their approval and ratification. Notwithstanding that the expected progress was not made at the meeting at Winnipeg, it is hoped that continued negotiations will result satisfactorily, so that the sanction of the

stockholders to the consolidation may be obtained without protracted delay.

The foregoing comment is made on the assumption that the results of the expert examination of the mines, in respect of both quantities of ore available and values contained, are such as to indicate without any reasonable doubt that the big tonnage required to justify operation on the greatly enlarged scale understood to be intended can be obtained from the mines. This phase of the situation appears to have been almost, if not quite, lost sight of in the published comments on, and advocacy of, the amalgamation proposals. If an enormous ore supply be not available, then the advantages expected from the proposed consolidation will scarcely be realized, at any rate not to the extent indicated in press opinions. With the reports of the several mine managers, as well as that of Professor Brock, before them the directorates of the companies immediately interested will be sufficiently informed on this view of the position. There is little diversity of opinion as to the theoretical desirability of the consolidation: the question of its promise of practical success is, however, one that can only be wisely determined by those who have all available facts before them, which newspaper writers advocating the adoption of the proposals have not.

In regard to certain statements published in provincial newspapers to the effect that the Le Roi Mining Co.'s smelting works at Northport would be permanently closed down should the consolidation be arranged, there is no doubt, so we have been authoritatively informed, that such statements are incorrect. The question of where ores shall be smelted will, assuredly, be dealt with entirely on its merits—from a profit-earning standpoint, and not from one of sentiment. For some time, at least, the operation of the Northport smelter would be continued, as well as that of the Trail works. There should be no doubt upon this point, since the general managers of both establishments have indicated that such is the intention. It may be that later as much of the Northport plant as can be moved with advantage will be taken to some suitable point on the British Columbia side of the International boundary—such a favourably situated place, for instance, as Cascade, in the eastern part of the Boundary district, which has already been suggested as a site for reduction works on a large scale, owing to its accessibility from both Rossland and Boundary mines by down-grade transportation routes. A decision as to this is not, however, immediately required, but can be reached later, after mature consideration of the various advantages and drawbacks of such a change. For the present it is enough to know that there appears to be a general disposition on the part of those most concerned to bring about the proposed consolidation, if mutually satisfactory terms can be arranged, and that the final settlement of all matters of economic development of the industrial features of this big enterprise will be left in such fully competent hands as will ensure the attainment of the best results.

ANNUAL REPORT OF THE MINISTER OF
MINES FOR THE YEAR 1904.

THE Annual Report of the Minister of Mines of British Columbia for the year 1904 has just been issued, its publication during the earlier half of the year comparing favourably with the customary much later date at which similar reports of other provinces or countries are made available to the public. Not only has there been commendable dispatch shown in its completion, but it is distinctly more useful by reason of its containing numerous special reports from the provincial mineralogist and provincial assayer, than reports of previous years, as a means of disseminating thoroughly dependable information relating to all, or nearly all, of the chief mining districts of the province, and therefore more valuable to all interested in the mining and metallurgical industries of the province.

From the report on the work of the Bureau of Mines for the year it is ascertained that the provincial mineralogist, in addition to performing his varied office duties, spent 160 days in the field examining mining districts and taking notes to be later prepared for publication in the Annual Report now under notice, while the provincial assayer similarly spent 40 days in the field. The mines visited by the provincial mineralogist were situated in the following mining divisions: Nelson (including Ymir), Ainsworth, Slocan, Slocan City, Fort Steele (East Kootenay), Atlin, New Westminster (Howe Sound) and Victoria. The provincial assayer made a special examination of the stone quarries of the coast, and examined mining properties in New Westminster division. The information obtained by these officials, as published, constitutes one of the leading features of the Report, sharing with the full and carefully-prepared statistical tables the interest and usefulness to the public it will be found to possess. Other noticeable features are the fully detailed reports of several of the gold commissioners—of Cariboo, Atlin, Nelson and Greenwood, respectively.

The illustrations are more numerous than in earlier reports, and they cover a wide range of subjects. Prominent among them, from a practical rather than an artistic point of view, are the several "flow sheets," drawn by the provincial mineralogist, which will serve to convey to the uninitiated an intelligent idea of the movement of ore in its passage through the concentration appliances of the silver-lead concentrating mills. These diagrams are the result of much careful work and will doubtless be regarded by many as a distinctly useful supplement to the reports they accompany. The half-tones are chiefly illustrative of the properties visited by the officials above-mentioned, and they are printed with the extreme care and excellent effect always characteristic of the work of Mr. W. H. Clark, foreman of the press room of the government printing office. Some of these views are decidedly striking and well-finished, notably that used as a frontispiece. The views of coast stone quarries should attract general attention to the occurrence of much superior building

material under exceptionally advantageous conditions as regards cheap transportation.

The index is more complete than in reports of other years, and there has been added a "Table of Contents" to facilitate ready reference, while the "Library Catalogue Slips" show a recognition of the value of having the report promptly catalogued and placed on library shelves.

With so much of interest to choose from, together with the desirability of making the choice general rather than particular, it has not been practicable to quote from the report to any considerable extent descriptions of individual properties, as would have been done had sufficient space been available, consequently this month's MINING RECORD presents chiefly the statistical and general review features of the report, to which have been added extracts relating to the newer properties or industries. Prominence has been given to the descriptions of the stone quarries and the plant for the manufacture of Portland cement, the importance of the development of the associated non-metallic mineral resources of the coast fully warranting this. The notes on the Britannia mine, as quoted, do not do justice to the provincial mineralogist's report on that property, want of space having necessitated the omission from our quotation of much connecting detail. Among other extracts as indicating the gradual development of the minor mineral resources of the province, are those relating to scheelite, magnesite, fluor spar, etc.

It is unnecessary to here make more than very brief comment on the increased total mineral production and the general improvement in the condition of the mining and smelting industries. These are plainly exhibited in "Progress of Mining," "General Mining Developments" and the statistical tables printed elsewhere in this issue. The increase in total value of mineral production in 1904 as compared with 1903 was \$1,481,405, and in tonnage of ore produced, 175,433 tons. While not equal to expectations, this increase is a substantial and gratifying one, the more so since there appears to be good reason to regard it as but a new beginning in the increase of development and expansion of production, as exemplified by the results already attained this year. While therefore, there is ample ground for satisfaction with the advance made in 1904, as shown in the comprehensive survey contained in the Annual Report under review, it is especially pleasing to find the outlook for a still more substantial advance during the year 1905 undoubtedly promising.

The Denver, Colorado, special correspondent of the *New York Engineering and Mining Journal* has communicated to that journal the names of nine companies which have decided to file separate suits against the Western Federation of Miners as an organization, and against its officers and prominent members individually, involving about \$1,000,000. Some of the leading firms of attorneys of Colorado have been retained in these cases.

PROGRESS OF MINING IN 1904.

(From Annual Report of Minister of Mines.)

THE mineral output of the province for the past year shows, as to the gross value of the product, a distinct gain over the preceding year, and, as a matter of fact, is the greatest ever made by our mines, except that of 1901. This gross value for 1904 is \$18,977,359, and represents an increase over 1903 of \$1,481,405, or about 8.5 per cent.

An analysis of the returns for the whole province shows, however, that this increase has not been general or equal in the various districts, or as to the various minerals produced. The placer gold output shows an increase of \$44,880, which is mainly attributable to one district—Atlin, the other districts only about holding their own; while in those districts where the placer gold is obtained from the river bars, exposed only at lowest water, there is this year a marked falling off in production, since the spring opened up early and the gradual melting of the snow in the mountains prevented any extremes of high or low water, so that the bars were not exposed, and, therefore, could not be worked in the usual manner.

The districts showing an increased output this year, named in the order of precedence, were East Kootenay, the Boundary, the Coast, and the Slocan, while the greatest decrease was in the Rossland camp, this last being accounted for by changes in the management of some of the producing companies, and by experiments being conducted as to the best methods of treatment of the low-grade ores of the camp, these temporarily retarding the output.

The tonnage of ore actually being mined in the province has perhaps a more direct bearing upon the general business prosperity of the local community than have the values produced, inasmuch as it represents the amount of work actually taking place, and in this respect the year 1904 shows a very greatly increased output of ore, amounting to 1,461,609 tons, an increase over the preceding year of 175,433 tons, or nearly 14 per cent.

To say that this increase was made chiefly by the Boundary, East Kootenay and Slocan districts, scarcely does these districts full justice, for not only have they made the increase shown, but they have also offset decreases in certain other districts.

In discussing the increase in tonnage of ore mined it must be remembered that the tonnage mined in 1903, than which that of 1904 is greater by 14 per cent, was itself greater than that of the preceding year (1902) by about 29 per cent, so that, looking back two years, it is found that the tonnage output increased in these two years about 46 per cent.

The number of mines shipping in 1904 was 142, as against 125 in 1903, an increase of 17, of which 15 were in the silver-lead district. These, however, shipped less than 100 tons each during the year. Of these 142 mines shipping, there were only 76 that shipped 100 tons during the year 1904, as against 74 in 1903,

indicating that there has been no material addition to the larger shippers, such increase as has been made in the number of shipping mines being confined to the smaller high-grade properties, and being in reality largely due to the introduction of the "tribute system" of mining. The total number of men employed during the year in these shipping mines was almost exactly the same as in 1903, viz.: 3,306 as compared with 3,303.

The following table shows the number of metaliferous mines which shipped ore during the past year, together with the location of these mines and the number of men employed both above and below ground:—

TABLE SHOWING DISTRIBUTION OF SHIPPING MINES IN 1904.

	Tons of Ore Shipped.	No. of Mines Shipping.	No. of Mines Shipping over 100 tons in 1904.		Men Employed in These Mines.		Total.
			Below.	Above.	Below.	Above.	
<i>Cassiar:</i>							
Skeena	303	2	1	7	9		16
<i>East Kootenay:</i>							
Fort Steele	76,895	2	2	199	75		274
Windermere	395	5	1	19	9		28
<i>West Kootenay:</i>							
Ainsworth	14,569	12	4	70	20		90
Nelson	74,442	17	12	150	115		265
Slocan	70,296	48	18	425	192		617
Trail	312,991	13	11	573	211		784
Other divisions	26,494	10	6	99	130		229
<i>Lillooet</i>							
Yale:	40	1	..	3	1		4
Boundary	801,925	20	14	439	276		715
Ashcroft-Kamloops . .	1,906	2	1	40	20		60
Coast	81,383	10	6	119	105		224
Total	1,461,609	142	76	2,143	1,163		3,306

In explanation of the table, it should be said that in its preparation, a mine employing 12 men for four months is credited in the table with four men for 12 months, so that the total given is less than the actual number of individuals who worked in mines during the year.

The "labour employed to the ton of ore mined" forms some criterion of the total cost of mining in a camp, since the cost of labour is in a more or less constant proportion to such total cost. In this respect it is interesting to note in the various districts the number of tons of ore mined to each man employed. An analysis of the above table shows, approximately, that, taking the province as a whole, there were 443 tons of ore mined for each man employed about the mines. In this respect, however, the districts vary very materially, since in the Slocan district the figures show 114 tons mined to the man in the year, in the Nelson district 280 tons, in the Trail creek (Rossland) district 400 tons, and in the Boundary 1,121 tons.

Such generalisation, of course, does not apply exactly to any one mine, but only to the district, and in the first two districts mentioned the mines vary in character so greatly, some having high-grade shipping

ores, and others low-grade concentrating ores, that care must be taken not to carry such average figures too far.

TABLE SHOWING NON-SHIPPING MINES AND NUMBER OF MEN EMPLOYED, 1904.

	Number of Mines.	Men employed under ground.	Men employed above ground.	Total.
Ain-worth	7	32	14	46
Boundary (Grand Forks, Greenwood, Osoyoos)	4	7	4	11
Coast	2	5	5	10
Lardeau and Trout Lake	3	15	2	17
Lillooet	1	14	7	21
Nelson	3	15	3	18
Slocan (Slocan, Slocan City)	3	6	6	12
East Kootenay (Fort Steele)	1	..	6	6
Yale	2	6	12	18
	26	100	59	159

COAL.

The producing collieries of the province are located on Vancouver Island and on the western slope of the Rocky Mountains, near Crow's Nest Pass, in the extreme south-eastern portion of the province. The former are operated by two companies, the Western Fuel Co., at Nanaimo, and the Wellington Colliery Co., at Ladysmith (Extension) and Union (Comox), while the eastern collieries are all operated by one company, the Crow's Nest Pass Coal Co. The conditions surrounding these two coal fields are so different that they must be considered separately.

The gross output of coal from the mines was 1,685,698 tons, of which 1,071,337 tons were sold as coal, 159,651 tons were used under companies' boilers, etc., 432,070 tons were used in making coke, and 22,640 tons were added to stock piles. The amount of coke produced was 238,428 tons, of which 229,618 tons were sold, and 8,810 added to stock.

The Vancouver Island collieries mined 1,023,013 tons of coal, which was disposed of as follows:—

	Tons.
Sold as coal	784,169
Used by company	135,034
Used to make coke	81,170
Added to stock	22,640
	<u>1,023,013</u>

The coke produced amounted to 19,371 tons, of which 12,934 tons were sold, and 6,647 tons were added to stock.

Of the coal sold, 53 per cent was exported to the United States, practically all to California, while 20 per cent of the coke sold found the same market. The local market is slow of growth, so the export market must be looked to for any expansion of business. In 1902, 75 per cent of Vancouver Island coal went to California, in 1903 about 45 per cent, and in 1904 about 53 per cent, which would indicate that the worst is already known of the competition of the California

fuel oil. The two companies have "pooled" their California sales under one selling agent, which should steady the trade. The local coast market in 1904 consumed some 13,000 tons more coal, but about 9,000 tons less coke, than in the preceding year.

The Crow's Nest Pass Coal Co. at its three collieries, Michel, Coal creek and Carbonado (Morrissey creek), mined in 1904 662,685 tons of coal, of which there were sold as coal 287,168 tons, and of this 168,980 tons were consumed in Canada and 118,188 tons exported to United States. Of the remainder of the output, 24,617 tons were consumed by the operations of the company and 350,000 tons converted into coke, of which there were produced 218,857 tons, and of this 119,004 tons were consumed by British Columbia smelters, and 97,690 tons exported to United States.

The distance of these mines from the coast has as yet prevented any but the interior markets being available, and as three new coal companies have this past year begun shipping from mines just outside of British Columbia, in Alberta, these companies have shared the market with the Crow's Nest Pass Coal Co., with the result that these British Columbia mines show this year a decrease in coal sold of 32,791 tons, which is, however, more than made up for by an increase of 66,930 tons in the coke sales.

The consumption of coke from these mines by British Columbia smelters has remained at about the same amount as last year, but the export of coke has increased from 27,758 tons in 1903 to 97,690 tons in 1904, chiefly by the opening up of markets in Montana through the completion of the branch of the Great Northern Railway to Morrissey. The company's ovens have not been run at full capacity, nor all the time, so that the limit of the present available market seems to have been reached, but there is every indication that it will be held during the coming year.

The following table indicates the markets in which the coal and coke output of the province was sold:—

Coal.	Crow's Nest		
	Coast.	Pass.	Total.
	—Tons—2,240 lb.—		
Sold for consumption in Canada...	368,764	168,980	537,744
Sold for export to United States...	414,248	118,188	532,436
Sold for export to other countries.	1,157	.....	1,157
	<u>784,169</u>	<u>287,168</u>	<u>1,071,337</u>
	Coke.		
Sold for consumption in Canada...	10,333	119,004	129,337
Sold for export to United States...	2,591	97,690	100,281
Sold for export to other countries.	.....	.....	.....
	<u>12,924</u>	<u>216,694</u>	<u>229,618</u>

GOLD.

Placer Gold.—The placer gold mining industry of the province this past year produced \$1,115,300 in gold, an increase of about 5 per cent over the preceding year, thanks to a successful season in the Atlin camp. In this camp, gauged by the royalties paid in, individual miners produced in 1904 about 45 per cent of the product of the camp, while in 1903 the individual miner paid 75 per cent of the royalty, the change indicating the replacement of individual by company

work, even in this camp. The output of the camp was about \$530,000, an increase of 20 per cent over the preceding year, a most encouraging showing, especially as the dredge, from which so much was expected, failed mechanically to handle the dirt. The two hydraulic companies which started up last summer made very creditable productions and promise to do better in 1905.

In the Dease lake district the output this year was only about one-third of what it was the previous year, as the most important property in the camp did not produce this past season, being engaged exclusively in installing a new and larger plant.

In the Cariboo district the placer output was almost exactly the same as last year, the Barkerville camp being just the same, while a deficit in the Omineca section was about balanced by an increased production in the Quesnel Forks section, where the Consolidated Cariboo Co., although only having water to sluice 88 days, produced \$90,000 of gold.

In the Fraser river section, placer mining is chiefly carried on on the river bars at extreme low water. The results this year have been very disappointing, as the usual very low water did not occur, since the winter's snow starting to go very early went gradually, with no extremes of high or low water, so these bars could not be worked to the usual extent.

Hydraulic Gold Mining.—The company operating in this manner on the largest scale is the Consolidated Cariboo, which, as already noted, produced \$1,000 a day while able to work with a head of water. It has been amply illustrated that the water supply is the measure of the output, and that to increase the latter must be done by first increasing the former. This, the company has decided to do, and will, this coming year, expend a large amount for further ditches and water. There have been operated in Atlin two very successful small hydraulic enterprises, and near Barkerville about the same number, which have paid very well this past season.

Dredging for Gold.—Dredging for gold has not, as yet, been a commercial success, despite all attempts to solve this problem. The difficulties are mechanical, but, therefore, none the less difficult to surmount. Many of the propositions which have been started have had ground sufficiently rich to pay very handsomely, if the conditions were right—that is, freedom from boulders or hard clay cement, a dredgible bedrock, and the gold not in too fine a state of division. The dredge in Atlin attempted to handle dirt that proved too tough for it, and from reports it would appear that the Lil-looet dredge was too weakly constructed to stand the work, and the constant stoppages for repairs interfered with what promised to be a very successful run.

Steam Shovels.—As yet the only attempt made in this province to work a placer gold property with a steam shovel was in Fort Steele mining division, and described in the Report for 1903. The conditions there were scarcely favourable and the shovel was not equipped with an auxiliary elevator to take the gravel from the shovel to the sluice, which appears to be a

requisite. This was to have been provided for this shovel but is not yet in place, and the machine has not been worked this past season.

Preparations have been made for the placing of one, or more, steam shovels on ground in the Atlin district this coming summer, notably by the British America Dredging Co., on its leases at Tar flat; and the Northern Mines, Ltd., (of Vancouver), on ground recently acquired on Spruce creek. In both these cases the character of the ground and its gold contents have been thoroughly and satisfactorily tested by individual workers, although the top burden was so deep as to prevent any profit being made from this class of work, but the ground appears admirably suited for working by mechanical means.

Gold from Lode Mining.—The greater part of the gold obtained from lode mining in British Columbia is found in connection with other metals and only separated or collected by smelting, probably not 5 per cent of the product being obtained from stamp mills. The lode gold product for 1904 was \$4,589,608, and was \$223,008 less than in 1903, due to the diminished output of the Rossland and Nelson districts. In the former district the tonnage of ore mined is about 5 per cent less and the gold contents about 8 per cent less than last year. In the Nelson mining division there has been less ore mined and the values per ton were, on the average, lower. In the Boundary district the tonnage of ore mined has increased about 30 per cent, and the gross gold contents is this year about 10 per cent greater than it was the previous year. In the Coast district the tonnage of gold-bearing ore has been 20 per cent less than the previous year, yet, for all that, the gold contents show an increase of about 8 per cent.

SILVER AND LEAD.

It has been customary in these reports to consider silver and lead together, since in this province about 80 per cent of the silver produced is obtained from silver-lead ores, the remaining 20 per cent being chiefly found associated with copper.

The total silver production for the past year was 3,222,481 oz., valued at \$1,719,516. About 50 per cent of this production came from the Slocan district and about 25 per cent from Fort Steele district, the two chief lead-producing centres, while the other 25 per cent was produced in all the other parts of the province. This output is 226,277 oz. greater than was made in 1903—an increase of about 7 per cent—and is chiefly attributable to the re-opening of the St. Eugene mine, in East Kootenay, the resumption of work in this mine being the direct result of the bounty on lead mined, offered by the Dominion government, without which assistance the St. Eugene cannot be profitably operated. In the Fort Steele mining division there were mined in 1903 less than 1,000 tons of ore, while in 1904 there were mined 76,895 tons, from which was recovered about two-thirds of the lead output of the province.

The total lead output was 36,646,244 lb. of lead, of which 21,071,236 lb. was produced in East Kootenay.

10,011,227 lb. in Sloean, and 3,091,048 lb. in Ainsworth mining division.

COPPER.

There has been a further advance made in the production of *per.*, the output this year being 35,710,128 lb., valued at \$4,578,937, an increase of about 4 per cent over the preceding year, which makes this output of copper the greatest ever made by the province.

The product was obtained in the following districts.

Boundary district	22,006,407 lb.
Rossland district	7,119,876 lb.
Coast district	5,960,593 lb.
Yale Kamloops district	328,380 lb.
Nelson district	220,500 lb.
Various districts	14,372 lb.
	<hr/>
	35,710,128 lb.

The average assays of the ores of the various camps, based upon copper recovered, were as follows: Boundary camp, 1.38 per cent copper; Rossland, 1.12 per cent, and Coast district, 3.68 per cent.

OTHER MINERALS.

Iron Ore.—There has been no ore mined for iron-making this past year, as the only iron blast furnace on the North-West coast, that on Puget sound, has not been operated. Formerly, the lead smelters mined ore (magnetite) at Kamloops for fluxing purposes, but this has been discontinued, as ores have been found nearer home which, although not carrying so high a percentage of iron, contained small values in copper, gold or silver, which rendered them more desirable.

Zinc.—Zinc ores have been receiving a great deal of attention during this past year, more particularly those of the Sloean district, but, with the exception of the ore from the Ivanhoe mine, Sandon, it could not be learned that any important amount of ore had been sold before the close of the year. In the Sloean district zinc blende occurs with the galena ores, sometimes in considerable quantity, and usually associated with iron carbonates. Most of the concentrating mills have now been equipped so as to separate out a "zinc concentrate" from the jigs and tables. These concentrates will run from 38 to 48 per cent zinc (as zinc blende), but will carry as impurities, considered from the standpoint of a zinc ore, from 2 to 5 per cent of lead, as galena, from 5 to 15 per cent of iron, as pyrite and carbonate, and from 20 to 45 oz. of silver to the ton, with the balance gangue matter, usually highly silicious.

Most of the zinc smelting works which are prepared to buy zinc ores are now using the Belgian furnace, in which the ore is mixed with coal or other reducing agent, placed in a clay retort, the reduced zinc being distilled off and caught in a condenser. Iron and lead are highly objectionable in this process, inasmuch as they flux with and destroy the retorts, adding greatly to the cost of the process. For this reason crude Sloean concentrates have not found a ready market, and to remove these objectionable impurities two "zinc enrichment" plants are under con-

struction, in addition to the Payne mine magnetic separator. It is believed that these impurities can be so removed, to such an extent at least as to render them non-injurious, but the question of the silver still remains to be solved, for, as far as could be observed, it is directly included in, and a part of, the zinc blende, and can not be separated, save by smelting or some other form of disintegration of that mineral.

While this silver cannot be considered as detrimental to the ore as a zinc ore, it is very difficult to separate and save the silver, and but a partial recovery can be made at the best, consequently, the price offered by ore buyers seems very low for the silver contents. For this reason it has so far been found advisable by all the producers to throw as much zinc into the lead concentrates as the lead smelter will accept without a penalty, in which case the producer gets no pay for his zinc, but gets a price for its silver contents which more than recoups him for his loss of zinc. These conditions apply to zinc smelting as it is usually carried on. There are, however, two or three newer processes not very widely known, which are especially adapted to such ores, but operators of these concerns are naturally only prepared to give enough for the ore to outbid the regular zinc smelter. An electric process is being developed in Vancouver which has considerable promise and which can be utilised in small units, and this may help to solve the problem by the local treatment of the concentrates.

The ore from the Lucky Jim mine, of the Sloean, is a zinc ore, low in silver, with iron and lead as occasional impurities. About 2,000 tons of this ore were shipped to Kaslo about the end of 1904, but the sales had not been completed by the close of the year.

There are zinc ore properties on Quatsino sound and also near Vancouver, but so far no shipments have been made and little development has been done.

