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# MINING RECORD

ESTABLISHED 1895

VOL. XII.

DECEMBER, 1905.

No. 12

## BRITISH COLUMBIA MINING RECORD

E. JACOBS.....Managing Editor

Devoted to the Mining Interests of the Pacific Northwest.

PUBLISHED ON THE 15TH OF EACH MONTH BY

**THE BRITISH COLUMBIA RECORD, LIMITED**

VICTORIA, B. C.

Office—Province Building. Telephone 243. P. O. Drawer 645.

### ADVERTISING AGENCIES:

London, England: E. Henderson & Co., Billiter Square Buildings.  
Denver, Colorado: National Advertising Co., Quincy Building.  
San Francisco, California: E. C. Duke's Advertising Agency, 124 Sansome Street.

### SUBSCRIPTIONS PAYABLE IN ADVANCE:

Canada and the United States, per year - - \$2.00  
Great Britain and Foreign, per year - - - \$2.50

Advertising copy should reach Victoria office by 5th of each month  
Rates on application.

Correspondence to be addressed to the Managing Editor.

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## NOTES AND COMMENTS.

Once again the MINING RECORD takes pleasure in wishing its numerous readers A HAPPY NEW YEAR. This is the eleventh time, since the establishment of this journal, that it has had a similar opportunity to show sentiments of goodwill towards those whose interests it persistently endeavours to advance. That such sentiments are cordially reciprocated by many good friends and well-wishers, is well-known to the writer, who has also to express his sincere appreciation of the many kind words of commendation and approval of his work, spoken from time to time by one and another of those with whom he comes in contact. May the year 1906 be a prosperous one. As its immediate predecessor closes the outlook for the new year appears big with promise so far as the mining industry is concerned. That this promise shall be abundantly realised is, perhaps, the best wish a mining journal can give expression to. May present expectations be amply fulfilled and the mining industry experience in 1906 an expansion even greater than that it is our happy privilege to be able to chronicle in pages that follow.

The publication of this issue of the MINING RECORD has been delayed longer than was intended when it was decided to make it the Annual Review number. Heretofore the general review of the progress of the mining industry of the province for the year just closed has appeared in January. With a desire to place before readers of this journal as early as practicable a fairly full summary of the year's developments and the general results achieved in connection with the utilisation of the mineral resources of British Columbia, efforts have been made to have these completed and published immediately after the close of the year, but unexpected difficulties have arisen and prevented this good intention from being carried out. We regret this exceedingly, but make no excuses; we simply admit that the work involved has proved to be too great to be completed sooner with the limited assistance and resources at our command. After several weeks' correspondence and other preparation for the collection of the data requisite for a comprehensive review of the situation over the wide field the province presents, the editor of the MINING RECORD spent nearly four weeks in the Kootenay and Boundary districts, which are the chief metalliferous min-

ing sections of the province, gathering facts and figures so as to be able to present as complete and reliable a statement as possible. The time available, however, proved too short to admit of the completion of the work before the end of December, hence this delay in the issue of the *MINING RECORD*. While lacking in some respects, the information given in the following pages will, on the whole, convey an idea of the progress made in 1905, but it will be an inadequate one. Yet one prominent fact is brought out, viz., that the mineral production of 1905 was the largest of any year in the history of mining in the province. This may be regarded as a positive statement, and as one that may be relied on as correct, as will most assuredly be proved by the official statistics when they shall have been collected and made public. No haphazard guesses have been made in arriving at the estimate of production presented in the tables given elsewhere. In the case of some of the most important of the producing sections actual production has been definitely ascertained so far as quantities are concerned, while values have been based on general average yields of the year immediately preceding. Wherever such particulars were not obtainable estimates have been made after careful consideration of the conditions that have obtained during the year in individual cases, and, as far as practicable, consultation with those best informed as to the position. The result arrived at is, therefore, an honest presentation of what is believed to be the value of the mineral production for the year, calculated at prices shown in one of the articles dealing therewith. It is true that the considerable increase over 1904 these conclusions show is to a large extent the result of higher average prices for metals than ruled in 1904, but apart from this there has been a decided increase in tonnage in 1905, as will be recognised if comparison be made with the quantities of metals produced in 1904. The whole position may be briefly summed up in a few short sentences. There was much development work done in the mines. Modern plant and machinery were installed at mines and smelters. Operating costs were reduced. New reduction processes were successfully adopted. Production of ore was considerably increased. More transportation facilities were provided. These and other factors combined to bring about substantial progress, and, in not a few cases, profitable results. The outcome of all these favourable conditions is the establishment of confidence in the mining industry of the province to an extent not experienced for years, and this confidence has induced, and is continuing to induce, an expenditure on further development and additional equipment that augurs well for even greater and more successful results in 1906. With a reasonable prospect of the prices of metals continuing to be such as will leave a good margin of profit on the year's mining operations, there appears to be good reason to look forward with confident expectation to the ensuing year witnessing a still further advance in the total value of mineral production.

Several of the newspapers of the Kootenay and Boundary districts issued special numbers at the close of the old or beginning of the new year. Those we have received are the Special Mining Review of the *Nelson Daily News*, the *Cranbrook Herald Annual*, and the Holiday Number of the *Phoenix Pioneer*. Since, with the exception of specially contributed articles on lead and zinc, practically the whole of the mining information in that number was prepared by the editor of the *MINING RECORD*, modesty prevents our expressing an opinion as to its merits, but we may be permitted to mention that the enterprise of the proprietor of the *Daily News* in issuing a 20-page special number has been freely commended by the provincial press, and the comprehensive review of the mining industry of the province generally characterised as a valuable advertisement of the extensive mineral resources of British Columbia. The summary of other industries of the Kootenay has been favourably mentioned as well. The *Cranbrook Herald Annual* is also a creditable publication, containing many pages of information. While the varied resources and industries of East Kootenay are given particular prominence, a wider field is covered by some of the articles, the whole constituting a valuable and attractive advertisement for the East Kootenay district in particular and the province in general. The Annual Holiday Number of the *Phoenix Pioneer* comprises an exhaustive and carefully prepared description of the industries of the Boundary district, which produces more copper than any other section of the Dominion of Canada. The full accounts given of the enterprises of the several large mining and smelting companies operating in the Boundary, the descriptions of their mines and smelting works, and the record of the operations from the time of the inception of their respective undertakings up to the present, constitute a compendium of information that will be valued by many stockholders and others interested in the big copper mines and smelters of the Boundary, with their unusually favourable record of low-cost mining and smelting. There is beside much information relative to smaller copper properties, the high-grade silver-gold mines of the district, electric power undertakings, railways, descriptions of the Boundary towns, etc. Altogether the number is one that the editor of the *Phoenix Pioneer* may well feel proud of, the more so since it is one that will be generally kept for reference purposes by those requiring full and accurate information relative to the Boundary. Just a few words, in conclusion, concerning two other publications. The *Grand Forks Gazette*, published late in December, together with valuable information concerning the agricultural resources of the Kettle River Valley, a history of the Granby Con. M. S. & P. Co., containing useful and authentic information of that organisation and its operations. The other special issue is that of the *Anaconda News*, published at Anaconda near Greenwood. The ordinary issues of the *News* are unpretentious, but this special issue contains brief but interesting descriptions of mines and smelters in the Boundary, and is a number that is a credit to its youthful editor and proprietor, Master Robert Keffer.

**COMPARATIVE REVIEW OF THE MINERAL PRODUCTION OF BRITISH COLUMBIA IN 1905.**

**S**UBSTANTIAL progress in production was made in 1905, as is evidenced by the statistical tables and comments that follow. They clearly demonstrate the extent of the advance made and afford grounds for much satisfaction, the more so since they give proof of the fact that the year's production was a record one in the history of mining in the province.

**TOTAL MINERAL PRODUCTION IN TEN YEARS.**

The totals of mineral production in British Columbia during ten years, 1896-1905 provide an object lesson to which, in the interests of the mining industry of the province, too much prominence cannot be given, so they follow:

Year.	Total Value.
1896 .....	\$ 7,507,956
1897 .....	10,455,268
1898 .....	10,906,861
1899 .....	12,393,131
1900 .....	16,344,751
1901 .....	20,086,780
1902 .....	17,486,550
1903 .....	17,495,594
1904 .....	18,977,359
1905 (estimated) .....	21,203,000

Total for ten years .....\$152,857,610

The considerable advance made in the year just closed is the more gratifying for the reason that the increase is not alone due to the higher average prices of copper, silver and lead as compared with those of 1904. A materially increased tonnage of minerals has also contributed largely to the gain made, and in this respect the improvement appears to be permanent rather than temporary, which is still more satisfactory. It is true that in several districts there has been a decrease, but in only one, viz., the Coast, has this been serious, and even here there is the sufficient reason that this was in part brought about by a labour difficulty that prevented one colliery from contributing its ordinary share to the year's total production. The other disturbing factor—the reduction in output of the Tyee mine, Mt. Sicker—will in 1906 (even should the Tyee not be again as productive as before, which it may be) be more than compensated for by a much larger output from the Britannia mines, which late in the year commenced shipping to the smelter and may be expected to produce to a steadily increasing extent from now on

**TOTAL VALUE OF MINERALS PRODUCED IN 1904 AND 1905.**

	1904.	1905.
Gold, placer .....	\$ 1,115,300	\$ 1,110,000
Gold, lode .....	4,589,609	4,640,000

Total gold .....	\$ 5,704,908	\$ 5,750,000
Silver .....	1,719,516	2,045,000
Copper .....	4,578,037	5,430,000
Lead .....	1,421,874	2,368,000
Zinc .....		320,000

Total metalliferous ....\$13,424,335 \$15,913,000

Coal .....	3,760,884	3,330,000
Coke .....	1,192,140	1,210,000
Building materials, etc....	600,000	750,000

Total non-metalliferous.\$ 5,553,024 \$ 5,290,000

**Summary—**

	1904.	1905.
Metalliferous ....	\$13,424,335	\$15,913,000
Non-metalliferous ..	5,553,024	5,290,000

Total production .....\$18,977,395 \$21,203,000

In calculating the values of the several minerals to obtain the totals shown in the foregoing table placer gold has been taken as worth \$20 per oz., lode gold at \$20.67 per oz., silver at 60 cents per oz. less 5 per cent; copper at 15 cents per lb.; lead at 4.6 cents per lb. less 10 per cent; zinc has been averaged at \$24 per ton; coal valued at \$3 and coke at \$5 per ton of 2,240 lb.

**QUANTITIES OF MINERALS PRODUCED IN 1904 AND 1905**

The quantities of minerals produced were as under:

	1904.	1905.
Gold, placer—oz. ....	55,765	55,500
Gold, lode—oz. ....	222,042	224,490
Total gold—oz. ....	277,807	279,990
Silver—oz. ....	3,222,481	3,587,719
Copper—lb. ....	35,710,128	36,200,000
Lead—lb. ....	36,646,244	57,200,000
Zinc—tons .....		13,330
Coal—tons of 2,240 lb. ....	1,253,628	1,110,000
Coke—tons of 2,240 lb. ....	238,426	242,000

It will be seen that, leaving out of account the small increase in placer gold which revised figures will probably show to have been under-estimated, the only mineral that did not exceed in quantity as well as value the production of 1904 was coal. As already stated the cause of this was a labour difficulty, which trouble led to the shutting down of the Western Fuel Co.'s colliery at Nanaimo, Vancouver Island, for six to seven months. Happily the matters at issue were adjusted and operations resumed before the year ended.

**MINERAL PRODUCTION BY DISTRICTS**

Coming now to production by districts, here again there is general cause for congratulation, the decreases having, with the single exception of the Coast district, been small, and all were due to causes that will in all likelihood be overcome in 1906. The comparatively big increase in East Kootenay was due chiefly to the enlarged output of lead from the St. Eugene

mine—a result first of the lead bounty granted by the Dominion government and next to the higher average price of that metal. The Crow's Nest Pass Coal Co.'s collieries also contributed to this increase to the extent of about \$327,000. In the Boundary section of Yale district the increase of more than 33 per cent is in a large measure the direct outcome of a combination of a much bigger production of copper-gold ore and the higher average price of copper the year through. The production by districts is shown in the following table:

District	1904.	1905.
Cariboo .....	\$ 474,600	\$ 460,000
Cassiar (Atlin, etc.) .....	558,573	563,500
East Kootenay .....	3,210,573	4,927,500
West Kootenay .....	5,806,070	5,706,000
Lillooet .....	34,583	30,000
Yale (Boundary and Similkameen) .....	4,190,281	5,651,500
Coast (Mainland, Vancouver Island, etc.) .....	4,102,679	3,114,500
Miscellaneous (building materials, etc) .....	600,000	750,000
Totals .....	\$18,977,359	\$21,203,000

### THE MINERALS AND THEIR PRODUCTION SEPARATELY REVIEWED.

**R**EVIEWING separately the production in 1905 of the several minerals, details of which are given in the foregoing comparative review, the following observations may be taken to indicate in a general way the position in regard to them, respectively:

#### GOLD.

A DECREASE IN PLACER AND AN INCREASE IN LODE GOLD.

*Placer Gold*—The dry and short season for placer mining operations was accountable for the lack of progress, from a production point of view, in connection with this branch of the mining industry. This, notwithstanding there has been real progress in the direction of mining methods that give much promise of making for permanent improvement in placer mining, whether by hydraulic mining, deep drifting or dredging. Before glancing at these in passing, it should be stated that though estimates published in provincial newspapers have variously stated the season's total recovery of gold in Atlin district at amounts ranging from \$600,000 to \$1,000,000, it has been deemed advisable, in view of the general unfavourableness of the season, to place it at less than \$550,000 in the accompanying estimate, no verified figures having yet been received to prove the district's production to have been much larger than that of 1904, which appears in the official records as having totalled \$530,000. Further, it will be seen that since the Consolidated Cariboo Hydraulic Co. recovered gold to the value of only \$21,733 in 1905, as compared with \$85,936 in 1904, it will be understood that even the considerably better season reported by several individual placer mines in Cariboo could hardly be expected to have overcome this shortage, hence the decrease shown

in the production of that district, which is only in gold. Some information concerning the Consolidated Cariboo Hydraulic Mining Co. is given on another page, for the purpose of showing its improved prospects.

In regard to improved methods in mining for placer gold—these are several, including the deep drifting now appearing to be approaching a successful outcome to the efforts of the past two or three years to overcome the serious difficulties that have attended it; the measure of success that has attended gold dredging operations, especially in the Atlin district, and the profitable return reported to have been obtained following the installation, late in the season, of a steam shovel, also at Atlin. The interesting notes by Mr. H. W. Ebbs Canavan, C. E., on dredging at Atlin, printed elsewhere in this issue, show some of the difficulties met with as well as the success achieved. The deep drifting operations at La Fontaine on Lightning Creek, of the Cariboo Consolidated (1904) Ltd., and on Slough Creek, also in the Cariboo district, of the Slough Creek Gravel Gold, Ltd., give promise of eventually proving successful. The great flow of water from the ends of the drifts, which is the chief obstacle in the way of mining the gold-bearing gravels occurring in the ancient channels in which these deep-drift workings are gradually being advanced, is being lessened, and the expectation is that ere long it will be possible to proceed with the extraction of the gravels lying on bedrock and which contain gold in such quantities as will yield large profits. An idea of the flow of water may be obtained from mention of the fact that last June more than 1,000,000 gallons per day were flowing into the deep drifts of the Slough Creek mine, which quantity kept the pumps going constantly at a moderate speed. Until the high pressure of so large a volume of water flowing in at the drift ends shall have been considerably reduced, the mining of the gravels on a payable basis will not be practicable. No particulars have been received relative to the steam shovel at Atlin other than that its operations were successful and profitable.

*Lode Gold*.—The increase in lode gold was contributed largely by the copper-gold mines of the Boundary section of Yale district, and by the Nickel Plate mine, near Hedley, Similkameen. These are estimated to have added about \$400,000 to the year's total. Ainsworth and Kamloops divisions will probably be found to have contributed from \$15,000 to \$20,000 on this account. On the other hand Rossland mines have, it is thought, yielded about \$250,000 less in gold this year. If this estimate be borne out by the actual returns, the smaller gold yield may be attributed to the fact that reduced freight and smelting costs admit of the marketing of lower grade ores, which in itself is an important gain, since there are, beside a fair proportion of higher grade, large quantities of such ores in Rossland mines ready to be turned to profitable account so soon as conditions shall admit of their being so disposed of. The Coast districts will probably be found to have suffered a loss of about \$100,000 in their lode gold, for which the lessened output of the Tyee mine will have been responsible.

**SILVER.****SOURCES OF ITS PRODUCTION AND THE OUTLOOK FOR A FURTHER INCREASE.**

By far the greater part of the net gain of \$325,000 made in silver is credited to East Kootenay, where the St. Eugene mine was a large shipper of lead-silver ore, and the Sullivan group, also in Fort Steele division, joined in the producing mines. Lack of suitable transportation facilities militated against northeast Kootenay doing even as well as it did in 1904, so a small loss has been anticipated in estimating its production. In West Kootenay, Ainsworth division should show a sil-

\$35,000 is estimated to have taken place in the Coast districts.

The outlook for a further total increase in the production of silver in the province is regarded as favourable, even should the present high price not be maintained. The introduction of improved processes at the lead smelters operating in the province may be expected to result in lower smelting costs; the marketing of zinc ores containing silver—a product heretofore practically unsaleable so far as British Columbia ores of this nature are concerned; and the extension of the leasing system, that is finding increased favour, especially in the Slocan, all make for increased produc-



Granby Co's Smelter, at Grand Forks.—Showing circular brick smoke stack, 150 ft. high, erected in 1905.

ver yield approximating \$50,000; Nelson a slight increase to about \$110,000; and Slocan and Slocan City divisions together well on for \$900,000, which would give them a joint gain of nearly \$80,000. For the same reason as that assigned for the expectation of reduced gold returns from Rossland ores, a loss of a few thousand dollars in their total silver contents is estimated. The Lardeau may also be regarded as having produced less silver, the cessation of shipments from the Silver Cup mine during the year having lessened production to a degree that will probably be found to have reduced the local silver yield to the extent of about \$15,000. In Yale district an increase of \$14,000 is looked for, largely from the Boundary, and to a small extent from Kamloops. A decrease of fully

tion. Further, the success met with in operating several of the "dry ore" mines of the Slocan, such ores usually carrying high silver values, will, no doubt, lead to renewed activity in the accessible parts of the "dry ore belt," with a resultant increase in the output of silver.

**COPPER.****ITS IMPORTANT POSITION AMONG BRITISH COLUMBIA'S MINERAL PRODUCTS.**

Speaking at the annual general meeting of shareholders in the Canadian Bank of Commerce, held in Toronto last January, the general manager of that important institution, in the course of a comprehensive address, commented briefly on the mining industry of

British Columbia. Of metalliferous mining he said: "The mining and smelting of metalliferous ores is probably in a sounder position than ever before. High prices for copper, increased knowledge of technical features of mining, a sufficient supply of coke, and the absence of share speculation in untested or worthless properties, are the satisfactory features. The least favourable is the uncertainty as to the permanence of reasonable relations between the mine owners and labour." The experience in British Columbia during 1905 has been in the main that the "satisfactory features" as above narrated, have been intensified, while the "uncertainty" has almost, if not quite, altogether disappeared. The year has most assuredly been a favourable one for copper mining, for if the larger copper companies of this province made profits, as they undoubtedly did, in 1904, with copper at an average price the year through of about 12½ cents, there was every incentive to secure an enlarged production with an average price nearly three cents higher, as was the beneficial experience of 1905.

The estimated gain in value of copper produced was mostly from the Boundary district, to which an increase of nearly \$1,000,000 has been credited. Kamloops has also been regarded as having made a gain—probably something like \$50,000. Rossland has been taken to have produced rather less copper than in 1904—probably to the extent of \$10,000 to \$15,000. The output of ore from the Silver King mine may have enabled Nelson to show a rather higher production of this metal. The coast must have fallen short of its 1904 yield by about \$160,000. No other part of the province than these several divisions is as yet a copper producer to an extent worth mentioning.

The production of copper in British Columbia now ranks second only to that of gold among the minerals produced in the province. With a continuation of similar progress to that made during recent years it may be expected to, ere long, exceed in value that of gold, and this notwithstanding that its market value is fluctuating. By far the greater part of the total production of this metal in Canada is contributed by this province. How large that proportion is may be gathered when it is pointed out that Mr. Horace J. Stevens, author of *The Copper Handbook*, and a well-known writer on copper matters, lately published an estimate of the production in 1905 of copper in the various countries of the world, in which that of Canada was placed at 21,000 tons. A reference to the estimate of British Columbia's production appearing on another page will show that it is placed at about 18,000 tons, or six-sevenths of the total Mr. Stevens estimates as that of the whole of Canada. Although not directly bearing upon the subject of copper production in this province the following excerpts from Mr. Stevens' article on "The World's Copper Trade" may be of interest:

"The year 1905 has given much the largest production of copper ever known. For that matter 1893 is the only year in the past quarter of a century in which the world's production of copper has not increased, and the falling off in that year, as compared with 1902,

was less than 3 per cent. The increased output of 1905, however, is incomparably the greatest ever known in the history of the trade.

\* \* \* \* \*

"During the decade ending 1905 the production of the United States has increased 148 per cent and the production of all other mines has increased 84 per cent. The largest percentage of increase outside of the United States is shown in other North American countries. For the decade ending 1905 the Canadian mines have increased in production by 425 per cent, and the mines of Mexico have increased 459 per cent. The mines of North America made 187,337 tons of copper in 1895 and 510,650 tons in 1905, an increase of 178 per cent. The mines of the balance of the world made 147,228 tons in 1895 and 212,900 tons in 1905, an increase of 45 per cent."

### LEAD.

A BIG INCREASE IN PRODUCTION, WITH CLOSING PRICES HIGH.