Platinum.—The production of platinum has this year been confined to Granite creek, in the Similkameen, and this creek produced only 35 oz., valued at \$12 an oz., recovered from the sluice-boxes in washing for placer gold. As far as can be ascertained, platinum has not as yet been found "in place" in British Columbia, although its occurrence is widespread in the gravel of the placer gold deposits throughout the province.

In the report of 1902 the occurrence of platinum in considerable quantity was noted at several points on the Quesnel river, Cariboo district. These occurrences were the subject of a special investigation by a representative of an Eastern firm interested in the metals, but with what results has not been learned.

Mr. J. B. Hobson, in his report of last year's operations of the Consolidated Cariboo Co., notes the occurrence of platinum, osmiridium, and also of palladium in the heavy concentrates from his sluice-boxes, and he is preparing to put in a system of undercurrents to collect all of these heavy concentrates.

In the Thibert creek hydraulic workings, platinum has previously been noted, but this company did no sluicing this past season. Mr. Hamfield, the manager, in his report, speaking of work planned for next sea-

son, says: "Definite measures are to be taken towards the saving of the osmiridium which is known to exist in the deposit to an appreciable amount."

Building Stone.—In a comparatively young country,

terior there has been comparatively little stone construction going on, and the quarrying of stone for such purposes cannot be said to exist as an industry. When stone is required, a few men are put to work



Individual Placer Mining, Boulder Creek, Atlin.

with lumber as plentiful as it is in British Columbia, the use of stone for building purposes is relatively too expensive, except in the cities, where wooden buildings are prohibited within the fire limits. In the in-

terior on one of the innumerable rock exposures simply to quarry out sufficient stone to meet immediate demands.

On the coast, the three largest cities of the province have created a market for building stone, and several

quarries have been opened up on the islands of the Gulf of Georgia, which afford exceptionally easy opportunities for the working of quarries, as the rock faces open up right from deep water, permitting of the stones being loaded directly on to boats. Most of these quarries will be found described elsewhere under the heading *Stone Quarries of Coast*. The stones quarried are granite, sandstone, and an andesite very much resembling sandstone in appearance. An export market for stone is being slowly but surely established in the American cities on Puget sound and in California.

Brick.—Red bricks are manufactured in small yards all over the province, for local consumption, the distribution of brick clay being so general as not to necessitate any large brick-making centre, although very extensive yards are in operation near Vancouver and New Westminster. The manufacture of fire brick has been carried on at Comox, by the Wellington Colliery Co., from fire-clay occurring in connection with the coal seams, and also at Victoria by the B. C. Pottery Co., from clay derived from the same source. The latter company has also entered extensively into the manufacture of drain and sewer pipe, tiles, etc., for which there appears to be a good local market.

Oil Shales.—It was noted in last year's report that apparently a large deposit of shale carrying oil had been discovered in the Beaver valley, near Harper's camp, Cariboo. Further samples of this shale and a small flask of oil retorted from it, were obtained through Mr. Carew-Gibson, of 150-Mile house. These the bureau sent to Dr. T. R. Marshall, of London, England, with the request that he turn them over for analysis, and report to some chemist who had experience with the oil shales of Great Britain. Dr. Marshall handed these to Mr. Arthur King, whom he considered expert in this matter, and reported as follows:

"As Mr. Arthur King's report was scarcely detailed enough, with no geological or general references, I have re-written it and signed it myself.

"Report on Samples of Shale and Crude Oil from near Harper's Camp, Cariboo District, B. C.

"Examination of Crude Oil.

"The crud oil was maintained at a temperature of 100 deg. C. until there was a complete separation of the oil from water and soluble constituents. Unfortunately, only about 100 cubic centimetres separated out, which would only yield by fractional distillation, fractions in such small quantities that detailed examination of individual portions would be impossible. A volume of two litres is the smallest practical quantity to operate on. However, in this case, the oil is of very low commercial value for the following reasons:—

"1. The oil is liquid at the ordinary temperature and has a very offensive smell. The fact that it is liquid at the ordinary temperature shows that it does not contain a practical amount of the solid paraffins, which is a very important source of profit. The oils from Central Ohio and Indiana, Kentucky and Kansas fields contain paraffin wax, but the oils generally found

in Texas and California contain asphaltum base.

"2. The specific gravity is .972, which denotes that the oil is very dense and is only fit for lubricating purposes. This dense oil is scarcely worth refining, as it would only give about 50 per cent of finished products and these would have very little market value. A passable oil should yield about 75 per cent of finished products.

"For purposes of comparison, it may be stated that a fairly good oil has usually a specific gravity of .890 to .895, usually under .895.

"Examination of Sample of Shale from Harper's Camp.

"The shale itself is worthless for commercial purposes, and from the geological point of view must be considered only as an indication that oil shales exist. Further prospecting may result in an oil find or discovery of rich shale, but not having examined the ground personally, it is impossible to venture an opinion. The shale on distillation yielded only a crude product, which floated on the aqueous portion and represented only 3 per cent of the weight of the shale. A shale, to be of commercial value, should yield not less than 8 per cent of crude oil.

"In Colorado and Utah there are extensive strata of silt now hardened to shale, yielding by distillation about 20 gallons of crude oil per ton of shale. The time may come when these immense deposits may have commercial value.

"In conclusion, I may say that neither of the samples has commercial value, but must be considered only in the light of valuable local indications. It may be that locally the more volatile constituents have evaporated into the air, and that shale and oil from more deep seated sources will prove of value. Whether or not a valuable find may be discovered can be determined only by careful geological examination of the district, in conjunction with actual prospecting."

Within the past few months Mr. R. H. Alexander, of Kamloops, writing from Lytton, sent to the bureau for examination a sample of black shale, which proved to be oil-bearing and very similar to those of Harper's camp. As was noted in last year's report, shales of a similar character were found in Calder creek, a tributary of the Flathead. As far as can be learned, no actual development took place in the Flathead oil district during 1904.

GENERAL MINING DEVELOPMENTS IN 1904.

THE year 1904 was devoid of sensational features in the way of new discoveries or remarkable development, but the year has brought increased output from the well-known mines rather than the opening up of new producing properties.

In the Boundary district the tonnage of ore mined has increased 15 per cent, and this has called for increased equipment on the part of the large companies owning their own smelting plants. These, realising that the oxidised ores found in the upper portions of the original ore-bodies were liable to be replaced at

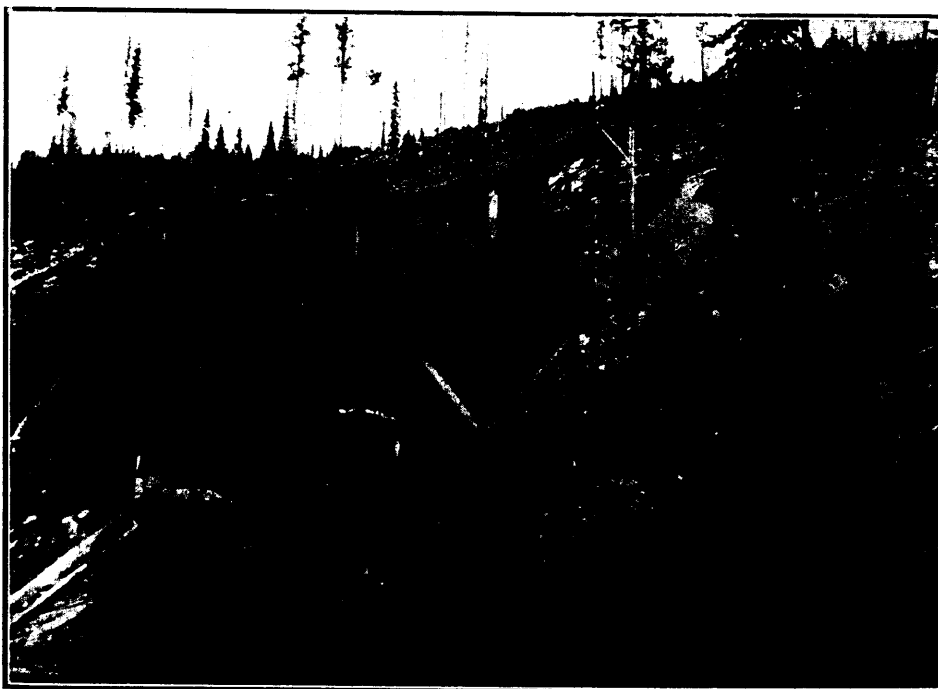
a greater depth by sulphides, have "taken time by the forelock" and secured, by means of purchase or consolidation, all available deposits carrying oxidized iron in excess, securing thereby a supply of such ore for fluxing purposes.

The average contents of the ore mined in the Boundary for the past year was 1.38 per cent copper, \$1.44 in gold, and 0.3 oz. in silver, to the ton, based upon the statistics of the district. To mine and smelt in British Columbia an ore of this grade at a profit, it must be done on a large scale and with the best appliances, and the ores must be self-fluxing or nearly so. That a profit has been made argues that all these conditions have existed, and, further, that the plants have been most economically run.

The company operating upon the largest scale in the district is the Granby Consolidated Mining, Smelt-

creased next year. The company acquired a three-quarter interest in the Emma mine which last year shipped over 36,000 tons of iron ore carrying small values, and used as flux by this company and by the Nelson smelter, which owns the other quarter interest in the mine. The company's smelter treated during the year, including custom ore, etc., some 210,484 tons of ore, containing 36,403 oz. of gold, 118,419 oz. of silver and 5,081,743 lb. of copper.

The Montreal and Boston Co. has been re-organized and consolidated with the Brooklyn-Stemwinder, Rawhide, Athelstan-Jackpot, Sunset and Morrison mines, thereby insuring a large and steady supply of ore, which it will be possible so to adjust as to make a self-fluxing mixture, an arrangement which should be of great benefit to all the parties of the consolidation.



Upper Terminal of Riblet Aerial Tramway, B. C. Standard Mining Co.'s Hunter V. Mine near Ymir.

ing & Power Co. The control of this company recently passed into the hands of New York capitalists, and under the new directorate still further additions have been made to both mine and smelter plants, while additional railway facilities have been acquired through an extension of the tracks of the Great Northern Railway Co.'s system. From the company's Old Ironsides and Knob Hill there were mined over 544,000 tons, while the company has been operating several other properties under bond and on shares, for the purpose of obtaining their fluxing or oxidized ores.

The British Columbia Copper Co. has made important improvements at the Mother Lode mine, and as most of the ore is now being quarried, the company will be able to even further reduce the cost of mining. The mine produced last year about 175,000 tons of ore, and the output should be materially in-

In the vicinity of Greenwood there are four small high-grade properties which have been developed and have produced several hundred tons of ore, running from \$50 to \$75 in gold and silver, for which a ready market is found at the local smelters. More attention has been given of late to this class of small high-grade deposit, and with very promising results.

The general costs of mining and smelting in the Boundary district have been reduced to a figure lower than hoped for, and now compare favourably with any work done elsewhere.

In the Rossland camp the year has been to a certain extent unsatisfactory, from the standpoint of production. It has been a period of experimenting with methods of concentration, which, as pointed out last year, has become a necessity, since, as a greater depth is reached, large bodies are found of lower-

grade ore, requiring treatment by concentration.

The Rossland Power Co.'s concentrator, located between Rossland and Trail, has been completed. This plant was erected to treat War Eagle and Centre Star ores, and several thousand tons of ore from these mines were sent to the mill for concentration, but, after a trial run of several weeks, the mill closed down early in December, for the purpose of making some changes in the plant, found necessary by experiment.

The Le Roi No. 2 mill, described fully in last year's report—a combination of hydraulic concentration and Elmore process oil concentration—has been working all year, but it is recently reported that the Elmore process has been temporarily discontinued. The Consolidated White Bear Mining Co. has, during the past year, erected an Elmore plant much larger than that of the Le Roi No. 2, and equipped with labour-saving devices which it is believed will materially reduce the cost of operation. This plant was started up only late in the year and definite results cannot yet be expected. The Velvet-Portland Co., with mines on Sophie mountain, has erected a small hydraulic concentrator, to ascertain what can be done with the ores of that mine.

It will be seen, therefore, that the efforts to arrive at a method of concentration are general throughout the camp, and, from all reports, have been so far successful. If only a portion of the product of the camp is concentrated, the iron-copper sulphides thus obtained would materially assist in fluxing the excess silica in the unconcentrated ores, thereby further reducing the cost of the subsequent smelting. Much importance is attached to these experiments, as their success will materially affect the future of the Rossland camp.

In the Slocan district the most important feature to be observed in connection with mining was the effect the lead bounty would have in stimulating lead mining, and it must be admitted that, as far as increasing actual production is concerned, the results have not been so great as was anticipated. There has been an increased amount of development going on, which seems attributable to the bounty, the effect of which will be felt later.

The utilisation of the zinc-blende recovered as a by-product in the concentration of galena ores has had a great effect on the prosperity of some of the mines and, as the cleaner separation of the zinc concentrates has been accomplished, a profitable market seems assured for the product in the future.

Nothing requiring special note has occurred in the Nelson division this past year, unless it be the successful prospecting done on Summit creek, in the eastern part of the division, and the opening up and equipping of the May and Jennie, a large, low-grade gold property in the western part of the division. The development in the Ymir mine has not been successful. The Silver King, operated under contract, did well on a small scale, and will be worked next year jointly by the company and the contractor. The Hunter V., a new company, has been successful and has cleared more than expenses this first year.

In the East Kootenay district there are two or three companies installing plants to work, by mechanical means, placer ground in the immediate vicinity of ground formerly worked by individual miners. These enterprises have not as yet made enough progress to have obtained definite results. In this district the effect of the lead bounty has been most beneficial, and may be said to be directly responsible for the production of 21,000,000 lb. of lead and 600,000 oz. of silver, which could not have been produced without it, while the product for 1905 promises to be at least 50 per cent greater.

The coal mines are the important factors in the production of this district; their output has greatly increased, and chiefly through the export of the products. Prospecting has developed further coal fields in this section, farther up the Elk river than the present mines, the general situation being, as described by one of the prospectors—"There is coal to burn in East Kootenay."

In the Windermere district mining has been very much at a standstill. As it is there firmly believed that the Kootenay Central railway will soon be built, and as this would revolutionise mining conditions, recent work has been largely confined to development.

In the Atlin district there has been a more than usually successful placer mining season. The work has been confined to the known field, chiefly in developing the "old channel," and installing plants to take the place of individual workings. The district is fully described by the provincial mineralogist in the report for 1904.

In the Liard division productive mining has been practically dormant, owing to the principal companies having been fully occupied in enlarging their plants, a serious undertaking in a district so devoid of transportation facilities.

In the Skeena division, as anticipated last year, the settlement of the Alaskan Boundary has led to the active development of several high-grade gold properties, which have considerable promise. No market has, as yet, materialised for the sulphur ores of the mines on the Ecstall river, and these properties have lain idle.

The coal fields of Queen Charlotte islands have been the subject of serious negotiations this past season, but, as far as can be learned, no further development of the properties has taken place, and drilling to prove the coal nearer the centre of the field has not yet been begun.

On Princess Royal island the Princess Royal group shipped 300 tons of ore, running over \$50 in gold to the ton, with a little silver and copper, and two other companies are actively developing, with a prospect of shipping in the near future.

In the Telkwa valley the development of what promises to be important deposits of semi-anthracite coal has attracted much attention, while in the same section prospecting has disclosed mineral properties from which some exceptionally fine samples of copper ores have been brought out. As this district is supposed

to be on the line of the approaching Grand Trunk Pacific Railway, it will, this coming season, be pretty thoroughly investigated by prospectors and those in search of land.

On Texada island, in the Nanaimo district, the Marble Bay mine has been continuously worked and has made a large output. The Van Anda mines have been under bond to an English syndicate, which has been seriously hunting for extensions of the old orebodies, but with indifferent success, as the syndicate is about to suspend operations and turn the properties over to the original company. The iron mines have not shipped or been worked this past year.

In the New Westminster division, the copper properties on Howe sound, owned by the Britannia Copper Syndicate, have been equipped with a tramway

III., has been unable to find a further ore lens than the one first struck. The Lenora has been the subject of negotiations on the part of the receiver, which are not yet completed. No work has been done at the mine.

A small copper property has been opened up a few miles from Ladysmith, and is now shipping very fair ore. On some four or five properties development has been satisfactory, and it is probable some of them will ship this coming year.

The Camp McKinney mines have stopped for an indefinite period, and at Fairview the Stenwinder mined and milled about 1,200 tons of \$4 to \$5 gold quartz.

At Hedley City, in the Osoyoos division, the Nickel Plate mine having completed its system of tramways and mill, mined and treated about 10,000 tons of ore,



Thistle Gold Mining Co.'s Hydraulic Mine, Eight-Mile Lake, Cariboo.

and accessories, and an extensive concentrating plant, which is now approaching completion, should be ready to operate by the middle of the coming summer.

On the west coast of Vancouver Island there are no new developments to report. The copper properties at Yreka, on Quatsino sound, have lain idle. In the same vicinity several new claims have been developed but are not yet producing; among these is a zinc blende property. At Sidney inlet the Prince group has lain idle. The Indian Chief group shipped a small quantity of ore, but later was also idle.

In the Mount Sicker district, on Vancouver Island, the Tye Copper Co. has had a successful year as far as shipments is concerned, but has experienced a cave in the mine which retarded operations, and has not as yet been successful in the search for ore below the 300-ft. level. The adjoining property, the Richard

yielding values of from \$12 to \$15 a ton, chiefly in gold. Other properties in the vicinity are being developed successfully, and will undoubtedly ship as soon as a railway is built into the district.

At Summit camp—near the summit of the Hope mountains—in the western part of the Similkameen division, development has been carried on on a number of claims, with results which have attracted much attention to the camp. This coming season will probably bring to two or three of these sufficient "ore in sight" to justify some means of transportation being provided.

In the Nicola district continued development is reported as having been carried on on the mineral properties of the Aspen Grove camp, and in the other claims of the district.

The coal fields near Nicola have, this past year,

received a great deal of attention and prospecting, with the result that the field has been found to extend beyond the limits formerly supposed to bound it. As yet the development is superficial, but the quality of the coal is even better than was expected. The following analyses by the Provincial Government Assay Office, from samples brought in by Mr. Alex. Faulds—late manager for Wellington Colliery Co.—from one of the properties examined by him, give an idea of the quality of the coal found:—

the two preceding years. The table shows in the placer gold production for 1904 an increase over the preceding year of \$54,880, while in the production of lode gold there is a decrease of \$223,008. The production of copper shows a small increase, while the lead production has been doubled, thanks to the Dominion government bounty.

Table V. shows the mineral production of the various mining districts into which the province is divided. The West Kootenay district produces a greater amount

NICOLA VALLEY COALS.

Analyses of Coal made for Mr. Alex Faulds.

	Moisture.	Ash.	Fixed Carbon.	Volatile matter.	Coking qualities.
No. 1—From upper bench in tunnel or coal gulch.....	4.5	9.3	55.5	30.7	Coke not very firm.
No. 2—Middle bench in tunnel, 120 ft. in.....	5.38	3.6	61.2	29.82	Firm coke.
No. 3—Bottom bench in tunnel seam in coal gulch.....	4.46	5.9	59.2	29.44	Firm coke.
No. 4—Upper bench from Rat Hole.....	2.99	7.7	63.9	25.41	Firm coke.
No. 5—From bench from Rat Hole, 50 ft. in.....	2.85	12.28	61.06	23.81	Firm coke.

STATISTICAL TABLES OF MINERAL PRODUCTION OF BRITISH COLUMBIA.

THE following is a summary of the contents of those of the statistical tables of the mineral production of the province here reproduced from the Annual Report of the Minister of Mines:

Table I. shows the total value, to the end of 1904, of each mineral product that has been mined in the province. Of these, the total product of our coal mines this year, for the first time in the history of the province, ranks first, amounting to \$68,274,893, closely followed by placer gold at \$66,803,403, while there has been produced of gold from lode mines \$31,451,956.

Comparing the production of the different metals, it is found that the value of the gold produced, from all sources, is greater than that of any other metal or mineral, the combined production of gold, placer and lode, amounting to \$98,255,359. Silver comes next, with a production of \$21,716,870, followed by copper, with \$21,381,791, and lead, with \$12,559,139.

Table II. shows the total production that the mines of the province made during each year from 1890 to 1904, and shows again for 1904 an increase over the preceding years. The production for 1904 had a gross value of \$18,977,359, which amounts to over \$100 per capita for the entire population of the province, and the table shows a steady rise since 1894 from \$4,225,717 to the present figures, a proportionate increase of about 450 per cent in these 10 years.

Table III. presents in graphical form the facts contained in the figures of the preceding table, and also shows by diagram, the production for the past 20 years of the lode and coal mines. It will be noted that the lines representing these outputs are rising steadily and rapidly.

Table IV. gives the amount, in the customary units, and the values of the various mineral products which go to form the total production of the past year, and also, for purposes of comparison, the same data for

than any other, followed, in order of importance, by the Coast, Boundary and East Kootenay districts. It must be noted that in the output of the Coast and East Kootenay districts are included the products of the coal mines within their respective boundaries, and, further, that the Coast district includes the three cities of Victoria, Vancouver and Nanaimo, where the greater part of the building material of mineral origin is used. Of the individual camps, the Boundary has been the greatest producer as to values, and has mined more ore than all the rest of the province combined, its tonnage of ore mined during the past year being more than 800,000 tons.

TABLE I.—TOTAL PRODUCTION FOR ALL YEARS UP TO AND INCLUDING 1904.

Gold, placer	\$ 66,803,403
Gold, lode	31,451,956
Silver	21,716,870
Lead	12,559,139
Copper.....	21,381,791
Coal and coke	68,274,893
Building stone, bricks, etc.	3,900,000
Other metals	113,799
Total	\$226,201,851

TABLE II.—PRODUCTION FOR EACH YEAR FROM 1890 TO 1904 (INCLUSIVE).

1852 to 1889 (inclusive)	\$ 71,981,634
1890	2,668,803
1891	3,521,102
1892	2,978,530
1893	3,588,415
1894	4,225,717
1895	5,643,042
1896	7,507,956
1897	10,455,268
1898	10,906,861
1899	12,393,131
1900	16,344,751
1901	20,036,780
1902	17,486,550
1903	17,495,954
1904	18,977,359
Total	\$226,201,851

TABLE III.—SHOWING MINERAL PRODUCTION.

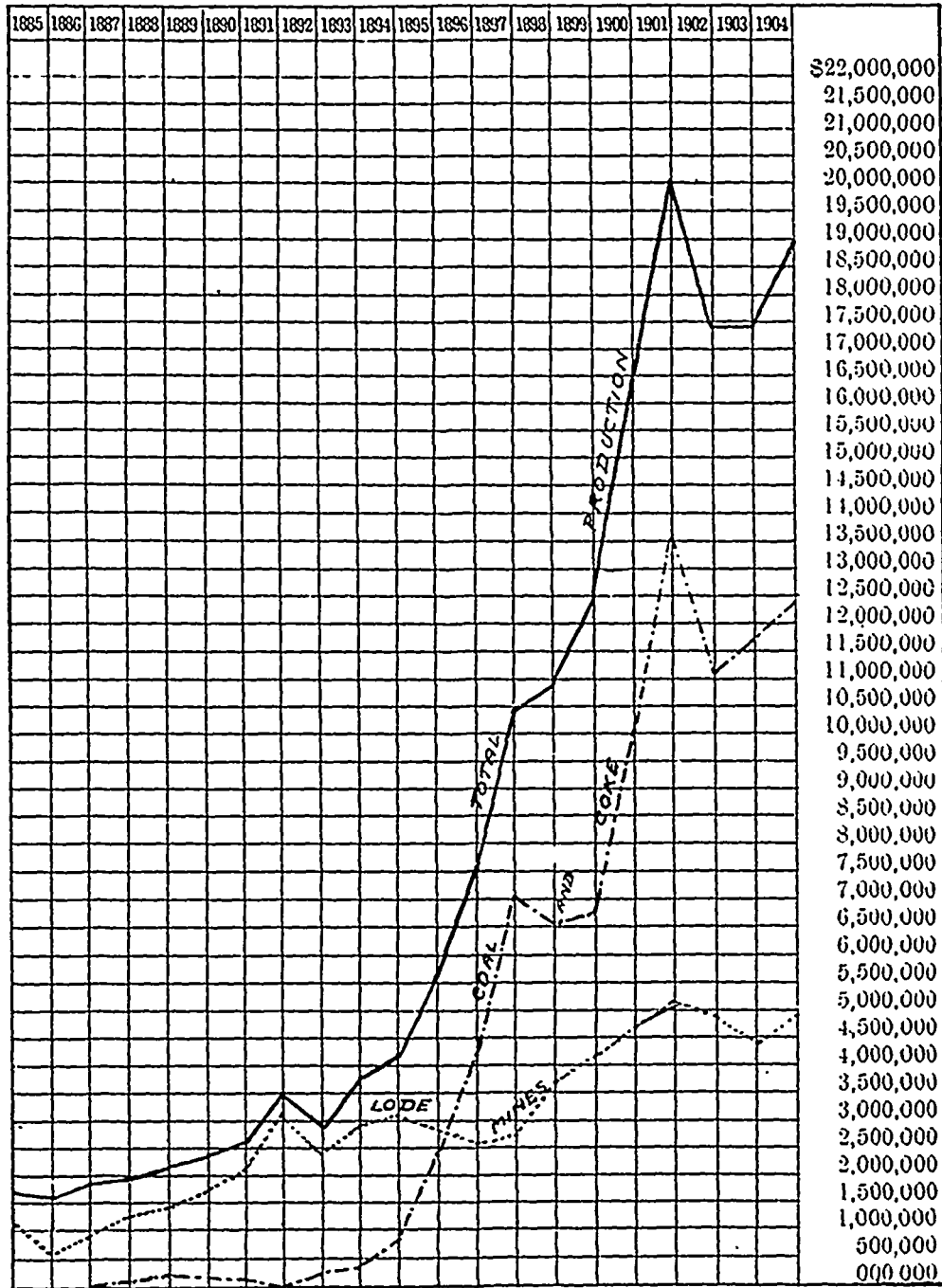


TABLE IV.—AMOUNT AND VALUE OF MINERAL PRODUCTS FOR 1902, 1903 AND 1904.

Customary Measure.	1902.		1903.		1904.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer	Ounces..... 53,957	\$ 1,073,149	53,021	\$ 1,060,429	55,765	\$ 1,115,300
Gold, lode	Ounces..... 236,491	4,888,269	232,831	4,812,616	222,642	4,589,608
Silver	Ounces..... 3,917,917	1,941,328	2,909,204	1,521,472	3,222,481	1,719,516
Copper	Pounds.....29,636,057	3,446,673	34,359,921	4,547,535	35,710,128	4,578,037
Lead	Pounds.....22,536,381	824,832	18,089,283	689,744	36,646,244	1,421,874
Coal	Tons, 2,240 lb. 1,397,394	4,192,182	1,168,194	3,504,582	1,253,628	3,760,884
Coke	Tons, 2,240 lb. 128,015	640,075	165,543	827,715	334,102	1,192,140
Other materials		480,051		531,870		600,000
		\$17,486,550		\$17,495,954		\$18,977,359

TABLE V.—PRODUCTION OF MINERALS BY DISTRICTS AND DIVISIONS.

Name.	—Divisions.—			—Districts.—		
	1902.	1903.	1904.	1902.	1903.	1904.
<i>Cariboo</i>				\$ 540,395	\$ 475,200	\$ 474,600
Cariboo division	\$ 340,395	\$ 314,400	\$ 313,000	.....	.....	.....
Quesnel division	160,000	132,000	150,000	.....	.....	.....
Omineca division	40,000	28,800	11,600	.....	.....	.....
<i>Cassia</i>				420,636	480,363	558,573
<i>Kootenay, East</i>				1,477,466	1,951,128	3,210,573
<i>Kootenay, West</i>				7,800,399	6,603,981	5,806,070
Ainsworth division	272,967	219,818	168,023	.....	.....	.....
Nelson division	818,494	653,457	466,683	.....	.....	.....
Slocan division	1,608,827	1,126,986	1,236,858	.....	.....	.....
Trail creek division	4,938,395	4,308,458	3,700,866	.....	.....	.....
Other parts	167,716	295,262	173,640	.....	.....	.....
<i>Lillooet</i>				31,429	31,283	34,583
<i>Yale</i>				2,843,537	3,714,422	4,190,281
Osoyoos, Grand Forks and Greenwood divisions..	2,782,263	3,654,234	4,110,366	.....	.....	.....
Similkameen division	2,700	2,000	2,500	.....	.....	.....
Yale division	58,574	58,188	77,415	.....	.....	.....
<i>Coast</i> (Nanaimo, Alberni, W. Coast of Vancouver Island, Victoria)				4,360,688	4,239,572	4,702,679
				\$17,486,550	\$17,405,954	\$18,977,359

BUREAU OF MINES.

WORK OF THE YEAR.

THE work of the Bureau of Mines increases year by year, and this growing activity is due to the following causes: The extension of the mining area of the province, with the proportional increase in the number of mines; the increasing desire of the outside public for the free information which the bureau supplies with regard to the various mining districts and camps; and the appreciation by the prospector of the fact that he may obtain, gratis, a determination of any rock or mineral which he may send to the bureau.

The routine work of the office, beginning with the preparation and publication of the report for the year just ended, followed by the examination in the field of as many of the mines and mining districts as the season would permit, together with the work of the laboratory and the instruction of students, fully occupied the staff for the year. The staff of the bureau consists of the provincial mineralogist, the provincial assayer, and a junior assistant in the laboratory, with the temporary assistance of a clerk during the publication of the report. In connection with inquiries for information and the collection of statistics, about 1,700 letters were sent out, with approximately the same number received.

In addition to the work performed in the office, the provincial mineralogist this last year spent 160 days in the field examining various mining districts, taking notes to be later written up for publication, while the provincial assayer was in the field for 40 days, making a special examination, with a view to a report, of the stone quarries of the coast, and examining mining properties in the New Westminster and Yale districts.

ASSAY OFFICE.

The following is a summary of the work of the assay office of the bureau for the year 1904, as reported

by the provincial assayer, Mr. Herbert Carmichael:— During the year 1904, there were made by the staff in the Government Assay Office, 1,099 assays or quantitative determinations, which is an increase of 379 over the number made during the previous year. Of these, a number were for the Bureau of Mines, or for the department, for which no fees were received.

Free Determinations.—In addition to the above quantitative work, a large number of qualitative determinations or tests were made in connection with the identification and classification of rocks or minerals sent to the bureau for a report. Of these no count was kept, nor were fees charged therefor, as it is the established custom of the bureau to examine and test qualitatively without charge samples of mineral sent in from any part of the province, and to give a report on the same. This has been done for the purpose of encouraging the search for new or rare minerals and ores, and to assist prospectors and others in the discovering of new mining districts, by enabling them to have determined, free of cost, the nature and probable value of any rock they may come across. In making these free determinations, the bureau asks that the locality from which the sample was obtained be given by the sender, so that the distribution of mineral over the province may be put on record.

Purchase of Gold Dust by Government.—The provincial government has undertaken to purchase any gold dust which may be presented at the treasury, and to pay therefor within 24 hours, in cash, to the full extent of its assay value, as is done at the United States Mint Assay Office at Seattle and the Dominion Government Assay Office at Vancouver. This enables the miner arriving with gold dust to dispose of it promptly at the highest market price, and as the local banks will always make an advance on a certificate of deposit of dust with the government, he is enabled also to obtain immediately funds sufficient for his wants. In connection with these purchases, the assay office of the

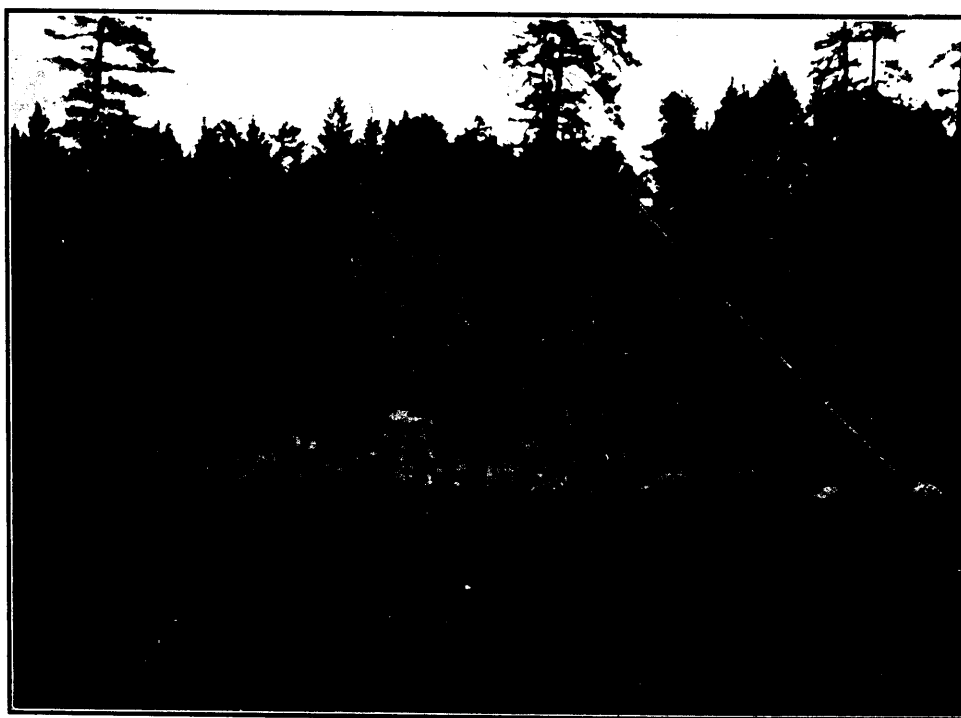
bureau has to melt and assay all lots of gold dust presented. The assaying is done by two assayers working independently, whose results must check, thus preventing error and assuring to the depositor full returns for his dust.

It is interesting to note that advantage is being taken of this provision, and that the number of such depositors is increasing. The number of separate lots of gold dust brought in for melting and assay in 1904 was 171, an increase over last year, having a total value of \$103,693, as against \$152,675 in 1903, indicating that the office is being more used by the small operator or individual miner.

Special Analyses.—In addition to the regular routine of the laboratory, a number of special analyses have been made, and among these may be mentioned a series of analyses of samples of coal taken from the

peated reports of finds of nickel from all parts of the country. Since the nickel of Ontario occurs in a pyrrhotite, many specimens of this mineral in British Columbia have also been suspected of carrying nickel, and have been tested for it by methods bound to give misleading results. For example, when much iron and a supposedly small amount of nickel are present in an ore, a method is adopted of separating the iron by precipitation as a basic acetate. This effects only a partial separation of the iron, some of which goes through the filter into the solution supposed to carry the nickel, and when, to precipitate the nickel, the reagent is added to this solution, a precipitate is produced which is deemed to be nickel, when in reality it is only iron which has escaped the previous imperfect separation.

Or again, in the precipitation of the nickel as a



Georgia Stone Co.'s Quarry, Jack's Point, Nanaimo Harbour.

new shaft being sunk at Cumberland, and samples from the new coal fields being developed in the Nicola valley. The result of these analyses are given in the report. A series of analyses was also made of samples of soil from the alkaline lands occurring in the Okanagan valley, for the purpose of devising some means of rendering them fit for cultivation. This work is being further prosecuted.

There are each year a number of reported finds of rare or unusual minerals from different parts of the province, which, upon being traced up and investigated, are in most instances found to be incorrect. These misleading reports have been traced, in a number of instances, to faulty methods of chemical examination, or to carelessness on the part of the assayer making the investigation.

As an example of this may be mentioned the re-

hydrated oxide, even if other metals have been carefully removed, the use of chemicals rendered impure by the presence of alumina, will result in the precipitation of a hydrate of alumina which may very readily be mistaken for nickel.

Tin, bismuth and tellurium have also been reported where they did not exist; while copper assays, vitiated by the presence of molybdenum, are quite common.

A standard chemical method for the determination and separation of molybdenum is in course of preparation in the laboratory, and it is hoped will be prepared for publication at no distant date.

Instruction of Students.—A course of instruction in assaying and blowpipe mineralogy is given each year in the laboratory to such students as may apply. This past year five students have been taking the course. Several students who in former years have taken the

course are now occupying important positions as assayers at mines and smelters.

The Mineral Museum of the bureau contains a large collection of the ores of the province, which, through additions made to it year by year, is gradually becoming more complete, although as yet the districts of Lillooet, Arrow Lake and Lardeau are poorly represented. These collections have been found of material use to the students mentioned, and to others, who spend much time in studying them.

STONE QUARRIES ON THE COAST.

(Report of H. Carmichael, Provincial Assayer.)

A LONG the coast and the islands of B. C. there is an immense quantity of good building stone, but none of the quarries have been worked to any great extent and all are in an undeveloped condition. This is, of course, due to the fact that a demand for their output in the erection of stone buildings has only recently sprung up. In such quarries as have been opened up, operations have been carried on in a more or less primitive manner, and the work has been done for the most part by hand, the "Knock system" of blasting being employed. This system consists of boring a series of deep holes into which a V-shaped rimmer is driven, the V's all having the same general direction. The holes are loaded with a light charge of powder and fired simultaneously by electricity, thus effecting an even fracture of the rock. With an increased demand for building stone, these methods will, no doubt, be replaced by others, less crude and more economical.

Haddington Island.—Haddington island is situated near the north-eastern coast of Vancouver Island, in Broughton strait, and about four miles east of Alert bay. The island, which is about half a mile long and a similar width, is in the route of the regular coast-wise steamers.

Its geological formation is entirely composed of igneous rock, being an andesite. The highest point of the island is about 300 ft. above sea level. On the north and west sides the slope to the water is gradual, but on the south and east is a little more abrupt, being at an angle of about 30 degrees. The stone is rent almost vertically by cooling fractures, which appear in the main to radiate from a common centre, while here and there the rock is again fissured by cross fractures.

At the south-eastern end of the island two quarries have been opened, only a short distance apart. Work has been commenced at the water's edge, and the quarry face gradually pushed back. In the eastern quarry, from which the larger quantity of stone has been taken, the face is 32 ft. high and 180 ft. long, and 41 ft. back from the water's edge. The main cooling fractures have a dip of 80 degrees, and a strike of N. 60 degrees W., into the hill, and although there are other irregular cooling fractures throughout the rock, large blocks of good building stone are to be obtained. From the smaller or southern quarry, which

was first opened, a considerable quantity of stone has been taken, and the face is now 25 ft. high, with a length of 230 ft., and is 40 ft. back from the water. The stone from both quarries is a light gray andesite, almost white in colour, and contains very little iron. It is of fine grain and compact texture, and being highly silicious, should stand the weather well.

Haddington island stone was exclusively used in the superstructure and carvings of the provincial government buildings at Victoria. Although this stone requires a little more care in dressing than does sandstone, its fine appearance and durability, taken in conjunction with the shipping facilities of a quarry where the rock can be loaded directly into scows, ensures a large market for the product of the Haddington island quarries. Following is an analysis of stone from these quarries:—

Silica	70.5 per cent.
Alumina (with a little iron) . . .	18.7 " "
Lime	2.7 " "
Magnesia	trace.
Alkalies	not determined.
Loss on ignition . . . . .	.8 per cent.

92.7

Beaver Cove.—Beaver Cove is situated on Broughton strait, on the north-eastern coast of Vancouver Island, some five miles south-east of Alert bay. Here, on the north side of Beaver creek and about a mile from salt water, there is a bluff of marble rock, 200 ft. in height, extending for about half a mile up the creek, and from this point some 20 years ago shipments of marble were made, but no regular quarrying has ever been done. Samples of this marble are of a bluish colour, and although the stone is somewhat granulated on the surface, it would possibly assume a more compact texture if quarried below the range of surface influences. This marble bluff is on land owned by Mr. Eustace Smith, of Beaver cove.

Saturna Island.—This quarry is situated on the southern extremity of Saturna island, in the Gulf of Georgia, and is owned by Mr. George Taylor, who resides on the property. The southern end of Saturna island rises abruptly from the sea, and is composed entirely of sandstone, interbedded with conglomerate, the strata dipping northerly into the island at an angle of 20 degrees, with a slight tilt to the east. The quarry is on the water's edge, and there is no regular working face, the stone being taken out along the bedding planes at different levels wherever rock occurs of the particular size and colour desired. The stone is of two colours, buff and blue-gray, the former being uppermost, is of fine grain, and free from "shakes," or any considerable quantity of iron, and should make good durable building material. In calm weather the stone can be loaded directly into scows. Some 30,000 cu. ft. of building stone has up to the present been taken from the quarry, the latest building constructed from Saturna island stone being the Carnegie Public Library at Victoria.

Gabriola Island.—Building stone has for a number

of years been quarried from the north end of Gabriola island. The quarry now being worked is easily accessible from Nanaimo, from which it is distant three miles by water. It is operated by Messrs. Kelly and Murray, of Vancouver. The shipping facilities are excellent, the quarry being on the edge of deep water. The quarry has at different times been worked for a distance of 400 ft. along the water front, the present working face being 75 ft. long, 28 ft. high, and 27 ft. back from the water's edge. An upper layer of sandstone, from 37 to 40 ft. thick, extends the whole length of the quarry, dipping, at the north-eastern end of the workings, 14 degrees to the north-east. This layer of sandstone is underlain by a small stratum of argillite, and this again by smaller seams of sandstone. In the middle and on the western end of the thick sand-

blocks, Vancouver. The quarry equipment consists of three large derricks, a hoisting engine, and a short piece of track by which the stone is conveyed to salt water.

Briggs Portage.—This quarry is situated at Jack's point, in Nanaimo harbour, about two miles from the town of Nanaimo. The work of opening up had been in progress only two months when the quarry was visited, but a face 50 ft. high had been exposed, and a considerable quantity of stone was ready for shipment. The stone is a sandstone, similar to that quarried at Gabriola island, and is dark-gray in colour, weathering to a slightly lighter shade, rather coarse-grained, and containing specks of mica and hornblende. Large blocks of stone are obtainable, for the handling of which an excellent derrick is in position. The quarry



Newcastle Island Sandstone Quarry, Nanaimo Mining Division.

stone seam, quarrying has been suspended, partly on account of hard lumps or nodules which are encountered, and also because of the height of the face above the water. The latter difficulty is overcome at the north-eastern end of the quarry, where the present workings are, by the dip of the sandstone stratum, and although twistings and hard nodules occur there in places, massive blocks of stone are obtained from this part of the quarry. Some two years ago a quantity of stone was taken from a point 200 yd. east of this, where there is a face 180 ft. long, by 40 ft. high, and 40 ft. back from the water, but these workings have been abandoned. The stone at present shipped is of a blue-gray colour, rather coarse, and contains grains of mica and hornblende. The Gabriola island quarries have supplied stone for the construction of the Post Office, Victoria, and the McKinnon and Flack

is on deep water and the loading is done directly on to scows.

Newcastle Island.—This quarry is situated on salt water on the western side of Newcastle island, in the north end of Nanaimo harbour, and is owned by the North-western Construction Co. of San Francisco, of which the representative in British Columbia is Mr. John G. Davis, who resides at the quarry. The stone is a light gray sandstone, and lies in nearly flat strata, with a small dark streak running through it, and is apparently composed of a granitic sand. There is a solid stratum some 16 ft. thick, from which very large blocks can be quarried. The Mint in San Francisco, built in 1870, was constructed from Newcastle island stone, while about 1,000 tons were shipped this year by schooner to that city. This quarry also furnished stone for the construction of the Bank of British North

America and the Bank of Montreal, in Vancouver.

There are a number of places in the neighbourhood of Nanaimo from which stone has been quarried in small quantities, but no regular quarries have been opened up.

Granite Island.—Granite Island lies off the mainland shore of British Columbia, at the mouth of Jervis inlet, 60 miles north of Vancouver. The island is about half a mile long and a quarter of a mile wide, and is composed entirely of massive gray granite. The quarry is at the south end of the island, on deep water, the stone being loaded on vessels from an inclined tramway by which it is brought down from the face. The main working face is from 80 to 100 ft. above the sea, and is 168 ft. long, showing at one point a depth of 26 ft. of solid granite. It has been worked back 47 ft. from the water's edge. Although at this point the cooling fractures are somewhat irregular, they are generally vertical, and very massive blocks can be got out. To the west of the quarry the cooling planes are more regular, and have a general dip of 12 degrees westerly. The quarrying is done entirely by hand. The Granite island quarries are worked by Messrs. Kelly and Murray, of Vancouver.

Nelson Island.—Nelson island, which adjoins Granite island, formerly supplied the demand for granite, but was abandoned a year ago in favour of the latter island, where the quarries are more easily worked. With the exception of the small amount obtained from boulders, all the granite used on the coast of British Columbia has been quarried from these two islands, and shipments are now being made to Seattle.

known to occur on Texada island, fine specimens of black marble having been obtained from the north end of the island. Samples of red marble have also been obtained, which when polished had a very handsome appearance, and a body of this material has lately been located by Mr. Alex. Henderson.

West Coast of Vancouver Island.—Marble has been found at various points on the west coast of Vancouver Island, notably on Barkley sound and at Nootka, the samples from the latter place being very fine. While some of the west coast marbles are nearly white, they are generally of a faint blue-gray colour.

MANUFACTURE OF PORTLAND CEMENT ON VANCOUVER ISLAND.

(By W. F. Robertson, Provincial Mineralogist.)

ONE of the greatest disadvantages the mineral industry of the province has been labouring under is that practically there is little or no home market for, and consequently little or no home manufacture of, products, in a merchantable form, from the minerals (other than coal) of the province. The result has been that in British Columbia there have hitherto entered into the category of "valuable minerals" only such as were rich enough to stand the heavy cost of transportation to eastern markets.

The establishment, therefore, at Tod inlet, near Victoria, of a cement manufacturing plant which will make

a valuable product out of the formerly valueless limestone and clay, of which there is more than a sufficiency, is noted as a matter of more than usual importance to the mineral industry, and as a pioneer enterprise which is sure to bring in its wake similar, if not allied, manufactures. The success of the enterprise is largely assured by the personnel of the company, who are not amateurs in the business, but men who have for years been successfully engaged in the same class of manufacture in Ontario, and who, before embarking on this new enterprise, have brought their Eastern experience to bear on a quiet but thorough investigation of the natural deposits and the facilities, and also of the probable market for the finished product.

The Vancouver Portland Cement Co. is a limited liability company, registered in British Columbia, with a capital of \$500,000. The president of the company is Mr. E. R. Wood, of Toronto, who is also a director of the Grand Trunk Pacific Railway, of the Crow's Nest Pass Coal Co., etc., etc. The managing director is Mr. R. P. Butchart, who formerly acted in the same capacity with the allied cement companies at Shallow lake and Lakefield, in Ontario, and the treasurer is Mr. H. A. Ross. The company has taken an office in the Board of Trade building, Victoria, which will be made the head office of the company.

Location of Works.—The plant is located on the shore of Tod inlet, a branch of Saanich arm, and is distant from Victoria by wagon road about 13 miles, and from Keating, a station on the Victoria & Sidney Railway, about 2½ miles. Transportation of the product will be exclusively by water, the facilities for which are of the best, as the waters of the Saanich arm and of Tod inlet are deep, and navigable by any sea-going vessel, and, being sheltered, admit of scows being used with safety.

The factory buildings are about 100 ft. from the shore of the inlet, into which a pile wharf, about 36 ft. wide, has been built for about 200 ft. This wharf is substantially built, and the end is provided with an adjustable apron to connect with car-transfer barges, from which the railway cars can be run directly into the works to be loaded or unloaded, standard gauge tracks having been laid for this purpose. The level of the wharf is about five ft. lower than the floor of the shipping room, bringing this floor and the car platforms on a level.

Raw Materials.—The raw materials used in the manufacture of the cement are limestone and clay. The limestone forms a ridge running parallel with the water front and about 100 yd. back of the factory buildings. The limestone quarry has been opened up at such a level as to give a slight down-grade track to the factory bins, the bottoms of which are higher than the crushing plant. To reach the quarry, an open cut about 200 ft. long, and some 20 ft. in depth at the deepest point, has been driven through clay which overlies the flank of the limestone, and this clay forms the other ingredient in the manufacture of the cement, so that both the raw materials are found at the proper elevation, within 100 yd. of the bins, and are both delivered over the same tram track. The only prepara-

tion the lime or clay quarries required was the stripping of a few feet of surface soil with its forest growth, so that (as will be seen) the occurrence of the raw material is as nearly as possible ideal.