An increase of 20,500,000 lb. of lead, or rather more than 50 per cent on the production of 1904, is a decidedly substantial and satisfactory result of the year's lead ore mining. While about 40,000,000 lb. of the 57,000,000 lb. produced came from the St. Eugene mine, East Kootenay, and a few mines contributed much of the remaining 17,000,000 lb., it is interesting to note that the total number of mines and prospects that shared in making up this large aggregate was fully 200. The sources of this production, as regards districts, were as follows:

Lead Produced in—	Tons.
East Kootenay .....	24,200
Ainsworth and Slocan .....	3,698
Other parts of British Columbia .....	738
Total for 1905 .....	28,636

About one-fourth of the lead ore and concentrates produced was exported to Europe and the remainder smelted in the province. The approximate figures are:

	Tons.
Exported as ore or concentrates .....	7,763
Smelted in British Columbia .....	20,873
Total .....	28,636

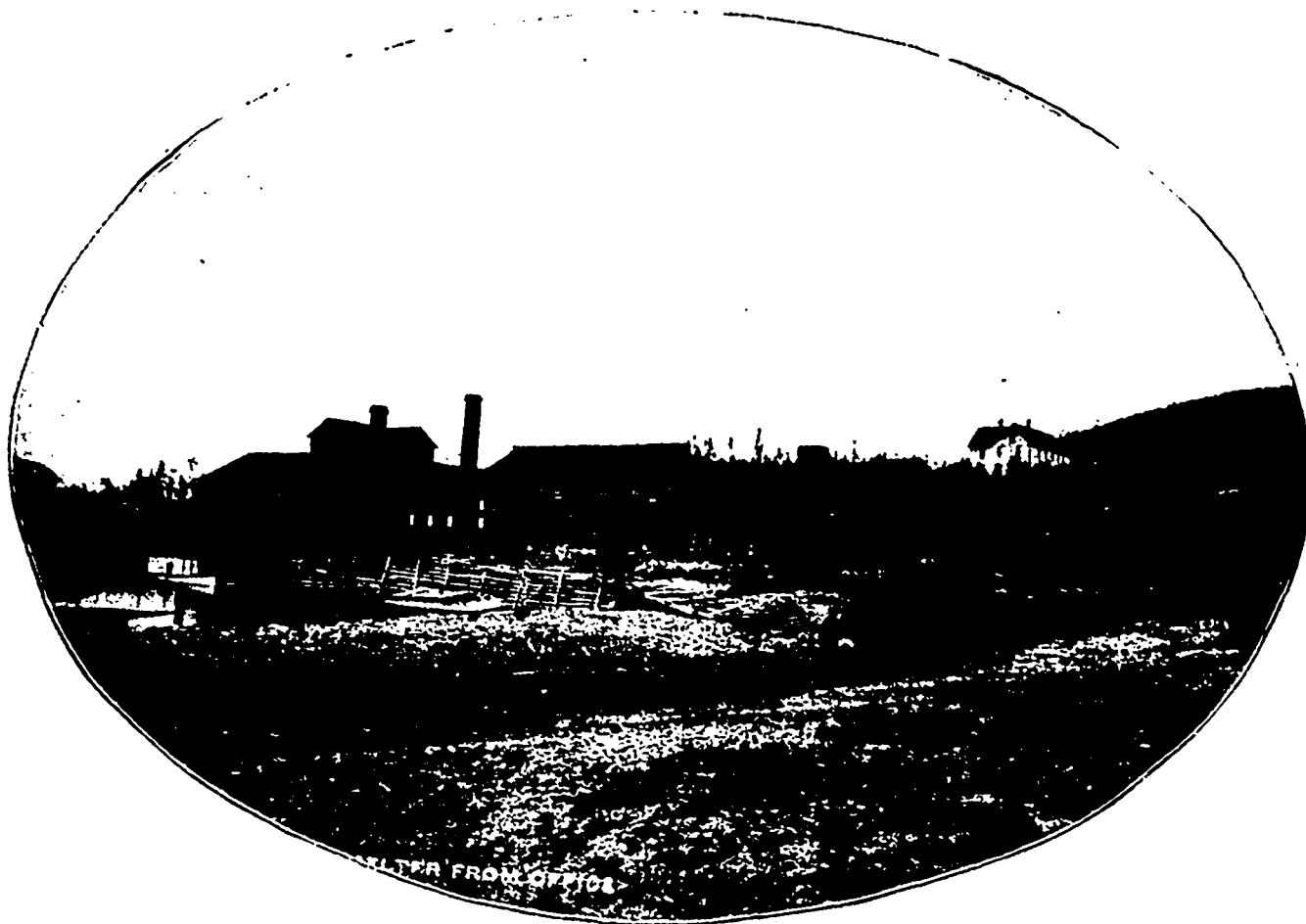
Had it not been that two fires destroyed buildings and plant at the St. Eugene and compelled a suspension of production at that mine for two to three months, fully 3,000 tons more of ore and concentrates containing lead would have been delivered to the home smelters, and so probably have made the year a record one for lead production in the province, the highest point reached having been in 1900, when the total was 31,679 tons.

As shown in Mr. G. O. Buchanan's article on another page, of the quantity smelted in British Columbia, in round numbers the proportions at the several smelting works were: Hall Mining & Smelting Co.'s

smelter, Nelson, 8,900 tons; Canadian Smelting Works, Trail, 6,400 tons; at other works (probably all at the Sullivan smelter, Marysville), 5,600 tons. Additional figures, being for the fiscal year ended June 30, are: Bounty (granted by Dominion) earned on lead smelted in British Columbia, \$240,059; on exported lead, \$97,157. The bounty on exported lead ceased on June 30, 1905. Towards the close of the year the price of lead rose above that at which the payment of the bounty automatically ceases. The extreme price—

*Slocan Division—*

Mine.	Tons.	Per Cent.
Lucky Jim (ore) .....	4,600	54.0
Lucky Jim (concentrates) .....	745	48.0
Slocan Star (concentrates) .....	4,093	33.5
Ruth (concentrates) .....	1,000	38.0
Ivanhoe (concentrates) .....	541	46.0
<i>Ainsworth Division—</i>		
Jackson (concentrates) .....	1,150	38.0



Pilot Bay Smelter, on Kootenay Lake. Recently acquired by the Canadian Metal Co.

London quotation—afterwards reached was that of December 29, viz., £17 15s.

**ZINC.**

BIDS FAIR TO ADD CONSIDERABLY TO MINERAL PRODUCTION IN THE FUTURE.

The production of zinc in 1905, shown in a foregoing table as 13,320 tons, includes a considerable quantity not actually shipped by the close of the year, but awaiting the convenience of the Canadian Metal Co., owners of the zinc smelter recently erected at Frank, south-west Alberta. The larger producers of zinc were the following:

*All Others—*

Say (concentrates) .....	1,201	40.0
Total .....	13,320	
Average .....		42.0

An average of \$24 per ton has been stated to the MINING RECORD as being that of this metal. While this estimate of value has been adopted as the estimate given, it will probably prove to be much too high, as also will the figures showing the quantity of zinc produced. Some 20 mines shipped zinc. It is thought that the number of zinc producers will be greater in 1906 and that production will be at least 40,000 tons.

Following the example previously set by the Payne and Ivanhoe, the Slocan Star, Ruth and Jackson mines



remodelled their mills and altered their mill practice so as to admit of their making a separate zinc concentrate in addition to the lead product, for which latter the mills were originally intended. The Monitor Mining Co. erected at Rosebery a water concentration plant adapted to the saving of separate lead and zinc products, and the Wakefield mill, near Silverton, also became a producer of the two materials. The Kootenay Ore Co. added to its ore sampling works at Kaslo a plant for magnetic separation of zinc, particulars of which are printed on another page. This plant is operating with satisfactory results in raising zinc concentrates in grade from about 36 per cent (about the economical limit of wet concentration) to 50 per cent zinc, which pays to ship. The present capacity of this plant is about 60 tons per day, but it can be enlarged at any time by the addition of more magnetic machines, its roasting capacity being already larger.

### IRON.

LITTLE, IF ANY, WAS PRODUCED IN 1905, BUT IMPORTANT DEVELOPMENTS MAY YET TAKE PLACE.

Iron, as a separate product of realisable value, has not been included in the estimate of value of the year's mineral production, for little, if any, was produced in the province in 1905. The iron constituent of much of the copper-bearing ore smelted is, relatively, of considerable economic value in connection with the recovery of the copper, lead, silver and gold contents of ores containing these metals, or any of them, but as a separate marketable product it possesses no practical value except where smelted for iron making purposes, and none was so treated in British Columbia in 1905. Some progress towards the utilisation of the iron resources of the province, though, was reported to have been made during the year. Announcement was made that preparations were in progress towards bringing about a resumption of iron-smelting on Puget Sound, Washington, with the object of again turning to commercial account the iron ore occurring on Texada Island and known, from past experience with it, to be of a character suitable for iron-making. This desirable object, was not, however, attained by the close of the year, though it is stated that probably it soon will be. The sale of a group of iron claims situated in the south-western part of Vancouver Island was lately reported, but as yet nothing has been done so far as known, in the direction of shipping ore from this property to an iron smelter. The sale of some iron claims situated near Crawford Bay, Kootenay Lake, was stated to have been effected a few weeks since, and the intended erection of iron making works on that lake announced, but the latter was not generally accepted as likely to occur within the next following year or two. Iron-making may yet become one of the industries of British Columbia, but at present it appears premature to look for its establishment in the near future.

### COAL AND COKE.

WESTERN FUEL CO., NANAIMO, RESPONSIBLE FOR DECREASE.

The estimated decrease in coal and increase in coke.

respectively, should be found nearly correct, the one element of uncertainty being the production of the Western Fuel Co.'s collieries at Nanaimo, Vancouver Island. With a lack of courtesy seldom displayed by managers of important mines in British Columbia the manager of the company mentioned, both in 1904 and 1905, entirely ignored several written applications for information. However, as that company spent the greater part of the year in the congenial occupation of endeavouring to compel its miners to accept its terms, which many of the men, although compelled at length to give in, considered unjust, its mines were closed during that long period, and for six or seven months there was practically no coal mined at Nanaimo.

Reduced to long tons (to conform to the practice followed by the Department of Mines in regard to tonnage and to thereby facilitate comparison with the official figures when these shall be published), the output of the coal mines of the province for 1905 was as under:

	Tons of 2,240 lb.
<i>Vancouver Island—</i>	
Wellington Co.'s mines .....	620,000
Western Fuel Co.'s mines .....	150,000
	<hr/> 770,000
<i>Crow's Nest Pass—</i>	
Crow's Nest Pass Co.'s mines .....	746,000
	<hr/>
Total production of coal .....	1,516,000
Less made into coke .....	406,000
	<hr/>
Net production of coal .....	1,110,000

(Note.—After the above comment was put in type the Nanaimo *Free Press* published a statement showing the coal output of the Wellington Colliery Co. to have been as follows: Wellington mines, 372,264 tons; Comox mines, 429,957 tons; total, 801,321 tons. In explanation of the difference between this tonnage and that given in the above table it may be stated the *Free Press* figures show the *gross* output of the mines in short tons, while the figures of the MINING RECORD are the approximate *net* output in long tons. There is a loss in washing the coal of from 12 to 15 per cent; also the coal used under the boilers of the collieries, and the quantity made into coke; these together about account for the difference in the respective totals of output shown. The *Free Press* also shows foreign shipments of the Western Fuel Co. to have been 169,874 tons. Reduced to long tons the quantity would be 151,674 tons. The MINING RECORD has credited the Western Fuel Co. with an output of 150,000 tons. The *Free Press* may have obtained from the Customs office its figures giving the shipments of the Western Fuel Co.—if they were supplied by the manager of the company he is to be congratulated on having turned over a new leaf in commencing the new year with an exhibition of common courtesy that, judging by the experience of some others, has not been habitual with him.)

The quantity of coke made was 271,433 tons, in the

following proportions: At the Crow's Nest Pass Coal Co.'s ovens, 261,933 short tons; at Wellington Colliery Co.'s ovens (approximately) 9,500 short tons, making a total of 271,433 short tons, equivalent to 242,351 long tons. There was a decrease in the quantity of coke made on Vancouver Island, consequent on the keeping closed down the whole year of the Britannia Co.'s smelter at Crofton by reason of ore shortage and the intermittent operation for a similar reason of the Tyee Co.'s smelter at Ladysmith, also on Vancouver Island. The prospects are favourable for an increased demand for coke in 1906, for the Crofton smelter will shortly resume smelting operations, and will probably be run continuously; the Tyee works may be expected to make longer runs than dur-

coal, which will bring the net increase in quantity of coal exported down to a little in excess of 50,000 tons. The competition of fuel oil and the previously-mentioned labour troubles at the Western Fuel Co.'s mines, together brought about the decrease in exports from Vancouver Island.

#### OTHER MINERALS.

OUTPUT VARIOUSLY ESTIMATED AT \$750,000 TO \$1,000,000.

The estimated value of the building materials, as given in the foregoing tables, may be found short of actual production, since there has been a considerably larger quantity of granite and sandstone used for build-



Monitor and Ajax Co's Concentrator, at Rosebery, Slocan Lake. Completed in 1905.

ing recent months; two smelters on Prince of Wales Island will want a supply of coke if it shall be found that they can be profitably operated there, and the several Boundary smelters will together treat a larger tonnage of ore than in any previous year, and so require more coke.

It is noteworthy that the Crow's Nest Pass Coal Co.'s exports of coal in 1905 exceed those of 1904 by more than 100,000 long tons, while its coke exports were rather more than 5,000 tons higher. The percentage of increase in coal exported by that company was more than 80 per cent. These increases denote an enlarged market having been found in the United States for the company's products. Against the above-mentioned increase, though, there was to be placed a considerable decrease in exports of Vancouver Island

ing purposes in the British Columbia coast cities—Vancouver and Victoria—and much more was shipped to Puget Sound points and San Francisco than in several years immediately preceding the one under review. In addition there has been an appreciably large production of Portland cement on Vancouver Island—an item not previously available for inclusion in mineral returns for at least 10 years. Of bricks, too, there have been more used in the province, while lime has been in much demand as well. Altogether the miscellaneous non-metallic mineral products usually included under the head of "Other Minerals" showed a considerable increase in 1905, so that the estimate of \$750,000 may be found short of the actual value, which has been stated to have reached quite \$1,000,000 in 1905.

## ZINC MINING IN 1905.

DECIDED progress was made in 1905 towards utilizing the zinc resources of British Columbia. In the following article contributed to the *Nelson Daily News*, the situation is reviewed by one who appears to be well informed on the subject:

The chief features in the Kootenay zinc situation in 1905 were the appointment by the government of a commission, consisting of experts of the highest rank, and the completion of the zinc separation plant of the Kootenay Ore Co., Ltd., at Kaslo. The position at the end of 1904 was that the Kootenay mine owners were thoroughly awake to the necessity of so working their lead mines as to save all the zinc ores which occurred in combination or alternately with the lead. With this object the Slocan Star, the Ruth and the Jackson mines had remodelled their mills and altered their mill practice so as to admit of making a separate zinc concentrate in addition to the lead product, for which the mills were originally intended. The Monitor mine at Three Forks also constructed at Rosebery, on Slocan Lake, a water concentration plant adapted to the saving of separate lead and zinc products; and the Wakefield mill near Silverton also became a producer of the two materials. It is the case, however, that economical mill practice does not admit in this district of producing a zinc concentrate higher in grade than about 36 per cent. zinc; and as this material does not pay to ship in the absence of high silver contents, which only very rarely occur, it was necessary to subject this product to a further treatment for the purpose of bringing up its zinc contents to a marketable point. This has been the object of the magnetic separation plant at Kaslo, which is now running successfully on these lines and is treating 36 per cent. and 37 per cent. zinc concentrates and raising them to a shipping product of about 50 per cent. zinc with a high rate of efficiency in the process. As a number of different ores have now been tested with good results this plant has an important bearing on the situation throughout the Kootenay as demonstrating the possibility of making a paying product out of a material which had previously not paid to move, just such a product as the zinc smelters in Europe and the United States are most anxious to secure, as the iron and lead contents are reduced to a minimum without an undue reduction of the sulphur contents which are a valuable asset in many plants.

This year has also seen the commencement and almost the completion of a large and important zinc smelting plant on the line of the Canadian Pacific Railway, at Frank, in Alberta; the Canadian Metal Co., Ltd., an incorporation of French capitalists, beside putting up a large and complete plant with no sparing of cost, have acquired some of the zinc producing properties on Kootenay Lake, in addition to the old Pilot Bay smelter and concentrating plant, which latter is being adapted for the concentration of their zinc ores when necessary. Until the Frank plant is completed and in operation it is too early to speak precisely of the effect it will have upon the en-

couragement of the Kootenay zinc industry in general; but that will be demonstrated in 1906, and in the meantime it is an important factor in the situation that the outside buyers of zinc ore are to have competition from an extensive and up to date local smelter. It is naturally unreasonable to suppose that such a plant will be unable to cope with outside competition, and there is no doubt that, other things being equal, the local producers will be most glad to do their part in contributing to the maintenance and prosperity of a local manufacturing industry.

The mines which produce clean zinc ore of grade sufficiently high for shipment without treatment have turned out considerable quantities during the year, led by the Lucky Jim, Mr. George W. Hughes's great mine at Bear Lake, which alone contributed several thousand tons of ore averaging about 54 per cent. zinc. A very noticeable feature in the situation during the year has been the attention paid by investors to the possibility of acquiring good zinc properties. More than one of these changed hands at prices which would have been impossible to obtain a few years ago; and there is no doubt that with the increasing facilities for making marketable products from every grade of zinc, this district affords one of the best openings on the continent for investment at the moderate prices resulting from a period during which zinc and zinc properties have had no demand.

The present high price of zinc, over £28 per ton in England, the highest price on record, taken with the largely increasing consumption of this metal and the fact that the reserve stocks have been entirely depleted, point to a continuance of the favourable condition for the zinc mining industry. There is no sign of diminution in the demand for galvanized iron or for brass, and in other directions zinc is finding new fields of profitable employment which open up infinite possibilities for its future. The world's production of spelter in 1904 was 618,770 long tons, and that of the United States 166,700 tons. In 1896 the world's production was 417,122 and that of the United States, 72,767 tons; whilst in 1886 the world's production was 294,402 tons, and that of the United States 38,072 tons. These figures, taken in connection with the fact that the consumption has pressed so closely upon the production as to leave practically no reserves of stock on hand, speak eloquently as to the future of a district in which the zinc ores are abundant and of a good quality.

The following recent description of the Kaslo zinc separation plant taken from the *Sandon Mining Standard* will be of interest:

The new separation plant of the Kootenay Ore Co. at Kaslo is working smoothly. The plant is operating on the Ruth ore and turning out a product ranging from 47 to 52 per cent. There are some points to be noted in connection with the magnetic process that are being demonstrated by this company. The electro-magnetic machine used is the Ding. Its capacity is equal to any of the high priced machines in treating roasted ore. The price of the other makes ranges from \$2,200 to \$5,000, and from three to five

of the Ding machines can be installed for about the cost of one of the others. As the Ding is about the same capacity, for the cost of one of the other machines, by installing the Ding fully 200 to 400 per cent. more capacity can be secured. This is a very important consideration.

Another point is in the roasting apparatus. The capacity should be large to cover the installation as needed of more low priced separators. The White-Howell roaster is used at Kaslo and does the work very satisfactorily. The question of cooling the roasted ore requires further experimentation. The cooling apparatus used is mainly experimental, serving the purpose of a conveyor as well as a cooler. The roasted ore as it comes from the spout is just a dull red, and scarcely any sulphur odour is in evi-

first-class work will be done. The zinc loss will be much less, and the capacity per machine and roaster increased. The roast required will be very slight. Not much dust is in evidence, and what is could be done away with by suitable hoods over the rolls and elevator doors. Some fumes are perceptible, but this also can be remedied. As the roasting practice is improved upon better work all through will be done, and the small amount of fumes eliminated.

The costs should not be heavy. The roaster uses wood for fuel and gives a good, long flame. Very little waste of heat by radiation is perceptible. Probably future practice will improve on the present plant, but it is a very distinct advance from the separation plant at the Payne mill. Costs will be much more lower and the process more simple. The adop-



Canadian Metal Co's Zinc Smelter, at Frank, South-west Alberta. Built and equipped in 1905.

dence. The roasting is also a subject for experiment to secure the best results. The conveyors to the screens are all of steel, work well and with little dusting. Sizing by screening is done after roasting, another good point greatly preferable to sizing before, because of the deslagrating action of the heat on the ore.

The iron impurity of the Ruth ore tested is the siderite with a good percentage of pyrite. The pyrite and blende are quite intimately commingled, necessitating finer crushing of the middlings. It is probable that the 6 per cent. tailing loss in zinc comes in the pyrite. The siderite generally breaks clean, and is easily removed. With an ore carrying the siderite only for an impurity, such as the Jackson,

tion of cheap separators and plenty of them is a step in advance over former methods. Some are apt to believe that if the roasting could be cut out there would be a distinct economical gain. It must be remembered that in any event the material treated must be dried, and very little more time and fuel is required for the roast. To treat unroasted ores requires very expensive machines with limited capacity. Roasting allows the use of several machines which give a large capacity at about the cost of the former type. Great credit is due for the successful working out of the different problems to Mr. Geo. Alexander and his efficient staff, notably Mr. Herriman.

LEAD MINING IN 1905.

**W**RITING on the subject of Lead Mining in British Columbia in 1905, Mr. G. O. Buchanan, of Kaslo, inspector under the Lead Bounty Act, recently contributed to the *Nelson Daily News* an article which showed the progress made in lead mining in the province in 1905. After giving in detail a list of the shippers of ore containing lead, Mr. Buchanan deals with his subject as follows:

Of this list of 200 names many represent prospects from which only trial shipments have been made, many others are gold, silver or copper mines, with lead contents of subsidiary importance, and of the whole list only about 40 are mines which have shipped during the last two years 50 tons or more of lead.

As to geographical distribution, the Coronado is in the Skeena mining division. Two small shippers are at Albert Canyon on the main line of the C. P. R. The Paradise, Delphine and half a dozen others are near Windermere, north-east Kootenay. The Ymir, Arlington and a dozen others are on the line of the Nelson & Fort Sheppard Railway. Another detachment of 15 or 20 is found in the Boundary district, 20 more are in Trout Lake and Camborne districts. One, the Alice, is at Creston. The St. Eugene, by all odds the "whale," is at Moyie, with no other mine of any kind within 30 miles. The Sullivan (next in size to the St. Eugene), and the North Star (until lately one of the very largest shippers), are close together at Kimberley, with no other producing mines near them, the balance (constituting a big majority), are on the island outlined by the waters of Kaslo River, Seaton Creek, Slocan Lake and River, and Kootenay Lake and River.

Every creek that comes down from the interior heights of this tract, Kokanee, Woodbury, south fork of Kaslo, south fork of Carpenter, Four-Mile, Ten-Mile, Lemon and a dozen others is followed by a wagon road, and every wagon road leads to lead-producing mines, some of them famous as amongst the richest silver mines in the world, as well as for being up to 50 and 60 per cent. in lead.

The production for the calendar year (December estimated), has been as follows:

	Lb. Lead.
Hall Mining & Smelting Co. (Nelson).....	17,785,862
Canadian Smelting Works (Trail).....	12,785,901
Elsewhere in British Columbia.....	11,206,169
Exported in ore to Europe .....	15,525,835
	57,272,767
Equal .....	28,636 tons
Output, 1904 .....	20,000 tons
Increase .....	8,636 tons

Except for the blank in shipments from the St. Eugene caused by damage to its works by fire (the months of October and November having been practically lost), the output for 1905 would have gone

close to that of the banner year, 1900, which was 31,679 tons.

For the fiscal year ending June 30, 1905, the returns to the Department of Trade and Commerce for bounty purposes show as follows:

	Lb. Lead
Delivered to British Columbia smelters.....	33,704,932
Exported to Europe .....	21,972,999
Total .....	55,676,931

Equal to 27,838 tons.

Bounty earned on home-smelted lead....	\$240,058.71
Bounty earned on exported lead.....	97,157.30

Total .....	\$337,216.01
-------------	--------------

For the year ending June 30, 1904, the figures were:

Lead production .....	13,397 tons
Bounty earned .....	\$195,283.92

The term for which a bounty was payable upon lead in ore exported to Europe ended on June 30, 1905, and a proposition for the extension of the term was not favourably considered by the government.

On November 29, 1904, lead was quoted in London at £12 12s. 6d, and the rate of bounty payable was reduced, the rate of diminution being 1.3579 cents per 100 lb. of lead for each advance of 1s. 3d. above £12 10s., the whole bounty being wiped out by 57 of such advances. The price went to £13 3s. 9d., on January 6, fell to £14 17s. 6d. on March 3, rose to £12 11s. 3d. on April 4, and from that time has steadily climbed until £16 was reached on November 29, and the extinction of bounty payments, for the time being, was accomplished. On December 29, £17 15s. was reached.

The extremes of variation for the last five years have been:

1900—September 15 .....	£18	os.	od.
1902—January 14 .....	£10	5s.	od.
1903—March 12 .....	£13	15s.	od.
August 16 .....	£10	18s.	9d.
1905—December 29 .....	£17	15s.	od.

That lead will remain permanently above £16 is not to be expected, but it is probable that we have seen the last of £12 lead. The predominant influence of the American Smelting & Refining Co., not so much in favour of an extremely high price as of a steady price, is beginning to be internationally felt, and there is, beyond that, universal testimony to the fact that the legitimate demand for lead has overtaken the supply, that the demand is growing and bound to grow, and the sources of fresh supplies are not in sight.