The lime quarry was being opened up by two men with a steam drill, the steam being supplied from the factory boilers. The face at present is about 40 ft. long and can be extended either way for an indefinite distance, while the height of face can eventually be made about 40 ft. above the track level. The lime rock is a blue-gray crystalline limestone, of which the following is given as a general analysis:—

Carbonate of lime	96 to 99 per cent
Silica	0.3 to 2 per cent
Aluminum and iron .....	.15 to 1 per cent
Magnesia	trace to 0.3 per cent
Sulphuric acid	trace

The clay deposit extends from the lime quarry down to, and covers the site selected for, the works, the supply being practically unlimited. The following is given as the analysis of the clay:—

Silica	60 to 63 per cent
Alumina and iron	25 to 28 per cent
Lime carbonate	3.75 per cent
Magnesia	trace to 2 per cent
Sulphuric acid (about)	0.29 per cent
Alkali	trace to .75 per cent
Moisture and organic matter (about)	5.75 per cent

These materials are used in the proportion approximately of three of clay to one of limestone.

Plant and Process.—The factory buildings are five in number, so grouped together as practically to form one; as in some instances the dividing walls consist of pillars only. The walls of all the buildings are of lime concrete about 15 inches thick, the lime having been burned on the spot in an old lime-kiln built by the former owners. To these walls an outer coating of cement will ultimately be given. The roof trusses are of wood, with iron tension bolts, while the roofs are boards covered with malthoid, a prepared roofing felt. The concrete walls are about 20 ft. high, and in these buildings where the process creates much dust, are surmounted by a wooden framework about eight ft. high, filled in with wooden lattice work between the concrete wall and the wall plate, thus securing ample light and ventilation, the projection of the eaves being sufficient to prevent rain from entering.

The plant has been laid out on what is known as the "level site" principle, as distinguished from the "successive bench" plan; that is, the working floors are all on the same level, for the sake of compactness, the material being elevated by mechanical means between the successive stages. The exception in this case is that the stock-room is at a level 10 ft. lower than the factory floors.

Following the line of the process, the first building is entered from the end, at about the level of the caves by the tram-line from the quarries, which tram-line runs directly over the limestone and clay storage bins. The bins are not much used at present, as the source of supply is so very convenient that the raw material is taken directly from the quarry to the crushing plant. The bins, however, serve for holding a reserve for night work or bad weather.

The preliminary crushing plant consists, for the limestone, of a Gates crusher, the top, or feed end, of which is set just below the floor level of the bins, and which discharges into a "rotary dryer," a hollow wrought-iron cylindrical shell five ft. in diameter and 42 ft. long, set on tires, with a slight inclination down from the feeding end, so that by the revolving of the cylinder, the crushed material travels through the dryer and is automatically discharged. Through the "dryer" is conducted a portion of the hot waste gases from the "rotary kiln" (described later), the amount taken being regulatable by dampers. These gases pass into the lower end of the dryer, meeting the crushed material and drying it, and pass out of the upper end into a separate stack.

The crushed and now thoroughly dried limestone is discharged from the "dryer" into a screw conveyor, which carries it horizontally, underneath the floor level, to the boot of a bucket-elevator, by which it is raised and deposited in the feed bin of a "Krupp ball mill," into which it is automatically fed. This Krupp ball mill is a horizontally-revolving iron shell, about six ft. in diameter and six ft. long, lined with a heavy chilled-iron screen, into which is fed the partially crushed limestone. In the mill there are a number of round steel cannon balls which, as the mill is revolved, roll over and through the crushed limestone, gradually grinding it until it is fine enough to pass through the enclosing screen, which in this case is 100 meshes to the lineal inch, and is then discharged through the end of the cylinder.

From the Krupp mill the now finely ground limestone, practically a dust, is discharged directly into a bucket-elevator, by which it is raised and deposited in the "ground limestone stock-bin," the bottom of which is some eight ft. above the floor level, and which has a storage capacity of about 50 tons of crushed limestone.

The clay is received over the same tramway as is the limestone, being dumped into the bin or fed direct to a "Potts disintegrator," practically a pair of rolls and revolving knife-like teeth, which thoroughly disintegrate the clay. From here it passes into the same "dryer" into which the limestone was fed, and which is used, as required, alternately for limestone or clay. Leaving the "dryer," the clay is found to be so finely divided as not to require to be passed through a Krupp mill, and is elevated directly to the "ground clay stock-bin," a companion bin to that in which the ground limestone was stored, the two being located side by side. At this point the materials, which so far in the process have been treated and handled separately, are mixed.

In front of both the ground limestone and ground clay stock-bins, and set on the general floor level, is an automatic weighing scale, so constructed that it can be set to receive a definite weight of ground material, and by the adjustment of these two scales any desired weight of limestone or clay is weighed off and gradually discharged from both scale hoppers into one horizontally placed screw conveyor, in which the two ingredients are thoroughly mixed and conveyed to an

elevator, and so raised and deposited in an elevated hopper bin, from which by gravity the now mixed materials are fed down into two "tube" mills, in which they are still more fully incorporated and ground.

These tube mills, as the name implies, are iron tubes made of boiler plate, about five ft. in diameter and 22 ft. long, set horizontally on rollers so that they may be revolved at a speed of about 25 revolutions a minute, by power applied through a cogged tire fitted around the tube. This tube is lined with very hard, tough, cut flint stones, imbedded in cement, the lining having a thickness of several inches. Inside the mill, and loose, are a number of larger round flint pebbles, which, as the tube is revolved, roll over and through the ground linerock and clay, fully mixing and more finely grinding them, the now thoroughly ground and mixed material being discharged at the lower end of the tube mills into a common screw conveyor, and so carried to another elevator, by which it is raised and deposited in a hopper bin, located above the end of the "rotary kiln," into which it is fed by gravity.

This kiln is an iron tube seven ft. in diameter and 70 ft. long, lined with firebrick, set nearly horizontal (3-4 to 12 in.) and mounted on rollers, and so arranged that it can be revolved by power. As the cylinder is revolved, the slight inclination given to it gradually carries the material charged in at its upper end to the lower end, where it is finally discharged, dropping through a chute into the boot of an elevator. The interior of the kiln is maintained at a temperature of about 2,700 degrees Fahr. by the combustion of fine, dry coal dust, so fine as to act as a gas, which is fed into the cylinder by a blast of air. The preparation of the dry coal dust will be described later.

The gases from the kiln are led by a flue to a large central stack, large enough and provided with openings for one or two additional kilns, for which latter there is room in the building. A portion of these hot gases, as already mentioned, is conducted through the dryer and provides sufficient heat to dry the material.

The particles of the finely crushed limestone and clay fed into the upper end of the kiln are, in their slow passage through this fiery furnace, cinkered or fused together, forming what is known as "cement clinker," which, when pulverized, is cement. This red-hot clinker discharged from the kiln is raised by an open link-belt bucket-elevator to the level of the walls of the building and shot down a wrought-iron tube to the "rotary cooler," which is a revolving iron cylinder about five ft. in diameter and 50 ft. long, set with a considerable inclination. Through this cylinder a draft of cool air is induced, which so cools the clinker that it comes out of the lower end of the cooler at a temperature sufficiently reduced to permit of its further handling. As the cooled clinker drops from the cooler, any large clinkers are automatically screened out and broken by hand.

At this point about one per cent of gypsum is added, for the purpose, it is said, of making the subsequent cement set a little more slowly. This gypsum is at present imported from the central western States, as

none is as yet being mined in the province.

From the cooler the clinker drops into an elevator and is deposited in an elevated hopper bin, from which it is automatically fed into a "Bonnot" ball mill, five ft. in diameter and eight ft. long, which is, in principle, similar to the Krupp mill already described, where it is partially crushed. From the Bonnot mill the material is conveyed by a screw conveyor to an elevator, the discharge from which is led into a "tube" mill, similar to the two already described, from which it is discharged, crushed, 95 per cent of it, to 100-mesh size, as a finished product, and is finally conveyed by a belt conveyor to the stock room, where it is deposited in bins ready for sacking and subsequent shipment. The sacks each hold 87 1-2 lb., that is, there are four sacks to the "barrel."

Power.—The power-house is a building separate from, but adjoining, the factory, and having cement concrete walls and partitions separating the engine and boiler rooms. Steam is generated in a battery of five tubular boilers, fired partly by wood and partly by slack coal. The engine is a 600-h.p. compound Corliss, made by Goldie & McCullough, of Galt, Ont., and is supplied with condenser, pumps, feed water heater, etc. While at present power is generated by steam, it is the intention of the company to operate eventually by electric power, to which end a water power of 2,000-h.p. has been secured at Sooke—about 10 miles distant—where a generating station will be built and the electricity conveyed across country to the works at Tod inlet.

Coal Grinding Plant.—Adjoining the engine and boiler-house is a separate building, about 50 ft. by 80 ft., in which the fuel for the kiln is prepared. About half of the building is given up to coal stock bins, into which the coal—slack coal or culm—is to be conveyed by a belt conveyor directly from a scow alongside the wharf. From these bins the culm is taken by a link belt elevator to a Bartlett rotary cylindrical dryer—essentially an inclined, revolving, iron cylinder, about five ft. in diameter and 20 ft. long—heated externally underneath by a fire-box using both wood and coal. The slack coal is delivered by the elevator mentioned into the upper end of this cylinder, and in its passage through the heated cylinder is thoroughly dried. The dried culm is then conveyed to a Raymond three-roll mill, a circular iron pan in which, revolving around a central axis, are three rolls—very much on the principle of the Huntingdon mill—which crush the coal until it is fine enough to be carried off by an exhaust draft, and so conveyed to an elevated iron tank in the kiln building, from which it is fed as required into the kiln by a blast of air.

Capacity of Plant.—The plant as at present completed has a capacity of 300 barrels of Portland cement a day, and with the increased machinery, for which accommodation has been provided in the present buildings, this capacity can be doubled at short notice. In April, 1905, the first shipment of the product of the works was made, by the barge *Alexander*.

Quality.—The only tests that the product of the

mill could have been subjected to at this early date are laboratory tests, but such are the tests by which the quality of cements is gauged. It is understood that the Canadian Government standard for neat cement briquettes is that they shall have, after seven days' setting in water, a tensile strength of 450 lb. to the sq. in. section. The product of the Tod inlet works is reported by the company's chemist, Mr. C. F. Heiberg, to have an average tensile strength, after setting for seven days in water at the temperature of the air, of 700 lb. to the sq. in., and even after setting for only two days, to have a tensile strength of 400 lb. A number of briquettes tested on a Fairbanks cement tester in the presence of the writer came fully up to the averages given, while one briquette, which had set for ten days, successfully resisted a tension of 1,000 lb.

COPPER PROPERTY AT EAST SOOKE, VANCOUVER ISLAND.

THE following is from a report by Mr. W. M. Brewer, on a copper property at East Sooke, Vancouver Island, owned by Mr. H. B. Thomson and others, of Victoria:—

Claims.—Area, Location.—The Sooke copper property comprises six full-sized mineral claims and one fraction. These are known as the Golden Thrush, Willow Grouse fraction, Willow Grouse, Blue Bird, Donaldson, Jack and Sydney mineral claims. The total acreage comprised within the boundaries of this group of claims is approximately 300 acres. This group of mineral claims is located on the Sooke peninsula, about 25 miles distant from Victoria by waggon road, and about the same distance by water. The group is admirably situated when the transportation facilities are under consideration, because the main workings are within about 3,000 ft. from a point in Sooke harbour, where vessels can lie at anchor, well sheltered from storms, while receiving or discharging cargoes. The difference in elevation is about 300 ft. between salt water and the point where the chief workings have been carried on at the mine. A gravity tramway, with an easy grade, could be constructed at a low cost, by following the course of a ravine which extends from the present mine workings to salt-water, and at the point where this ravine forms a junction with the shore line, there is a splendid opportunity to construct bunkers and a wharf, so that all the material handled from the mine could be delivered on board a vessel with the least possible manual labour.

Geology.—The Sooke peninsula is made up entirely of igneous rocks belonging to the Vancouver Series, as described by the late Dr. Dawson. Evidently this peninsula was the scene of very heavy volcanic disturbances, which have been followed by the formation of mineral-bearing zones of considerable extent, in which have been deposited bodies of chalcopyrite, pyrrhotite and iron pyrite. All the rocks observed by the writer belong to the hornblende or pyroxene series, and in the areas mentioned are found to occur as masses and crystals disseminated through a highly basic in-

trusive rock, which in several places on the peninsula occupies fissured zones, through which there have been considerable shearing movements subsequent to the eruptive action which produced these fissured zones, as is attested by the numerous slicken-sided cleavage planes, but not sufficient to produce well-defined schistosity. So far as at present known, the most pronounced of these zones occurs in the property described in this report. This is easily traceable for a long distance on the Blue Bird and Willow Grouse mineral claims, where its boundaries on either side are well-defined and persistent, and are found to be composed of a coarsely-grained granitoid rock, which should probably be classified as a syenite.

Characteristics.—At a point close to the No. 1 stake of both the claims mentioned, the first discovery of an outcropping of chalcopyrite was made. This discovery was followed by a serious attempt on the part of the owners to determine the extent and probable permanency of the ore-body. This has determined several important characteristics of the main ore-body. The occurrence of a fissured zone fully 100 ft. in width and of undetermined length has been fully established. Within this zone occur not only several extensive lenses or pockets of high-grade chalcopyrite, but the green basic rock, which is really the matrix of the ore, is found to be thoroughly impregnated with masses and grains of chalcopyrite deposited as sheets and elongated kidneys.

As already stated, the full extent of the zone has not yet been determined, but where the main work has been carried on the width of ore-bearing ground opened up is fully 50 ft. This has been exploited by actual openings for a length of 150 ft., while about 500 ft. in a south-westerly direction down the ravine there is exposed in a shallow open cut the same character of ore-bearing material showing chalcopyrite as impregnations. Northerly from the main workings these surface indications, where such are exposed, show the green basic rock which fills the fissured zone where the ore-body has been opened, as well as the well-defined boundaries on the hanging and foot-wall sides, clearly indicating that the zone maintains continuity in that direction for a considerable distance. The dip of the hanging-wall is almost vertical at the surface, the slight inclination there is being towards the west.

So far as the writer could see, the true foot-wall, while being generally well-defined, has not been exposed in any of the workings, but is situated about 40 ft. easterly from the shaft, which has been sunk at the edge of the ravine. That the lenses of solid ore in this zone possess extent is demonstrated by the fact that the main showing of ore, which carries from 11 to 18 per cent copper, as exposed in a deep open cut and shaft, is upwards of 70 ft. in length, with solid ore still showing at the north end of the cut, and from four ft. in width at that end to about 11 ft. in width at the south end. Surface stripping beyond the deep part of the cut at the north end shows that the lenses occur lying in echelon to the one referred to, and these show an aggregate width of nearly 15 ft.

At the southerly end of the open cut a vertical shaft has been sunk 50 ft. in ore, and a cross-cut tunnel has been driven from the bottom towards the hanging-wall, or western boundary of the ore-bearing zone. At the time of the writer's examination, he was unable to make any inspection of these workings, because they were full of water and he had no facilities at hand to pump it out, but during the progress of sinking the shaft in 1902 he made two visits to the property, and saw that the shaft was being sunk in ore. As the cross-cut through had not been made at that time, he is unable to describe the condition from personal knowledge. On information, and judging from the material on the dump, it would appear that this cross-cut had been driven a portion of the distance through solid ore, and all of the distance where solid ore was not encountered through the green basic rock, which is the matrix of the ore, and a large portion of which carries sufficient ore as impregnations to give it commercial value.

Developments.—The work of development has been confined to the open cut and shaft, with cross-cut from the bottom, together with several shallow prospecting pits and some surface stripping. As a result of the main workings, a dump containing probably 400 tons of chalcopyrite ore has been accumulated, which, judging from the samples taken by the writer at various times, will yield an average value of 10 per cent copper, with low gold values. The length of the deepest part of the open cut is about 70 ft., and surface stripping has been done for a distance of about 50 ft. in addition, thereby exposing ore at the particular point for a distance of 120 ft. Southerly from this cut, shallow pits have been made, exposing ore a further length of probably 30 ft., while another shallow pit, sunk in the ravine about 500 ft. distant from the main workings, also exposes ore.

Conclusions.—After having made a careful examination of this Sooke copper property and also other deposits on the Sooke peninsula, which have been in the past prospected as iron properties, it is the opinion of the writer of this report that the Sooke copper property is a prospect possessing great possibilities, and meriting a most thorough exploitation and development. With regard to the so-called iron-ore deposits, the writer is of the opinion that they have no value when judged on their possibilities for producing iron ore of a commercial grade, but that when considered from the standpoint of their possibilities of developing into copper propositions, on the theory that the so-called iron ore is merely an iron capping covering a deposit of ore (copper ore), the writer is of the opinion that they also merit further and systematic exploitation.

There is every facility for carrying on mining operations on the Sooke copper property as economically as can possibly be done in other sections of the province, when it is considered that this is a sinking proposition, but owing to the possibilities of extent of the mineral-bearing ground, and the character of the rock, it will very probably be shown that the "glory hole" system of mining could be adopted, and a great saving

in cost for the timbering thereby made.

The cost for transportation from the mine to salt water by means of a well constructed tramway should not exceed 10 cents per ton, while the cost for transportation to either of the British Columbia smelters on the east coast of Vancouver Island should not exceed 50 cents per ton.

The following analysis of an average sample from the dump, taken by Mr. D. W. Moore, ore-buyer for the Canadian Smelting Works, Trail, shows that the ore is practically self-fluxing, and, consequently, could be smelted at as low a cost as is possible:—Gold, .03 oz. per ton; silver, trace; copper, 11.1 per cent; iron, 15.7 per cent; silica, 49 per cent; lime, 2.8 per cent; sulphur, 13 per cent.

AINSWORTH, SLOCAN, AND SLOCAN CITY MINING DIVISIONS.

(From Report by the Provincial Mineralogist.)

LAST summer Mr. W. F. Robertson, provincial mineralogist, spent nearly two months visiting mines in the Slocan district. His official report, as published in the Annual Report of the Minister of Mines for 1904, occupies some 50 pages, so is too lengthy for reproduction here. It is comprehensive, taking in all the important mines, of which much valuable information is given. It is the more useful since it includes tables and diagrams, to which are added "flow sheets" of three of the concentrating mills, these last enabling the non-technical reader to obtain a good idea of the "flow" of the ore during the somewhat intricate process of concentration, from the time it enters the mill as crude ore until its final discharge as either concentrate or tailing. This report has the additional and important merit of being the most complete official report on the district the Department of Mines has yet published. Space limitations preclude the reprinting here of any of the descriptions of individual mines or mills, so only the introductory notes to the several mining divisions included in the district are quoted, as under:—

The Slocan district, as the term is used with relation to mining, includes the Ainsworth, Slocan, and Slocan City mining divisions, each of which has its own recording office and mining recorder, while the whole district is under the jurisdiction of Mr. E. E. Chipman, as gold commissioner, with office at Kaslo. The Slocan district is the silver-lead district of British Columbia, and within its boundaries is mined most of the province's output of "silver-lead" ores, and "dry" silver ores, although East Kootenay produces more "lead-silver" ore than does the Slocan.

The area from which the actual production of ore is made is not as great as the geographic boundaries of the district would seem to imply, for most of the mines are towards the heads of the creeks which radiate from the central range of mountains forming the divide between Kootenay lake, Kootenay outlet and Slocan lake, so that a circle 20 miles in diameter

would include most of the silver-lead mines and also most of the "dry" silver ore producers.

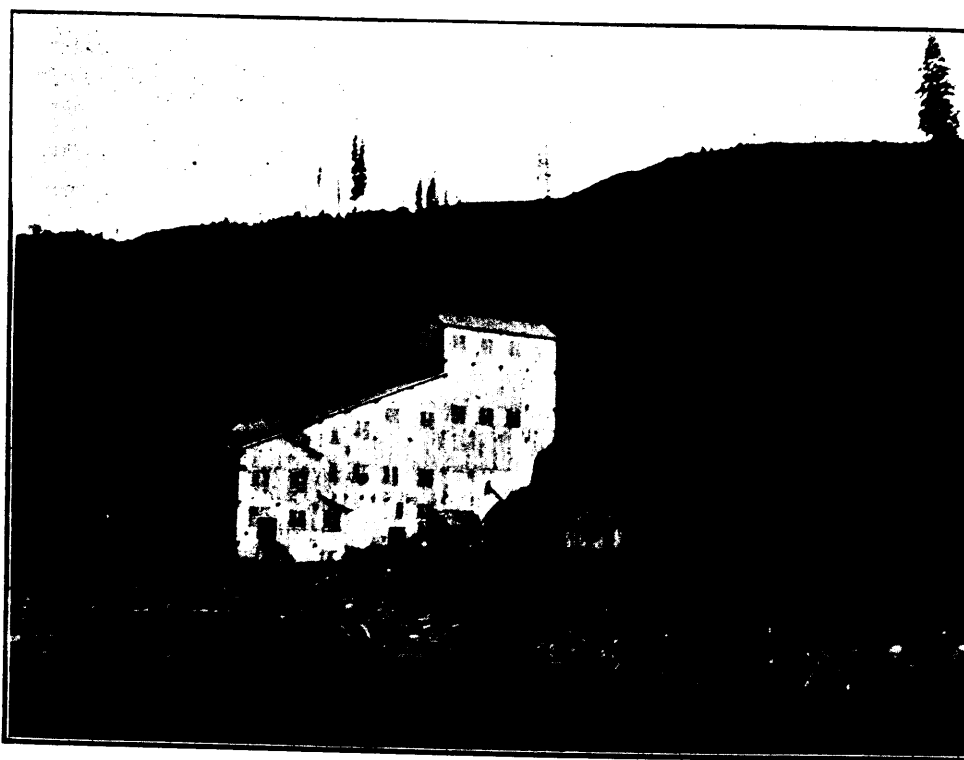
The geological formation of the district, speaking generally, may be said to be a belt of dark slates and allied sedimentaries, flanked and often penetrated by more recent granite upheavals, the whole being cut by numerous dykes of still later origin. The galenas occur in the slates, usually associated with igneous dykes, while the dry ores are in the granites, or in the slates near the granite contacts.

The output of the district this past year will show an increase over the preceding year, but the district has not, as yet, recovered the high standard reached in 1897 and maintained until 1902. The condition of mining in the district is, however, better even than the increased output would imply. Formerly, all visible ore was taken out as quickly as possible, and develop-

because there is no general standard of concentrate produced, and each mine has to seek out its own market, and further, because, speaking generally, the ore is not as yet properly prepared to meet the general requirements of the zinc ore market.

This matter is, however, receiving careful attention, now that the point is recognized, and "zinc enriching" plants for custom ores are under way on both Kootenay and Slocan lakes, while certain individual mines contemplate erecting plants of their own. Formerly, the zinc shipped with the galena, when in excess of about 10 per cent, was a source of "penalty" by the lead smelters, so that any reduction in this penalty, effected by the separation, must be regarded as just so much to be credited against the cost of the separation.

The zinc concentrates will average about 25 oz.



Highland Co.'s Concentrator, Ainsworth.

ment was largely left to take care of itself, to which system the mines lent themselves most readily, as in many cases shipping ore was encountered at "grass roots," and followed down or into the hill. The inevitable day of reckoning came, finding the mines generally short of proper development. This is only now being caught up with, and receiving the attention necessary to keep the camp up to anything like a uniform production.

Only recently has the value of the zinc blende, which accompanies much of the galena, been recognized, and serious attempts made to save it. Most of the mills have, within the past two years, been altered with a view to saving the zinc concentrates, and this is now being done; but the market for such concentrates has not as yet taken a definite standard of price, partly

silver to the ton, and as yet no adequate price has been offered for this silver, as is evidenced by the fact that all the mills throw zinc into their galena up to the penalty limit (10 per cent), for which zinc they get no pay, but they do get a price for its silver contents.

There is as yet no zinc extraction plant in the province, and such sales of ore as have been made have been for delivery in Kansas or in Europe. Ore-buyers for these points have been over-running the district this past year, and, naturally, not offering for the ore any higher prices than they were obliged to, and these have, as a rule, not been acceptable to the mine-owners, who prefer to hold the ore for the present; which policy seems to have been justified, as one of the largest producers, in a letter recently received, reports that he has recently made sales at prices 50

per cent in advance of what he was offered during the past summer for the same ore.

With all the mines at present operating—except the Lucky Jim, of Bear lake—zinc ore is strictly a by-product, although in the Slocan Star the tonnage of zinc concentrates is three times that of the galena produced. Until a satisfactory market is obtained and is on a settled basis, it is impossible to do more than guess what the zinc output of the district will prove to be; for, until lately, zinc has been a thing to be avoided rather than developed.

The bounty on lead mined, given by the Dominion government, though it has not in the Slocan proper increased the output to the extent which was hoped for, has nevertheless been of great assistance to the mines working, and has, moreover, encouraged the accomplishment of an amount of development which would otherwise probably not have been undertaken. And this is, after all, about all that could be expected, for an increase in production is impossible until the development, which fell so far behind during the years of depression, is caught up with, and this will take at least another year to accomplish.

Aside from the general development noted, the most encouraging feature of the mining in the district was the numerous small properties being worked under lease or tribute by individual miners; and while each of these units is small in itself, collectively they are important, and promise in the future to be an important factor in the output of the district, at the same time constituting a form of development bound to lead to new discoveries of ore, either on new properties or on the properties being worked. In this district some 60 mines have reported their output during the past year—a greater number than is found in any other district in the province. In the detailed reports on the different mining divisions of the district will be found descriptions of many of the individual properties.

AINSWORTH MINING DIVISION.

Ainsworth mining division may properly be said to be the starting point of metalliferous mining in the Kootenays, the success of the earlier mines there stimulating prospecting, which extended over the divide into the Slocan and Rossland, and thence to the Boundary district. This expansion, coming so close on the heels of the first discoveries, and being synchronous with the development of the Ainsworth division, the claims of that district in this respect are often overlooked.

The first mine to be worked in the Kootenays was the Blue Bell, situated on the east shore of Kootenay lake, opposite Ainsworth, or the "Hot Springs Camp," as it was called in the early days. In those days silver was worth more than \$1 an oz., and the mine giving great promise, a smelter was erected at Pilot Bay. The Blue Bell contained an abundance of ore, and does yet for that matter, but working of the deposit proved that the ore was of a lower grade than was expected, containing only from 4 to 8 oz. of silver to the ton, and this was followed by a drop of about 50 per cent

in the value of silver, which closed down this property along with many others in this district.

With this the prime importance of the camp became overshadowed by the Slocan, where ore bodies rich in silver were found almost at "grass roots," so that mining in Ainsworth languished until, in 1902, less than 5,000 tons of ore were mined, having a gross value of about \$273,000, or nearly \$55 a ton.

This was the lowest ebb in mining, as far as tonnage was concerned, for about that time concentrators came into use, rendering possible the working of low-grade deposits, and in 1903 the tonnage of the district rose to nearly 25,000 tons, having a value of \$220,000, or about \$9 a ton. This tonnage was produced from nine mines, of which, however, only two produced over 100 tons during the year.

The Dominion government bounty on lead mined has had a stimulating effect on the mines of the district, and a number of properties have, during the past two years, been developed to an extent which, although it has not as yet increased the tonnage of the district, promises to do so within the coming year.

SLOCAN MINING DIVISION.

The recording office of the Slocan mining division is at New Denver, on Slocan lake. The division comprises the drainage area of all streams flowing into Slocan lake above a point half-way between Eight and Ten-Mile creeks, on the east shore of the lake, and above a point one-half mile north of Indian creek, on the west shore of the lake.

Of this area the watershed to the west of Slocan lake, which is chiefly granite and allied rocks, does not appear to have produced any productive mines, although the superficial geology is very similar to areas on the eastern side of the lake, which have well repaid prospecting, but it must be admitted that in the latter case the mineralisation has been found nearer the contact with the Slocan slates and shales.

On the slope of the hills to the east and draining westward into Slocan lake, there has been a great deal of mining going on for years, in the vicinity of Silverton, of New Denver, and on Carpenter creek and its tributaries, which latter includes the vicinity of Three Forks, Sandon and Cody, the most productive portion of the famous Slocan district, wherein were discovered in the early nineties the wonderfully rich silver-lead deposits, which "paid from grass-roots," and brought British Columbia, as a "Mineral Province," so strongly before the notice of the world.

Of the famous early producers a number are still being successfully worked—as the Slocan Star, the Reco, the Ivanhoe, etc., with every indication of continuing to produce for some time to come, but others, after all the visible rich ores, which were found near the surface, had been "guttled out" to pay dividends, without the development necessary to permanent mining being kept up, have collapsed, their ownership has changed, and many have lain idle for the past two or three years, while little or no systematic attempt has been made to prove by development whether they are

dead or only dormant. They are simply held, under crown grants, idle.

Relief from this condition, however, appears to be at hand, in the system of leasing, which is just beginning to come into vogue in the district. The local business men, or miners who had worked in the various properties and had faith in them from knowledge so obtained, have, in several instances, secured leases to work the properties on "tribute" and under bond, which has been in some instances done successfully, revealing other ore-bodies. These discoveries will probably lead to the further development of the properties, which, as they now stand, may be said to have reverted to the rank of prospects.

As to the geological features of the division, the shore of Slocan lake is chiefly granite, while to the east lie the Slocan slates, the contact being not far distant from the lake. Inland, the granites constantly crop out through the slates in knobs and mountain peaks, the whole being cut by igneous dykes, sometimes of great size, suggesting the thought that the slates had been "floated up" in an immense igneous upburst, and, while in evidence on the surface, and often for considerable depth, they may still be underlain by a general granite mass.

It seems permissible here to make passing mention of Slocan lake, for of the many beautiful lakes in British Columbia which it has been the writer's good fortune to see, Slocan lake is certainly the most beautiful. The lake is 25 miles long, and 2 or 3 miles wide, flanked on the west by a rugged range of grand granite peaks, timber-clad on the lower portions, but bare and broken towards the summits, where lie glaciers, which, seen of a summer evening, glistening and flashing in the setting sun, form a picture not easily forgotten. On the eastern side of the lake the hills slope more gradually and are rounded, while along their foothills is some very good agricultural land.

The towns of Silverton and New Denver are on the eastern side of the lake, and for situation have few rivals in America, and aside from any future they may have from mining in the vicinity, seem destined to become summer resorts for those tourists who are not rushing through the country by the fastest trains, but who have time to take a breath of the mountain air here found in perfection.

SLOCAN CITY MINING DIVISION.

The ores of the Slocan City mining division are chiefly dry ores—that is, they are smelting ores, containing but an unimportant percentage of lead, the values being in silver and gold; and as such ores are almost necessary to the lead smelters for the economic handling of the galena ores of the Slocan and of East Kootenay, which are chiefly lead concentrates, they command the most favourable smelting rates. The success of the district from an economic point of view is, therefore, of more than local importance, and is consequently watched with more than usual interest. The surface geology of the district may be said to be a series of repeated contacts of the granites with sedimentary rocks, which to the north form the Slocan shales, etc., and which there carry the argentiferous

galenas of that section. These dry ores are not by any means so "showy" as the glittering galena of the adjoining district, their values being determinable only by assay, and they failed to strike the eye of the old-time prospectors, who, many of them, looked upon assays as more or less "expensive luxuries," with the result that these less brilliant ores were in many cases passed by, and the possibilities of the district have not yet been developed.

From a general survey of the camp and an inspection of most of the working properties, the opinion was formed that the district would prove to be one of small, high-grade properties, calling for careful and skilful individual work, both in the mining and follow-up of the ore-bodies, which class of mining is particularly suited to the "tribute" or leasing system of working, since, by this system, the success of the miner is dependent on his personal care and watchfulness of minute details and indications, which are liable to be overlooked by one not at all times actually in contact with the work. It seems, therefore, that the successful development of this district will be achieved by a large number of small producers, rather than by company management on a large scale.

That there are, and will continue to be, exceptions to this rule, is unquestioned. The Kilo group, for example, demands a stamp mill for its economic development and working, and such is likely to be erected only by a company; but even here it is a question whether a properly run custom stamp-mill would not be of greater benefit to the camp than a mill owned and operated by any one mine.

Under the limitations stated, the demand from the smelters for "dry ores," together with reasonably good transportation facilities, makes the outlook for this camp as bright as for any in British Columbia. The tributor and leaser are only beginning to operate to any extent in the province, and their advent is regarded with much interest, as this class of work is the best school for independent, careful miners, who depend, not on day's pay, but upon the output of ore they make; and as their success means the success of the camp, there are no conflicting interests.

PRESENT CONDITIONS AT THE MINES IN SLOCAN CITY MINING DIVISION.

(By W. D. McGregor, M.E.)

HAVING recently re-visited the Slocan lake "dry ore belt," and knowing the district intimately, a few notes on the present situation there may be of interest, perhaps of value, to many readers of the MINING RECORD.

The granite country lying north-east of the south end of Slocan lake and comprised in the Slocan City mining division has for years been known as a producer of exceptionally high-grade silver and gold-bearing ores; also, alas, as a happy hunting ground for unscrupulous or ignorant promoters, who, assisted by inefficient management of the mines, have certainly succeeded in bringing to the verge of wreck what

should be one of the best mining camps in the province. Business in the Siocan lake towns is dull and the exodus of all classes of people considerable, hope deferred, together with bright reports from other fields, being responsible for the latter. I confess that, as one friend after another met me with a complaint against present conditions, I began to share the general feeling of discouragement, and it was not until after I had pretty well made the round of the camp I decided that, so far from the bottom having fallen out of everything, the past season's work had been on the whole decidedly satisfactory.

Above the lake port of Silverton, seven properties, chiefly in the hands of lessees, are producing ore in merchantable quantity.

On Ten-mile creek, the lessee of the Enterprise, Mr. W. E. Koch, who during the past two years has extracted some 1,700 tons of high-grade ore from the upper levels of this once-said-to-be-worked-out vein, has withdrawn his working force, pending, it is understood, making new arrangements, with the owners in regard to deep-level exploration. The adjoining property, the Neepawa, also in the hands of lessees, would seem likely to take the place of the Enterprise as a comparatively heavy shipper, its output for the last two months having run to nearly one car per week. The lease of this property running out on May 1, the owners, I am informed, have determined to work the mine under their own management. The ore as now being shipped, roughly hand-sorted, returns about \$1,500 per car of 20 tons. Opposite the Neepawa, Mr. J. Griffith is opening, on the Westmount, by a series of adit tunnels, what may be the same vein, the winze below No. 2 showing ore of a similar class and quality.

On Twelve-mile creek the winter's work on the Colorado showed the ore in the discovery tunnel to have been persistent for about 100 ft. and the owners, satisfied that they have a shoot of value, are driving a cross-cut at a lower level in order to get stoping ground above them. About half-a-mile north on the same vein, Messrs. Benson and Hinchcliff are preparing to break down and ship a car or more of ore exposed in their work on the Hidden Treasure group.

On Springer creek the Arlington people seem to be in the same condition of uncertainty as during the past three years. The buildings and plant generally, are kept in excellent repair and some of the main levels are being retimbered. As it is estimated that there are more than 30,000 tons of low-grade ore on the dump and in the old workings, left after sorting out between 6,000 and 7,000 tons of shipping grade, which yielded roughly 500,000 ounces of silver, it will be realised that this both was, and is likely to again be, a factor in the camp. The Ottawa, situated some two miles west, and in another of the big north and south fractured belts in this particular ridge of granite, is now, of course, the banner producer in the camp. Its bunkers are choked with ore, awaiting shipment. The spring break-up of the road has been abnormally long this year, owing to the early advent of spring—by March 1st—on the lower reaches. This mine, which experienced the customary series of mishaps in its early stages, has proved to be

working on twin or parallel veins, in each of which valuable ore bodies have been discovered. It is opened by a series of adit tunnels, Nos. 2, 4 and 6, about 200 ft. apart, and having cross-cuts to one or both of the veins. On the west vein rich ore was taken from near the surface, a short shoot being also cut in No. 4, while the drift from No. 6 has yielded equally good ore for the last 90 ft. On the east vein the big ore shoot was a few feet long in No. 2, about 90 ft. in No. 3, and in No. 4 it reached to nearly 300 ft. No. 6, 200 ft. below, is still 130 ft. from a point under the ore in No. 4, but there is ore in streaks and bunches all through the vein. Last year's shipments, all from above No. 4, are given at 1,330 tons; smelter returns approximately \$120,000, and expenses \$50,000. Plans for future development are not yet definitely decided upon; much depends on the showing of the big shoot on No. 6. Up to the present no large quantity of second class ore has been developed, but considering the showing in the lower tunnel on both veins it will not be long before the manager, Mr. McPhee, may be expected to take a hand in solving the question of profit-making out of the low-grade ores, although this mine is now, and promises to continue to be, a great money-maker out of its rich ore.

The Pioneer Mining Co., working the old Black Prince property, under Mr. J. W. Moffat, has blocked out some 1,200 tons, besides shipping between 200 and 300 tons during the short season their sleigh road was available. The ore runs low in comparison with that of the Ottawa—say 60 oz. silver per ton, so transportation by pack trail is out of the question, the three miles of packing at present required eating up most of what would otherwise be profit.

Over the divide to the south, on the head waters of the north fork of Lemon creek, there is a group of gold-bearing prospects more or less developed and waiting the advent of a custom mill. Some of these have paid part of the expense of their development by shipping the richest of the ore encountered, but the method is slow and extremely expensive. Probably the installation of a properly equipped mill on the Kilo will be proceeded with this summer, and, if prepared to treat custom ores, this should prove of much assistance to many of the neighbouring properties. The Kilo has been shipping sorted ore running over four ounces in gold all through the winter. Its vein is explored by a series of tunnels, about 1,200 ft. in all, showing white quartz from 18 in. to four ft. wide, a large proportion of which the manager, Mr. N. F. McNaught, is satisfied will yield profitable mill returns.

Near the north end of the gold belt, on Robinson creek, development has also been done. The owners of the Northern Light are planning for a year's work on their property, smelter returns having proved satisfactory, while the owners of the Club, having had returns of \$10 gold and 50 oz. silver from their trial shipment, should manage to proceed with systematic development. It would seem that these properties will eventually be milling propositions, and most promising ones, too.

NEW SURFACE WORKS AT C.N.P. COAL CO.'S COAL CREEK COLLIERY.

MENTION was made in last month's *MINING RECORD* of the characteristic energy displayed by the Crow's Nest Pass Coal Co. in making arrangements to replace the trestle and tipples destroyed by fire at its Coal creek colliery, near Fernie, East Kootenay, on March 11, last. The destroyed structures were temporarily replaced in wood, and now the work of constructing a permanent steel trestle across the valley, and equipping same with modern tipple and coal-handling appliances, is well in hand.

ers on the two loaded tracks, the locomotives returning by the motor track and crossing over back of the trips to the empty track where they pick up their trip of empties.

Trips are brought out from No. 2 mine to the south approach, on which there are two empty and two loaded tracks, by tail rope haulage, and from No. 3 mine to the south approach by inclined plane passing underneath the trestle and back switching on to the main tracks, in both cases the trips being delivered to the auxiliary feeders. There are two ropes leading from No. 2 mine, each rope bringing out loaded trips and taking back empty trips, these empty trips being pushed into



Smith Gravity Hydraulic Box Car Loader. The Crow's Nest Pass Coal Co., after having used one of these Car Loaders at its Carbonado Colliery for two years, is about to install two at its Coal Creek Colliery.

Present provision is for an output capacity of about 4,000 tons daily, but the structure is designed for an eventual extension to 8,000 tons per day. The following description has, at the request of the *MINING RECORD*, been courteously supplied:

The permanent steel structure is to supply Nos. 1, 5 and 9 mines, on the north side of Coal creek, and Nos. 2 and 3, on the south side. As projected this structure will be approximately, 900 ft. long, and located about 150 ft. above the site of the old tipples. The general arrangements of the tipple and the method of handling coal are as follows:

Trips are brought out from Nos. 1, 5 and 9 mines to the north approach—on which there are two loaded, one motor and one empty track—by electric locomotives, which deliver them directly to the auxiliary feed-

position for attaching rope by empty trip feeder. No. 3 mine is served by a single rope, the loaded trips back switched onto one of the loaded tracks and the rope attached to a trip of empties.

There is a system of three trip feeders for serving each of the dumps, two for pulling the trips up until front end is engaged by the third feeder which delivers the cars directly to the dumps. This system applies to both the north and south ends of tipple, except that at the south end the auxiliary feeders are placed beyond the curve, so as to receive the front end of the trips as they are landed and push them around the curve until they are engaged by the third feeder.

After passing the dumps the cars run to kickbacks and return by gravity to the tripmakers, which elevate them to tipple floor level and make them into trips

ready for being returned to mines.

The cars are dumped two at a time by means of rotary dumps; the coal dropping into hoppers from which it is passed by feed conveyors to shaking screens. The coal which passes through the screens falls into a hopper, from which it is taken by a belt conveyor and delivered into a hopper over the railroad cars on slack track; the coarse coal which passes over the screens, which are also provided with veils for producing run-of-mine, is fed to the picking tables, which extend out from the tippie parallel to the railroad tracks; the discharge ends of picking tables are hinged so that they can be lowered approximately to bottom of railroad cars, which allows the coal to be loaded with the least possible amount of breakage.

For taking care of the refuse a belt conveyor running parallel to and between the picking tables is provided. This conveyor discharges into a belt conveyor, which carries the refuse up an incline and discharges it into a refuse bin. This bin also serves as a rock bin, the rock cars being pushed by hand into and out of rotary dump on tippie floor and the rock passed to bin by inclined chute; the rock is drawn from bin through gates into small cars at grade level.

Beneath the tippie fine coal will be loaded into open top hopper cars. The screened coal will be loaded into open top cars or into box cars as the case may be. For the purpose of facilitating the speed of loading the latter class of car two Smith gravity box car loaders will be installed. The total amount of trackage for handling loads will require six tracks running under the tippie.

The machinery and equipments for the tippie will contain many features that have never before been brought into use in Canada, in particular the trip-makers mentioned above.

It is calculated that the structure with this equipment, when installed and ready for operation, will have cost about two hundred thousand dollars (\$200,000). The contract has been placed with the firm of Heyl & Patterson, Incorporated, contracting engineers, Pittsburg, Pa., who are under bond to have the plant in running order by July 15, next.

THE BRITANNIA MINE.

(Notes by W. F. Robertson, Provincial Mineralogist.)

THE immense deposit of copper-bearing schists constituting the Britannia mine, on Howe sound, has been known, and its extent well authenticated, for several years, and a very full description of the property and its exposures of ore was given in the Report of the Bureau of Mines for 1900. While the importance of the deposit has for some time been fully realised, the scale upon which it must necessarily be worked to secure the best economic results was so large, and demanded the outlay of such a large amount of capital, that only within the last year have operations leading to the actual exploration of the property been begun.

The property is held now as in 1900 by the Britannia Copper Syndicate, Ltd. The name of the company remains the same, although the personnel has changed largely, owing to transfers of interests to capitalists already interested in copper mining in Montana and elsewhere, whereby working capital was secured.

The officers of the company are: President, Hon. Edgar Dewdney; secretary, Mr. J. W. Lee; managing director, Mr. Geo. H. Robinson; and engineer, Mr. C. W. McMicking.

The provincial mineralogist visited the property on November 1, 1904, and found in process of construction what promises to be one of the largest concentrating plants in British Columbia, the completion of which must have a powerful influence upon the mining development of this section of the province. At the mine it was found that very little development of the ore-bodies had been made since the property was previously reported on, which fact must not be taken to imply that this important matter has been neglected, but rather that the development of 1900 was so satisfactory as to justify, without further work, the present large expenditure being made for plant.

The Britannia group is situated at an elevation of about 3,500 ft. above and 3.8 miles from deep salt-water, on the eastern shore of Howe sound, and is about 28 miles distant to the north from the city of Vancouver. The present examination was confined to the actual underground workings. These are sufficient to satisfy anyone that there is here an immense zone in the schists which has been impregnated with an appreciable amount of copper, constituting an exceedingly large, low-grade concentrating proposition of very great importance, and requiring an extensive plant and a large amount of capital.

Seven claims, the Fairview, Edith fraction, Jane, Clifton, Heather fraction, William and Mineral Creek, containing 297.04 acres and covering over 8,500 ft. of the lode, on its strike, are included in the Britannia group. The Britannia claims are traversed by a lode, or zone, of schistose silicious ore, 300 to 600 ft. wide, impregnated with copper and iron pyrites and enclosed by a green, porphyritic rock on the south, and black slate on the north, the general strike being north-west and south-east, with dip to the south. Locally, this feature is known as the "Britannia mineral zone," and has been definitely traced for several miles in either direction from the Britannia group, which appears to occupy the central position.

The ore exposures are all located in the bluffs which surround a basin at the head of Jane creek, and as already noted, little further development has been done on these since 1900. The Jane tunnel has been run to a total distance of 360 ft., and the cross-cut therefrom has been extended further, developing the ore already noted. With a view to the active exploitation and treatment of the ore, construction work was proceeding energetically. Elevated trestles were being built connecting both the Jane tunnel and the Big Bluff workings with a central receiving bin situated at the upper terminal of the aerial tramway.

Trestles.—The Jane trestle will be about 600 ft. long, with a down grade to the receiving bin of $8\frac{1}{2}$ per cent, whereas that from the Big Bluff will be about 640 ft. long, with only a slight down grade to the bin. On each of these trestles one or more 10-ton self-dumping cars, operated by wire-rope haulage from an engine, will convey the ore to the central point. Here, it is understood, it is proposed to install Blake crushers, crushing the ore to say 2 or 3-in. cubes, whence it will pass on to a sorting belt. On this belt the first-class shipping ore and also the waste rock will be picked off, the former going to a special bin and the latter to the waste dump, while the bulk of the ore will be delivered to the receiving bin for transmission by the tramway to the concentrating plant. This receiving bin was nearly completed, and was 60 ft. long by 17 ft. wide by 20 ft. high, built of logs, and has a capacity of about 1,000 tons of crushed ore.

A compressor plant will be installed at the mine, driven by electricity generated at the beach, and transmitted by the three-wire system over a pole line which follows the tram line.

The Tram Line.—The aerial tramway will be 16,800 ft. long, in two sections, with an intermediate dumping and re-loading or transfer station, at a point where an angle in the line was unavoidable. The upper section will be 5,800 ft. long, in which distance it will drop 1,400 ft., while the lower section will be 11,000 ft. long, with a drop of 1,800 ft. All the supports for the cables were in place, and the terminals were approaching completion. The pole line was nearly finished, the copper wire being on the ground ready to be strung.

At the Beach.—A substantial dock has been built, and a commodious office and quarters for the officers of the company erected, together with a store, hotel, and several private houses. The concentrating plant was under construction, but was not sufficiently advanced for the reception or erection of the machinery. The concentrator building is a large rectangular building—built upon piles at the water's edge—and having two floors, the lower of which will be largely occupied by bins, while the upper will be provided with an extensive equipment of reciprocating tables and slimers. Excavations were being made on a bench about 100 yd. from the concentrator, and 100 ft. above the sea level, for the crushing plant, which will be capable of crushing 500 tons of ore a day to a fineness of about 40 mesh, the crushed material being conveyed in launders to the concentrator for the separation of the mineral.

The mining and transporting of the ore are straightforward propositions, for which perfectly definite plans can be made, but, from the nature of the ore, or rather from its mode of occurrence, the methods of crushing and of concentration must be, to a certain extent, developed by experiment; and as the plant has not as yet been installed, it is thought best not to enter into a description of plans which may be materially modified, further than to say that the crushing plant will consist of Blake crushers and rolls, to be followed, for finer crushing, by Huntington and Chilian mills. The concentrating ore, after the shipping ore has been

sorted out, will probably not run over three per cent of copper, contained as chalcopyrite in the quartzose schist. This should produce a concentrate ranging about 15 per cent copper, which will require to be smelted, and which will, for the present at least, be shipped to some of the coast custom smelters for treatment.

Power.—Water for power is to be taken from the creek, the intake being 1,900 ft. above the beach, at which point the water-wheels will be situated. The intake dam has been constructed and the grading done for a line of pipe, the upper portion of wood and the lower of steel, which will convey the water to the power plant. The distribution of power will be by rope transmission to the nearer points, and to the mine and points more removed, by electricity.

SOUTH FORK OF KASLO CREEK, AINSWORTH MINING DIVISION.

THE following information concerning the leading mining properties on the south fork of Kaslo creek is contained in the special report of the provincial mineralogist included in the Report of the Minister of Mines for 1904. It may be premised that the concentrator for the Silver Star Mining Co.'s Cork mine has lately been given a trial run. The particulars of the south fork properties are as under:—

The south fork enters Kaslo creek from the southwest about six miles from Kootenay lake, at Kaslo, that is, at Six-Mile station on the Kaslo and Slocan Railway, from which point a fairly good wagon road has been built up the south fork about six miles. On this creek a great deal of prospecting has been done, and a number of very promising properties located, several of which have previously been reported upon by the writer.