Of our home-smelted product the electrolytic refinery at Trail is now treating 50 tons per day, or at the rate of 18,000 tons per annum. At the present moment the refinery is busy with orders for Canadian consumption, and it is probable that we can count the Canadian market as good for, from this time onwards 18,000 tons per annum. The product of the Trail refinery in both silver and lead exceeds in purity any

hitherto produced upon a commercial scale, and both metals command a premium in competition with the product of other refineries.

The year has introduced an era in the provision of lead-smelting facilities. In the early spring the Sull Group Co.'s new smelter went into blast at Marysville in East Kootenay. This smelter has two stacks, only one of which has yet been in use, of a capacity of 100 tons per day each, and the appointments and machinery embody the most modern features. With com-

of which Mr. J. J. C. Fernau, M. I. M. E., is general manager, with head office at Nelson, and which has almost completed at Frank, Alberta, a massive establishment for the treatment of zinc ores, proposes to have also a lead stack at an early date at Frank. This multiplication of smelters and introduction of metallurgical economies should certainly foreshadow better treatment rates for the producer at an early date.

The subject of zinc will no doubt be fully dealt with elsewhere in this review, but it may be mentioned here



Canadian Smelting Works, at Trail. General View of Electrolytic Lead Refinery Buildings.

mendable enterprise this company installed as a part of their plant a Huntington-Heberlein outfit of ovens and pots for ore roasting. While nothing as to results has been given out by the company, the fact is patent that the smelter has run almost continuously with no ore supply except that afforded by their own mine, a grade of ore with some reputation as difficult, from a smelting standpoint.

That the object lesson has not been lost is evidenced by the fact that at both the Hall Mines and Trail smelters similar roasting plants are under erection.

The Hendryx smelter at Pilot Bay, after nine years of idleness, is undergoing renovation at the hands of the Canadian Metal Co., and it is announced that the lead stack will soon be in commission. This company,

that some profitable disposition of the increasing quantities of zinc ore developed in connection with lead mining in the Slocan and Ainsworth camps had become the most serious problem confronting the mine owner.

The problem has been attacked from all sides, by local enterprise in the installation of separating plants, by foreign capital in the erection of the magnificent works at Frank, and by commission of enquiry under the direction of the most eminent living specialists, employed by the Dominion government.

In connection with the subject under review the following notes will be of interest:

The long tunnel on the Rambler-Cariboo is scheduled to reach the ore body (at least the place where it

ought to be) on May 1. Ore from stringers recently cut has shown values similar to those for which the shipments from the upper workings were famed.

The Monitor and Ajax Fraction mine, after a prolonged suspension of production, has again entered the list of shippers, and its mammoth and completely-equipped concentrating mill at Rosebery has been in successful operation.

In Ferguson camp the Silver Cup mine has large quantities of ore in sight and is ready to ship heavily.

The La Plata Mines on Kokanee Creek (we once spoke familiarly of them as the Molly Gibson) have concentrating works installed, and a bright future outlined.

A question of "apex rights" growing out of the 1892 Mineral Act, of which the contestants have been J. M. Harris of the Reco mine and the Byron N. White Co., has resulted in much prosperity to the legal and mining expert fraternities, and to a decision which for the present upholds the apex rights of the Byron N. White Co.

The Ivanhoe, after holding for some years a place near the head of the procession as a shipper, has paused to take breath and recover its ore bodies.

The old-time Blue Bell, now in the hands of the Canadian Metal Co., is being put in shape for heavy production and will be an important factor in feeding the works at Pilot Bay and Frank.

In Slocan camp the "leasing system" has come to stay, having proven profitable to both parties concerned, and the Payne, Whitewater, Whitewater Deep, Wakefield, Lone Bachelor, Hewitt, Emily Edith and a host of others are under operation on that basis.

Extensive works for the corrosion of lead were established during the year in Montreal by the Carter White Lead Co. The contract for their supply of pig lead for a term of years is held by the refinery at Trail. Their method of corrosion is new and improved, and this, coupled with the perfect freedom from adulteration of the lead from Trail, has enabled them to put upon the market a grade of paint lead never before equalled. The works are rushed with orders, and their requirements of raw material consequently increased.

Largely as the result of the persistent agitation begun and for the last seven years carried on in this district, the Finance Minister carried through the Federal Parliament at its last session a bill increasing the duty upon corroded lead from 5 to 30 per cent. At a sitting of the Tariff Commission held in Nelson in September, interested parties were heard upon the subject of an increase in the duty upon other lead products, (including pig). The Tariff Commission is expected to report at the coming session.

In this connection it may be mentioned that the finance minister has the prospect of a grateful relief in the matter of lead bounty payments for the current fiscal year. Under the dwindling rates at which bounty has been payable since July 1, the earnings have been kept down to about \$80,000 and should lead remain above £16 until June 30 the surplus will be larger by \$420,000 than was expected.

## BRITISH COLUMBIA "THE MINERAL PROVINCE OF CANADA."

BRITISH COLUMBIA'S mineral production in 1905 has established more strongly than ever the province's undoubted claim to the name "The Mineral Province of Canada," by which it has often been designated, so far as the production of the several metallic minerals, gold, silver, copper and lead, are concerned. A glance at the figures of production in 1904 will serve to show what the relative positions of British Columbia, Yukon Territory and the rest of Canada, respectively, were, in respect of the proportions of the total value of the several minerals mentioned contributed by each of these three divisions of the Dominion. These were: 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. This showed British Columbia to have in the year 1904, produced the four metals above named to a value of \$1,173,272 greater than all other parts of the Dominion of Canada combined. It is true that when iron and nickel (of which metals British Columbia did not produce any quantity worth taking into account) were added, the position was somewhat changed, for these brought the total production of metallic minerals in the whole Dominion up to \$30,796,431, of which, though, British Columbia contributed nearly 44 per cent. It is too early to obtain, in time for this review, even an estimate of the production in 1905 of metallic minerals in Canada east of the Rocky Mountains, but there are two known facts that suggest the probability of British Columbia being shown, when statistics shall be available, to have at least held its own, even though it may not have further strengthened its pre-eminent claim to the designation "The Mineral Province." These are (1) that its own production of metalliferous minerals will have been nearly \$2,500,000 higher in market value in 1905 than in 1904, and (2) that the value of the production of the Yukon will be found to have been from \$2,300,000 to \$2,500,000 less, these together giving British Columbia an increase in proportion of the aggregate of the Dominion that may offset even the gain Ontario is understood to have made in the Cobalt district, where phenomenally rich silver ores have been found.

That a substantial increase was made during the year 1905, and to an extent that will show the year's production to have been the highest in the history of the province, may be safely accepted as an assured fact, for the estimate of its value gives a total some \$1,116,000 higher than that of the production of the highest previous year, viz., that of 1901, when a total value of \$20,086,780 was reached, which margin is believed to be more than sufficient to cover all over-estimates, if any have been made, of individual districts. The probabilities are, rather, that the official figures, when these shall be made public, will be found to prove the general reliability of the accompanying estimate, for an amount known to be well within the actual production has in some cases been

taken—such an one as Atlin, for instance, where the estimate has been kept down to very little more than the 1904 official value, while the lowest of other estimates published since the close of the season have placed the production of that district at fully \$70,000 higher than that of 1904. This being the case, it will be readily seen that while there may have been some over-estimates, there is an equal probability of these being counter-balanced by under-estimates that will have the effect of keeping the estimate of the aggregate value of the production for the year well within its actual limits.

### CARIBOO DISTRICT.

CARIBOO DISTRICT has produced up to the present time, as nearly as can be ascertained, gold to the value of about \$39,000,000. Its gold placers are now worked by three methods, viz., ordinary placering, hydraulicing and deep drifting—the last-mentioned constituting the latest means of endeavouring to recover gold from the ancient river channels known to exist and believed to be rich in the precious metal.

Ordinary placer mining along lines that in the early history of the district produced such sensational results as to make the name "Cariboo" known throughout the then civilized world, is still followed on many creeks, but it is not from this somewhat primitive method of recovering gold that big returns are expected.

Hydraulicing yields a large proportion of the total that Cariboo produces now-a-days. The more prominent of the hydraulicing properties in the Cariboo division are the China Creek, Bear Creek, Thistle, Mucho Oro, Forest Rose, Waverly and Mosquito Creek (Flynn Bros.) All of these are reported to have done well in 1905. In the Quesnel division the season's operations at the big hydraulic mine of the Consolidated Cariboo Hydraulic Mining Co. gave exceptionally small results in gold recovered, for to quote from the report of the manager: "Owing to lack of ample precipitation the past season turned out the most disappointing one experienced since the equipment and opening of the property." No information is available as to the season's work in Harper's camp, Horsefly, also in Quesnel division, but it is not thought that much of importance was done here in 1905. On Snowshoe Creek the Hayward and the Smith and Anderson properties again had a good season.

Three or four deep-drifting enterprises have been prosecuted for several years with much energy and with results that promise success, although, for reasons already stated, that goal has not yet been reached by the larger of them. The Cariboo Consolidated (1904) Ltd., has been concentrating its efforts on its La Fontaine property on Lightning Creek, leaving its hydraulic property on Lowhee Creek inoperative for the time being. The Slough Creek Gravel Gold, Ltd., latterly discontinued development work underground, with the exception of one shift running a drive to make a new opening, and confined its operations chiefly to

draining the gravels already tapped by openings from the tunnel and bor-holes. The Willow River Co. sank to bedrock and made preparations for more work at a deeper level than previously opened. At Keithley Creek Messrs. Veith and Borland continued to work their Onward property with satisfactory results.

The operations of the Lightning Creek Gold Gravels & Drainage Co., also known as the Great Caribou, may possibly have been sufficient to class it as a legitimate mining enterprise, since money has been spent in boring and other work, but the grossly extravagant nature of the printed circulars issued from its New York office do not give it a favourable appearance.

Quartz mining in Cariboo did not make much, if any, progress in 1905. Mr. B. A. Lasell had made a cyanide test of quartz which seemed to indicate that excellent results could be obtained from treatment by that process. The ore tested was low grade, but it is thought it could be worked at a profit if on further development it were found in sufficiently large quantity. Should the wagon road to Keithley Creek be constructed, as has been promised, the likely-looking quartz ledges on Snowshoe Mountain will probably be prospected to an extent that will determine their value.

Nothing appears to have been done to turn to commercial account the scheelite, the discovery of which in the Cariboo district was reported some time since. It is probable that the absence of railway transportation facilities is in the way of the development of this mineral as well of other resources of the district that it is believed will be available when this serious obstacle to progress shall have been removed.

An attempt was made to attract public notice to the stated possibilities for oil in the Horsefly country, but there does not yet appear to be much warrant for assuming that these give reasonable promise of developing into a payable industry.

With the provision of more capital to considerably increase the supply of water for hydraulicing, and the gradual advance being made towards success in deep drifting, it would appear that the Cariboo district will in the near future become of increasing importance as a producer of gold. That it possesses enormous possibilities may be gathered from the claim of Mr. John B. Hobson, the well-known hydraulic gold mine manager, that the Consolidated Cariboo Hydraulic Co. alone has leases of 500,000,000 cu. yd. of auriferous gravels, and that it is safe to say it has not in these leases one-fifth of the available gravels, so that in the Quesnel Forks section alone there must be from 2,500,000,000 to 3,000,000,000 cu. yd. of auriferous gravels, which there is every reason to believe are as rich as those of the Consolidated Cariboo Co.'s deposits. As has been officially remarked: "The immensity of these figures is hard to grasp, but to illustrate—if ten cu. yd. yield \$1 in gold, then there is in the Quesnel section of Cariboo alone \$300,000,000 worth of gold, but this vast amount of gold is so diluted with sand and gravel that the only possible means of extracting it is by the use of immense volumes of water under pressure; that is, by hydraulic mining."

The following are extracts from the report for 1905



of the manager of the Consolidated Cariboo Hydraulic Mining Co.:

"Owing to lack of ample precipitation the past season turned out the most disappointing one since the equipment and opening of the property. The total quantity of water afforded amounted to only 45,071 5-10 in. which was not sufficient to warrant the opening of the mine for regular mining operations.

The small quantity of water available was, however, used to face up the bank so as to afford Mr. Charles Hoffman, the expert for Mr. John Hays Hammond, an opportunity to test the gold values of the deposits of the upper bench from the floor of the excavation to the surface.

"When the canals were opened and sufficient water accumulated in the pooling reservoirs the water was used at intervals of a few hours each to clear the cuts and sluices of the ice that accumulated therein during the winter months. This work commenced on April 20, and was completed on May 11. During the progress of the work, including 74 hours' washing, 8,275 miner's inches of water were used.

"Washing to remove the talus and to face up the bank commenced on May 12 and continued for a period of 354 hours, equal to 14 days and 18 hours' washing. During the progress of the work 36,796.85 miner's in. of water were used to wash out volcanic mud capping, from which was recovered 1,268.7 oz. of gold, valued at \$21,733.47—an average yield of 11.81 cents per cu. yd. The duty attained for the water used was about five cu. yd. per miner's in. per 24 hours."

Mining operations and results are shown in the following brief summary:

"Total time occupied in washing top gravel, 354 hours, or 14 days 18 hours; total quantity of water used washing gravel, 36,796.85 miner's in.; total quantity of top deposits washed, 18,394 cu. yd.; average duty of water per miner's in., washing gravel, 5 cu. yd.; average yield per cu. yd. washed, 11.81 cents; total gold produced during season, 1,268.7 oz.; total value of gold recovered from June 1, 1894, to June 22, 1905, \$1,233,936.51."

Regarding water supply, the report says:

"The precipitation for the season commencing at close of mining operations on September 4, 1904, and ending June 22, 1905, turned out the lowest record for the district since the phenomenally dry seasons of 1864 and 1887. Precipitation for season, 1904, 24.39 in.; precipitation for season, 1905 (rainfall 7.04 in., snowfall 6.75 in.); total for season, 13.79 in.; season, 1905, precipitation less than that of 1904 by 10.60 in.; quantity of water available and used during season 1905, 45,053 miner's in.; season of 1905, water supply less than that of season of 1904 by 180,146 miner's in.

The rain precipitation occurred in such light showers that only on three occasions, namely, October 20, 1904, .60 in.; May 11, 1904, .68 in.; and May 20, 1905, .75 in., did it prove sufficient to contribute any water to the reservoir lakes.

"The snowfall, which averaged 67.05 in. on the watershed tributary to the reservoir lakes, went too slowly under the influence of moderately warm days

accompanied by northerly winds and temperatures falling under freezing point at night—bad weather conditions for a water supply and accounting for the unusually small percentage of the snow precipitation that was contributed to the reservoir lakes."

The report continues as follows.

"Careful gaugings of the water supply flowing from Spanish Lake from November 15, 1904, to date, indicate that the watershed tributary to that lake is capable, even with the light precipitation recorded for the past season, of affording ample water to keep the mine in continuous operation throughout the open season, and the company's water system should be extended with all possible haste to that source of abundant and permanent water supply.

"The 10 by 10 ft. sluice tunnel was advanced 679 ft. at a cost of \$16.34 per ft., making a total length to face 930 ft., and leaving 300 ft. of tunnel and 60 ft. of upraise to complete the new opening into the hydraulic excavation, the floor of which is now about 75 ft. above the bedrock of the channel. During the months of May and June several dykes of extremely hard rock were encountered, which interfered with the progress of the work and added materially to the cost thereof. The tunnel and upraise should be completed without delay so as to facilitate the working of the high grade deposits included in the lower bench and on the bedrock and the cutting out of about 4,000 feet of sluice, which is very expensive to maintain.

"The large amount of necessary repairs and development work done during the progress of the past two seasons' work leaves the water supply system and the mine in as good condition as possible for the continuous use of an abundant water supply; but the mine will not be in first-class condition until the sluice tunnel is opened and the bank can be worked in one bench from surface to bedrock.

"The upper gravels washed during the season showed a marked increase in grade, indicating that the low grade zone encountered in the current-crossing has been passed.

A bank blast of about 6,000 kegs of black powder, to cost about \$27,000, is strongly recommended. Such a blast would disintegrate and break up ready for economical washing the heavy capping of indurated volcanic mud at a cost not exceeding one cent per cu. yd., as against of about 12 cents per cu. yd. to break it up with dynamite and hand labour. The proper disintegration of indurated alluvial deposits tends to increase the washing duty of the water, thereby increasing the gold output, besides working a material reduction in the cost of mining."

The economical treatment of such ores as those of galena occurring side by side with zinc, and which occur frequently in the Slocan, is largely dependent upon a better market for zinc and better facilities for preparing zinc ores than have heretofore obtained in that district. However, the excellent work done by the Zinc Commission, appointed by the Dominion Government, during last autumn, and the increasing attention the zinc situation is receiving, will together assist in greatly improving the position for 1906.

## CASSIAR DISTRICT.

CASSIAR DISTRICT includes the most northerly region of gold-mining in British Columbia.

It embraces the Skeena mining division, in the southern portion of the district, and in the North Atlin and Bennett Lake sections and the Teslin, Liard and Stikine mining divisions. Atlin is the chief gold producer in Cassiar; in fact, nearly the whole mineral production of this northern part of British Columbia has, ever since 1898, been contributed by the Atlin mining division. Its aggregate production to date is in excess of \$3,500,000. Its highest yield in any one year was in 1899, when a total recovery of \$800,000 was made. In 1901 its production fell to \$300,000, but each year since then has seen an increase. Last year's total was \$530,000, and it is estimated that there was a rather higher recovery in 1905.

That Atlin will in 1906 make an even better showing in regard to yield of gold may be taken for granted, unless it experience an unprecedented shortage of water—a remote contingency, by the way. With dredges and steam shovels to facilitate the handling of gravel on a much larger scale than has been possible in past years, there should be more gold recovered than during any one of the five years since the first big season's results were obtained. Dredge mining for gold has been made profitable in both New Zealand (where it is carried on on a large scale) and in California. It seems quite reasonable to look for similar success at Atlin, now that the chief difficulties appear to have been overcome.

The individual placer miner has been, to a considerable extent, superseded by the company, with its larger capital and greater facilities for economical and profitable mining. There are still creeks which are exceptions to this rule, and these have been energetically worked. New discoveries have been reported, but these have not yet been proved of sufficient value to cause any "stampedes" such as are common in some gold placer mining districts when "pay" is found on creeks not previously worked. There is one matter of especial concern to the individual miner that is noted with satisfaction, that is, the action of the Provincial Government in forfeiting hydraulic leases in cases where statutory requirements have not been carried out. Early in 1905 Dr. H. E. Young, M. P. P. for Atlin district, informed his constituents, through the medium of the press, that he had received assurance from the government of its intention to throw open all land which had been illegally held and to give due notice of such intention, so that all might have an equal chance of re-staking. Further, it was stated that the Gold Commissioner had received instructions to give two weeks' public notice of all cancellations. It is noted, too, that the appointment of a resident County Court judge has led to the more expeditious settlement of mining disputes, while a liberal expenditure on roads and trails has materially assisted in opening up some of the newer parts of the district.

As an instance of progress made by companies in Atlin district the following has been taken from a published statement of Mr. J. M. Ruffner, manager of the

Pine Creek Power Co., and the North Columbia Gold Mining Co., which together have spent more than \$500,000 in connection with their Atlin mining enterprises: "There is one thing that may be said of the district, as compared with Dawson, in Yukon territory, or Nome and Tanana, in Alaska—and that is, while our deposits do not contain such rich paystreaks as are found in those camps, we have deposits of yellow gravel, especially in the Spruce and Pine Creek valleys, that are really enormous in extent, and, though low in value, are singularly uniform in their gold contents. The values run from 35 to 50 cents per cu. yd., in gravel banks ranging from 20 to 80 ft. in depth. Speaking of our own operations, we have already opened up sufficient of the yellow gravel deposits to keep us busy for the next 30 years."

It should be noted that other companies have also made large expenditures in the Atlin mining division, in at least one instance to a considerably greater extent than above mentioned.

Gold quartz mining, while it has had some attention, has not yet made sufficient progress in the district to add anything to the value of the mineral production. Several local residents have interested themselves in coal lands situated in outlying parts of the country, but so far as known no important development work has yet been undertaken on these. The deposit of magnesite occurring near Atlin city, and from which a bulk shipment was made to San Francisco some time since, has not been further worked, returns from the shipment made having demonstrated that under existing conditions it cannot be profitably developed.

There is not much of moment to chronicle relative to other parts of the big Cassiar district. Of the north-eastern section, including Teslin, Liard and Stikine mining divisions, little is heard, excepting occasional reports of the work being done by two hydraulic companies—the Berry Creek Mining Co., operating on Thibert Creek, and the Rosella Hydraulic Mining & Development Co., on Rosella Creek. The former has done a deal of preliminary work in bringing in water and installing hydraulic equipment, and is understood now to be in readiness to commence operations and to continue them so long as the season shall be favourable for such work. The latter also has been doing dead-work, and, according to reports supplied to the press, may yet succeed in recovering gold from the ground covered by its leases.

The Skeena division of Cassiar has had an accession of population consequent upon the announcement of intended railway construction through it to the coast. The occurrence of coal over a comparatively large area of country has been reported, and, too, the discovery of promising occurrences of metalliferous minerals. Except in a few isolated instances, though, not much development work has been done. Some hydraulic work on Lorne Creek seems to have been the most important feature from a mining point of view. On the coast, Kitimat Arm, Observatory Inlet, Portland Canal and Graham Island (Queen Charlotte group), have all had more or less prospecting work done on them, while Princess Royal and Gribbell Island mines have shipped gold-copper ore to coast

smelters. It may be expected that the greater part of this northern coast country will largely benefit from the construction of the Grand Trunk Pacific Railway, and its western feeders, whenever that anxiously looked-for work shall be actively undertaken.

BERRY CREEK MINING CO., LTD.

The expense account of the Berry Creek Mining Co., Ltd., for the 1905 season shows a total expenditure in connection with actual mining operations of \$31,579.04. This included the cost of making provision for a larger supply of water; putting in new plant; erection of sawmill and necessary mine buildings; cutting of two years' supply of lumber; work on roads, trails and bridges; further opening up of several pits for hydraulic; gravel washing operations for the part of the season when it was practicable to carry them on; and the customary salaries, fees to government, and general and travelling expenses.

The construction of flumes and ditches, laying of pipe, and the setting of new giants and water gates during the season brought the plant to a capacity to, in a full season, use 150,000 miner's in. of water. The new buildings erected included a general store 20 by 16 ft., boarding house 20 by 16 ft., kitchen 10 by 10 ft., log house for director 16 by 14 ft., log house for foreman 16 by 12 ft., blacksmith shop and other buildings.

Construction work and the putting in of new plant took up so much of the season that it was not until late in the season washing operations could be commenced and that with a fast-failing water supply. Out of a possible 150 days for washing gravel a total run of only 51 days was made, as follows: In No. 1 pit, 5 days; No. 2 pit, 29 days; No. 3 pit, 10 days; No. 4 pit, 5 days; and No. 5 pit, 2 days; total, 51 days. While the plant is designed for 1,000 in. of water per day, the supply was so scant last season that on an average only 835 in. were obtainable each 24 hours worked. Gold to the value of \$6,834.74 was recovered. No. 3 pit was not cleaned up, so the recovery in that pit will be credited next season. Top gravel exclusively was washed, so the yield was proportionately small. Next season will benefit by this, since the proportion of bottom gravel, which carries relatively higher values to be washed, will be greater. A large "cave" in No. 2 pit, extending upstream to No. 1 and downstream to No. 2 pit, brought down thousands of tons of top dirt and gravel, which was thus made ready for easy removal by the giants. This cave-in carried away between 200 and 300 ft. of pipe line and the bridge carrying the pipe across No. 2 cut, so for the time being it hindered washing operations. A "cave" to a similar extent is not likely to occur again, for there is now laid out sufficient bottom and middle gravel to last for at least two years' washing.