Of these older mines the Montezuma was probably the best known, but it has been shut down since 1900, as the amount of zinc present in the ore rendered it unprofitable. While until quite recently there had been no market for zinc ore, the increasing inquiries for this product, with the material advance in the price offered for it by the buyers, have again aroused interest in this property, and development work has been resumed and it is hoped that the Montezuma will become once more a shipping mine.

The Silver Bell property has already been described in these reports, and some small shipments of exceedingly good ore have been made, but no active work was in progress in 1904.

Of the Joker Group and Gibson and Palouse claims, formerly described, and situated at the very head of the creek, little could be learned, but no active development was in progress on either, and they were not visited.

Bismark.—The Bismark is situated on the south side of the valley of the south fork, on Briggs creek, about 12 miles from Kaslo, and lies above the Black Fox claim, further up the hill, and at an altitude of about 6,500 ft. It is owned by a local syndicate, composed of Messrs. N. F. Mackay, C. N. McAnn, C. Hanson

and J. B. Gerrard. The property is opened up by three tunnels, the lowest of which, at an altitude of 6,300 ft., has been run in for about 480 ft. on a fairly well-defined lead, somewhat crushed, but apparently continuous. No. 2 tunnel, which is about 240 ft. higher up, is not connected with the lower tunnel, and is in some 170 ft., with, at 30 ft. from the face, a raise extending 112 ft. up to the upper level, which has been run in some 290 ft.

The ore is essentially oxides of iron, with lead carbonates and galena, in a quartz matrix, which, as shipped, will assay about 6 to 10 per cent lead and 130 oz. in silver a ton. The occurrences of ore in the vein are somewhat irregular in size, and while the property does not give promise of any large tonnage, the indications are good for continued shipments on a small scale of such ore as mentioned, which, for its gangue, should command low treatment rates. The shipments during 1904 will amount to about 100 tons of ore, mined by two or three men. The country rocks in the vicinity are shales and sandstones, with limestone, cut by numerous dykes.

No. 2 tunnel seemed the most promising, chutes of ore showing near the mouth of the tunnel, near the first cross-cut to the left, and again in this cross-cut is a second small chute parallel with that in the level. Near the face in the main tunnel is a chute of ore, while another crosses the tunnel here, and has been followed by drifts to both right and left. The country rock at this point appears to be twisted and faulted, producing fissures, in which the mineral was deposited.

A short distance below the last-mentioned property and lying to the north-east, there is a string of adjoining claims, through which what appear to be the same veins cut, and which have been developed at several points. These claims are the Black Fox, Daisy, Dublin, Cork and Province. The main lead is a large interbedded quartz vein, having a strike about N. 50 degrees E., and is on the average about 8 ft. wide, although the width varies, sometimes swelling out to large dimensions.

Parallel with the main vein are four or five others which, as far as known, are of secondary importance, although they may, of course, upon development, prove to be valuable. Scattered through this quartz are a few bunches of galena which might be sorted out for shipment, but the greater amount of the mineral is so disseminated through the quartz as to require concentration. Fairly clean samples of galena were found to run from 60 to 80 oz. of silver to the ton, with gold to the extent of from \$4 to \$6 a ton.

On the Daisy claim, owned by the Black Fox Mining Co., some 1,000 lin. ft. of development work has been done, disclosing some small bodies of clean ore and large bodies of concentrating ore, which, however, are not continuously connected. The property has lain idle for several years.

Cork.—The Cork and two or three adjoining claims have been acquired by the Silver Star Mining Co., a French company of which Mr. P. Maris is the local representative, with office at Kaslo. This company has done extensive development work on its property,

and has developed a large chute of concentrating ore, the limits of which have not been defined; but work sufficient has been done to show it to be of such a size as to justify the erection of a concentrator for its treatment. The rock formation of the vicinity is the same as that of the district generally—shales, schists and lime cut by numerous dykes—which in the vicinity of the ore deposits seem to be close-grained, light-coloured and highly silicious, and which seem from their association to have had some direct relation to the mineralisation.

No. 1 tunnel is in about 116 ft., and cross-cuts, near its portal, an ore chute carrying galena and zinc, with some arsenical pyrites carrying gold, which chute, as the tunnel advanced, seemed to dip under at an angle of about 50 degrees, and the inner part of the tunnel is barren. A winze from the tunnel, when sunk 10 ft., recovered the ore chute, and was sunk in it for about 54 ft., or to the level of No. 2 tunnel. No. 2 tunnel was a barren cross-cut for about 118 ft., or until it struck the ore chute from the upper tunnel, on which drifting to the right and left had been done for some distance in ore of a concentrating grade.

Satisfied with the development at this level, the company started a long cross-cut tunnel from a point as low on the hillside as was consistent with leaving height sufficient for the installation of the proposed concentrator. This cross-cut tunnel is at a level about 250 ft. lower than the No. 2 tunnel, and had been driven in 925 ft., cutting the ledge and ore chute, on which drifts had been set off, to the west for 213 ft., and to the east for 250 ft., from each of which drifts a raise had been started up, and had progressed in July about 50 ft., while, from later reports, one of these raises has since been connected with the upper workings. The dip of the ore chute here is greater than above, being about 70 degrees.

In the driving of this lower tunnel a vein was cut through some distance to the north of the main lead, and this is supposed to be the Black Fox vein, and on it a drift has been run, to the west for 17 ft., and to the east for 36 ft., which had not, however, disclosed ore in workable quantity.

The upper workings were regarded as of a prospecting nature, but this lower tunnel, has been run as a working tunnel, and is a most creditable piece of work, timbering, track laying, drains, etc., having been done with an accuracy and care seldom seen in the province, and this will have a direct influence in lessening the working costs when actual extraction begins.

Near the No. 2 tunnel a comfortable bunk-house, dining hall and office, together with other buildings, had been built, but since the lower tunnel is in, all new work is being centered around its outlet. Here a small but convenient building has been put up, in which is installed a 4-drill Ingersoll-Sergeant air compressor, operated by a Pelton wheel capable of generating 200 h.p. A sawmill had been erected, and was in operation making lumber for the mine's use, and also getting out the timbers for the concentrator building which it was planned to erect a couple of hundred yards from the tunnel, and on the lower side of the

wagon road, the latter being crossed by an elevated tram track. This concentrator had not been begun in July when the property was visited, but has since been completed, and should be in operation during the early part of 1905. The mill was designed and the plant constructed by the Allis-Chalmers Company, of Chicago, while the mill was erected by Mr. Charles Culver, for several years the mill man of the Slocan Star of Sandon. At the end of the year the "value of plant" is given by the management as \$8,000. As an average for the year, about six men were employed at the mine under ground, and about twelve men above ground, this being in addition to the construction force employed in the latter part of the year.

Province.—The Province mineral claims adjoin the Cork on the east, the development on both claims being adjacent to the dividing line, and it is certain that the ore-body in the Province is a continuation of that developed in the Cork, which has been shown to extend across the boundary for about 100 to 150 ft. The main tunnel of the Province is a cross-cut to the south for 173 ft., when, at a point about 220 ft. east of the Cork side-line, it was turned off sharp to the west towards such side-line and continued as a drift in that direction for 180 ft. Here a cross-cut was made to the north for about 50 ft., which cross-cut the ore-body coming in from the Cork, and on this a couple of small winzes have been sunk. The main tunnel had passed through the line of the ore-body without encountering it, indicating that this particular ore-body did not extend into the property for that distance.

To the east of the main tunnel, nearly in line with the ore-body, is a loose slip filled with oxidized iron material which has been followed in for 60 ft., and was found to be very loose and soft, rather indicating a water-course, but containing no commercial values as far as explored, although the writer was of the opinion that it was a continuation of the series of lenses met with in the previously described property, and gave sufficient promise to be well worth following up.

This main tunnel was below the surface at its face from 100 to 120 ft., estimated. Some 70 ft. above this tunnel a small tunnel had been run into the lead and some good ore found.

As compared with the development of the Cork that on the Province is slight, but the success of the former has added much to the value and importance of the latter claim. The two properties are on the same ore-body, and it would greatly increase the economy of working both if they were worked as one mine through the Cork tunnel.

MOUNT BAKER MINES.

(Notes by H. Carmichael, Provincial Assayer.)

THE Mount Baker mines are situated south of Chilliwack, near the International Boundary, which forms the southern limit of the New Westminster mining division. From Chilliwack the municipal roads are followed south till the Chilliwack river is reached, where the broad, flat valley of the

Fraser is left behind, the trail following east along the north bank of the Chilliwack through a rugged country, the Cheam range lying to the north, while to the south, across the river, is a rough, mountainous country, with unnamed peaks.

The Chilliwack is a river of considerable size, and is fed from the south by several fairly large creeks, notably Tamiky and Slesse creeks, which are torrential streams subject to rapid rises and falls. Slesse creek rises some six miles south of the International Boundary and flows into the Chilliwack river about twelve miles above the municipality, and the majority of the claims in the Mount Baker district are reached by a trail following up this creek from its junction with the Chilliwack, which river is crossed by a pack bridge. A shorter route than the present (which is about 40 miles), from Chilliwack to the International Boundary, would be through a pass in the Cheam range to the Chilliwack river, and thence south. Within half a mile of the International Boundary, a wild mountain stream called Glacier creek, and having its source among the glaciers of Red mountain, falls into Silica creek from the south-west. About a mile and a half from the Boundary, and east of Slesse creek, is Tamiky mountain, a jagged, irregular peak which is a landmark in the district.

During the mining excitement of a few years ago, some misunderstanding was caused by an observation post placed on Slesse creek when the forty-ninth parallel was first surveyed in 1859-61. The post was taken for a boundary mark, and to ascertain whether certain claims in the neighbourhood were in Canada or in the United States the boundary was re-surveyed in 1901, and is now clearly marked with iron posts, the line being chopped out through the timber.

In 1898 gold-bearing quartz was discovered on the Nooksack river, a few miles south of the Boundary, and from there prospecting has been pushed north into British Columbia; but, with the possible exception of the Pierce claims, no mineral in workable quantity has so far been found in the drainage area of Slesse creek. There is, however, a wide range of country still unexplored and unprospected, and the region lying to the east along the Boundary seems well worthy of attention.

About four miles from the Chilliwack river, on the left bank of the creek and near the point where it is crossed by the pack-bridge, several mineral claims have been located, of which the Telaca and King Solomon chiefly have been worked. These claims are owned by T. Beaumont, of Sumas, B. C. The mountains here rise abruptly on either side of the creek, and on the left bank a few shots have been put into a zone of contorted slate, slightly mineralised with iron pyrites.

Higher up the mountain, about 70 and several hundred ft. respectively, there are two felsitic dykes, also slightly mineralised with pyrites, on which some work has been done. Samples from all of these workings were taken, but upon assay disclosed nothing of value.

The Queen mineral claim is situated on Slesse creek, near the mouth of Glacier creek, and is owned by Louis Bromer, of Chilliwack. A drift has been run for

about 20 ft. into a zone of altered slate, about two or three ft. wide, cut by a felsitic dyke, both being slightly mineralised with iron pyrites. Selected samples from this vein gave only a trace of gold, and two-tenths of an ounce of silver to the ton.

From the mouth of Glacier creek, Slesse creek rises rapidly, and on the right bank, some two and a quarter miles above the bridge, are the Jumbo and Lincoln mineral claims, owned by Thos. Lay, *et al.*, of Chilliwack. These claims show generally a decomposed black oxide of iron, in zones of movement in slate, traversed by felsitic dykes, and carry low values in silver, with some copper pyrites. Some 150 ft. of tunnel, entirely in country rock, had been run by former owners of the property.

Across Slesse creek from the Jumbo, and on the western slope of Tamiky mountain, is the Tin Cup mineral claim, the workings on which are 1,000 ft. above the creek, and are reached by a steep zig-zag trail. A mountain torrent has here denuded the hillside, laying bare a few stringers of quartz, frozen tight in a granitic formation. These stringers appear, from samples taken, to carry values so low as to make their profitable working improbable. Red mountain is a semi-circle of rock towering high above timber line, its sides being covered with blue glaciers, and its summit crowned with perpetual snow. The oxidation of the iron, with which the rock is mineralised, has stained the mountain side, giving the appearance from which its name is derived. On a spur of this mountain, between Glacier and Slesse creeks, a trail leads to the claims of the Red Mountain Co., half a mile south of the International Boundary. Near a cabin built on a shelf of rock on the mountain side, a tunnel and upraise are being driven, to tap a quartz vein which is exposed higher up the mountain. When the claims were visited the snow rendered this quartz vein inaccessible, but the writer was informed that it was two ft. wide and carried good values.

There are, south of the boundary line, a number of claims, which, although in American territory, are more easily accessible from Canada, the most notable of these being the Post Lambert group, of which the Lone Jack is the principal claim. The Lone Jack is situated on the southern slope of Bear mountain, four miles south of the boundary, and while it may be reached from the Nooksack river by crossing a high divide, it is more easily reached from Canadian territory, by a trail following up Slesse creek, which heads among the glaciers of Bear mountain. In the Geological Survey Report of the State of Washington, the Lone Jack is described as having a two-ft. quartz vein in slate walls, on which vein a 10-stamp mill has been erected and considerable development work and stoping done, the values averaging \$32 to the ton, in free gold and tellurides.

The Pierce mineral claims are situated on the western slope of Tamiky mountain, and as they could be reached only by returning down Slesse creek to the Chilliwack river, and thence making a long detour up Nesaquatch creek, they were not visited. The

property is said to have a four-ft. quartz vein, averaging \$40 to the ton, with good water power, and it is reported that the erection of a stamp-mill is contemplated.

NOTES ON SIWASH CREEK CLAIMS.

(By H. Carmichael, Provincial Assayer.)

Siwash creek flows into the Fraser river from the south, about two miles above the old town of Yale, and is reached by walking up the Canadian Pacific Railway track for two miles, and crossing the Fraser in a cage on a cable ferry suspended some 50 ft. above the river. At the mouth of Siwash creek several placer leases have been taken up, and pipes are now being laid to work the ground by the hydraulic system. The mineral claims on the creek have all been located at the junction of the north, south and middle forks, about four miles from the Fraser river, and about 1,200 ft. above the level of the C.P.R. track, and a wagon road has been built from the river to the claims. Two companies are operating here, and between them own all the claims, the Mount Baker & Yale Mining Co., Ltd., owning the Old Puss, British Queen, Captain Jack and Louisabelle, while the Ward, Ruby and Independent are operated by the International Gold Mining Co., Ltd. The first-named company has worked chiefly on the Old Puss. On a spur of the mountain, between the middle and south forks, a tunnel has been run in over 20 ft. on a porphyry dyke, slightly mineralised with iron pyrites, with slate as the general country rock, and some 50 ft. higher up a drift has been run 10 ft. into a dyke with similar characteristics. This dyke appears to follow the trend of the mountain spur, and to cross the north fork of the creek in a north-westerly direction, as on the far side of the creek there is an outcrop of rock, similar although more decomposed, which has been prospected by several short tunnels. Sufficient development work has not been done to show the size of this dyke, and although surface indications promise a large tonnage, the values are admittedly so low that the property will be operated profitably only by working on a large scale and by careful management.

A 10-stamp mill, supplemented by two Wilfley tables, is being erected on the middle fork, from lumber cut by a small sawmill on the ground, and the stamps should soon be dropping, the power being obtained by means of a Pelton wheel, driven by water from the middle creek under 300 ft. head. This is only a sampling plant, built for the purpose of testing rock encountered in prospecting the property, and does not assume to be in any way a working mill.

The Ward is the principal claim in the International Gold Mining Co.'s group, and adjoins the property of the Mount Baker & Yale Co. This claim is situated on the spur between the middle and south forks of Siwash creek, on a sharp ridge about 500 ft. above the creek. Here on the surface is a crumbling mass of quartz and rock matter, with rusty quartz predominating, but no extensive body of quartz in place could be seen.

Immediately below this float quartz, a tunnel has been driven into the hillside, running in entirely on the dyke* matter noted on the Mount Baker & Yale Co.'s property lower down. This tunnel appears to be the only development work undertaken by the International Gold Mining Co., which is, however, erecting a stamp-mill, to be driven by a Pelton wheel, for the purpose of testing its ground as prospecting proceeds.

A considerable amount of placer gold has been taken from Siwash creek, but it was derived probably from the degradation of quartz veins in the slate formation, rather than from the larger igneous dykes.

*Samples of these dykes were sent to Prof. J. A. Dresser, at Montreal, for microscopic examination, and the following is his report thereon:—

I. *Dyke in Old Puss Claim, Siwash Creek.*—In the hand specimen this is a finely crystalline rock, showing no structure to the unaided eye. It is grey in colour, but with numerous flesh-coloured spots, apparently due to some decomposition product. In the thin section it is found to be a rock, which is wholly, but finely, crystallized. The greater portion consists of a fine ground-mass of quartz and feldspar, with a few larger crystals or phenocrysts of feldspar. The latter are so turbid in appearance from the alteration which the rock has undergone that it is impossible to say whether they are orthoclase or plagioclase. There are more numerous patches of chlorite and epidote, with grains of iron ore, in this slide, probably representing a primary bisilicate mineral. Spots of some carbonate, apparently dolomite, are also present. The rock is an altered porphyry or porphyrite, probably the former. The distinction between these two classes depends on the character of the feldspar which, as pointed out above, could not be definitely determined.

II. *Dyke Across the North Fork of Siwash Creek.*—In the hand specimen this rock differs from the last only in having a reddish colour and showing specks of pyrite. In the thin section also this rock is found to be similar to the last. It, however, contains many rusty spots, due to the oxidation of pyrites, and has also a more pronounced porphyritic structure, showing numerous well-defined phenocrysts of orthoclase, but none of quartz. There is, however, less basic material present than in the last. It has been crushed and sheared by subjection to pressure after its solidification. It is a quartz-porphyry.

The above rocks strikingly resemble many of the copper-gold bearing volcanics of the Eastern Townships of Quebec. They are but slightly differentiated phases of a common magma, such a degree of differentiation in these rocks frequently taking place within a distance of a few feet.

NANAIMO MINING DIVISION.

(Report of Marshal Bray, Gold Commissioner.)

There were 472 mineral claims in good standing at the end of the year, and while fewer locations were recorded during 1904 than in previous years, more development work was done and recorded, giving in many instances very satisfactory results. The great difficulty is that many of the properties are handicapped by the owners not having means to do the development work which the showings really deserve.

The mines of Vancouver Island and the coast made a good showing during the past year, as the returns from the Tyee smelter, at Ladysmith, show. The following is the record of the work done, viz.:—

Furnace record from 1st January, 1904, to 31st December, 1904:

Furnace in blast 267 days of 24 hours each.	
Smelted—Tyee ore,	57,450 tons.
“ custom ore,	7,953 “
Total smelted,	65,403 tons.

The custom ore includes the ore from the Van Anda mine, on Texada island. The Marble Bay mines shipped part of their ore to Tacoma for treatment.

Total value of the above ore smelted, less refining charges only, was \$831,902.41. All the ore smelted by the Tyee smelter was from Vancouver Island and coast mines, with the exception of 1,274 tons of foreign ore, and this marks another step in the progress of mining enterprise on Vancouver Island. Already, ores from many properties are brought to the Tyee smelter for treatment, and ores will be handled during the coming year in increasing quantity, as development work on the mines of Vancouver Island and the coast has established their permanence.

Texada Island.—The Marble Bay mines, belonging to the Tacoma Steel Co., under the management of Mr. A. Grant, produced and shipped during the year 13,249 tons, dry weight. The development work consisted of sinking the main shaft 100 ft., and driving a total of 450 lin. ft. on the 360, 460, and 560-ft. levels. The 560-ft. level is 515 ft. below high-water mark. The new plant installed comprises one 100-h.p. boiler; a station pump, capacity 16,000 imperial gallons per hour; an electric light plant; costing, including buildings and connections, over \$6,000. The average number of men employed for the year was 52 white men and 12 Chinese ore sorters. The gold and silver values have been maintained with depil, and the copper values have improved.

The Van Anda properties, held by the Van Anda Copper & Gold Co., Ltd., under the management of Mr. G. L. Mackenzie, shipped during the year 3,539 tons. The development work done was: 480 ft. of drifts, 60 ft. of winzes, 35 ft. of raises, and 44 ft. of cross-cutting. Plant installed: a gravity tram connecting the Copper Queen with the main line from the Cornell mine, and a link-motion hoist installed at the Copper Queen mine. The average number of men

employed during the year was 30 white men and 12 Chinese.

The Puget Sound Iron Co.'s mines did not ship any ore during the year; but development work was done in driving an open cut into the hill 113 ft., to open a large deposit of iron ore. The number of men employed for the year was five.

The Cordillero Mining Co. has been steadily developing its properties, having run a tunnel upwards of 200 ft., and also done some cross-cutting. An automatic ventilating plant has been installed in the tunnel.

The Loyal Group is being developed by a Seattle syndicate, under a bond from Mr. H. W. Treat, and the showings are favourable. Many other claims have had considerable development work done on them during the past year, and the coming year promises to be a prosperous one for Texada island. During 1904 only assessment work was done on the mineral claims situate on Phillips and Frederick arms, and Thurlow, Valdes and other islands.

Oyster District.—The Vancouver Island Exploration & Development Co., Ltd., has been steadily developing its group of claims in Oyster district, under the management of Mr. H. Cecil, and has shipped 40 tons of ore to the smelter at Ladysmith, and built two miles of wagon road to connect the mine with the Esquimalt & Nanaimo Railway at Brenton's crossing. The development work at the mines consisted of the upper tunnel (cross-cut) having been driven 64 ft., and a drift run west on the ledge 64 ft.; lower cross-cut tunnel 120 ft.; drifted west on ledge 72 ft., and east 40 ft. The ledge shows a bornite ore about 2 ft. in width, and the property promises well. The average number of men employed for the year was seven.

Considerable work has been done on several other claims in this district, with favourable results.

Dunsmuir District.—The Nanaimo Jubilee Mining & Development Co., Ltd., has been developing its Delphi group of claims in Dunsmuir district during the past year, having sunk the shaft 70 ft. and opened up a fine body of copper ore. These claims and the Jubilee group of claims owned by this company could ship ore steadily if they had a branch line to the E. & N. Railway. It would require a branch of only about 16 miles to tap these mines and those on Mount Mystery.

Much work has been done on other claims in this section, revealing some very good showings. Owners of claims have done development work in Bright and the northern part of Cowichan lake districts, and are well satisfied with the results.

The mineral claims recorded during the year are situate in the following places throughout the Nanaimo mining division, viz. :—

Texada island 83, Valdes island 7, Thurlow and Hansen islands 2, Pearse island 4, Cracroft, Deer and Savary islands 3, Fort Rupert 3, Theodosia arm 1, Phillips arm 5, Knights inlet 2, Beaver harbour 6, Menzies bay 1, Powell and Horn lakes 2, Oyster district 12, Dunsmuir district 6, Bright district 3, Cowichan lake district 3, total 143.

OCCURRENCE OF MAGNESITE AT ATLIN.

THE following particulars of a deposit of magnesite occurring at Atlin are from a lengthy special report on Cassiar district, by Mr. W. F. Robertson, provincial mineralogist, in the Annual Report of the Minister of Mines for 1904:

A very curious and unusual occurrence of magnesite ($Mg. CO_3$) is found actually within the townsite of Atlin and less than a hundred yards from the government office. The formation in the vicinity of the town is composed of the magnesian rocks already mentioned. On these rocks, overlain with wash, is the townsite, rising from the lake to a height of about 200 ft. Skirting the townsite on the rear—that is, the east—is a low depression or flat "draw," swampy in character, devoid of trees and in places showing "hummocks" of white magnesite which seems to be "growing up" from the swamp level; for certainly these deposits are constantly rising higher and higher, and now form mounds five to eight ft. above the swamp level. The deposit is exposed on the surface over several acres and is, when dry, perfectly white. It has been dug into for a depth of about 10 ft., and continues equally pure and clean from all foreign matter, such as clay or gravel, as on the surface. This deposit was at first considered to be simply an accumulation of magnesite formed from the decomposition of the surrounding rocks and deposited by surface waters in this swamp. If such was its origin, it seems incredible that the deposit should be so free from clay and other materials, equally portable by water, and that it should be deposited in mounds above the water level. It seems probable, therefore, that the deposit is not from water, but that underlying this draw some particular stratum in the magnesium rock occurred, which, being softer, was more easily worn away, so forming the draw, and being more susceptible to the action of swamp waters carrying carbonic acid, was altered from an oxide of magnesia into the carbonate of magnesia or magnesite, in which operation it would be greatly increased in bulk and so rise in mounds, seeming to "grow up" from below. In this connection attention is drawn to the analysis, given further on, of a mineral spring in the vicinity.

The magnesite deposit has been staked as a mineral claim by Mr. A. C. Hirschfeld, of Atlin, who, during the season of 1904, dug from the surface exposures some 200 tons of the material, which was sacked and shipped to San Francisco, Cal., as an experimental lot. The transportation companies are understood to have given a rate of \$8 per ton from Atlin to California, which apparently still leaves a margin of profit for the producers. It is stated that this shipment was intended to be used in the manufacture of "magnesia brick" for furnace linings. The remarkable purity of the deposit would seem, however, to render it applicable for other uses, and this would justify a higher price being paid for it than is at present realised.

Mineral Industry says that the consumption of magnesite in the United States in 1902 was 53,252 short

tons, of which 49,786 tons were imported from Greece and Austria; the greater part of the home production came from California, where it is calcined and the calcined product shipped east to the principal point of consumption, Pennsylvania. The uses to which the mineral is put are given as refractory lining for open-hearth steel furnaces and converters, as a lining for rotary kilns used in the manufacture of Portland cement, and as a non-conducting covering for steam boilers and pipes. It is also used in the manufacture of paper stock by the sulphite process. A limited but increasing quantity of magnesite is used for the production of carbonic dioxide gas, which is liquefied under pressure and so sold. This is done either by calcination direct or by treatment with sulphuric acid; in which latter case, magnesium sulphate (Epsom salts) is produced as a by-product. The average price of calcined magnesite in 1902 in California was \$15 a short ton.

The writer saw the magnesite being mined and no selection of the material was necessary; it was simply shovelled into sacks. A sample from the shipment brought by the writer to Victoria, and analysed in the Government laboratory, gave the following:—

Iron	trace
Alumina	trace
Sulphates	none
Chloride:	none
Silica	1.12 per cent
Carbonate magnesia (Mg. CO ₃)	88.62 per cent
Oxide (Mg. O)	9.44 per cent
Moisture.....	0.80 per cent

Mineral Spring.—Near the north end of the town-site of Atlin, and flowing out underground from the swamp in which the magnesite deposit occurs, is a mineral-bearing spring. In 1900, Mr. J. C. Gwillim, then of the Geological Survey, took some of this water to Ottawa for analysis, upon which Dr. Hoffman, chemist of the survey, reported as follows:—

"This water was found to contain: Potassa, traces; soda, very small quantity; lime, very small quantity; magnesia, somewhat large quantity; ferrous oxide, trace; sulphuric acid, very small quantity; carbonic acid, large quantity; chlorine, very small quantity; silica, trace; organic matter, faint traces.

"The magnesia amounted, approximately, to 1.834 parts in 1,000, an amount which would correspond to 3.851 of magnesium carbonate, or 5.869 of magnesium bicarbonate. It is more than probable that it is to the water of this and similar springs in the vicinity that the deposits of hydro-magnesite occurring back of Atlin townsite owe their origin."

SCHEELITE IN CARIBOO DISTRICT.

(From the Report of Mr. John Bowron, Gold Commissioner for Cariboo District.)

MR. AUSTIN J. R. ATKIN, assayer and metallurgist, who has been exploiting the quartz veins of Cariboo, writes me:—

"The season was spent in still further checking the

information gathered in the previous two summers, and the least promising properties were temporarily thrown up. Although there are many ledges which will well repay thorough and systematic prospecting as soon as a railway lowers mining cost, it is unfortunate that none but the very richest veins in the country can be opened up under present conditions. The most important find of the season, and one which may prove of great commercial value, was made on Hardscrabble creek.

"The following account may draw attention to the care which should be exercised in having every unidentified mineral thoroughly examined and its composition determined: In drifting up the channel some years ago for alluvial gold, some pieces of white mineral were occasionally found, and an examination showed them to be barytes (Ba. SO₄). Later on, the white pieces became more numerous, and seemed heavier, until the dumpbox required so much water to keep the riffles clear, that but little of the fine gold was saved. It was noticed that the finest mineral was the heaviest, and was unlike the white substance (barytes) which first caused the trouble. When the situation was at its worst, a change took place in the character of the bedrock, and at the same time the troublesome mineral disappeared, so that no further investigation into its composition took place.

"Some 'black sand' had been put away and the writer was asked how best to clean it, and to explain the circumstance of the white mineral. After separating some of the latter, an examination, since checked many times, showed it to be scheelite, of very good quality. The old workings being still in good condition, an attempt was made to find the deposit from which it came, and very little work exposed the scheelite-bearing zone. This consists of highly altered country rock, the scheelite being scattered through it in small patches, but it is in the quartz stringers that most of the mineral is found. Some of these, varying from one in. to four in. wide, contain about one-third scheelite, with a little galena, and products of decomposition of iron pyrites. This zone appears to be from 12 to 20 ft. wide, as determined by work done up to July, 1904, and gives every promise of turning out a valuable deposit. Unfortunately, the country rock has been altered by the infiltration of calcite, until it approaches limestone in hardness, so that, before the lode can be opened up, machinery will have to be installed to concentrate the calcium tungstate.

"A test was made by washing some of the decomposed surface, but the ore had not sufficiently weathered to make this very satisfactory, as when the rock was exposed to Tertiary times, the stream removed the surface as soon as it was at all decomposed. However, sufficient clear scheelite was obtained by this crude method to indicate a concentrating ratio of 1 into 10 (approx.). These concentrates contained about 70 per cent tungsten trioxide, with very little galena or pyrites. With a ready market, which this mineral commands at present, the outlook for the new find is very encouraging.

"There are other deposits of scheelite in the Caribou schist belt, for the writer has specimens in his possession which are 'float' from other ledges, which further prospecting may discover, although these ledges are not to be looked for in Willow river section."

A quantity of this scheelite was sent to Mr. E. C. Rollins, of Chicago, to have tests made to determine its value, in response to which a communication was received from Messrs. Cramer and Burt, of 1,114 Monahock Building, Chicago, stating, "The scheelite is of good quality, and there is at present a considerable demand for it, at prices varying from \$360 to \$460 per ton, according to quality." As there is no duty on tungsten ore going into the United States, the discovery of its existence here in large quantities but emphasizes our demand for proper transportation facilities.

COAL ON THE TUYA RIVER, CASSIAR.

THE following is from a report made by Mr. R. D. Featherstonhaugh for the Atlin-Tuya Coal Prospecting Syndicate, upon certain coal lands situated on the Tuya river:—

"I left Atlin on July 4, 1904, over the Dominion telegraph trail to Nahlin, thence over the old Teslin trail to Telegraph creek, arriving there on July 17. I learned there that the Tuya river was very high and it would be impossible to cross it if I went up by the Dease trail and Caribou camp on the east side of the river. As the stakes of your property and the principal outcrop of coal are on the west side, I had to go up on that side, following an old Indian trail for some distance, having to cut out a trail for the pack-horses for 12 or 15 miles. This necessitated the employment of two extra men and one horse for seven days, and leaving Telegraph creek on the 18th, I arrived on the property on July 21.

"The easiest route to reach the property would be from Wrangel by steamer up the Stikine river to Telegraph creek, thence by saddle horse, which would occupy about three days from Wrangel.

"The property is situated on the Tuya river, in the Cassiar district, British Columbia, about 25 miles up stream from where the Tuya empties into the Stikine river and about 35 miles from the village of Telegraph Creek. At the latter place there are stores, hotels, post office and telegraph office. The property consists of 13 leases, each one mile square, or over 8,000 acres.

"The country for about 15 miles along the Tuya river is of sedimentary formation, consisting of carboniferous conglomerate, sandstone and shales, the general trend being north-east and south-west, the contact on the north being principally granite and on the south basalt and other eruptive rocks. The sandstone and conglomerate apparently extend in a westerly direction, a distance of nearly 50 miles, to the Nahlin river, where the same formation with the same plant fossils can be easily seen.

"Lying between the strata are large seams of coal. Outcrop No. 1, marked on the plan, is a seam of coal 38 ft. thick lying on a bed of clay and shale, capped by

a stratum of conglomerate of varying thickness, then a stratum of coarse sandstone, on top of which has been deposited by ice at a later period about 20 ft. of coarse gravel composed of granite and syenite boulders. This coal seam strikes approximately N. 30 degrees W. and S. 30 degrees E., and has been tilted to an angle of about 40 degrees, and has been cut through by the river for a depth of 35 ft., thereby saving a large amount of prospecting to get the information which has been obtained at this point. An analysis made by the provincial assayer at Victoria, from samples, last November, gave the following results:—

Moisture	11.35 per cent
Volatile matter	28.36 per cent
Fixed carbon	49.22 per cent
Ash	9.92 per cent
Sulphur	1.15 per cent
Heating value in British thermal units.....	11,401 per cent

"Outcrop No. 2 on plan is a seam of coal 26 ft. thick and about one-half mile down stream from outcrop No. 1, dip and strike corresponding with No. 1, but a distinctly separate seam, and can be traced for a long distance on the surface.

"Outcrop No. 3 on plan shows up on Coutts creek about 400 yd. up stream, on the right-hand side going up. Coutts creek is a large creek running nearly east and west, emptying into the Tuya river about one and a half miles below No. 1 outcrop. This outcrop is over 40 ft. wide, dipping at an angle of 35 degrees to the north, and strikes more with the trend of the country, namely, easterly and westerly. A great deal of coal can be found in the wash in the creek bottom.

"The whole area is fairly well timbered with spruce, affording sufficient supply for mining and construction purposes. A practically unlimited water power can be obtained at a reasonable cost from the Tuya river and Coutts creek. Of course railway facilities for the handling of the coal are an absolute necessity. The proposed line from Kitimat harbour or Hazelton to Dawson would pass through the property within a few miles of the present outcrop of coal, following the old survey of the Cassiar Central railway."

FLUOR SPAR NEAR NELSON.

AT the close of his special report on the Nelson district, appearing in the Annual Report of the Minister of Mines for 1904, the provincial mineralogist gives the following interesting particulars of an occurrence of fluor spar:

A short distance to the east of Nelson, at 5-Mile point, fluor spar has recently been discovered, and, as far as is reported, this is the only known occurrence of the mineral in the province, which gives any promise of its existence in commercial quantities. The claim lies just above the Nelson and Fort Sheppard railway tracks, and within 100 yards of the hand-car house at 5-Mile point station. The property is owned by Geo. Huston, Hawkins and others, of Sandon. The country rock here is also the Nelson granite, and running through the claim there is in the formation a

fault plane or fissure, along which the granite has been much crushed, and subsequently somewhat decomposed by percolating water. Along this fissure calcium fluoride has been deposited, the crushed rock on either side being impregnated for some distance, gradually shading off into more solid granite.

Along this fissure for some 75 ft. a tunnel has been run in which shows in the roof in places a seam of about 12 in. of the mineral, comparatively pure. On either side the mineral is more or less mixed with the crushed country rock. The deposit is recent, and, as a matter of fact, the water seeping through the fissure at present is depositing the mineral, as in places the walls of the tunnel, which was driven some years ago, show a distinct deposit of fluor spar deposited there recently. The mineralisation followed the fissure at least as far as the tunnel had developed it, and nothing could be seen on the surface, which is covered with underbrush.

The mineral is used commercially as a flux in smelting, and in the manufacture of hydro-fluoric acid, for both of which purposes there would be a strong local market if the future development of the property proves satisfactory.

The Hall Mines smelter took hold of the property this fall, and did some work on it, mining some tons of the mineral for experimental purposes, the result of which operations has not been learned, further than that, mined in quantity from the present development, the mineral contained a higher amount of silica than was desirable.

MAGNETIC CONCENTRATION IN AUSTRALIA.

MUCH interest is being manifested in the approaching system of concentration under magnetic conditions, the crude ores in the Broken Hill Junction North mine, in New South Wales. Experiments have already proved that, with lead at £12 per ton, silver at 2s. 2d. per oz., and spelter at £20 per ton, the refractory sulphide ore characteristic of the mine can by magnetic separation be turned into a profitable commodity, and any advance in these metals will correspondingly increase these profits. Up to the present time on the Barrier attention has only been given to treating tailings and secondary products for market purposes by the magnetic process, so that the concentration of raw ore by this method on the Junction North will prove a valuable object lesson. The crude sulphides in this mine as a whole are highly charged with rhodonite (manganese spar), and likewise with garnet sandstone, which makes them highly sensitive to electrical influences, and the metals become readily separated with very high recoveries. The arrangements are complete, with the exception of the magnetic separators, eight in number, which are being constructed in South Australia.—*London Mining Journal.*

MONTHLY AVERAGE PRICES OF METALS.
(From The Engineering and Mining Journal, New York.)

SILVER.

Month.	New York		London.	
	1904	1905	1904	1905
January.....	57 055	60 690	26 423	27 930
February.....	57 592	61 023	26 665	28 047
March.....	56 741	58 046	26 164	26 794
April.....	54 202	56 600	24 974	26 108
May.....	55 430	55 578	25 578	26 711
June.....	55 673	55 673	25 611	26 760
July.....	58 085	58 085	26 760	26 760
August.....	57 806	57 806	26 591	26 591
September.....	57 120	57 120	26 349	26 349
October.....	57 921	57 921	26 760	26 760
November.....	58 453	58 453	26 952	26 952
December.....	60 563	60 563	27 930	27 930
Year.....	57 221	57 221	26 399	26 399

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

COPPER IN NEW YORK.

Month.	Electrolytic		Lake.	
	1904	1905	1904	1905
January.....	12 410	15 008	12 553	15 128
February.....	12 063	15 011	12 245	15 136
March.....	12 293	15 125	12 531	15 250
April.....	12 923	14 920	13 120	15 045
May.....	12 758	12 758	13 000	13 000
June.....	12 269	12 269	12 399	12 399
July.....	12 380	12 380	12 505	12 505
August.....	12 313	12 313	12 168	12 168
September.....	12 495	12 495	12 620	12 620
October.....	12 993	12 993	13 118	13 118
November.....	14 281	14 281	14 456	14 456
December.....	14 661	14 661	14 849	14 849
Year.....	12 923	12 923	12 990	12 990

Prices are in cents per pound. Electrolytic quotations are for cakes ingots and wire bars; cathodes are usually 0.25c. lower.

COPPER IN LONDON.

Month.	1904		1905	
	1904	1905	1904	1905
January.....	57 500	68 262	57 256	68 262
February.....	56 500	67 963	56 952	67 963
March.....	57 321	68 174	57 645	68 174
April.....	58 247	67 017	60 012	67 017
May.....	57 321	57 321	65 685	65 685
June.....	56 339	56 339	66 334	66 334
Av. year.....			58 857	58 857

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904		1905	
	1904	1905	1904	1905
January.....	28 845	29 325	26 573	29 325
February.....	28 087	29 262	27 012	29 262
March.....	28 317	29 523	27 780	29 523
April.....	28 132	30 525	28 506	30 525
May.....	27 718	27 718	29 185	27 718
June.....	26 325	26 325	29 286	26 325
Av. year.....			27 986	27 986

LEAD IN NEW YORK.

Month.	1904		1905	
	1904	1905	1904	1905
January.....	4 347	4 552	4 192	4 552
February.....	4 375	4 450	4 111	4 450
March.....	4 475	4 470	4 200	4 470
April.....	4 475	4 500	4 200	4 500
May.....	4 423	4 423	4 200	4 423
June.....	4 406	4 406	4 600	4 406
Av. year.....			4 309	4 309

SPELTER.

Month.	New York		St. Louis	
	1904	1905	1904	1905
January.....	4 563	6 190	4 673	6 032
February.....	4 916	6 132	4 717	5 989
March.....	5 037	6 067	4 841	5 917
April.....	5 219	5 317	5 083	5 667
May.....	5 051	5 051	4 883	5 051
June.....	4 760	4 760	4 596	4 760
July.....	4 873	4 873	4 723	4 873
August.....	4 865	4 865	4 716	4 865
September.....	5 046	5 046	4 826	5 046
October.....	5 181	5 181	5 033	5 181
November.....	5 513	5 513	5 363	5 513
December.....	5 872	5 872	5 720	5 872
Year.....	5 100	5 100	4 931	4 931

COMPANY MEETINGS AND REPORTS.

SLOUGH CREEK GRAVEL GOLD, LTD.

The first ordinary general (statutory) meeting of the Slough Creek Gravel Gold, Ltd., was held in London, England, on April 14, Sir J. Ewan Edwards, chairman of the company, presiding.

The chairman said: "Gentlemen.—This meeting is called to fulfill the conditions of the Companies' Act, but there is no resolution before it, and no business in the general sense. It, however, gives the directors an opportunity of meeting the shareholders and giving them any information they may wish. I, therefore, propose to make a short statement of our business and prospects. Last autumn, Mr. J. D. Kendall, consulting mining engineer, went to Cariboo to report upon our properties on behalf of a group of gentlemen interested in mining, with the object of acquiring the property from the old company if Mr. Kendall's report was satisfactory. As this proved to be the case—and we must all acknowledge that the report was highly satisfactory—a new company was registered for the purpose of acquiring the property, and the terms offered to the old shareholders were unanimously agreed to. On the formation of the new company Mr. Kendall was appointed consulting engineer and the work at the mine is now being carried out energetically under his directions.

"I should now like to say a few words on Mr. Kendall's report, and I would strongly recommend the shareholders to read it, as they can obtain a copy of it on application to the secretary. The report, I need hardly say, is very conservative, because he could only report on ascertained facts; but Mr. Kendall confidently recommends the property to investors as a perfectly legitimate undertaking, promising with efficient management, good returns for those who put their money into it. He estimated the value of the gravel as at least £1 (\$5) to the yard cube, but he feels very sanguine that it will be higher, and that, with an output of 200 cu. yd. a day, the gravel can be worked at 10s. (\$2.50) a yard including expenses. There will be no difficulty in maintaining this output from the present shaft alone, when the gravel is opened up, and Mr. Kendall considers that by sinking two, three or more shafts, and thereby drying a large extent of channel, this output of 200 yd. a day can be increased to any extent suggested by economical considerations. Even if the estimate of the value of the gravel made by Mr. Kendall is not exceeded, we have a most valuable property; but the gravel so far met with in opening up the channel in Slough creek has nowhere been less than £3 (\$15) to the cu. yd.—more than three times as rich as Mr. Kendall's estimate. A cable from the manager received on April 3, tells us that he finds the gravel in the channel, which has now been tapped 300 ft. down stream from the previous openings, richer than any previously met with.

"It will not be out of place here to compare the company's property in Cariboo with the Australian deep leads, as they would appear to have much resemblance to each other; and especially as this class of mining is at present receiving considerable attention in this country through the work now being carried on by several English companies, in opening up the deep leads north of Ballarat in the Australian State of Victoria. These celebrated deep leads—or channels as they are called in California and British Columbia—have already produced large quantities of gold and paid handsome dividends to the companies which worked them. The greatest of these was the Madam Berry lead, which produced £5,000,000 from seven miles of the upper part of the lead—at the rate of £700,000 to the mile. The next in order was the Majorca lead, which joins the Madam Berry lead 30 miles below its source, and has produced £2,000,000 from six miles, or over £300,000 to the mile. The Cariboo, the Williams creek channel—of which we own 11 miles—will compare favourably with the Majorca lead, as it produced £2,000,000 from two miles of its upper part. You will therefore see that the Cariboo channel as regards richness compares favourably with those in Victoria. They can also

claim other advantages over those in Victoria. The Cariboo channels are narrower and better defined, making it easier to locate the lead by boring; nor are they so deep as those in Victoria. The width of the wash is less, which means that the gold is more concentrated, and, therefore cheaper to work. The amount of water to be pumped to dry the channel is very much less—estimated by Mr. Kendall to be only 2½ million gallons for every 100 ft. of the channel. The company possesses water rights which provide electrical power at a very considerable saving, as compared with electrical power generated by steam as in Victoria. On the other hand, in Cariboo we are 280 miles from the railway, which means very high freight rates and also higher wages; but this disadvantage will soon be overcome, as a railway has for some time been projected which, if it does not actually pass through the company's property, will pass through the district. I need hardly say that the successful opening up of this district, by this and other companies working in it, will be a strong inducement for the construction of a railway through it to the coast.

"The Slough creek shaft, which is the only shaft put down as yet in the company's property, is on the old channel of Williams creek, eight miles below the part which has yielded gold at the rate of £2,000,000 to the mile. In these eight miles the old channel receives numerous feeders from leads which have produced large quantities of gold from their upper parts. The work already done from the shaft in Slough creek gives every indication that the gravel in the channel at that point will equal in richness, even if it does not exceed, that of the upper part of Williams creek. The company's property extends to 13 miles of old channel or deep lead—11 of which is the old channel of Williams creek. It must not be forgotten that this channel is in the very centre of the gold belt, that there are no engineering difficulties in opening up the gravel which cannot easily be overcome, and, without attempting to estimate the amount of gold buried in this old length of channel, we may certainly congratulate ourselves that we possess a property which will take many years to work out, and which, in the words of Mr. Kendall, is one of great possibilities. In conclusion, I may say that, should it be advisable, the board will call the shareholders together in the autumn, so that they may be informed of the state of the company's business, and so that they should not have to wait till the annual meeting, which, in the ordinary course, would not be held till the early summer of next year."

Mr. J. D. Kendall, the company's consulting engineer, said: "Although Slough creek is in Cariboo, it is not one of the creeks that figured so conspicuously in the wild excitement in that district in the early sixties, nor yet in the milder-mannered activities of the early seventies. It lies between two creeks—Williams and Lightning—which have produced between them a large part of the bullion that has come from the extremely rich alluvial ground of that district. Many of the claims in those two creeks were remarkably rich, one of them yielding as much as 200 lb. of bullion in a single day, worth over £7,000 (\$30,500) sterling. From other similar small creeks over 600 oz. of bullion were turned out in a day, and from one of those small claims 52 oz. of bullion were got in a single small pan of dirt. But as we are not proposing, even if it were possible, to work that old ground over again, I will not say more on that subject. The deep gravels which occur on Slough creek were not worked in those early days, nor have they been worked since, for reasons which I will endeavor to explain.

"You have before you a diagrammatic section of Lightning creek, in which the alluvial deposits are shown in various shades of red, and the bedrock on which these deposits rest is shown in a neutral tint. From this section you will see that the bedrock becomes gradually deeper as we go down the valley. At the upper end of the valley, where the rich gravel rests on the bedrock, there was very little cover, and they could in consequence be worked in open cast; but as operations extended down the valley, it became necessary to sink through the superincumbent strata in order

to get at the rich gravels on the bedrock. The thickness of this overlying alluvial matter increased as the distance down the valley increased. Where the bedrock was shallow the workings were dry; but as the bedrock became deeper, water began to appear, and this increased to such an extent ultimately that, with the means and appliances then available, it became impossible to contend with it in the deeper ground, and therefore operations in that direction had reluctantly to be abandoned. The history of Williams creek in this respect is very similar to that of Lightning creek. As you can imagine, longings looks were very often turned towards this deep-lying ground by those who had been baffled; and in the early seventies, after the construction of the Canadian Pacific railway, and the road that leads from that railway to Cariboo, attempts were again made to reach this deeper ground with improved machinery. But failure again awaited them, and they were defeated by the water. Since then very little has been done in this deep ground, except by the Cariboo Consolidated Company, on Lightning creek. That company reached the gravel on bedrock, and when I visited its mine in the latter end of October last it was rapidly reducing the water and preparing to open up gravel to drain preparatory to its being worked.