The report of the manager (Mr. Alexander Hamfield) deals in detail with the season's work, and closes with the following summary:

"From the foregoing it will be seen that certain improvements, which had been decided upon a year ago, have now been completed.

"The new plant is finished and now in operation:

pit No. 1 has been opened up; new buildings at mine have been erected; experiments for saving platinum have been made; the flume has been re-levelled; the two new ditches from Dease Creek nearly completed; the sawmill erected and lumber sawed, and certain improvements to trails and bridges made.

"It was, of course, most unfortunate that the plant could not be installed in time, and that the water supply was so limited as to allow of only a very short run, and this under the most disadvantageous conditions. The result of this year's operations should therefore hardly be taken as a guide of what the mine can do when operated a whole season with a full supply of water and under normal conditions. For this purpose the result obtained in 1903, during a run of 98 days with 475 miner's in. of water is, I believe, much nearer the average of what the mine can do in the future.

"The mine is now prepared to handle 1,000 miner's in. of water per 24 hours, making for a full season of 150 days 150,000 in. of water.

"The season of 1903 showed a gold recovery of 45 cents per in. of water, and I see no reason why the same result should not be maintained when an equal amount of top and bottom gravel is worked. The total output for the year, with this amount of water and gravel yielding 45 cents per in., would then be \$87,500.

"But supposing, for safety's sake, we consider the output at something less—say 40 cents per in. of water, and allow 20 days for wasted time, we would then have a total for the season of 130,000 in. of water, and a gold output of \$52,000.

"The total running expenses in 1903 were \$17,400, and with the increased water supply this should not exceed \$25,000 per year. In the former instance there should therefore be a profit of \$42,000; in the latter of \$27,000.

"It need hardly be pointed out that with the Thibert Creek Mining Co.'s seven leases, and your newly-acquired three leases, you have here a deposit which will, with the present plant, require from 70 to 80 years to work out.

"As most of the improvements are now finished, the plant in running order, and a plentiful supply of water assured, it seems that you can look forward to a successful operation of your mine, but it must not be forgotten that the financial affairs of the company must be so arranged that the management will be able to lay out the plan of work in plenty of time, for only by being prepared beforehand is it possible to keep the mine running to its full capacity from the beginning until the end of the season, and only by doing this is it possible to obtain successful results."

ROSELLA HYDRAULIC MINING & DEVELOPMENT CO., LTD.

From the report of the manager of this company of the 1905 season's operations it is gathered that with a party of men he left Vancouver on April 21 last and reached Rosella Creek on June 16. During the season 625 ft. of 3-ft. flume was constructed, with provision for widening to a 4-ft. flume if found necessary. Clearing for the pipe-line was commenced and posts for foundation of pressure box put in. On September

29 the party left on their way out to the coast.

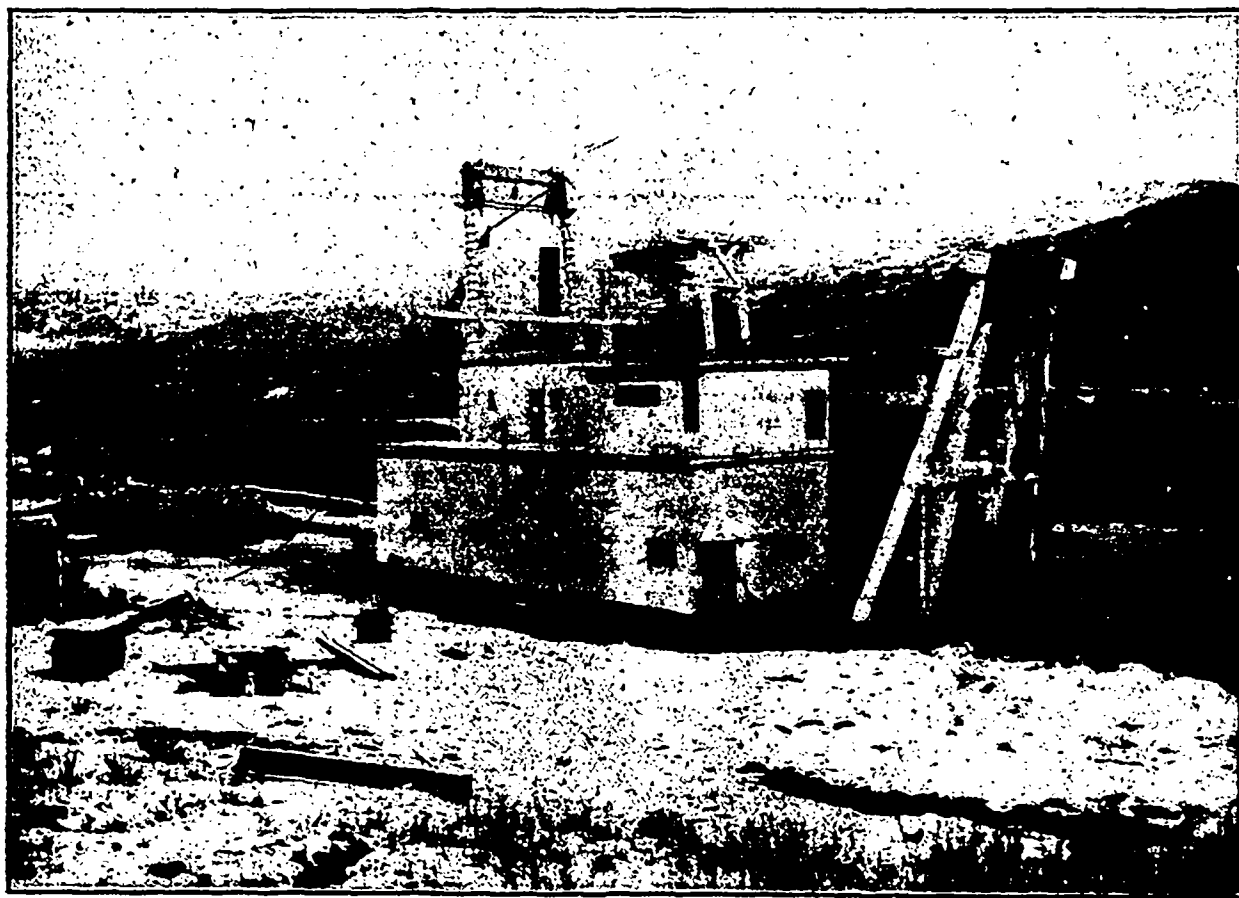
The report further states that: "At present the head of the flume is on bed-rock in pay gravel, but the company will have to run this flume from 200 to 300 ft. further before they strike the lower end of the Haskins lease. At the end of the flume the gravel is about 6 ft. deep, but when they strike the end of the Haskins lease they will have to run through a point of bench about 30 ft. deep, after which they will be, I believe, in a well-defined channel. From the head of the flume the bedrock is rising, so that the company will be enabled to clean bedrock from this point on, which

### ATLIN DISTRICT.

By H. W. Ebbs Canavan, C. E.

THE mining season just closed in the Atlin district has been notable from the fact that a number of representative men from different parts of the country visited the camp and went away greatly impressed with the many advantages possessed by this most northern placer camp in British Columbia. Experts in gravel mining were surprised at the immense area of auriferous gravel deposits and watched with much interest the work being done by the different dredging and hydraulicing companies.

During the season several large tracts of placer



British Columbia Dredging Co's 7½ cu. ft. Bucket Dredge—open connected type—on Spruce Creek, Atlin. Completed in 1905

could not be done this season owing to lack of drainage. About 10 tons of plant are on Rosella Creek, and about five tons at Haskins' Landing, which must be sleighed in with dog sleighs during the winter if the company desire to have the plant in working order by June 1. It will take about 6 weeks with 15 men to put the plant together and set it up, and the company will require this year for water-flume, pressure-box and gravel-flume, 15,000 ft. of lumber. It will require at least \$15,000 to pay all expenses to last of October, 1906."

ground changed hands for cash considerations. This will result in increased activity and the installation of new plants next year, which will mean the expenditure of a large amount of money, with a consequent increase in the output of gold.

The appointment of His Honour Judge Young, as resident judge, has done much to bring about confidence, also a clearer understanding of the mining laws and the ready adjustment of disputes. The progressive policy of the government in giving all possible encouragement to the placer miners by building roads and trails into districts discovered this

year will no doubt help to increase the gold output in future years.

By the cancellation of numerous mining leases by the Department of Mines this year, large tracts have been thrown open for staking that have been held under lease, instructions having been issued to the effect that leases cannot be held without *bona fide* attempts being made to work the ground covered by them.

The following summary of the work done by the different companies during the season will be of interest:

#### DREDGING OPERATIONS.

Dredging—being the latest method of working—has been closely watched. A great deal depends upon the success of this method of working the Atlin gravel deposits. Owing to the delay in shipment of machinery, the Gold Run dredge operated by the British American Dredging Co., Ltd., of Philadelphia was unable to start operations until June 17, at which time the old bucket lips had been removed and new ones put on, this work taking about two weeks. The new lips were of manganese steel 10 in. wide, with a reinforced cutting edge 1¼ in. thick. With these extra strong lips and the liberal use of powder it was thought to overcome the difficulty experienced last year in handling the heavy wash.

Although these improvements increased the yardage to a great extent, it was found that the dredge was too light to work with much success in this part of the district. The wear and tear of the machinery was too great and several serious breakages took place, notably that of a 5-in. driving shaft, a cylinder shaft and both spuds were cracked, one of steel, the other of Douglas fir 30 in. square. A heavier boat, with stronger machinery throughout, aided by the use of dynamite, would handle a much greater yardage at the same cost, and the values known to exist throughout the ground are sufficient to yield a good return. The dredge was working in ground about 30 ft. deep, the first 10 ft. being composed of loose black dirt and some boulders, but easily handled and yielding some six cents per yard; the next 10 ft. was hard, tight gravel with small values; then about 3 ft. of a sticky, yellow gumbo, carrying little value; following this to bedrock is a tight yellow gravel in which large and small boulders are firmly embedded in almost a cement, carrying good values to bedrock, which is a hard, irregular diorite, cut in places by veins of a soft serpentine. The constant pounding of the buckets against this hard material causes the gold to drop to the bottom and find lodgment in the crevices of the bedrock, and in this way a large percentage of the heavy gold is not recovered. While most of the boulders can be raised on the bucket line they must be removed by hand derrick, which necessitates delay, and delay means less yardage.

The British Columbia Dredging Co. completed the building of its big dredge at Blue Canyon on Spruce Creek, also the pole transmission line, and the dam to flood the dredge pond. This dredge is said to be one of the best yet constructed and is of

the Bucyrus type, open connected 7½ ft. bucket, with a capacity of 3,000 cu. yd. per day. It uses 250 h.p., which is taken from the British American Dredging Co.'s power house on Pine Creek, and carried over 7½ miles of copper wire, at a voltage of 22,000 volts to the property, where it enters a transformer house, and is then stepped down to 400 volts, and is carried thence to the dredge by insulated cable. This dredge is stronger and heavier throughout than the Gold Run dredge, and the bucket line is driven by a belt connection in place of a sprocket chain, as formerly. This relieves much of the constant jar noticed in the Gold Run dredge. Another great improvement is a Robins belt conveyor 100 ft. long, which carries the tailings and deposits them behind the dredge to an elevation of 40 ft. Running along this conveyor ladder is a 6 in. sand pump, which keeps the fine material from accumulating under the boat. The bucket ladder and bucket line are built exceptionally heavy, to handle large boulders, which are taken off the ladder by derrick, placed on a car, run to the rear end of the boat and there dumped over, causing little delay. The buckets empty into a hopper, from which the material passes into a revolving screen 25 ft. in length, the biggest holes in this screen being about 2 in. in diameter. There all material is thoroughly washed by a spray pipe, the largest rocks being caught upon a grizzly and carried off in chutes on either side of the boat. The other material not going through the holes in the screen is caught and carried away on the belt conveyor, while the finest material carrying the values is passed over a large area of gold saving tables fitted with different styles of riffles and supplied with quicksilver. After being thoroughly washed it is carried off in sluices on either side of the boat. This dredge was completed and the electric power turned on on Sept. 17. The starting of the new boat naturally had to be done with caution and the machinery thoroughly tested and adjusted, which took some days, so that very little work could be done the past season, the frost coming early at Blue Canyon, which is 1,900 ft. above Atlin Lake. The two small clean-ups made before closing down on October 17 were satisfactory to the management. The yardage handled was about 1,600 yd. per day. The ground upon which the dredge is working is loose gravel with boulders lying upon a sandy clay false bedrock, easily dug up by the dredge. The pay is found upon the false bedrock and generally throughout the gravel in the creek and benches. Under the bedrock there is a soft blue wash of unknown depth, carrying little values as far as prospected. A drill hole 70 ft. deep failed to reach bedrock.

#### HYDRAULICING.

Hydraulic operations throughout the district have been successful in point of return for the time of operating. The 1905 season was a short one for some of the operators, owing to the unusually limited supply of water, consequent upon the open winter last year, and the exceptionally hot spring on Pine Creek. The North Columbia Gold Mining Co. was

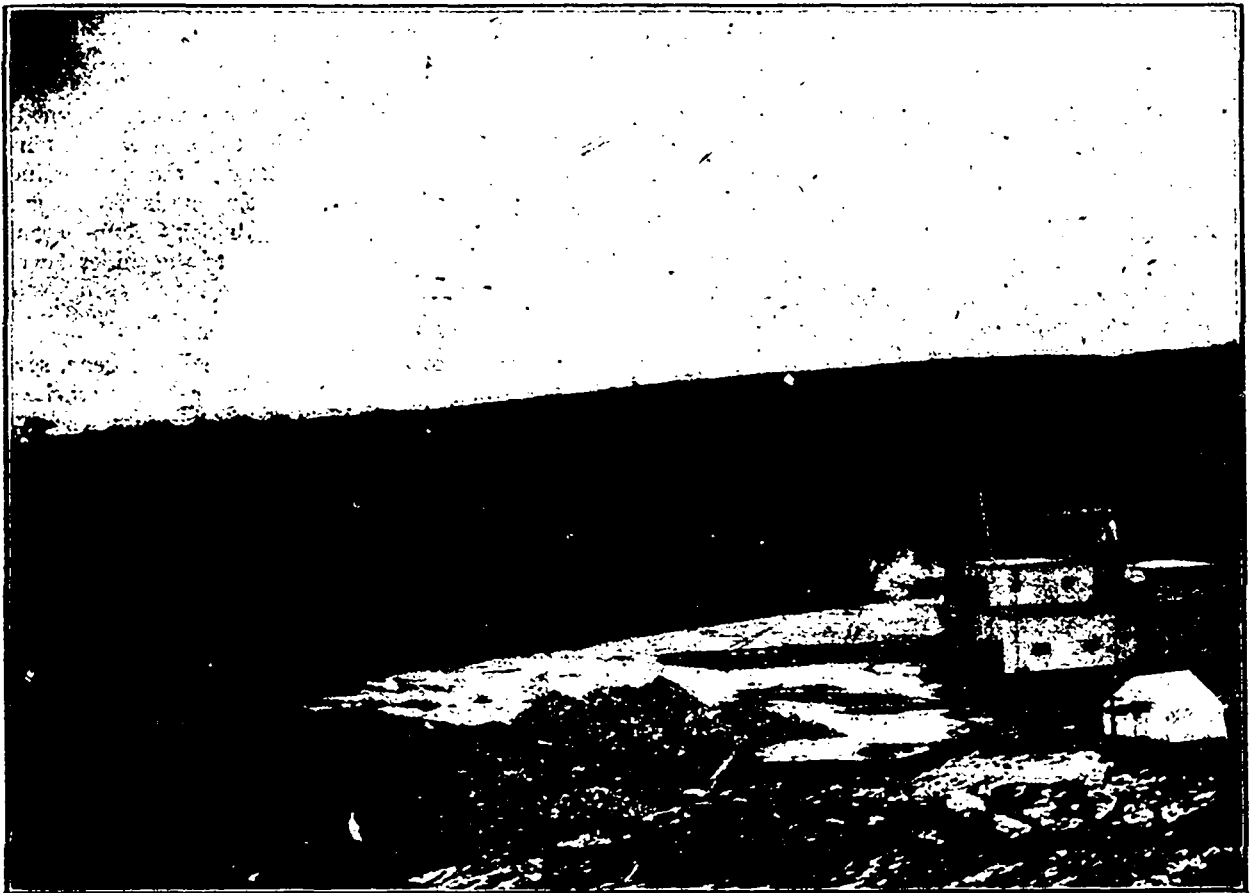
very successful. Having had water the greater part of the season it handled an immense quantity of dirt with good results, and its weekly clean-ups were gratifying to many of the company's officers and stockholders who visited the camp during the year. With the increased water supply for which provision has been made, and the large area of ground of known value it holds, its returns should next year be very large.

The Willow Creek Mining Co. operated on its southern benches, having installed an entirely new pipe line last spring, with good results. A thorough prospect and examination was made during the summer of Tar Flat benches, on Pine Creek, and the re-

have not been published, but it is understood the management is well satisfied with the season's work. This method appears to be a good one for working many parts of the district.

It is contemplated putting in a dam on Pine Creek at Surprise Lake, thereby raising the lake several feet. This will conserve all the water that would otherwise be wasted during the winter and spring freshets and will give a minimum supply of about 13,000 miner's inches, which will be ample to supply the needs of the various companies operating on Pine Creek.

During the season several new placer strikes were reported in outlying districts and a number of pros-



British Columbia Dredging Co's new Dredge. Showing Tailings Stackers and Belt Conveyor.

sults warranted the purchase of this property. It is the intention of the purchasers to install a large electrically-driven shovel the coming season and to use electric cars for carrying off the tailings. This will be built on entirely new lines, the details of which are now being worked out. As the property is in the hands of practical mining engineers, formed into a close syndicate, there is little doubt they will make a success of their undertaking, especially as they have almost unlimited money for carrying out their ideas.

A small steam shovel has been successfully operated on Spruce Creek during the season. The results

pectors spent some time on these streams, but not sufficient to demonstrate the values, being unable to get to bedrock on account of water.

Some 20 placer claims were represented on Volcanic Creek and a good deal of prospecting work done. The values recovered have induced the miners to determine to take hoists and pumps over there next season. The government is now constructing a trail to these new diggings.

On Ruby Creek a syndicate of miners owning adjoining claims have sunk to bedrock and crosscut the creek channel, with good results. They are preparing for more extensive work next year.

Some 40 or 50 non-working leases on O'Donnell Creek were cancelled, thus giving an opportunity for prospecting this valley.

### EAST KOOTENAY.

**E**AST KOOTENAY includes the Fort Steele, Windermere and Golden mining divisions. In no other district in the province was there such a large increase in mineral production in 1905, as compared with 1904, as in East Kootenay, the Fort Steele division of which produced lead, silver, coal and coke in greater quantities in 1905 than ever before, to which advantage was added the higher price of the two metals mentioned. Nor was the advance confined simply to mineral production, for in connection with the expansion of the mining industry there was the introduction of a modern lead ore treatment process—by itself an important evidence of progress—and the installation of the up-to-date plant and machinery equipment, the Crow's Nest Pass Coal Co. put in to replace that destroyed by fire early last spring.

The particular instances of progress in mining in the Fort Steele division were the considerably enlarged operations at the St. Eugene lead-silver mine, which is by far the largest producer of lead in Canada; the commencement of regular ore production by the Sullivan group, also lead-silver mines; and the important additions to plant and equipment and increase in production at the collieries of the Crow's Nest Pass Co.

#### ST. EUGENE CONSOLIDATED MINING CO., LTD.

The year's progress at the St. Eugene mine may be forcibly told in but few words, and in order to better show its increased tonnage its 1904 production is given, as well, in brackets, all figures being in round numbers: Ore milled, 130,000 tons (73,000 tons); concentrates shipped, 30,000 tons (15,000 tons); lead produced, 40,000,000 lb. (21,000,000 lb.); silver produced, 1,000,000 oz. (541,500 oz.). Of the ore and concentrates produced 11,708 tons were shipped to Europe, and the remainder to the smelters at Nelson and Trail. The average of the metal contents was silver 34 oz. per ton and lead 67 per cent.

Development work consisted of 2,029 lin. ft. of sinking and raising, and 5,744 ft. of crosscutting and drifting, making a total of 7,773 lin. ft., and bringing the aggregate footage of development in the mine up to about 42,000 ft., or 8 miles.

New machinery installed included three Jenckes Machine Co.'s boilers, each 165 h.p., and one Canadian Rand-Corliss air compressor, capacity 3,100 cu. ft. of free air per minute. New shaft house and boiler and compressor buildings were erected at a cost of about \$20,000.

The net earnings for the year were more than \$500,000. Four quarterly dividends, each of 2 per cent were paid in January, April, July and October, respectively. The authorised capital stock of the company is \$3,500,000, but in the dividend tables of the *Engineering and Mining Journal* it is usually shown as "Issued stock, \$3,202,000." To date dividends aggregating 16 per cent have been paid; calculated on

the issued stock, this means that altogether profits amounting to \$512,320 have been divided among the stockholders.

The foregoing concise statement partly tells the story of the progress made at the St. Eugene mine last year. It does not tell, however, of the striking developments underground, the big shoots of lead-silver ore opened up, and the new finds made. It conveys no information of the great wealth contained in the mine, nor the promise it gives of contributing largely to the mineral production of British Columbia for years. It is simply a plain, dry statement of figures and facts, and leaves to the imagination of the reader the more attractive side of the subject with which it deals. And yet there is not much to be added, for it tells the best part of the story of mining wherever carried on—the story of development, of production, of profits earned and of dividends paid. This is the story that British Columbia's mines most need to be the subject of, and if it were told by scores of mines, whether owned by companies or by individuals, there would soon be brought about a transformation in the mining industry of the province. The St. Eugene is a conspicuous figure in the mining world of British Columbia, and is doing much to attract attention to the mineral wealth of the province.

#### OTHER MINING PROPERTIES.

As a result of the activity at the St. Eugene, several neighbouring properties are either being worked or preparations are in progress to shortly commence work on them. These include the Aurora, Society Girl, and the enterprise that embraces a deep-level tunnel under Lake Moyie to prospect for the extension of the St. Eugene leads.

The Aurora group of five claims, situated on the west side of Moyie Lake, is under bond to Messrs. Walter McKay and Richard Wilson, of Portland, Oregon, who have been doing development work on the property. About 260 lin. ft. of work were done during the year, and operations are being continued. A raise is being made from No. 1 to connect with the winze from the shaft level, the distance between the two levels being 230 ft. The raise was started at a point 280 ft. from the mouth of No. 1 tunnel and the winze was sunk at the end of the 70-ft. drift, opened from the shaft at a depth of 50 ft. The workings are on a strong lead of ore. If the winter's developments shall justify operations on a larger scale, the Portland men will branch out, so they have intimated, and work on a more extensive scale.

No information has been received concerning the Society Girl group of seven claims, which adjoins the St. Eugene group on the east. Some 400 tons of ore were shipped from the Society Girl to the Nelson smelter some time ago, but the property seems to have remained idle ever since.

Much interest has been shown in a recent movement having for its object the work of driving a cross-cut under Moyie Lake to endeavor to cut the St. Eugene leads. It is proposed to sink a shaft on the lake shore, and then, at a depth of 260 ft., drive under the lake. Soundings taken to obtain the depth of the lake have

indicated that this drive will be about 100 ft. below the water, which varies down to 158 ft. in depth.