"The alluvial deposits in Slough creek correspond in character with those at the lower end of Lightning creek and Williams creek; but they are deeper—they are thicker—that is to say, the bedrock is deeper there than it was in either Williams or Lightning creeks, and that is the reason why the deep-lying gravels in Slough creek have not been hitherto worked. The predecessors of this company, after a considerable expenditure of money, succeeded in sinking a three-compartment shaft, mostly in bedrock, to a depth of about 362 ft. From the bottom of that shaft they made a tunnel also in bedrock for about a length of 1,100 ft. Both the shaft and the tunnel are now in good order. Near the end of that tunnel branch drifts were put out which reached the gravel at several points, and tapped a considerable body of water which has been running off for the last two years, gradually diminishing in quantity. The quantity of gravel worked by the old company was very small, owing to the large body of water that they had to contend with; but I am told that they obtained several rich samples, one of them yielding as much as seven oz. of bullion to the cu. yd. When I examined the mine in October last I took from one opening into the gravel three samples—it was impossible to obtain samples from any other point, on account of the quantity of water coming—and the average value of these three samples was over £1 a yard. After the present company got possession of the property, a drift was put out from the main tunnel for the purpose of cutting the gravel at a lower point than had hitherto been reached, so as to reduce the water pressure on the other points where the gravel had been cut. After driving about 145 ft. the gravel was cut, and in a telegram which I had from the manager about a fortnight ago he said: 'The gravel prospects well. Best yet. The gold is coarse.' This must mean that the gravel he has just cut is better than any of the gravel found by the old company, for this is the first gravel that the present company has entered. We have another short drift to drive for the purpose of letting away the water at a lower level, and then I think we shall be able to proceed with regular development. The quantity of water we are pumping is comparatively small, and will not interfere with the work in the least when we are once fairly in the gravel; but now, whilst it is issuing from a few relatively restricted points, it induces pressure on the drifts which renders it necessary to proceed cautiously. After the two lower drifts which I have just referred to are well into the gravel the pressure will be largely removed from the higher points where the gravel has been cut, and, therefore, we shall be able then to work the gravel at those points more easily and more quickly.

"In conclusion, I may say that the indications are that the ground will be rich, and do not think it will be long before we will be able to demonstrate this on a commercial

scale. There is no apparent reason why it should not be as rich as it was in either Lightning creek or Williams creek. However, time alone can settle that; but the present prospects are excellent."

COMPANY NOTES AND CABLES.

- Alaska-Mexican*.—March: 120 stamps 25 $\frac{1}{2}$ days, 16,552 tons ore; estimated realisable value of bullion, \$28,922; 328 tons sulphurets, estimated realisable value, \$19,056; total, \$42,978. Working expenses, \$32,610.
- Alaska Treadwell*.—March: 240 stamps 27 $\frac{1}{2}$ days, 300 stamps 5 days, 37,723 tons; estimated realisable value of bullion, \$60,610; 706 tons sulphurets, estimated realisable value, \$37,317; total, \$97,927. Working expenses, \$68,427.
- Alaska United*.—March: Ready Bullion claim, 120 stamps 27 $\frac{1}{2}$ days, 17,760 tons; estimated realisable value of bullion, \$19,727; 310 tons sulphurets, estimated realisable value, \$10,407; total, \$30,134. Working expenses, \$26,014.
- Le Roi*.—March: Shipped from the mine to Northport during the month 11,585 tons of ore, containing 4,465 oz. of gold, 4,036 oz. of silver, 266,700 lb. of copper. Estimated profit on this ore after deducting cost of mining, smelting, realisation and depreciation, \$18,500. Expenditure on development work during the month, \$5,500. Mine is looking well. Sinking a winze 1,450 ft. level, to further explore ore body to 1,550 ft.
- Le Roi No. 2*.—March: Shipped 1,050 tons. Net receipts \$51,644, being preliminary payment for 1,877 tons shipped; \$3,297, being deferred payment on 945 tons previously shipped; no payment for concentrates; \$54,941 in all.
- Slough Creek Gravel Gold*.—M. J. D. Kendall, the consulting engineer, has received the following cable from the mine: "North crosscut is in 46 ft. In gravel at top, 4 in. The gravel prospects well. The best yet. The gold is coarse. Considerable pressure. Would prefer to drive crosscut to south to divide water and pressure before continuing west drift."
- Sunset*.—The Sunset Copper Co., Ltd., has gone into voluntary liquidation, and William B. Bower, of Grand Forks, B. C., has been appointed liquidator. All claims against said company are required to be in on or before June 1, 1905.
- Tyce*.—March: 10 days smelted: Tyce ore, 1,906 tons; custom ore, 188 tons; total, 2,094 tons. Matte produced, 211 tons. Gross value of contents (copper, silver and gold) after deducting costs of refining and purchase of custom ore, \$33,086.
- Ymir*.—March: 35 stamps 29 days, 2,600 tons, 616 oz. bullion; estimated realisable value, \$6,750; concentrates, 170 tons shipped; estimated value, \$3,750; cyanide plant, 2,100 tons tailings, bullion, estimated value, \$1,300; sundry revenue, \$287; total, \$12,087. Working expenses, \$11,410. Profit, \$677. Expended on development, \$100.
- A report from Grand Forks states that at a general meeting of the McKinley Mines, Ltd., owning the McKinley and Hanna mineral claims in Franklin camp, north fork of Kettle river, a working bond for \$150,000 was granted Mr. Miles M. O'Brien, Jr., of New York, as trustee for Boston and New York capitalists. The bond covers a period of 18 months from April 1.

ORITUARY.

Mr. George Gooderham, whose name is well known in British Columbian mining circles by reason of his having been president of the War Eagle and Centre Star mining companies, died at his home in Toronto, Ontario, on May 1, at the age of 75 years. A fortnight previously he had returned from a visit of several months' duration to California and thence through the south to Florida. Within a few days of his return home he contracted a cold, which developed into a severe and later fatal attack of bronchitis, death coming with appalling suddenness. The Toronto *Globe* published a

lengthy review of his life, and its editorial comment was, in part, as follows:

"The death of Mr. George Gooderham will leave a large blank in the business world of Toronto. His interests were so great and so varied that there is scarcely a branch of finance or commerce with which he was not in touch. Manufacture, real estate, banking, insurance, mining—in all of these he was a colossal figure. He inherited wealth and multiplied what he inherited. He was in a position to have devoted himself to mere pleasure. Such a life does not seem to have appealed to him. He was, indeed, always the prompt, reliable, active business man, and in the round of commerce and finance he seemed to find the kind of enjoyment that suited him. He was steadfast to a degree. When he put his hand to the plough there was no turning back. He showed little or no taste for public life. This probably sprang from his dislike of show or parade of any kind. His business and his home claimed his thoughts and his time. He was appointed to the Senate of Toronto University soon after the fire which partially destroyed the building, and served for ten or twelve years. Without pretending to any insight as to academic problems, his business judgment and unflinching level-headedness were much prized by his colleagues. He was a man of the simplest habits. He preferred a street car to a carriage, and a desire to shine as a chief of the social world was very far from his thoughts. The ownership of a steam yacht and of the handsomest residence in the city were almost the only visible signs of the great wealth of which he was master."

PERSONAL.

Mr. M. Galbraith is assayer at the Eva mine, Camborne.

Mr. Lewis Stockett is general manager of the Pacific Coal Co.'s coal mines at Bankhead, Alberta.

Mr. A. H. Gracey, manager of the Eva Gold Mines, Ltd., has removed from Nelson to Camborne, Fish River camp.

Mr. W. P. Rodgers, mining engineer, of the Nickel Plate mine, near Hedley, Similkameen, lately visited Pittsburg, Pennsylvania.

Mr. Thomas Gough, late superintendent at the Yellowstone mill, Salmo, is now filling a similar position at the Granite mill, near Nelson.

Mr. P. C. Coates, formerly of Victoria, has completed a course in mining engineering and will practice his profession in British Columbia.

Mr. A. R. Fingland, superintendent of the mines of the Monitor and Ajax Fraction, Ltd., has returned to the Slocan from a visit to the coast cities.

Mr. Geo. D. Potter, a well known Slocan mine manager, is reported to have disposed of his mining interests and intends shortly leaving the district for a while.

Mr. Lorne A. Campbell, manager of the West Kootenay Power & Light Co., left Rossland last month on a visit to Montreal, New York, and other eastern cities.

Mr. J. W. Astley, general superintendent of the Le Roi Mining Co., has returned to Rossland from Spokane in much improved health, and has resumed active duty.

Mr. C. F. Heiberg is chemist for the Vancouver Portland Cement Co., which recently commenced the manufacture of cement at its works, Tod Inlet, near Victoria.

Professor R. W. Brock has been entrusted by the Dominion Geological Survey with the work of making a detailed structural survey of the mineralised portion of the Rossland district.

Mr. Francis A. Thomson, metallurgist for the New Western Reduction Co., who is superintending the erection of a sampler and mill for his company at Goldfield, Nevada, U.S.A., is a son of Capt. J. A. Thomson, Dominion Inspector of Steamboats, Victoria, B. C.

Mr. W. M. Brewer has been spending several recent weeks in the north purchasing ore for the Tyee Copper Co. He has visited all points in north-western British Columbia, the Yukon Territory, and south-eastern Alaska, at which ore supplies are likely to be obtained.

Among recent graduates of the Faculty of Approved Science at McGill University, Montreal, Quebec, are two from British Columbia, viz., Mr. Theodore Scouler, of New Westminster, in electrical engineering, and Mr. George P. Sharpe, of Agassiz, in mining engineering.

Mr. A. H. Kelly, manager of the Reliance Gold Mining & Milling Co., which has been putting in a 50-ton mill, for treatment of its May and Jennie gold ore, at Forty-nine creek, near Nelson, has gone to New Brunswick on a vacation prior to starting operations at that mill.

Mr. Rudolph Liden, formerly assistant superintendent, first at the B. C. Copper Co.'s smelter, Greenwood, Boundary district, and afterwards at the Alaska Smelting & Refining Co.'s works, Hadley, Prince of Wales Island, S. E. Alaska, is now with the Allis-Chalmers Co., Chicago, Illinois.

Mr. Frederic Keffer, manager of the British Columbia Copper Co., operating the Mother Lode mine, and the smelter at Greenwood, recently accompanied Mr. F. L. Underwood, president of the company, and Mr. W. H. Thomas, consulting engineer, both of New York, on their return from the Boundary country.

Mr. Patrick Clark, a well-known mining man of Spokane, Washington, who recently visited Tonopah and other Nevada mining fields, has been mentioned in the press as authority for the statement that Mr. John McKane, formerly of Rossland, is estimated to have made about \$2,000,000 in mining transactions in Nevada.

Mr. G. G. S. Lindsey, third vice-president and general manager of the Crow's Nest Pass Coal Co., and a vice-president of the Vancouver Portland Cement Co., spent several days at Victoria in the early part of this month. With Mr. R. P. Butchart, managing director, he visited the cement works at Tod Inlet, and examined closely the cement-manufacturing operations in progress there.

Mr. Frank W. Hodges, of London, England, a director of the Tyee Copper Co., was recently the guest of the general manager, Mr. Clermont Livingston, Duncans, V. I. The company's mining property at Mt. Sicker and smelter at Ladysmith were both visited by Mr. Hodges, who, being engaged in metal industries in England, was the more interested in the mechanical improvements made at the smelter and the hot-blast system now being installed there.

VISIT OF AMERICAN INSTITUTE OF MINING ENGINEERS.

From the second circular sent to members of the American Institute of Mining Engineers it is learned that a change has been made in the plans of the summer excursion to British Columbia and the Yukon. This provides for the party visiting Nelson, Rossland and the Boundary on the way to the coast, as indicated in the following excerpt from the circular: "This change will enable all members of the party to see the beautiful Selkirks on the return trip from Alaska over the Canadian Pacific, starting from Vancouver on July 23. The former plan divided the party at Revelstoke, those interested in the mines of British Columbia leaving the special train, and joining again at Medicine Hat, thereby omitting the most beautiful scenic features of the road. According to the present new plan, members will return to Chicago some two or three days earlier, namely, about July 30.

The following itinerary has been provisionally announced: Leave New York June 23, Chicago 24th, Spokane 26th, Nelson 27th, Rossland 28th, Grand Forks 29th, Spokane 30th, Seattle July 1, Victoria to be reached on the afternoon of Saturday, July 1st; sessions for the reading and discussion of technical papers to be held in Victoria on July 3rd, 4th and 5th, and at noon of the last-mentioned date the steamer to convey the party to Skagway will leave. Thereafter the dates and places will be: July 11th Whitehorse and Skagway, 11th to 15th Dawson, 19th Whitehorse and Skagway, 23rd Vancouver, 24th to 26th Glacier, Field and Laggan 28th St. Paul, 29th Chicago, and 30th New York.

The steamer *Jefferson* has been chartered for the trip up the coast from Victoria to Skagway and back to Vancouver.

Several short stops will be made en route from Victoria—probably at Snetteshan Bay, Wrangel, Douglas Island (where the Treadwell mines are located), and Juneau. On arrival at Whitehorse, all who so desire may enjoy the pleasure of shooting the Whitehorse rapids. A very interesting programme is being arranged by the authorities at Dawson, where four or five days will be spent.

CERTIFICATES OF INCORPORATION.

- Arrowhead Water Supply Co., Ltd.*, with a capital of \$50,000, divided into 50,000 shares of \$1 each.
- Koksilah Mining Co., Ltd.*, with a capital of \$50,000, divided into 50,000 shares of \$1 each.
- La Plata Mines Co., Ltd.*, with a capital of \$2,000,000, divided into 2,000,000 shares of \$1 each.
- Surf Inlet Power Co., Ltd.*, with a capital of \$50,000, divided into 50,000 shares of \$1 each.

LICENCE TO AN EXTRA-PROVINCIAL COMPANY.

Montreal & Boston Consolidated Mining & Smelting Co., Ltd., is authorized and licensed to carry on business in British Columbia. The head office of the company is situated at Toronto, Ontario. The capital of the company is \$7,500,000, divided into 1,500,000 shares of \$5 each. The head office of the company in British Columbia is situate at Greenwood, Boundary district, and Arthur Murdoch Whiteside, barrister-at-law, whose address is Greenwood, is attorney for the company.

REGISTRATION OF EXTRA-PROVINCIAL COMPANIES.

- United Empire Co.*—Head office at Phoenix, Arizona, U.S.A. Capital, \$500,000, divided into 500,000 shares of \$1 each. Head office in British Columbia, at Princeton. Similkameen. Attorney (not empowered to issue and transfer stock) William Campbell McDougall, mine manager, Princeton.
- Unuk River Mining, Smelting & Transportation Co.*—Head office at Danville, Illinois, U.S.A. Capital, \$500,000, divided into 500,000 shares of \$1 each. Head office in British Columbia, at Vancouver. Attorney (not empowered to issue and transfer stock) Edgar Bloomfield, barrister-at-law, Vancouver.

APPLICATIONS FOR CERTIFICATES OF IMPROVEMENTS.

<i>Mineral Claim.</i>	<i>Mining Division.</i>	<i>Applicant.</i>
Flying Cloud.....	Fort Steele.....	J. C. Drewry, Jos. Trainner, and J. F. Armstrong
Edward VII.....	Greenwood.....	Henry J. Homann and George M. Bennet
Eureka.....	do.....	John Matthews
Messina.....	do.....	Alfred Cameron Edward Tennessen and Chas. Stooke
Putnam.....	do.....	John Matthews
Superior.....	do.....	John Gray
Rosemount.....	Lillooet.....	J. H. Purdy and Dr. Alfred Poole
White Rose.....	do.....	do..... do.....
Wooloomooloo.....	Nelson.....	W. G. Sivyer
Invincible.....	Similkameen.....	William Knight and Thos. H. Reed
Unhorn.....	do.....	E. E. Burr
Imperial Limited.	Trout Lake.....	Jas. Z. Hall
Vancouver.....	do.....	do.....
Whistler.....	do.....	do.....

CANADIAN AND UNITED STATES PATENTS.

Mr. Rowland Brittain, patent attorney, Vancouver, sends the following report of patents issued recently:

David-Campbell, electrician, Vancouver, has received a Canadian patent on an improved lamp bulb, the construction of which is designed to afford a better reflecting surface for the light from the filament. This result he attains by depressing one side of the bulb within the other part, and by carrying the filament round the inwardly projecting portion. The inwardly depressed portion can thus be silvered to afford a reflecting surface and as the silvered portion will be exposed to the outside air it will not be excessively heated by the filament.

Messrs. John Park and M. Snee, Vancouver, have received a Canadian patent on an improved wheel flange, wherein a series of ball bearings are inserted to lessen the friction of the wheel in passing round the curves.

Messrs. W. J. Cummings and S. Abernethy, Port Moody, have received Canadian and United States patents on an improvement in inserted teeth for saws. This invention is applicable to inserted teeth of the kind exemplified by the Howe, Simonds and Dieston, and is directed to prevent the tendency to lateral displacement of the cutting edge of the bit, which is a common fault in saw teeth of this class, and which not only is productive of rough work, but by permitting sawdust to escape from the gullet past the swage of the lock portion, causes heating of the blade of the saw with its attendant injurious effects. In this invention a V-shaped projection is provided extending as a chord across the seat of the bit on which the heel of the lock portion bears, which projection fits into and laterally engages a similarly shaped groove in the heel of the "bit" and any tendency to lateral displacement is thus prevented.

Messrs. E. J. Swyny and G. Plucknett, of Australia, received a Canadian patent on an improved process for the extraction of normally buoyant mineral particles from slimes, tailings and like metalliferous materials.

United States Patent No. 785,167 was granted March 21st, 1905, to Eric Hedburg, of Joplin, Mo., on an improved process of separating and refining complex ores, as follows:—

1. The herein described process of treating ores, consisting in, first, drying the ores; second, roasting the same; third, subjecting the heated material to the action of a hydrocarbon gas; fourth, subjecting the material to an air-blast to partially cool the same, and fifth, passing the same through a magnetic separator.

2. The herein described process of treating ores, consisting in, first, drying the ores; second, roasting the same; third, subjecting the material while heated to the action of a hydrocarbon gas generated by the heat from the roasted ore; fourth, partially cooling the material, and, fifth, separating the magnetic components by passing the ore through magnetic fields of progressively increased strength, whereby the strongly-magnetic ores are attracted by the lesser-energised magnetic field, and the slightly-magnetic ores by the highly-energised magnetic field, substantially as described.

3. The herein described process of treating ores previously reduced to fine particles, consisting in, first, roasting the same; second, subjecting the same while heated to the action of a hydrocarbon gas; third, partially cooling the material, and, fourth, passing the same through two magnetic fields the second of which is more strongly energised than the first, substantially as described.

Mr. Geo. S. Waterlow, director of the Le Roi Mining Co., after recuperating at Glacier, following his recent severe illness at Calgary, is again giving attention to the proposed amalgamation of Kootenay and Boundary mines and smelters under one company.

MACHINERY NOTES.

It is announced that a contract has been let for the installation of a compressor plant at the Wilcox mine, near Ymir. A 75-ton concentrating mill is to be put in at the La Plata Mines Co.'s Molly Gibson mine, near Nelson, during the ensuing summer.

A small hoisting plant, consisting of a vertical boiler and combined engine and hoist, has been supplied to Mr. H. McMaster, Cariboo, by the Vancouver Engineering Works, Ltd., for use in prospecting a new mining property.

Mr. E. G. Warren, manager of the Greenwood Electric Co., has secured the contract for wiring the new zinc enriching plant at Rosebery, on Slovan lake, and installing the electric machinery. The work will be commenced about the 1st of June.

The zinc separating plant the Kootenay Ore Co. recently completed installing at its sampling works, Kaslo, is reported to be working satisfactorily and to be turning out a product ranging from 50 to 55 per cent zinc, with but a small percentage of iron.

The Silver Star Mining Co.'s 100-ton concentrator, built last year at the company's Cork mine, on the south fork of Kaslo creek, and the equipment of which was lately finished, was started on its trial run on April 29. The crushers and jigs proved to be in good working order, with only unimportant adjustments needed to ensure their doing effective work.

A small but complete plant, including locomotive type boiler, Ingersoll-Sergeant air compressor, machine drills, etc., was recently shipped by the Vancouver Engineering Works, Ltd., to Loughborough inlet, for the Cuba Silver Mining Co., of which Mr. F. W. McCrady is manager and engineer. This plant is for use in developing the Cuba Co.'s mining property on the inlet.

The Providence Mining Co., of Greenwood, B. C., lately purchased from the Vancouver Engineering Works, Ltd., one of its latest types of steam boilers. The boiler was fitted with a temporary sheetiron casing, the intention being to use it for a time in connection with shaft-sinking at the Providence mine and then remove it where it will be employed for other purposes.

The Nelson *Tribune* states that the Canadian Metals Co., which is erecting the zinc smelter at Frank, Alberta, has purchased the steel stack, 105 ft. high, formerly used by the Republic Power & Cyanide Co., of Republic, Washington. It has also purchased from the same company three carloads of machinery, including two sets of 26-in. steel rolls, an H crusher and a number of mine and mill cars.

The Vancouver Engineering Works, Ltd., lately finished the construction, and is now installing at the Tyee Copper Co.'s smelter, Ladysmith, Vancouver Island, a new hot-blast system, designed by the smelter manager, Mr. Thos. Kiddie. If this system prove successful, it will probably be adopted by other smelters. The installation will be completed before the close of May, after which its effectiveness will be fairly tested.

The Canadian Westinghouse Co., Ltd., recently sold to the Edmonton, Alberta, Street Railway Co. a 200-kw. railway generator and a number of double equipments of railway motors. Edmonton is the most northerly city on the American continent to operate an electric street railway. Another recent sale made by the same company was that of a 500-kw. turbo-generator unit to the Canadian Pacific Railway Co. This unit is to be installed at Fort William, on the C. P. R., and is to be used for supplying power to the various grain elevators at that point. The unit is to operate 3-phase, 600-volt, 7,200 alternations, 3,600 r. p. m.

The Canadian Rand Drill Co., and the Jenckes Machine Co. having the same representatives in British Columbia, confusion sometimes arises in newspaper notices as to which company receives orders for plant and machinery. Last month it was stated in a number of newspapers and mining jour-

nals that the Jenckes Machine Co. had received an order from the St. Eugene Consolidated Mining Co. for a 30-drill air compressor and some steam boilers, the latter of a total capacity of about 500-h.p. While the Jenckes Machine Co. is supplying the boilers, it is the Canadian Rand Drill Co. that is manufacturing the compressor. Similarly the makers of the 30-drill air compressor and the 12 by 18 hoisting engine ordered for the Western Fuel Co., have been mixed up. The Jenckes Machine Co. is executing the order for the hoisting engine, and the Canadian Rand Drill Co. that for the air compressor.

TRADE NOTES AND CATALOGUES.

The Holt Manufacturing Co., of Stockton, California, has issued an illustrated bulletin giving information relative to its traction engines.

The Abner Doble Co., of San Francisco, announces that arrangements have been made with the John McDougall Caledonian Iron Works Co., Ltd., of Montreal, Quebec, whereby the latter become sole licensees for the manufacture of the Doble system of water-wheels in the Dominion of Canada.

The Schaake Machine Works, of New Westminster, sole makers of Emett's Hardite crusher jaws, stamp-mill shoes and dies, wire rope sheaves, etc., are advertising the excellent wearing qualities of this metal wherever there is hard usage and consequent liability of parts to excessive wearing or breakage.

The Westinghouse companies' publishing department has issued advance copies of two illustrated pamphlets on Westinghouse direct current and alternating current fan motors, respectively. These contain descriptions of these handy appliances, and the illustrations show some of the uses to which they can be put.

E. G. Prior & Co., Ltd., of Victoria, B.C., have secured the contract for the supply of structural iron and steel to be used in the erection of the big hotel the Canadian Pacific Railway Co. has arranged to build in Victoria. The materials to be supplied under this contract include steel girders, joists, rods, etc.; cast iron columns, and much miscellaneous iron and steel, aggregating in weight about 1,500,000 lb. Delivery will be commenced about the end of June and will be continued thereafter as building requirements shall call for it.

A distinctly handsome publication is the 70-page booklet, entitled *The Westinghouse Companies in the Railway Industrial Fields*, the Westinghouse companies' publishing department has prepared for distribution at the International Railway Congress at Washington. The brief account, historical and descriptive, given of the various Westinghouse works, with incidental mention of some of the more remarkable apparatus that have been built in them, makes interesting and instructive reading. The booklet covers quite a wide field of manufactures, including air brakes, railway signals, electric machinery of various kinds, arc, Nerst and other electric lamps, etc., and well repays careful perusal.

PUBLICATIONS RECEIVED.

United States Geological Survey. Water Supply and Irrigation Paper No. 117. The Lignite of North Dakota and Its Relation to Irrigation. By Professor F. A. Wilder. Pages, 59; illustrated.

Professional Paper No. 39. Forest Conditions in the Gila River Forest Reserve. By Theodore F. Rixon. Pages, 89; with reconnaissance map.

Bulletin No. 258. The Origin of Certain Place Names in the United States. (Second Edition.) By Henry Gannett. Geographer to the Survey. Pages, 334.

Underground Waters of Eastern United States. By Myron L. Fuller. Pages, 272; illustrated.