In the vicinity of Fort Steele and in the St. Mary's River section some prospecting has been done on lode properties, but no particulars have been received. In the Kimberley and Marysville neighbourhood work has been continued on the North Star group, and the Sullivan group has been maintaining regular shipments to the smelter at Marysville for several months. The work on the North Star is understood to have been chiefly exploration for new ore shoots, but it does not appear that much success has yet been met with. The *Cranbrook Herald* recently published the following concerning the North Star and Sullivan properties: "On the North Star there is just as much known of how it is progressing as there is work being done on it to warrant that progress; but the Sullivan mine on the other side of the valley is shipping 600 tons a week, and could just as easily ship twice or three times that amount. Some idea of the immensity of the ore body in that mine may be formed when it is stated that inside 400 ft. square they have in sight 400,000 tons of ore to 12 ft. of depth. How entirely this statement underestimates the true conditions of this very extraordinary ore deposit only those who have been permitted to examine the mine can fully appreciate. It was not very surprising that the American Smelting & Refining Co. took hold of this property and of the smelter at Marysville, which was erected to treat the ore of the Sullivan. This was the first big investment of the A. S. & R. Co. in British Columbia."

#### PLACER MINING.

Hydraulic mining on Perry Creek and Wild Horse Creek and ordinary placer mining on several other creeks in the Fort Steele division have been carried on, but no returns of gold yield are yet available. In 1904 the official estimate of value of placer gold recovered in the division was \$20,000—it is unlikely that the results of the 1905 season were higher; the probabilities are they were not so high.

The Bull River Mining & Power Co., which controls a number of leases on Bull River, has not yet completed its undertaking, which included hydraulic mining operations on the river and the putting in of a hydro-electric plant with a generating capacity of about 10,000 h.p. It was recently stated in a district newspaper that the company had made financial arrangements that will admit of its proceeding with its enterprise, which for lack of funds had not made progress latterly.

#### WINDERMERE MINING DIVISION.

Generally speaking mining was at a standstill in the Windermere mining division during 1905. Rumors were current at the beginning of the year that the construction of the proposed Kootenay Central Railway would be immediately undertaken. This railway would give the district access to the outside world and would provide transportation facilities for its mines, some of which have been developed sufficiently to enable them to maintain regular shipments of ore. At present shipping facilities exist only dur-

ing the few months the Columbia River is navigable for steamers, but the intermittent nature of such transportation arrangements, which admit of the mines producing only for a short period in each year, has a discouraging effect on those owners who have long struggled against this difficulty and that of a sufficient labour supply. The commencement of railway construction put fresh heart into mine and claim owners, with the result that for a time work was done on a number of undeveloped prospects as well as on several developed mines, but when it became evident that construction was not to be vigorously proceeded with a reaction set in until work was confined chiefly to the Paradise, Lead Queen and Nettie M., the last mentioned being a recent discovery. On each of these three properties a small number of men are being employed for the winter.

From Mr. E. J. Scovil, of Wilmer, the following information relative to the Windermere division has been obtained:

The various mineral belts in the Windermere mining division that extend from Findlay Creek to Salmon River, on the eastern slope of the Selkirk range, have been partly prospected with good results. These include the following creeks and their tributaries: Findlay, Dutch, Johnston, Brady, Salter, Goldie, Toby, Horse Thief, No. 2, No. 3 and Salmon Creeks. This territory comprises an area of about 45 miles in length by 25 miles in width. The drainage area of the upper Kootenay above Canal Flat has received but little attention from prospectors, and not much is known of the locations recorded from that part of the division. In fact, prospecting has been almost exclusively confined to the Selkirk range west of the Columbia Lakes and River.

During the past few years prospectors have restricted their explorations in the Windermere division largely to Toby, Horse Thief, No. 2 and No. 3 Creeks and their tributary streams. The ledges found in these several localities have every appearance of strength and permanence. The following are the principal mining properties:

*Paradise*—The Paradise mine is situated on Spring Creek, a tributary of Toby Creek. Total development up to date consists of 5,242 lin. ft. of work. In the course of doing this work more than 6,000 tons of ore were taken out, and of this quantity 2,053 tons of a gross smelter value of \$85,681 were shipped to the Canadian Smelting Works, Trail. The average return from ore shipped was, silver 57.94 oz. per ton, and lead 58.9 per cent. The work for the year consisted of more than 500 ft. of additional development and exploratory work and three carloads of ore were shipped. The winter's work will be confined to extending the long tunnel (No. 4). Operations on a large scale will be undertaken whenever the transportation difficulty shall be overcome. The question of constructing an aerial tramway and putting in suitable reduction works is under consideration. A rough calculation made by the provincial mineralogist when he visited the mine in July, 1903, gave, if not of ore actually "blocked out," certainly "probable ore," about 50,000 tons, which quantity, there is good reason to



believe, has been largely increased by subsequent developments.

*Nettie M.*—The Nettie M. group is situated on the south side of Toby Creek. It consists of three claims which were located last July by B. M. Washburn, who disposed of one-third interests to R. R. Bruce and Geo. Starke. Work was at once commenced on the property and two cars of high-grade ore were shipped to the smelter before the close of navigation. The ore is a mixture of galena and grey copper, carrying about 0.5 oz. gold, 160 oz. silver per ton, 8 per cent copper and 25 per cent lead. The lode is a contact and is well defined; it is about 3 ft. in width, with a pay-streak of 11 in. of clean ore and carbonates. The pay-streak has been stripped for more than 800 ft. Development work includes numerous open cuts and two tunnels. No. 1 tunnel is in 125 ft.; it tapped the ledge at a depth of 75 ft. No. 2 tunnel, which is already well under way, will be driven about 800 ft. and work will be continued throughout the winter.

*Delphine.*—The Delphine group is on the north fork of Toby Creek. Some 300 ft. of development work was done on the property during the year and three cars of ore taken out under a lease were shipped to the smelter. This ore gave a return of 85 oz. of silver per ton, 30 per cent lead and 2 to 3 per cent copper. Total shipments to date are about 200 tons of a gross smelter value of \$13,100.

*Tecumseh.*—The Tecumseh group is on McDonald Creek. During the fall a shipment of 53,675 lb. of ore was made to the Trail smelter, from which an average return of silver 83 oz. per ton and lead 56.60 per cent was received. Total quantity shipped to date is 56 tons of a gross value of \$4,349.79. The pay-streak on this property is 18 in. wide, of clean ore; development work has been very encouraging.

*Plarmigan.*—This property, situated at the head of McDonald Creek, has been idle for some time and is likely to remain so until railway transportation facilities shall have been provided. Between 3,000 and 4,000 ft. of development work, chiefly drifting, have been done in the mine, from which small shipments of sorted ore were made while work was being carried on.

*Lead Queen.*—The Lead Queen group of five claims on B. D. S. Creek, a tributary of No. 3 Creek, promises to be a large producer of lead ore. All the claims are on one ledge, which is about 10 ft. in width, with up to 3 ft. of clean ore running 65 oz. silver and 71 per cent lead. On the Lead Queen a crosscut tunnel encountered the lead at 264 ft. at a depth of about 150 ft. A drift for 100 ft. north showed 2 ft. of clean ore and 6 in. of carbonates all the way, while to the south for 30 ft. the clean ore was 3 ft. wide and the carbonates 6 in. Last summer much surface work was done on the Big Chief claim and a cross-cut tunnel was started. The driving of this tunnel is being continued and it is expected the main lead will be met with at about 200 ft. in and a similar distance below the surface. On the First Effort claim a tunnel driven 150 ft. on the lead was in ore the whole of that distance. The ore here runs higher in silver and lower in lead than on the Lead Queen, and zinc occurs. Assay re-

turns show silver 73 oz. per ton, lead 60 per cent and zinc 15 per cent. Besides the main lead there are two small veins, the ore in which also runs well in silver and lead, but not much work has yet been done on these. The owners of the Lead Queen group are Thos. Brown, Hy. Schweisguth and S. A. Derr, all working miners. In addition to the comparatively large amount of development work they have done, without outside assistance, they have built two substantial cabins and made a good rawhiding trail from No. 3 Creek bottom up B. D. S. Creek to Lead Queen basin. Ample supplies have been taken in and they intend continuing development work throughout the winter. The energy and persistence with which these three men have been and are developing their property is creditable to them and affords an excellent example which might be generally followed with great advantage to the mining industry of the province.

*Other Claims.*—There are many other mineral claims on the several creeks mentioned on which more or less development work has been done, and still others on Boulder, Law, Horse Thief, No. 2 and Findlay Creeks.

#### GOLDEN MINING DIVISION.

This mining division comprises the northern portion of the district of East Kootenay, and includes the country on either side of the Columbia River from the summit of the Rocky Mountains on the north-east to the summit of the Selkirk range in the south-west, and extends in a north-westerly direction from Galena, above Spillimacheen, to about seven miles north of the Big Bend of the Columbia, a distance of about 140 miles. The Canadian Pacific Railway traverses the district in an easterly and westerly direction. On the north side more or less development work has been done at different times on the Monarch, near Field (argentiferous galena and blende), and on some silver-lead claims along the Otter Tail, also on Beaver Foot Creek and Ice River and in the Blue Water country, north of Donald.

On the Selkirk, or south-west side, the mining camps are more numerous, and are generally found near where the slates and schists have been broken through by the eruptive rocks.

The Spillimacheen and Jubilee Mountain camps, about 40 miles above Golden and on the south-west side of the Columbia, are, however, exceptions, as at these points, and for some distance south-east, the carboniferous limestone extends across the Columbia, and the lodes—argentiferous galena and copper ores—are found either in the schists or limestone near the contact.

There are strong, well-defined lodes and very encouraging prospects in a dozen other camps in the division, and in some of them the surface showings are unusually good; but, except in one or two camps, little work of importance in determining the extent of the ore bodies or the prospective value of the lodes has been done.

Most of the camps are at a standstill for want of capital, the Laborers' Co-operative Mining Co. seemingly having been the only one that continued development and took out ore, albeit its production was but

small. There seems to be a good opening here for development companies to take hold of properties on working bonds. There are government trails to all the camps, and the cost of visiting and examining the most promising claims would not be great.

In almost every locality where lodes are found there are streams in the immediate vicinity capable of furnishing all the power required to generate electricity for operating purposes. Timber is plentiful, and the conditions in other respects are favourable to mining.

### WEST KOOTENAY DISTRICT.

**W**EST KOOTENAY district includes the Ainsworth, Nelson, Trail Creek (Rossland), Slocan, Trout Lake Lardeau, Revelstoke, and other divisions. It is a big district and heretofore has easily held the leading place in mineral production in the province. In recent years, however, it has steadily lost ground, while Yale district (chiefly the Boundary section of it) has gradually gained. The estimated production for 1905 shows West Kootenay, with \$5,706,000, to now have a formidable competitor in Yale, the estimated total of which for the same year is \$5,651,000. With such a comparatively small margin to the good it may easily happen that the revised and official figures will place Yale in the lead for the year just closed. Not that it matters much which part of the province leads in production so long as a steady advance be maintained, but that it is always more satisfactory to see the older and better known mining sections maintaining their ground. Yet it is the common experience in mining as in other matters—"the old order giveth place to the new." Taking the several divisions in the above-mentioned order, the prominent features of the year are briefly reviewed in the following paragraphs:

#### AINSWORTH.

In Ainsworth district, while there has not been any considerable increase in production, there certainly has been progress in connection with both the mining and reduction of ores. Several mines long idle have been opened up and shipments of ore made from them, while others are being further developed with the object of making them productive. This has been the case not only at the Highland, Highlander and other properties in that vicinity, but as well across Kootenay Lake at the historic Blue Bell mine, on the south fork of Kaslo Creek, and even away in the northern part of the district, where the Consolidated Mining & Smelting Co., of Trout Lake, has been at work, notwithstanding the distance its properties are from transportation. The installation of a plant for the magnetic separation of zinc at the works of the Kootenay Ore Co., Kaslo, was a timely advance to meet the needs of shippers of zinc ore. The completion of a concentration plant at the Silver Star Co.'s Cork mine, south fork of Kaslo Creek, though not yet of monetary benefit to its owners, was another forward step. Last, the resumption of work—for the present, probably, of concentrating only—at the Pilot Bay smelter, after it had been closed down for eight or nine years, is a matter for congratulation. The inves-

tigations of the Zinc Commission will doubtless prove of eventual benefit to Ainsworth division, as well as to Slocan and East Kootenay, and, incidentally, the information gained by the visiting experts concerning the lead resources of Ainsworth will probably also have the effect of increasing practical interest in the opportunities offered to turn to good account its minerals of commercial value.

#### NELSON.

Nelson division has shared in the general improvement in mining matters. The arrangement under which the Silver King was worked through the year resulted in mutual advantage to both parties directly concerned, viz., the owners—the Hall Mining & Smelting Co.—and Mr. M. S. Davys, under whose direction the work was done and some 800 tons of ore shipped to the smelter. The Granite-Poorman mines, under lease to Messrs. S. S. Fowler and M. S. Davys, produced 2,800 tons of ore, which yielded between 800 and 900 oz. gold and 400 oz. silver, and the property is now looking as well as at any previous time. The Reliance Gold Mining & Milling Co. completed the erection and equipment of a mill on its May and Jennie mine, on 49-Creek, and after exhaustive tests of the Hendryx electro-cyanide process, together with the ordinary cyanide treatment, reached conclusions that, it is stated, will meet the requirements of its ore and lead to the recovery of a large percentage of its gold contents. Other 49-Creek properties were also worked. On Kokanee Creek the Molly Gibson, now known as the La Plata mines, obtained \$70,000 for further development and equipment after a year's satisfactory exploitation of the mine, erected and equipped a 75-ton concentrator, installed an air compressor and other plant, and shipped 820 tons of ore taken out in development. Nearly 3,500 tons of ore were mined by the Alice Broughton Mining Co. from the Alice mine, near Creston, in the Goat River section, and from this about 500 tons of concentrates were obtained. The La France, on La France Creek, and the Bayonne, on Summit Creek, both in what was formerly the Goat River division, continued development with encouraging results.

The Hall Mining & Smelting Co. was able to show a profit of more than \$30,000 on its operations during its financial year ended June 30 last. The total of 37,394 tons of ore received at the company's smelter at Nelson during the calendar year 1905 was 3,000 tons in excess of the total receipts for 1904. The substantial improvements made at the company's works include the installation of a Merton roaster, the adoption of the combination syphon spout and matte trap designed and patented by the company's metallurgist, Mr. H. Harris, and a general betterment of the ore-handling appliances. Further, the preparations for putting in a modern process for the treatment of lead ores are well advanced, so as to make the works up to date in this particular, as well as in others previously dealt with.

#### YMIR.

The Ymir portion of the Nelson district saw marked improvement in several cases, notably at the Ymir mine, in which ore of good grade and in considerable

quantity has been opened up at the 500, 600 and 1,000-foot levels, respectively. Conditions at the Ymir mine are understood to be better than at any previous time during the last two years, and the outlook is that the mine will again become a profitable enterprise. The B. C. Standard Co.'s Hunter V. and Double Standard mines were leased to the Hall Mining & Smelting Co. about the middle of the year. Shipments of ore totalled rather more than 7,000 tons. Values contained in about 3,300 tons sent to the Nelson smelter in the latter half of the year ranged from 3 to 16 oz. silver and up to 0.12 oz. gold, though as a rule gold was much lower. Recent shipments showed a better grade than earlier ones. At Salmo the Queen and Kootenay Belle both did well. The year's output at the former was about 6,100 tons of ore, nearly all of which was milled at the Yellowstone mill. The values totalled \$64,584. The Arlington, Erie, produced 1,300 tons of ore averaging 2.6 oz. gold, 6.3 oz. silver and a little lead. The Hastings (British Columbia) Exploration Syndicate, Ltd., owning this mine, paid a dividend in 1905 of rather more than \$15,000. The Second Relief Mining Co., owning the Second Relief mine, Erie, mined and milled nearly 5,600 tons of ore, which gave an average yield in gold to the value of about \$10 per ton.

## SLOCAN.

One of the chief subjects of interest in the Slocan during the year was the work done by the Zinc Commission appointed by the Dominion government, for the purpose of promoting the zinc industry of British Columbia. Another satisfactory feature was the payment of dividends out of profits from several mines. Still another matter that attracted attention was the prominence given the question of leasing mining properties, though this was not done to as great an extent as the number of unworked properties make desirable in the best interests of the district. Again, the development work being done at depth by the Rambler-Cariboo Mines, Ltd., is worthy of note. Other evidences of progress are the additions and improvements to the concentrating plants, of which mention is made elsewhere, and the working of several mines with excellent results to those operating them.

As the publication of the ore output of the Slocan has not been kept up by local newspapers, no figures are available to show what the approximate total production for 1905 has been. Probably it has fallen short of that of 1904 as regards silver-lead ores, but it has more than made up the shortage of tonnage in this direction by shipments of zinc to an extent greater than was expected at the beginning of the year, yet far short of what is looked for during next year. The high prices ruling for silver and lead should have stimulated more production than they did. It is not easy to point out just what has prevented the Slocan as a whole from being prosperous—it may be a combination of circumstances, yet since there has been a distinct advance in several instances, there is ground for expectation that ere long an improvement will be general.

The dividend payers of the Slocan in 1905 were the Lucky Jim, Reco, Slocan Star and Mountain Con. Several others paid their owners or lessees good profits. An instance is that of the Payne mine, the lessees of which did well. The leasing system is being gradually extended towards which desirable end the Sandon *Mining Standard* has conducted a persistent campaign, which has compelled the attention of all concerned. The most prominent instance of development work at depth is that of the Rambler-Cariboo Mines, Ltd., which company has been continuing the year through the work of driving a cross-cut tunnel, which was started in 1904, and the purpose of which is to cut the vein at a depth of more than 1,400 ft. Before this tunnel was commenced it was estimated that the work would take about two years and the cost be about \$60,000. The tunnel has been driven with such expedition that it is expected the vein will be reached next spring. If good ore in quantity be found at this deep level the success achieved in this connection will bring about a transformation in mining some of the larger properties in the Slocan, for other mine owners contemplate doing similar work should the expectations of the Rambler-Cariboo Co. be realised.

About Three Forks and around Silverton excellent results have been obtained from the working of several properties, some of them leased. Prominent among these are the Lone Bachelor, near Three Forks, and the Hewitt and Lorna Doone group, near Silverton, the latter property having shipped between 500 and 600 tons of ore averaging about 125 oz. silver to the ton. The Hewitt is described as "looking splendid," and it certainly is maintaining an enviable reputation as a silver producer.

Slocan City division is reported to possess several mines that did well last year, notably the Ottawa, about which, though, only very brief particulars of the year's development and production have been received at the time of writing. What is known as the "dry ore belt" is situated chiefly in this division, and in this section are properties that, besides having already been productive, promise well for the future.

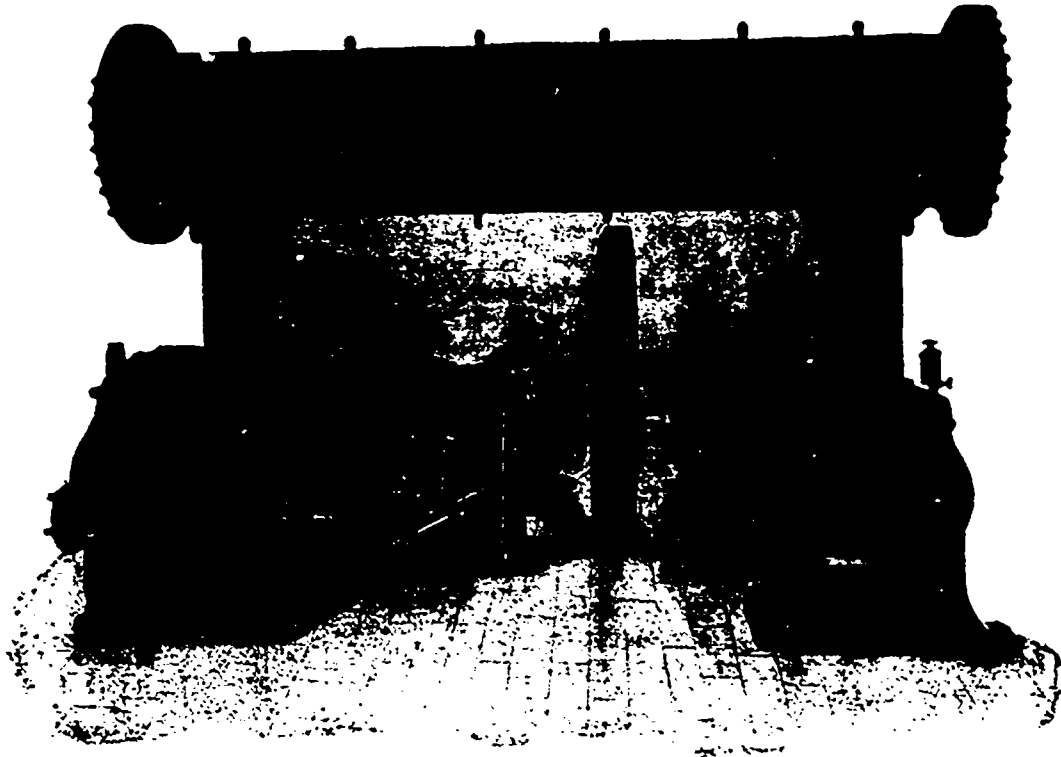
## ROSSLAND.

The chief mines of the Trail Creek division are at Rossland, though there are as well a few properties being worked that are situated in outlying parts of the division. The Le Roi, Le Roi No. 2, Centre Star and War Eagle—the companies owing the last-mentioned two having recently been consolidated—are the chief producers in the camp. To what extent this is so may be gathered from the following summary of the approximate production in 1905:

Mine.	Tons.
Le Roi .....	113,500
Centre Star .....	94,500
War Eagle .....	61,000
Le Roi No. 2 .....	22,000
Jumbo .....	10,000
All other mines .....	13,000
Total .....	314,000

Amalgamation proposals have had much attention throughout the year, but as yet the only "merger" effected was that of the Centre Star and War Eagle, which, however, had for years been operated under joint mine management. A further consolidation proposal, viz., that of the Centre Star-War Eagle with the Le Roi, Rossland, St. Eugene, Moyie, and the Canadian Smelting Works, Trail, was recently rejected so far as the Le Roi Mining Co. was concerned. The differences of opinion that led to this result were mainly upon two points, viz., (1) the advantage or otherwise to be gained by permanently closing the Le Roi Co.'s smelting works at Northport, Washington, for the purpose of having the Le Roi ore, as well as that of the Centre Star-War Eagle, treated at the Canadian Smelting Works, and (2) the

secure as large a part of the Rossland ores as possible so that its railway may have the business of hauling the ore from Rossland to Northport, and resultant freight traffic connected with the transportation to the coast, for Bessemerising purposes, of the copper matte produced from that ore. The matter is not yet finally disposed of, but the probabilities are that the adverse decision of the large majority who voted upon the question at a meeting held recently in London will be sustained should a poll of the stockholders be taken. It may be of interest to note that in his report to the directors of the Le Roi Co., the general manager, Mr. John H. Mackenzie, submitted that the great advantages to be derived from the proposed amalgamation were set forth under six headings, as follows. (1) A reduction in the cost of min-



Canadian Rand Drill Co's Compound Steam, Compound Air Compressor. Many of this type have been installed in British Columbia.

practical dispensing with an English directorate, the intention having been to have control of the consolidated companies in Canada. Notwithstanding this decision of the Le Roi stockholders to retain the separate entity of their company, there is widespread feeling that, if consummated along equitable lines, such a consolidation would be to the benefit of all joining it. Unfortunately, though, there is the fear that behind all the agitation for and against the scheme submitted to the Le Roi stockholders are interests of rival railway companies, one owning the Trail smelter, for which it is desired to obtain a supply of ore sufficiently large to admit of more furnaces being continuously operated than is practicable under former conditions of about one-third of the output of Rossland mines going to the Northport smelter, and the other greatly concerned to see the Northport works

ing and exploration; (2) a substantial saving in administrative and office expenses; (3) reduction in freight and treatment charges; (4) reduction in present cost of marketing copper; (5) competent management and skilful direction of exploration work under one head; (6) the prestige and advantages of a large and powerful corporation, with sufficient capital to assure the future, backed by the support of a great transcontinental railway vitally interested in the upbuilding of a profitable mining and smelting industry in British Columbia.

Much progress was made in actual mining during the year, deeper levels having been opened than at any previous time in the history of the Rossland camp. Ore has been found on the Le Roi on several lower levels down to 1,550 ft. depth on the incline, but so far no permanent ore body has been proved to

occur at that depth, although shoots of high-grade ore were met with on both the 1,450 and 1,550-ft. levels. Sinking to a greater depth is in progress, the intention being to continue the 1,350-ft. level winze down to 1,750 ft., and at the latter depth to prospect for ore. Nearly 5,000 lin. ft. of development work were done during 1905. An experimental concentrator was put in at the Le Roi. The result of the tests made with this plant was that it was demonstrated it would not pay to mine ore for concentration. The only ore that will pay to concentrate appears to be that taken out in the course of development, and against which no mine charges are made, i. e., such ore as is too low in grade to send to the smelter, and which would, in the absence of some plant to treat it at low cost, be put on the dump.

The Centre Star produced nearly 95,000 tons of ore in 1905, and the War Eagle 61,000 tons. The footage of development work done was nearly 6,500 lin. ft. in the Centre Star, and 6,600 lin. ft. in the War Eagle. The diamond drill was used, some 9,000 ft. of holes having been drilled in the two mines. The depth reached in the Centre Star is about 1,500 ft. vertical, at which depth a level is being opened. New ore shoots on levels Nos. 4 and 8 are giving a good tonnage of shipping ore. In the War Eagle prospecting is being done at Nos. 10 and 11 levels, which are a similar depth to those correspondingly numbered in the adjoining Centre Star.

Concerning the recent amalgamation of the Centre Star and War Eagle companies, the position is that the Centre Star has taken over all assets of the War Eagle Company, giving therefor two shares of Centre Star for three of War Eagle. The number of shares so transferred and to be divided *pro rata* among the shareholders of the War Eagle is 1,166,667. The authorized capital of the amalgamated companies is \$4,666,667, of which \$3,500,000 is Centre Star. The management hopes that by using one shaft for the two mines, and other economies, to effect a saving of \$25,000 to \$30,000 a year. It has been announced that the Centre Star in the past year earned a net profit of \$144,840, and had in its treasury and in cash due \$217,254. For some time the War Eagle has been paying expenses, but little more.

The Le Roi No. 2 during 1905 produced about 20,000 tons of ore, rather more than half of which was treated at its own 50-ton concentrator. The total receipts from this ore were approximately \$310,000. On the 600-ft. level and the 650-ft. intermediate level the downward continuation of old shoots of ore have been exposed. Work on the 500 ft. level was also successful. Some 3,200 lin. ft. of development work were done in 1905, and diamond drill holes to a total of more than 3,000 ft. were bored. Sinking from the 900-ft. level was discontinued and instead a cross-cut has been driven from the 1,350-ft. level of the adjoining Le Roi into the ground of the Josie, owned by the Le Roi No. 2. The company paid an interim dividend of one shilling per share on October 30.

Several properties operated on a smaller scale will be briefly noticed. The Jumbo shipped ore all this year, its output having totalled about 10,700 tons. The

Spitzee has shipped nearly 5,000 tons. To provide necessary funds for further development and equipment the shareholders in the Spitzee authorized a change in the par value of the shares, which will permit of assessments being made that will total \$100,000. The Velvet-Portland crushed and concentrated nearly 2,000 tons of its second-class ore and then closed down. The White Bear Co. shareholders agreed to an arrangement for raising money by assessment. The mine was unworked for part of the year. Some 4,300 tons of ore were raised, and three-quarters of that quantity was treated at the company's mill and concentrating plant. A 400 h.p. induction motor was installed to drive the power plant. The Cascade-Bonanza, situated in the outlying Norway Mountain part of the Trail Creek division, was operated under bond for a while by some Philadelphia people, who sent 15 tons of ore to the smelter. The Inland Empire, in the same section, was bonded by New York men, who did some work and made a test shipment of ore.

The structural survey of a part of Rossland camp, by members of the geological survey of Canada, was proceeded with, Messrs. R. W. Brock, W. H. Boyd and A. G. Young having been engaged during the field work season. The Centre Star and War Eagle mines were closely examined and considerable progress was made towards procuring sufficient data for the preparation of the map to be issued in connection with this work.

#### REVELSTOKE AND THE BIG BEND.

During the year the Prince Mining & Development Co., of Revelstoke, continued the development of the Standard mine, situated in Standard Basin, north of Revelstoke. This company has for years been engaged in opening up this property, though lack of transportation facilities has made the work costly and has prevented the shipment of ore, consequently progress has not been rapid. United States capitalists, having become financially interested, lately sent a mining engineer to examine and report on the property. While the nature of the expert's report to his principals has not been made public, its general tenor may be regarded as favourable, since he has intimated that the surface indications, the vein outcroppings, and the development work done, together demonstrate to his mind the existence of immense ore bodies.

In the Big Bend there has been the customary amount of placering and hydraulicing on several of the creeks.

An interesting bulletin on this section of the country, prepared by Mr. Herbert Carmichael, provincial assayer, and published by the Department of Mines, was issued a few weeks ago.

#### LARDEAU.

Camborne camp in northern Lardeau made fair progress in 1905. The Eva Gold Mines, Ltd., did more than 1,300 ft. of development work on the Eva group, and mined 12,000 tons of ore, all but about 600 tons of which was milled at the company's 10-stamp mill at Camborne. Some \$50,000 in gold was

recovered, the average value having been rather more than \$5 per ton. The installation of an air compressor and use of power drills in the mine, and the enlargement of the stamp mill, are having the consideration of the management of the company. The Beatrice shipped high-grade galena ore and did a lot of development work. The Silver Dollar obtained an air compressor, which is at the mine; a mill building has been erected on the property and the requisite machinery and other equipment is to be installed as soon as it can be got in. The Camborne Gold Mining Co. has been endeavouring to raise sufficient money to admit of replacing its buildings and aerial tramway destroyed by fire some time since and for development of the Goldfinch properties. The Mammoth, owned by the Edward Baillie Syndicate of Rosslund, is being further developed and its shoots of high-grade ore opened up for shipping purposes.

The Ferguson Mines, Ltd., has for some time been engaged in a comprehensive scheme of development of its Silver Cup mines and has encountered high-grade shoots of ore apparently of good size. The Metropolitan Co. of Minneapolis last season continued the exploration of its Triune property. An undertaking that may lead to important discoveries of ore is the driving of a 4,000 ft. tunnel into Nettie L. Mountain at considerable depth. A Trout Lake syndicate commenced work late in the year on the Broadwater, one of the old Horne-Payne Co.'s properties.

The Chestnut Hill Co. has been continuing to operate the Lucky Boy, situated near Trout Lake. Other than the output of this property there was not much ore produced in his vicinity in 1905.

Several claims in Poplar camp had development work done on them, but production has not yet been commenced in this camp.

## YMIR DISTRICT.

By Percy Gleazer.

**Y**MIR DISTRICT made satisfactory progress, on the whole in 1905. The most striking event of the year in connection with mining was the important change in conditions at the Ymir mine. For about two years there had been little or nothing encouraging to report of this once profitable enterprise. Late this year, however, there has been much that is satisfactory of actual discovery and accomplishment, until now all doubt of permanency of operation is removed. The importance of this fact to the Ymir camp, and its influence on the mining industry of the province generally, can hardly be over-estimated. For on the London market the group of companies of which the Ymir Gold Mines, Ltd., is the best known, has always been considered representative of the conditions of mining in British Columbia.

*Ymir.*—The discovery of what appears to be an entirely new ore shoot was made in the 500-ft. level of the Ymir mine last September. Here, in the west drift, 5 ft. of \$20 ore was met with. The present manager, Mr. E. M. Hand, conceived the theory that if the vein contained ore-shoots other than the original one, these would be found to the west of the present work-

ings. This theory, although in antagonism to the expert theories upon which operations have been conducted during the last two years, was amply justified by the discovery in the 500-foot level, a discovery which was quickly followed by a similar one in the 600-foot level west. So far about 50 ft. has been driven in the 500-ft. level, all in ore. The place where the ore was encountered in the 600-ft. level is still 150 ft. east of the point at which it was discovered in the 500-ft., proving a very considerable length for the new shoot.

Most important of all, however, is the discovery of what is believed to be the same shoot in the 1,000-ft. level west. The uncertainties of mining are seldom more plainly exemplified than in this instance. Two years ago the then manager, Mr. G. H. Barnhart, was giving the same level when he received directions from his directors in London to cease this work and confine his deep developments to driving east on the 1,000-ft level, consequently the east drift on this level had been driven more than 2,000 ft. without any important result. After Mr. Hand obtained permission to drive west on this level, he commenced this work and had only driven a few feet when he reached pay ore. This ore is still a long distance from a point directly beneath the discovery in the 500-ft. level, and should it prove continuous so far west, and up to the 500-ft. level, the shoot will give many years' mill supply. At the time of writing the mill is temporarily shut down, undergoing a thorough overhauling, preparatory to starting up on the new reserves. The production for the whole year is not known, but for eight months it totalled 16,080 tons, valued at nearly \$80,000.

*Wilcox.*—The Broken Hill M. & D. Co., owning the Wilcox mine, went into liquidation last August. Stephen Bywater, the president of the company, is now operating the mine for the benefit of the creditors as liquidator. This financial embarrassment will probably be of short duration, having been brought about by over-expenditure on new plant. The mine itself is looking well and ten days' run of the 10-stamp mill resulted in a brick worth more than \$2,000.

*Hunter V. and Standard.*—About the middle of the year the B. C. Standard Mining Co. leased the Hunter V. mine to the Hall Mining & Smelting Co. The latter company has since operated the property continuously, the shipments averaging about 1,000 tons per month. The method of mining has undergone a change here, it having been found that the exposed situation of the property made the system of open quarrying impracticable. Underground mining is now the rule, therefore, and this system has resulted in the finding of what may be termed veins or paystreaks. As is well known, the calcite ore of this property is an immense deposit of triangular shape, on the ridge of a mountain. Under existing conditions the whole of this deposit, although very low-grade, can be shipped at a profit to smelters which need it for lime flux. Recently, however, a number of streaks of quartz have been found in the lime and these streaks sometimes carry higher than average values in gold and silver. A number of cars of this class of ore have recently been shipped. At present the ore is all going to the

Nelson smelter, although contracts have been made with the Marysville smelter and the Canadian Metal Co.'s works to be shortly opened at Pilot Bay. In addition to the lessee company's work, the B. C. Standard Co. contemplates the simultaneous operation of diamond drills to thoroughly prove the extent of the ore deposits. The year's tonnage of ore shipped was 7,047 tons.

*Arlington.*—The Arlington mine, at Erie, during the year declared a dividend of one shilling per share. Shipments have been continued at the rate of about four carloads per month, but considerable ore has been allowed to accumulate and will be shipped over the winter road, when hauling can be done much more cheaply than in the summer. As a general rule the car loads shipped from the Arlington net the company \$1,000 each, but as during the past summer some of the richest ore ever found in the mine was encountered, it is expected that in the future the returns will be above the average.

*Second Relief.*—The Second Relief Mining Co. is operating the Second Relief mine, Erie, continuously under the direction of G. H. Barnhart. A 10-stamp mill is running constantly, and, although no returns are given out, it is understood the company has had a very successful year.

*Leasing.*—Leasing has come into fashion in the Ymir district during the past year and a large number of properties have been worked under lease, in some cases with good results to the lessees. Among other properties thus operated are the Porto Rico, Tamarac, Arizona, Pilot, Fern, Yankee Girl, Cliff, Kootenay Belle and Keystone.

*Hydraulic.*—A good start has been made at the systematic working of the immense beds of auriferous gravels on Hall Creek. On the Myrtle hydraulic lease a 1,500-foot flume and a pipe line of 1,100 feet of 10-in. pipe, carry water to a giant working under a 300-ft. head. This plant was finished only just before the snow came, but a short test was made and more than 40 cents per cu. yd. saved, while much of the fine gold, and all of the valuable black sand escaped. Next year concentrating tables will be installed to catch the sand, which occurs in exceptionally large quantities on this ground and carries a high value in gold.

#### SALMO AND ERIE.

**S**ALMO AND ERIE are in what is generally known as the Ymir district of Nelson mining division. The following notes are additional to the particulars of the Ymir district mines printed on another page:

##### SALMO.

*Queen.*—This is regarded as one of the best properties in the Ymir district. It is owned by Mr. Wm. Waldie, who last spring bought out the interests of his former partners. About 920 ft. of development work was done during the year, 630 ft. being cross-cutting and drifting and 290 ft. sinking and raising. The output of ore was 6,100 tons, of which 124 tons were shipped as crude ore and the remainder put through

the Yellowstone 10-stamp mill. The crude ore and 405 tons of concentrates were shipped to the smelter at Nelson. Returns were: From crude ore, \$4,840; bullion, \$43,540; concentrates, \$16,204; total, \$64,584. A compressor and boiler house was built and an air compressor, boiler, hoist and pump installed.

*Kootenay Belle.*—This property was under bond part of the year to Mr. P. Clarke, of Spokane, but owing to some difficulty with the owners the bond was thrown up. It is at present being worked by Mr. Geo. Bell under lease. About 300 tons of high-grade ore were taken out in 1905 and shipped to the Trail smelter. The ore is stated to have averaged about \$60 per ton. There are about 1,000 tons of lower grade ore; this is being shipped to the Yellowstone mill. A cross-cut tunnel was driven during the year about 180 ft., cutting both ledges at from 80 to 100 ft. depth. A raise is now being made to connect with a prospect shaft above.

*Ore Hill.*—This mine is under bond to some Oregon people, with Mr. A. D. Westby in charge. A two-stamp mill was run, but power was insufficient, so a large Pelton wheel had to be obtained. Ore is now being taken out and milled, and the property is reported to be looking well and developing quite satisfactorily.

*Mother Lode.*—This property was lately bonded to a San Franciscan syndicate, who are employing 10 men in prospecting it.

##### ERIE.

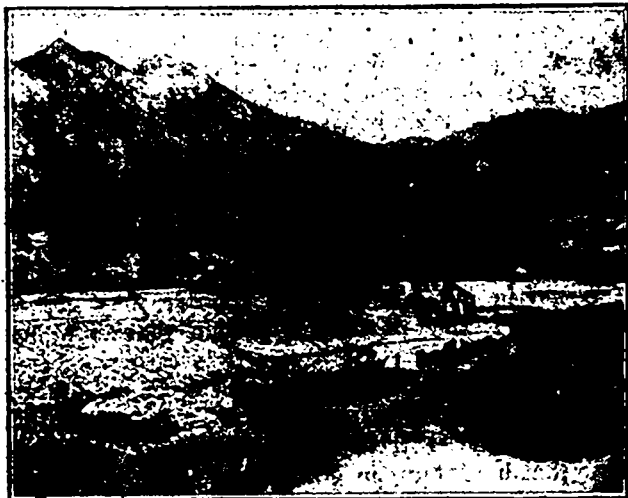
*Arlington.*—During the calendar year 1905, the Hastings (British Columbia) Exploration Syndicate Ltd., of which Mr. Leslie Hill, of Nelson, is manager, mined about 1,300 tons of ore which was shipped to the Nelson smelter. The metal contents of 1,180 tons for which returns had been received were as follows: Gold, 3,169 oz.; silver, 7,432 oz.; lead, 93,893 lb. Average contents per ton were: Gold, 2.685 oz.; silver, 6.3 oz.; lead, 80 lb. The company paid a dividend of one shilling per share, or a total of £3,018 15s.

For the company's last financial year the manager reported: "During the year returns were received from the smelter on 1,128.75 tons of ore, the gross value of the contents being \$66,140 and the net smelter returns, after deducting the cost of freight and treatment and the usual smelter deductions, \$52,700.57. The average gross value was \$58.60 per ton, and the average net smelter value, \$46.70. Of this ore 112 tons shipped were taken from the Head Arlington workings, the average net smelter value of this ore being \$59.33 per ton, and 1,016 tons were from the Arlington workings, the average net smelter value of which was \$45.30. These values were slightly higher than those obtained last year."

Regarding the future the manager said: "The development of the new ground on the 77-ft. north level is of very great importance to the future of the mine, as it opens up large possibilities. There is a large block of ground belonging to the company lying to the north of the present workings, and if the vein carries ore throughout the ground lying between the present stopes and the old Micawber workings, it will

be seen that there is a large area of the vein to be developed."

*Second Relief.*—This property is owned by the Second Relief Mining Co., Ltd. It is located on the north fork of Salmon River, about 13 miles from Erie. The company operating it was incorporated in March last under the laws of British Columbia for the purpose of acquiring the property from the Relief Gold Mining Co. The mill has been kept running steadily since the middle of April, making a profit above operating expenses of approximately \$26,000. or about \$3,000



Dredge at work on Horse Beef Bar, three miles below Lillooet Fraser River.

per month. Late development work in the mine has resulted very satisfactorily and a materially increased profit will be made during the coming year.

The mine is worked through three adits, the lower one giving a depth on the vein of about 400 ft. The ore consists of pyrrhotite in a quartz and greenstone gangue. There is sufficient ore blocked out on three sides to keep the mill running 4 to 5 years, and on two sides sufficient for several years more. The ore is conveyed to the mill by a gravity tramway 650 ft. in length. The plant consists of a 10-stamp mill, with 9 by 15 in. Blake crusher, amalgamating plates, Wilfley table, Frue vanners, cyanide plant (the latter not at present being operated), and 14-drill air compressor. The mill and compressor are driven by three Pelton water wheels under a head of 190 ft., the water being brought in a flume a distance of nearly two miles.

The results of the year's work are as follows: Development work done, sinking and raising, 160 ft.; cross-cutting and drifting, 550 ft.; total 710 ft. Ore produced 5,582 tons; shipped as crude ore, 22 tons; milled, 5,560 tons; concentrates shipped, about 400 tons. The average yield of the ore in the mill has been about \$10 gold per ton during 1905. Of the gold recovered 75 per cent was by amalgamation, and 25 per cent in the concentrates.

*Keystone.*—Four men have been at work here at development, running a long tunnel. Only a little ore

has been taken out, and but one car was shipped to the smelter.

*Canadian King.*—This property has been worked under lease. It is reported that it may be taken over by the company owning the Arlington.

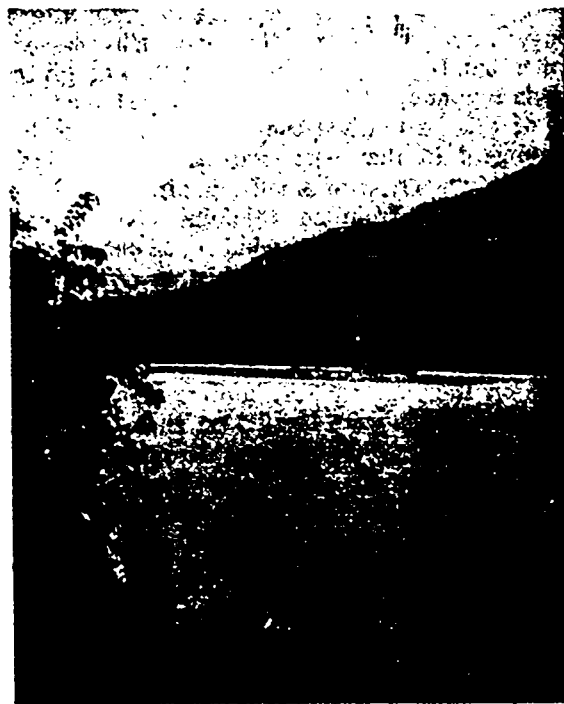
*Armstrong and Treasure Box Group.*—The Transvaal-Zambesi Co., owning this group, has granted a lease of it. Some rich silver ore has been taken out and the lessee has a carload ready to ship.

*McEvoy.*—A lot of work was done on this property, chiefly sinking. No ore was shipped during the year.

#### CLINTON MINING DIVISION, LILLOOET DISTRICT.

Specially Contributed.

CLINTON mining division has so far been more farming and pastoral than mining. The gold returns of any value have been obtained by desultory mining, principally by Chinese, from the margins of that great ground sluice, the Fraser River. In the early history of the province, the late fifties and early sixties, rich returns were obtained by white miners, who skimmed the exposed bed of the river. These exposurers were named by the early miners "bars," and they still retain the original name, given to particular portions of the river bed, nearly all of them covered in summer by high water. The river runs through the Clinton division



View on Fraser River, showing bar on which dredge has been working.

more than 60 miles, and there cannot be a doubt that there is in that part of the river untold wealth to be yet acquired by properly constructed dredges



operated by men who thoroughly understand these machines and the river they have to deal with, and, last but not least, financed on a sound and honest basis. Without these requisites any attempts to dredge the Fraser river can only end in failure.

Dredging for gold is now being prosecuted in many lands, with more or less success. No doubt the rivers of New Zealand bear a greater resemblance to the Fraser River than any other where gold dredging is an industry, and it would be well that we take them as an example. As gold producers the people of New Zealand are younger than we are. True, in the early fifties it was known that there was gold in that country, but returns were insignificant until after 1861; now New Zealand has an export credit through the Customs of more than 15,000,000 oz. Of late years river dredging has been an important factor in its weekly returns, averaging 2,000 oz. While their climate may be a little better than ours, the Fraser River from Quesnel to Lytton should be giving equally good weekly returns for at least ten months in the year.

There is only one other place in the Clinton division that has yielded any gold returns, viz., Scottie's Creek, a small tributary of Bonaparte River. Small quantities were found there in 1868, and various small amounts since that year.

A number of quartz claims were located in the valley of the Bonaparte in 1896. A considerable amount of prospecting was done on them then, but the original holders allowed them to lapse after obtaining Crown grants, and they eventually passed into other hands. A prospecting option was given on them last winter, and work was carried on till autumn of this year, when they were again abandoned. The mineral in that particular group of claims is principally copper, with small quantities of gold and silver. Samples from an adjoining claim gave returns of an association of white crystalline dolomite and white scaly hydro-mica schist, carrying quantities of bornite and chalcopyrite, thus showing valuable ores of copper. For some reason work has apparently ceased on this claim also. East of these claims, on the high ridges, chrome iron was found and several claims were located on an extensive mass of this mineral. Analysis gave it as chrompicotite, a variety of chromite or chromic iron, no doubt of value, but the claims have been abandoned.

Cut-off Valley, lying north-east and south-west, in length about 16 miles, with an abrupt descent to the Bonaparte River on the north-east, and a still more abrupt and steep descent to the Fraser River on the south-east, is bounded on the west by a range of limestone marble, on the north by volcanic basalt, on the east by various rock formations, granite, porphyry, etc., folded on both sides of the valley by numerous quartz ledges and other intrusions. The whole of this valley has been more or less filled up with glacial drift. Gold exists in the glacial deposit. Rich specimens of gold-bearing float quartz have been found in various places, and gold-bearing

quartz ledges occurring as foldings or intrusions are found in the Marble Mountain range (*vide* Dr. Geo. M. Dawson's "*Mineral Wealth of British Columbia.*")

In other lands the diamond drill has for many years been a prominent factor in proving values at depth. It is high time the provincial government step in and in this province lead the way in this class of prospecting, under the management of a skilled geologist, and the best and most intelligent labour to be had. Prospecting of that nature would settle the question which often comes up, as to the value of deposits underlying the glacial drift in Cut-off Valley. Again the diamond or Keystone drill could be used on the exposed portions of the bed of the Fraser River, with better effect during the winter than at any other time, and would prove beyond peradventure the value of the gravels in these exposures. Any other evidence is worthless. Few of the miners of '58 and '60 are now left to tell the tale of the rich skimmings they took off these exposures. It would be simply absurd to suppose they got all the valuable minerals from a ground sluice that has been used by nature for ages. It is earnestly to be hoped that the provincial government, or private enterprise, will move in the matter. Take any one bar so tested and let there be undeniable evidence to show that it contains in gold so much per cubic yard at 10, 20, 30 or 40 feet, and capital would at once take hold of it. At present the moneyed man looks over a barren waste of perhaps a mile long of water-worn, polished boulders, and, without anything in the shape of reliable evidence to guide him, naturally concludes he will have nothing to do with it. There is ample room in the district of Lillooet for a score of dredgers properly constructed to deal with a turbulent river, properly managed by men who have practical experience in similar waters, and above all properly financed. Previous attempts to dredge the Fraser River have all failed by reason of the entire absence of these requisites. Needless to point out the benefits that would arise from a flourishing industry of this nature in the district: Iron works at the coast, or in Canada, labour employed, and local requirements created and supplied.

In south-east Kootenay little has been done in the direction of proving the value of the oil fields it is claimed exist there. One company is stated to have made a wagon road for 20 miles, erected cabins, put in a drilling machine, and otherwise prepared to do actual prospecting work. Others have limited their operations to endeavouring to sell stock or have waited for something to turn up to enable them to do so. The amount of *bona fide* effort to find oil in quantity, so far as known, has not increased public confidence in the commercial value of that part of the district as a probable producer of oil.

BOUNDARY DISTRICT.

LACK of space prevents particulars of the extensions of development work and additions to machinery and plant at the mines of the Boundary district being given this month, so they are unavoidably held over.

In no other part of the province, save in the Fort Steele division of East Kootenay alone, where the St. Eugene added so largely to the mineral production of the district, was there in 1905 so much progress in connection with the mining industry as in the Boundary section of the big Yale district. Even admitting that Fort Steele made a larger showing in point of value of its mineral products than did the Boundary, the comparison is certainly largely in favour of the latter when tonnage of metalliferous minerals is taken into account. Yet with more than \$1,500,000 in lode gold to its credit, and about \$4,000,000 in silver and copper—chiefly the latter—the Boundary occupies the pride of place in the production of metalliferous minerals in British Columbia. And the advance is along lines that make for permanence, which is so much more in favour of the district than if it were short lived. The tonnage of ore produced is indeed large, about 930,000 tons, with the output steadily increasing, so that the yearly output should not hereafter be less than 1,000,000 tons, which is the goal many had hoped to see the district reach in 1905.

The following table will serve to show the approximate tonnage of the mines for 1905:

	Tons.
Granby Co.'s mines . . . . .	650,000
B. C. Copper Co.'s mines—	
Mother Lode . . . . .	175,000
Emma . . . . .	9,000
	184,000
Dominion Copper Co.'s mines . . . . .	86,000
Oro Denoro . . . . .	3,000
Sundry small shippers . . . . .	7,000
	930,000

Year by year the Boundary becomes better known among mining men and metallurgists accustomed to big operations and successful achievements, and never to its discredit. Last summer its visitors included many members of the American Institute of Mining Engineers, among them men skilled in the various branches of geology, mineralogy and metallurgy. Their stay was necessarily a brief one, for they were *en route* to the Yukon Territory and could not devote much time to visiting any one place no matter what its merits or attractions. The editor of the *Bi-Monthly Bulletin* of the Institute, in the course of his account of the excursion made to British Columbia, Yukon and Alaska, made this observation in his brief notes on the visit paid to the Granby Co.'s big mines at Phoenix, Boundary district: "Without attempting here a complete scientific account of these remarkable deposits, it may be said that they contain immense

masses of sulphide ore, carrying a small percentage of copper, with values in gold and silver which become important when large quantities of ore are economically treated. The weight of ore shipped by the company's mines during the year, ending June 30, 1904, was (after deducting moisture) 514,387 tons. A rough calculation indicates that this ore yields somewhat less than 1.5 per cent. of copper, 30 cents worth of silver and \$2 in gold per ton. It is self evident that such an ore could not be mined, transported and metallurgically treated with profit except by a complete combination of engineering and metallurgical skill, mechanical systems of handling, etc., and thorough, systematic executive management and economical control, aided by exceptionally low rates of railroad transportation."

The striking features of the year's progress in the Boundary are the extension of the scale—already large—upon which mining is carried on in the chief copper-gold mines, and the considerable additions to power machinery and plant both at the mines and at the smelters. The most modern machines and economical methods of mining, treating and handling the ores are adopted, and the general results achieved are a surprise to many who do not expect to find mining and smelting done neither so extensively nor cheaply as is the case at the leading mines in the Boundary district.

The aggregate tonnage of ore produced by the Boundary mines is now in excess of 3,400,000 tons. Yet up to the end of the first half of the year 1900, the total of ore shipped was less than 5,000 tons. The district has indeed made advances in its mineral production since then. With the enormous tonnage available for shipment, and the increasing enlargement of smelting capacity, it is not surprising that the Great Northern Railway Co. has constructed a branch line to the Granby mines, nor is it likely that much time will elapse ere the same company also makes connections with the two smelters in the Boundary Creek valley, those at Greenwood and Boundary Falls respectively. So favourable a field from a freight point of view, was one that the United States company, with its lines already at its gateways, quickly entered when the time became ripe to compete with the Canadian Pacific railway for a share of the traffic that is obtainable.

To others besides railway companies the Boundary offers inducements to make large expenditures of money, for the purpose of eventually sharing in its industrial prosperity. Next to railway construction the most important recent undertaking is that of the West Kootenay Power & Light Co., which is hastening on the completion of two electric transmission lines from Bonnington Falls to Greenwood, so that it may soon be in a position to deliver power to mines and smelters in the Boundary. Each of these lines will be capable of delivering 7,000 h.p. at Greenwood, and to make ample provision for the probable increased requirements of the future, the new generating station on the Kootenay River is to be equipped

with a plant for generating 16,000 h.p. The Boundary not long since experienced difficulties and incurred losses consequent on a shortage of power, but after the completion of the power system now being put in, it is not likely to again have trouble in a similar direction. Until the new system shall have been completed, power will be obtainable from the existing generating station on the Kootenay River, which supplies Trail and Rossland.

A brief reference, before passing on, to the high-grade silver-gold mines of the Boundary. Several of them have done well in a small way. Others, as might be expected, have not been equal to paying their own way, as would have been necessary to keep them working, for there was in several instances little or no capital provided with which to develop them until sufficient ore could be mined to keep things going. Of the twenty or more small gold-quartz claims that have had more or less work done on them during the last year or so, fully half of them among the number either pay their own expenses or give promise of doing so. Though not a high-grade mine, there is one property again being operated that has long been idle, viz., the Jewel. In 1902 it produced about \$25,000 worth of ore, and when it was closed down there was no lack of ore in its stopes and levels, so it should make one more to swell the production of the district.

Both the west fork and north fork of Kettle River are having more development work done on them than in past years, and with promise of some of the properties becoming producing mines. The coming year should see much progress in both these districts. Camp McKinney alone of the Boundary camps is almost entirely neglected. Yet it is thought it will again be given a trial, for it had one mine that paid nearly \$550,000 in dividends ere it was shut down, and it may be that another such will be found there to give life to that old and well known camp.

Beyond the Boundary proper, in the southern Okanagan, Fairview is another camp that in years gone by enjoyed prosperous times. Like McKinney it is out of favour now, but it has big shoots of low-grade quartz ore, and another turn of the wheel may again see its fortunes changed for the better.

#### SIMILKAMEEN DISTRICT.

**R**AILWAY construction has done much to encourage many to turn their attention to the Similkameen, big in area and with big potentialities. The Great Northern is proceeding with the construction of the V., V. & E. line from the International boundary on up the Similkameen River. The Canadian Pacific is entering the district from the north, starting at Spence's Bridge, and going thence through the Nicola country. It is freely stated that it will push on its construction southward to Princeton during 1906. Thus the Similkameen, so long to some extent practically a *terra incognita*, is to be opened up to the advance of trade and industry, and not least under the latter head will be mining.

The widely talked of Nickel Plate mine at Hedley has had its first whole year of production, that is as regards period of time. Shortage of water, and consequently of power, may have occasionally prevented the operation of the Daly Reduction Co.'s 40-stamp mill, and so interfered with the regular maintenance of ore output from the Nickel Plate. No official statement has yet been made public showing what was the total tonnage of ore from the mine, that is the quantity actually mined and treated during 1905, but this may be safely asserted, it was unlikely to have been as great in either quantity or average value as many assume. Still the output of this mine forms a welcome addition to the mineral production of the province, the more so since it stands alone in a large district as a producer. It has been announced that additions are to be made to plant and machinery of the mill at Hedley, for the purpose of providing for treatment of a bigger tonnage of Nickel Plate ore.

The British Columbia Copper Co. has been developing two groups of claims in the Similkameen. Of these the Sunset group on Copper Mountain is the better known. It can hardly be said that this property has anything like come up to the expectations of its over sanguine owners in earlier years. It may be that the B. C. Copper Co. will take up its bond on a controlling interest in this property, but, on the other hand, it would not be surprising to learn that the mine does not give promise of becoming a steady and permanent producer. There are several other and less known properties in the district upon which much work has been done, and which have showings of ore that appear to warrant their being extensively prospected, but as a rule development has not been carried down to any considerable depth.

Aspen Grove and Aberdeen camps were the subject of a report by Mr. Robert A. Johnston, of the Geological Survey Department of Canada, which report was published by the department in 1905. The coal lands of the Coldwater, Nicola and Quilchena sections of the upper Similkameen have been examined by Dr. R. W. Ells, one of the coal geologists of the Geological Survey, while Dr. H. S. Poole, another well known expert on the geology of coal, also visited these parts last autumn. There has been more enquiry for the coal lands of the Nicola and surrounding country the past year than, probably in any previous time, and there has been more testing by drills in prospecting these lands. With the opening of the Spence's Bridge-Nicola railway a few months hence, there will arise a local demand for coal, so that opportunity will soon be given to prove the size and quantity of some of the seams occurring in these parts, and at the same time to find a market at hand for such coal as shall be taken out in the course of development.

Coal outcrops are not usually black and glistening, but rather dull and earthy, and brownish in colour. In the West some coal croppings, lignite, look like brown shales.

## THE CANADIAN METAL CO.'S WORKS AT FRANK AND PILOT BAY.

By E. Jacobs.

ONE of the most important enterprises affecting the material prosperity of the Kootenay districts of British Columbia established in 1905 is that of the Canadian Metal Co., Ltd., which has its head office in Nelson. It owes its existence to the persistence and energy of Mr. J. J. Constant Fernau, its general manager, who for about two years has been assiduously working towards effecting the organization and bringing about the operation of this undertaking, which is comprehensive in its objects and gives abundant promise of proving of general benefit, particularly to the zinc and lead producing sections of British Columbia, and, incidentally, to that part of south-west Alberta, immediately beyond the confines of this province, in which it has been found advantageous, owing to the existence there of a supply of cheap fuel, to erect the zinc smelter, which was the initial undertaking of the company.

## THE ZINC SMELTER AT FRANK.

The company's zinc smelter at Frank consists of all buildings, machinery, plant and accessories requisite for the manufacture of zinc. The accompanying illustration (see page 457) will serve to give an idea of the works, although one view is not enough to convey an adequate impression of their extent and importance. They were visited, just before the completion of the part now ready for the uses for which the smelter was designed, by Messrs. W. R. Ingalls and P. Argall, members of the Zinc Commission appointed by the government of Canada to report upon the zinc resources and conditions of British Columbia. Shortly afterwards an experimental run was made, chiefly for the benefit of two visiting large stockholders of the company, when a car of zinc concentrates—the first received at the works—from the Grey Copper mine, near Sandon, Slocan, shipped by Mr. J. A. Whittier, manager of the Goodenough Mines, Ltd., was smelted and the first zinc made in Canada was produced.

The sampling department is equipped with automatic samplers and crushing machinery. The ore, after having been passed through the samplers, is conveyed to the storage bins, from which it is weighed out to the roasting furnaces. There are four Merton's patent furnaces each having five decks; combined they give a hearth area of about 5,000 sq. ft. The whole operation is automatic, the ore being fed to the furnaces by automatic feeders and taken thence to the adjacent mixing room by a screw conveyor.

In the mixing room there are bins for roasted ore; coal and coke crushers; mixers, of the pug-mill type; and elevators to dump the ore into cars for conveyance to the distillation furnaces. These furnaces are in an adjoining room, which contains five blocks of furnaces, comprising in all 1,240 retorts.

The roasted ore is mixed in the mixing room with about 40 per cent of its own weight of coal and

coke dust, and is then introduced into the retorts by skilled workmen, who throw it into the retorts with small scoops, this part of the treatment process requiring care and practice, to secure best results. The retorts are heated by means of producer gas, and the air for combustion is pre-heated by the waste gases of combustion in apparatus known as generators, which are similar to those used in steel furnaces.

The application of heat to the mixture of roasted zinc ore and coal and coke dust liberates the zinc, which is very volatile; it is distilled out of the retort and is caught in a condenser. From the condenser it is scraped into ladles. Afterwards it is cast into ingots and the zinc, if the product of ore of sufficiently good quality, is then ready for market. If much lead or other metal be present with the zinc in the ingots the metal has to be refined.

Roasting, mixing and distillation are the three essential processes of zinc smelting. In connection with these processes a pottery is necessary, also a gas producer plant. Other requisites are a forge, carpenter shop, stores, brick making plant, etc. All of these have been provided at the Canadian Metal Co.'s works and are in operation. The pottery may be mentioned as being one of the best of its kind, and the machines for making the pots used in the zinc works are of a style being rapidly adopted in the United States, although two or three years ago there were in that country only two plants equipped with this class of machine, the main principle of which is the use of hydraulic pressure of 3,000 lb. to the square in., whereas the method commonly adopted, even to-day, is the use of an auger machine which simply drills out the superfluous clay and makes pots thicker and less dense than those made by the hydraulic pressure method. The pottery is also supplied with machines for mixing, screening and stamping the clay before it is moulded.

An elevator delivers the clay required for the bricks to the brick-making department, which is necessary owing to the large number and variety of differently shaped bricks needed in the construction of the furnaces. Adjacent to the pottery are two large brick kilns for burning the bricks at a temperature of 2,500 degrees Fahrenheit.

In a separate building is placed the gas producer plant. Here coal is burned by a mixture of air and steam, giving off what is called producer gas. The coal for these gas producers or generators is obtained from the company's own colliery, situated close at hand, and the entry to which is from the works. Coal is brought direct from the mine to the top floor of the gas producer building, thus avoiding any intermediate handling between mine and zinc works.

The dimensions of the main building, which contain the roasters, mixing chamber, and distillation furnaces, are: Length 750 ft., width 50 ft., height to eaves 26 ft. The buildings in which are housed the forge, carpenter shop and stores, are similar in general design to the main buildings. All are of brick, roofed with galvanized iron. An enlargement of the

works as originally planned is being made, and when the whole shall have been completed some 2,000,000 ordinary red bricks and 500,000 fire bricks will have been used in construction. The greater number of the bricks, including all those specially shaped, were made at Frank, most of the remainder were brought from St. Louis.

To supply power to the works there are five 60 h.p. steam boilers. Steam is supplied to five separate engines, it is conveyed to the different departments in well covered pipes. Water and electric light are obtained from the respective water and light systems provided by private enterprise for the town of Frank. Transportation facilities are convenient, the Crow's Nest branch of the Canadian Pacific railway passing close by the works, and connection with it is by two sidings, one running through the centre of the works and the other at the back.

The treatment capacity of the plant, when completed, will be about 125 tons of zinc ore per day. A commencement will be made in January with half that capacity, and within six months the full capacity will have been provided for.

The ore supply will be obtained entirely from British Columbia, or practically so, at least for some time to come, and no doubt is entertained that an ample supply will be available. As most zinc ores of the province contain silver to a greater or less extent the ashes from the distillation furnaces will be saved and a second process in all respects similar to that used at the Trail and Nelson smelter for the treatment of dry ores will be adopted at Frank, and for this purpose a lead stack is being erected. Coke, from the Belgian ovens at the West Canadian Collieries Co.'s Lille colliery, situated about five miles away, will be used in this furnace. The only special feature in connection with this stack will be the large amount of room allotted for settling the fumes, which will be equivalent to a length of flue of one mile and a half. The noxious gases from the lead stack and from the roasting process will be carried away to the top of a neighbouring hill by a flue and smokestack, the latter rising to a height of 300 ft.

#### THE SMELTER AT PILOT BAY.

The industry that the company is establishing at Pilot Bay is one that will be of almost, if not quite, as much importance to the Slocan and other districts chiefly concerned, as that of zinc smelting at Frank, for it will provide a local market for mixed ores, many of them of such nature as to make them, under conditions that have heretofore obtained, quite unsaleable. The plant here includes a concentrator, which, when the smelter was operated in 1895-7, concentrated about 200 tons of ore per day. This plant is being thoroughly repaired and renovated, and in addition 12 magnetic separators are being installed. These separators are designed to extract the ore up to a percentage sufficiently high for the purposes of the zinc smelter.

The company's lead smelting operations will be carried on at the Pilot Bay works. A supply of lead ores will be obtained partly from the concentrator

and partly by the purchase of such ores. There is already on lead stack available for smelting lead whenever it shall be found advisable to commence operations in this connection. This is a 42 by 96 in. stack, with six 3½ in. tuyeres on each side. The hand roasters formerly in use here will be replaced by mechanical roasters.

Steam will be the motive power at these works, the machinery installed including a 150-h.p. Corliss engine and separate engines for driving the furnace blowers and electric light plant.

Slips are being constructed at the lake side to facilitate the delivery of ore and other materials. It is hoped the supply of ore will soon be large enough to warrant the addition of more lead stacks, for the erection of two or three more of which provision has been made in the existing smelter buildings. It is intended to enlarge the plant in all departments whenever the quantity of ore received shall justify this being done. It is expected that such enlargement will be required specially in connection with the treatment of dry ores. Future developments will be in the direction of making provision for the treatment of ores at the lowest possible cost.

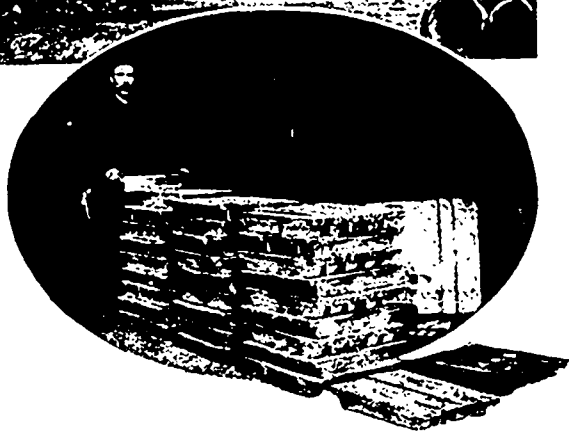
#### THE COMPANY'S EXCEPTIONAL ADVANTAGES.

The combination of plants possessed by the Canadian Metal Co., which has purchased outright the Pilot Bay works and the Blue Bell mine so long associated with them, will give exceptional advantages in the purchase of ores, since it will be able to deal with those of even low as well as ordinary grade, and to utilise them in a manner and to an extent that cannot but be of mutual advantage to both buyer and seller. The main advantage to many mine owners will be that even the low-grade zinc ores will be saleable. The company's zinc smelting plant, being a thoroughly modern and complete one, together with the advantages of the company owning its own coal mine and the assurance of a supply of ore being regularly maintained, ensure a combination that will admit of low cost of treatment and a consequent ability to pay the highest price for ores. The company's enterprise is intended to be mainly the establishment of works for the treatment of custom ores. The object the company has in purchasing and operating mines—beside the Blue Bell, which is situated close to Kootenay Lake, the company has acquired two or three mines at Ainsworth, and has leased the Emily Edith mine, near Silverton—is to steady the supply of ore. It has already commenced to buy custom ores—in fact has been doing so for two or three months, and its intention is to endeavour to buy all suitable ores obtainable.

The many friends in the Rossland and Boundary districts of Mr. S. F. Parrish, M.E., will be interested to learn that, for his health's sake and a rest, he has removed from Salt Lake City, Utah, to La Jolla, San Diego County, California, where he has a house in a charming locality, only a few hundred yards from a fine surf.

## THE SMELTING WORKS OF BRITISH COLUMBIA.

**P**RACTICALLY all the ore produced in British Columbia is milled or smelted at works situated in the province, the most important exception to be noted in 1905 having been that sent from Rossland mines to the Le Roi Mining Co.'s smelter, situated a few miles south of the International boundary line within a short distance of Rossland. Next year there will, it is expected, be another important exception, viz., that of the Canadian Co.'s zinc smelter, situated a few miles east of the eastern boundary line of British Columbia, which will smelt zinc ores from the province. The following notes will indicate most of the changes and im-



At Hall Mining and Smelting Co.'s Smelter, Nelson. Stack of Silver-lead Bullion Smelted at These Works.

provements made at the various smelters during the year 1905. The Pilot Bay smelter has mention on another page:

### THE NELSON SMELTER.

The Hall Mining & Smelting Co.'s smelter at Nelson, on the west arm of Kootenay Lake, was built in 1895 for the purpose of smelting the produce of the Silver King mine—a copper-silver ore. Several years later, the supply of copper ore having meanwhile practically ceased, the furnaces were adapted to the requirements of lead ores and dry ores, and the work of the smelter has since been almost altogether confined to the treatment of these ores. The works and plant include a sample mill; well-equipped

laboratory and assay office, two blast furnaces with blowers; hand and mechanic. roasters, etc.

Recent improvements comprise the completion of installation of a Merton roaster, the putting in of an entirely new automatic sampling and fine-crushing plant, with an automatic ore-bedding system; an automatic haulage system, with the erection of a number of gravity bins, and extensive changes in levels to effect savings in labour. The installation of a new desulphurisation process has been commenced, and this will be completed in due course.

It may be mentioned here that the Colorado Iron Works Co. Denver, Colorado, U. S. A., is building for the Hall Mining & Smelting Co. the equipment for a complete crushing and sampling plant, in which six of the former company's impact screens will be installed, also an automatic bedding system, consisting of conveyors with reversing trippers, an automatic mixing and distributing system for crushed material for the lead-converting plant, and a car system, including 17 cars and 24 turntables.

The Merton roaster was erected at these works for the purpose of roasting ores for lead smelting. The furnace is compact, occupying a floor space of only about 9 by 35 ft. It has three decks in the body of the furnace and one exterior hearth. The great advantages claimed for this furnace are that the system of rabbling is such as to lift and turn every particle of ore with each revolution, exposing it more thoroughly to oxidation than any other system. Further, the exterior hearth makes it possible to obtain any degree of heat or oxidation. After having made the changes found to be necessary—such as water-jacketing all shafts and arms, and substituting more suitable rabblers—this furnace has done here fairly good work on a great variety of ores from pyrite to galena concentrate carrying 60 per cent lead. The fault remaining with the furnace is that it passes material too rapidly through, allowing too short a time in which to thoroughly roast difficult material. Its capacity is from 10 to 15 tons daily, according to the charge. It is very economical in fuel, while its labour costs are not high. When well equipped maintenance is light.

Another improvement is a combination syphon spout and matte trap, for use on blast furnaces. This device is the invention of Mr. H. Harris, A. R. S. M., metallurgist at the Nelson smelter. It consists of an L shaped cast-iron box about 30 in. long, lined with tile or water-jacketed to suit conditions. This is placed in free communication with the tap-hole of the furnace. The walls are deep enough to afford a sufficient heat to retain the amount of slag and matte desired in the furnace. Placed in this box at right angles to the face of the tap jacket is a water jacket partition, below which is an aperture a few inches in height and which serves to laterally divert the matte. The manner of operation cannot be well described in the absence of plans and sections for reference. Sufficient to say that its operation requires but little skill or attention, and it will run two or three weeks without change, which, when necessary, is quickly made.

the apparatus being mounted on small wheels run on rails on a truck placed at a height corresponding to two short rails at the furnace. Among the advantages gained by the use of this matte separator, which is here in use in connection with the smelting of lead ores, are that it reduces the slag losses, effects a saving in labour and material at the furnace by doing away with the customary periodic tapping of large quantities of matte at one time, admits of the advantageous automatic granulation of the slag, and, not being an integral part of the furnace, may be removed or a change be effected in a few minutes. Mr. Harris has patented this invention and thus protected his rights therein.

During the year 1905 the tonnage of ore smelted at these works was 37,394 dry tons, the material contents of which were as follows: Gold, 9,490 oz.; silver, 1,234,292 oz.; copper, 154,943 lb.; lead, 17,471,440 lb. This showed a larger tonnage of ore treated and of metals produced than in 1904.

The following is an excerpt from the annual report of the directors for the financial year ended June 30, 1905: "The company's furnaces have been kept fairly regularly in blast during the year, with results which, considering the keenness of the competition, the directors consider satisfactory, and an earnest of steady improvement in this branch of the business in the near future. The supply of lead ore, although at times during the year rather uncertain, is gradually becoming more assured, and under the influence of better prices for metals a good many more mines have been able to resume work, with the result that we have made our purchases of lead ores from 125 miles, as against 102 last year. The question of adopting one of the several processes for an improved method of lead smelting has been receiving the careful consideration of the board. Much useful information bearing upon this subject has been collected by Mr. R. R. Hedley, the smelter manager, and as soon as possible an improved process will be installed in conjunction with our present plant, which, it is calculated, will sensibly enhance the company's profits.

#### GRANBY CO.'S SMELTER AT GRAND FORKS.

At the Granby Consolidated Mining, Smelting & Power Co.'s big smelting works, at Grand Forks, Boundary district, numerous improvements and additions were made in 1905. Some of these were rendered necessary by the construction of a second railway spur to the works, the Great Northern Railway Co., on the completion of its branch line to Phoenix, where are situated the mines of the Granby Co., having made the connection, so as to enable its trains to deliver ore to the smelter.

The additions made to the receiving bins last year increased the total ore storage capacity at the smelter to about 15,000 tons. The bins into which the Great Northern trains deliver ore are parallel with and within 20 or 30 ft. of those into which the Canadian Pacific ore cars dump their contents. The Great Northern bins extend along a distance of about 1,000 ft.; the C. P. R. bins cover a shorter length. The upper part of the space between the rows of bins

is floored, which convenient arrangement provides a long, flat bin for coke, 3,000 tons of which can be stored in it.

Now that all the ore produced by the company's mines is crushed at Phoenix, there is comparatively little work for the crushers in the smelter sampling mill to do. Of course all custom ore is passed through the sampler, but only one car in eight of Granby ore is sampled.

The electrically operated mechanical furnace charging system devised by the general superintendent of the Granby Co., Mr. A. W. B. Hodges, was put into full operation at the company's smelter early in the year. In this, side-discharge cars are used and they are run into the furnaces two at a time. Each car has four compartments so arranged that the charge can be placed in any part of the furnace desired, thus securing the distribution of the charge wherever needed. These cars are moved along tram tracks between ore bins and coke bins and furnaces by electric locomotives, and this charging system is operated so economically that a saving at the rate of \$80,000 to \$90,000 per annum with six furnaces running, was effected, this having been the difference between the cost of hand feeding and this system of mechanical feeding. This was the estimated saving before the two large furnaces were blown in—now the saving is considerably larger than with only six furnaces running. Five 20-h.p. Westinghouse electric locomotives are used, three of them doing the work of charging the six smaller furnaces. Sometimes the two big furnaces run so fast that there has to be available a separate locomotive for each of them. The small furnaces smelt on an average about 300 tons each per diem, and the big ones about 500 tons. Occasionally the daily run is higher, but not as a rule. The 20-h.p. locomotives will haul four tons to a car. Two short cars are used instead of one long one for convenience in going round curves to and from the ore bins.

The number of slag pots or cars, for dumping the slag hot, has been increased by 12, making 40 in all. As these pots cost about \$600 each it will be seen that even this part of the smelter equipment is costly in the aggregate.

An addition to the blowers is a big Connersville blower, one of the largest made and known as the "Jumbo" size. It is claimed that it is the largest blower in Canada, and that outside of seven at Anaconda, Montana, there are none so large in use in the United States. Its capacity is 30,000 cu. ft. of air per minute and it has a double drive, being operated by two 150 h.p. induction motors.

A new flue chamber of brick has been built. It is 500 ft. long, 11 ft. wide and 10 ft. high. It connects with a circular brick smokestack 150 ft high and 13 ft. inside diameter. (See illustration on page 451.) This stack stands on a base of first 30 ft. square of solid concrete 4 ft. thick; then 10 ft. of solid masonry, which brings the foundation to surface level. Above this the stack is 20 ft. square, up to where the circular construction commences.

In connection with the converting plant, there has been added a duplicate blowing engine, capacity 6,000 cu. ft. of air per minute, driven by a 30 h.p. induction motor. Added to the capacity of the old engine, a total of nearly 10,000 cu. ft. of air per minute is obtained, which is sufficient to run three converters continuously. A third converter has been ordered; this will be of similar size to those now in use, and should be received in about three months. Another recent addition is an up-to-date converter-lining mixer. A new crusher, and rolls, to break up the ore for making converter linings, are being installed.

Other improvements effected include the extension

which, roughly, is equal to about one-half horse-power for each ton of ore smelted, the calculation including the power required for the conveying plant. In a general way the proportionate power requirement at the company's mines is similar.

The West Kootenay Power & Light Co. is about to connect its new electric transmission line with the smelter, so that hereafter there should not be any stoppages through lack of power.

The tonnage of ore smelted here during the year was about 683,000 tons, the approximate value of which was between \$3,500,000 and \$4,000,000.



British Columbia Copper Co's Smelter, at Greenwood, the Blast Furnace Plant at which is shortly to be entirely remodelled.

of the briquette drying house, which is now so arranged that the briquettes are dried for 48 hours instead of for only 24 hours, as formerly; the machine shop has been extended; a big new warehouse for bar and sheet iron, new blacksmith shop, and a round house for the three locomotives that draw the slag pots to the dump, have been built; the power tool equipment of the machine shop has been added to the new tools including lathe, punch, shears, 2,200-lb. steam hammer, etc. Another pump has been put in—a Byron-Jackson centrifugal pump, equal to 650 gal. per minute. The tools and buildings enumerated in this paragraph cost about \$25,000.

About 1,500 h.p. in all is required to run the plant,

#### B. C. MINING CO.'S SMELTER, GREENWOOD.

Few permanent improvements were made at the British Columbia Copper Co.'s smelting works, at Greenwood, during 1905, it having been deemed inadvisable to incur much outlay in this direction under the circumstances that it is intended to, in 1906, remodel the entire blast furnace plant. The additions to plant, etc., made in 1905, were the putting in of a briquetting plant, having a capacity of five tons of briquettes per hour, and the substitution of electric locomotives for steam locomotives for the removal of molten slag.

The total quantity of ore smelted was 214,608 tons, practically all of which was from the company's own



mines, the Mother Lode having sent to the smelter about 180,000 tons, and the Emma the greater part of the remainder. Some 5,000 tons, chiefly of silicious ores, were received from the United States.

The company also operates here a copper converting plant, and besides the matte from its own smelter furnaces it received 2,110 tons of matte from other smelters, which was converted into blister copper.

The total production of metals during the year was as follows: Gold, 28,229 oz.; silver, 99,286 oz.; copper, 5,776,711 lb.

The company has made public its intention to enlarge its smelter to an extent that practically means reconstruction and re-equipment along the latest and most approved lines. Contracts have been made for the supply of the new machinery and plant, as under: Three blast furnaces of a size and capacity—approximately, 600 tons per diem each—larger than any of the copper furnaces now in Canada. The hearth area of each furnace is given as 48 by 240 in. Furnace charging will be from side dumping cars hauled by trolley locomotives. Molten slag will be hauled to the dump in 25-ton cars by electric motors. The slag cars will each have an electric motor for tilting the car. There will be three large Roots' blowers, each driven by a 300-h.p. induction motor. A 100-kw. motor generator and several smaller motors will also be installed. Five trolley locomotives will be used for hauling ores to the furnaces and slag to the dump. Ore bins are to be enlarged, coke bins constructed, railway trestles raised, a larger railway scale put in, a machine shop with full equipment of power tools provided, together with all accessories requisite to make the smelting plant modern and complete. The new furnace building will be of steel and generally buildings and plant will be such as to make the works second to none in regard to completeness of equipment and in provision for economy in operation.

The changes have been designed by and are to be made under the direction of the manager, Mr. J. E. McAllister, who before taking charge of these works had the benefit of a valuable experience, in the capacity of assistant superintendent at the Tennessee Copper Co.'s large and modern smelting works in Tennessee.

#### DOMINION COPPER CO.'S SMELTER, BOUNDARY FALLS.

The Dominion Copper Co.'s smelter was idle the greater part of the year. It was operated by the Montreal & Boston Consolidated Mining & Smelting Co. until May 20, when it was shut down and remained idle until, at the end of November, one furnace was blown in, the Dominion Copper Co. having meanwhile acquired possession of the works. Altogether between 150,000 and 200,000 tons of ore were smelted here during 1905.

No additions of importance were made to plant, but should the Dominion Copper Co. decide to keep it running for any great length of time additions and improvements will no doubt be made to the full extent required.

(To be continued next month.)

#### CROW'S NEST PASS COLLIERIES.

TWO MILLION tons of coal and 500,000 tons of coke per annum is the advertised present capacity of the coal mines and coke ovens at Coal Creek, Michel and Carbonado, the three collieries of the Crow's Nest Pass Coal Co., Ltd., which now has a payroll of between 1,700 and 1,800 men, receiving in the aggregate more than \$1,500,000 per annum.

The operations at the company's collieries during the past few years have been briefly summarised for the *Fernie Free Press* Souvenir Edition, just issued, as follows: At Coal Creek colliery six separate mines have been opened up, and five of them are at present producing coal. Electric, compressed air, and main and tail-rope systems of haulage have been installed in these mines, and the present output of 2,000 tons per day could, at short notice, be doubled. At Michel colliery six separate mines have been opened up, but at present only two of them are being operated, producing 1,200 tons per day. The total capacity of this colliery is more than 2,000 tons daily. At Carbonado colliery (Morrissey Mines), five mines have been opened up, but only three are being operated. The full capacity of these mines is 1,000 tons per day.

It will be seen, therefore, that the combined capacity of the three collieries at present is about 5,000 tons per day. This could quickly be increased to 6,000 tons, so that any rapid increase in the consumption of coal in the territory tributary to this coal field could easily be provided for by the production of these mines.

The chief additions made to plant, machinery, etc., during the year and underground developments at the several collieries were as follows:

At Coal Creek the two tipples destroyed by fire last March were replaced by a steel structure, which is one of the largest and most modern tipples in the country. It crosses Coal Creek valley from one side to the other, so as to connect with the mines on both sides. Its length is 832 ft., and it is equipped with modern coal-handling machinery and appliances, all selected with a view to labour-saving and expedition in handling coal in large quantity. Electric locomotives, trip and auxiliary feeders, dumps, and kickbacks handle the loaded and return cars; shaking tables, belt conveyors and picking tables provide for the screening and dry-cleaning of the coal, and a gravity box car loader delivers it into cars ready for shipment.

No. 2, which is one of the most productive of the mines, now has a main level 6,000 ft. long. No. 1, on the opposite side of the valley, i. e., the north side, is still producing first class steam coal; its main level is in about 5,000 ft. No. 9, on the same seam, was largely developed in 1905; its tunnel is in 2,000 ft., and its output of coal is steadily increasing. No. 5, also a new mine on the north side, is developed to about the same extent as No. 9.

At Michel colliery the most important change made in 1905 was the installation of a high pressure haulage system, including a 400-h.p. four-stage air compress-

sor compressing air to 1,000 lb. and supplying air for compressed air locomotives used to transport the coal from mine workings to points of shipment. The Canadian Rand Drill Co., Montreal, installed this system at No. 8 mine, the main tunnel of which has been driven into the mountain between 6,000 and 7,000 ft. No. 6 is the only other mine here that is being worked. This produces a good domestic coal, but the tunnel is only in about 1,000 ft. Nos. 3, 4, and 5 mines are kept open but no coal is being taken from them at present. A wash-house, 40 by 150 ft. and capable of accommodating 200 men, was built here in 1905.

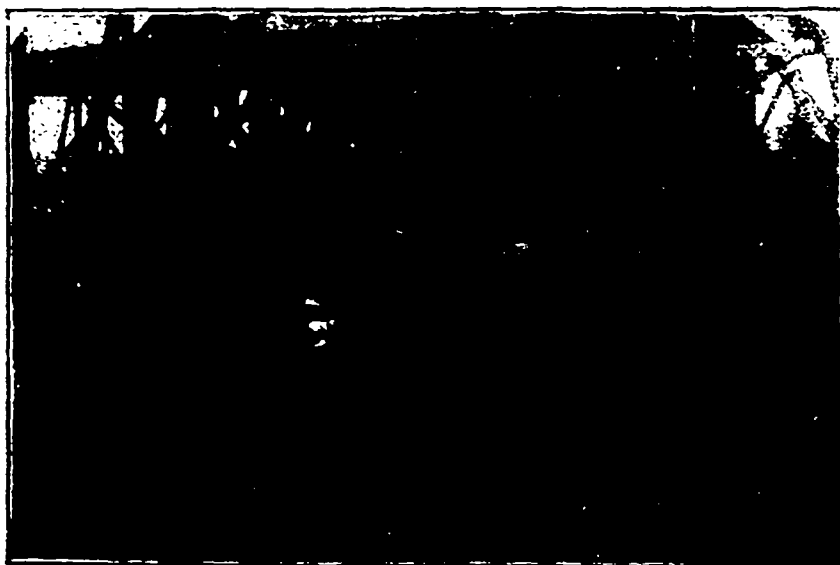
At Carbonado, mines Nos. 0 and 3 are being worked steadily: the latter is in a seam of semi-anthracite coal. During the year No. 6 mine was opened up, and the tunnel is now in about 600 ft.

More coke was made in 1905 than in any previous year. The company has 1,128 bee-hive coke ovens: their combined capacity, burning 72-hour coke, is 1,500 tons of coke per day.

#### WEST CANADIAN COLLIERIES, LTD.

This company's collieries are in the Blairmore-Frank section of the Crow's Nest country, a few miles east of the Alberta-British Columbia boundary line. Although this company's works are not yet altogether out of the development stage, more progress was made during 1905 in development and equipment, and in production, too, than probably in all previous years put together. As evidencing the advance made, the following production figures are given: In 1904 the approximate output was 75,000 tons of coal and 17,000 tons of coke; in 1905 the production during eleven months to November 30 was 165,000 tons of coal and 31,000 tons of coke. Development, however, was increased to a larger degree than production, for the quantity of coal blocked out shows a very big advance in this direction.

At the company's Lille colliery, No. 1 mine is past the development stage. In 1905 it was equipped with a modern and complete automatic tippie, with



Rand Compressed Air Motor, hauling coal at the International Coal & Coke Co's Colliery, at Coleman, Alberta. Supplied by the Canadian Rand Drill Co.

The year's output of coal and coke was the largest in the history of the Crow's Nest Pass Coal Co., which continues to be the only shipper of these products from the British Columbian part of the Crow's Nest coal fields. The gross tonnage of coal mined in 1905 was 835,000 tons, as against 742,000 tons in 1904, and 661,000 tons in 1903. The quantity of coke manufactured was 262,000 tons, as compared with 245,000 tons in 1904, and 168,000 tons in 1903. The exports of coke totalled 115,000 tons, those for 1904 having been 109,000 tons, and for 1903 only 31,000. The percentage of increase in 1905, as compared with 1904, was: Of coal, rather more than 11 per cent., and of coke, nearly 8 per cent. The company's standard number of employees at its three collieries was: In 1905, 1,745; in 1904, 1,728; in 1903, 1,450. The totals of the payrolls for the respective years were: In 1905, \$1,516,008.95; in 1904, \$1,419,795; in 1903, \$1,370,632.

cross-over dump, shaking screens, and picking table. This tippie, with the single picking table installed, is capable of handling about 1,200 tons of coal per shift. The addition of a second table would increase the capacity to about 1,800 tons per shift. No. 1 mine is shipping 700 to 800 tons per day; about 225 tons of this goes to the Belgian coke ovens, of which there are 54 in operation, and the remainder is shipped chiefly to the Canadian Pacific and Canadian Northern railways, smelters in British Columbia, and to supply the domestic trade throughout the North-west Territories.

A recent installation is a Luhrig jig washing plant, in connection with the coke-making operations. This is the first coal-washing plant to be operated in Alberta, and it is giving first-class results. The coal at this plant is first elevated above the washery, thence it goes through an over-sized screen to grading boxes,

and then into two batteries of five jigs each. The coal after being washed is elevated above the four storage bins, goes thence to the crusher, and then to the storage bins above the oven larries. The installation of this washing plant is notable in connection with the history of the development of the Alberta coal fields.

Other improvements made include putting the branch railway into first-class condition; erecting a sawmill in the centre of the company's large timber limit from which was obtained all lumber, except dressed material, used in the numerous buildings the company has erected; hotel, schoolhouse, town hall, and a number of cottages for employees.

At Bellevue mine much progress was also made in 1905. The development of the mine had chief attention, in which connection a small installation of steam boilers and a 2-drill air compressor was made, for the purpose of hastening the opening up of the mine. It is expected that next summer this mine will be equipped with a tippie and other necessary plant.

The coke being made by this company is, so it is claimed, equal to any that can be obtained in the country, and finds ready sale to the smelters.

#### CANADIAN-AMERICAN COAL AND COKE CO.

This company, with mine at Frank, has overcome the many difficulties against which it has had to contend during three years, and its production is now about 600 tons of coal per day. The fire that for eight months was burning in the mine has been extinguished and all the district of the mine affected by it is now working. Labour troubles have been settled by an agreement with the United Mine Workers of America. The effects of the tremendous rock slide that in April, 1903, buried part of the mine and town have passed away and both are now as active and vigorous as before that dire catastrophe. Altogether, the prospects for both the company and the town are regarded as being bright.

#### INTERNATIONAL COAL & COKE CO.

No information was received relative to the operations of this company, which is operating coal mines and coke ovens at Coleman, in the Blairmore-Frank district. It is reported that the output of the mines is about 1,000 tons of coal daily. A complete Rand air haulage system has been installed by the Canadian Rand Drill Co.

The Wonder Air Hammer Rock Drills, manufactured by the Hardsocg Wonder Drill Co., of Ottumwa, Iowa, U. S. A., have been used during the year at the mines of the following companies: Crow's Nest Pass Coal Co., of Fernie; the Pacific Coal Co., of Bankhead, Alberta; the Western Fuel Co., Nanaimo, and the Tyee Copper Co.'s mine, Mt. Sicker, Vancouver Island; the Great Cariboo Gold Co., and Slough Creek Gravel Gold, Ltd., and others. Generally these drills have given satisfaction, so that their use to a larger extent is quite probable.

#### CANADA'S PRODUCTION OF COPPER.

REGARDING Canada's share in the world's production of copper in 1905, Mr. Horace J. Stevens, in the course of a comprehensive and interesting article on *The World's Copper Trade*, observes:

"In Canada there is little change in the eastern provinces, the bulk of Ontario copper coming from the nickel-copper ores worked by the Canadian Copper Co. in the Sudbury district. In British Columbia the mines of the Boundary have made progress in the way of improving the finances of several of the weaker companies. The Boundary ores, while occurring in almost inexhaustible quantity, are very low grade, and the companies that work them successfully must have large capital as well as good management. The Granby remains easily foremost, and has had a very good year. The smelting plant is being increased, and the Granby is evidently destined to become a very great producer. On the British Columbian coast the Tyee, a promising property, seems to have fallen upon evil days, and the local management has been changed, with what seems undeserved contumely. The Britannia mine is being developed by strong and experienced copper men and promises to be the leading producer of the coast. In the Yukon district, a little copper ore of high grade is produced from the Whitehorse district."

While generally correct in these observations, Mr. Stevens is in error in stating that the local management of the Tyee Copper Co. has been changed. Mr. Clermont Livingston is still manager, and it is understood that shortly after the annual meeting of the shareholders in London, at which reflections (entirely unwarranted by the way) were reported in the English press to have been made upon him, he received assurances from the directors of the company of their continued confidence in his management. The omission of the British Columbia Copper Co., which ranks next to the Granby Co. as a copper producer in this province, and of the Dominion Copper Co., also becoming an important contributor to the copper output of British Columbia, was perhaps necessary owing to space limitations. Information relative to the operations and production of these two companies, however, is printed elsewhere in this number of the MINING RECORD.

Professor Milnor Roberts, Professor of Mining at the School of Mines, University of Washington, recently visited the larger mines and the smelting works of the Boundary district, prior to returning to Seattle for the "Short Course for Mining Men," beginning January 9 and lasting three months. In providing these mining courses without charge (except for material used) the authorities of the University of Washington are following a policy that cannot but be mutually beneficial to that institution and the numbers who will doubtless take advantage of the exceptional opportunity thus afforded them of obtaining gratis high-class instruction in mining subjects.

## THE MAINLAND COAST.

**C**HIEF among the mining properties of the lower mainland coast is the Britannia, situated about 30 miles from the city of Vancouver and within a short distance of the shores of Howe Sound. The occurrence of immense bodies of mineralised rock on Britannia Mountain has been known for six years, but not until the autumn of 1905 was the work of opening them up and shipping ore undertaken systematically and with a force sufficiently large to enable an output of 200 to 300 tons of ore per diem being kept up regularly. There occur here several very large surface exposures of ore, on the Jane,

Mountain wrote thus of these ore showings: "In Britannia Mountain are ore bodies which rank with the largest and best in the world. The practical man has measured up 2,000,000 tons of workable ore; the theoretical man sees 10,000,000 tons and feels very sure of his ground. With the natural facilities at hand and the proper equipment, a conservative estimate of the profit per ton of this ore is \$3, or \$30,000,000 for the whole. The profit represents less than one-third of the actual value of the ore, or in other words, \$100,000,000 as it stands in the mountain. It is sufficient to say that the extraction of this great wealth means the centring here of a copper camp unequalled on the Pacific slope."



Big Surface Showing of Ore on United Verde Syndicate's Property, Fitzsimmons Creek.

Mammoth Bluff and Fairview properties, respectively. These are included in the holdings of the Britannia Copper Syndicate, Ltd., which has erected a large crushing and concentrating plant at Britannia Beach and provided transportation facilities by putting in an aerial tramway between the mines and the concentrator, a distance of 16,800 ft., a little more than three miles. The magnitude of these ore showings may be grasped when it is mentioned that the Mammoth Bluff exposure is about 600 ft. long, it has an average visible height of 200 ft. from its exposed base and an average visible width of 150 ft. A geologist who reported on the geology of Britannia

The larger shareholders of the Britannia Copper Syndicate have organized the Britannia Smelting Co., Ltd., purchased the smelter at Crofton, Vancouver Island, appointed Mr. Thomas Kiddie general manager of the works, and have since been preparing for a long, and it is hoped, a profitable run of the furnaces.

A recent discovery is a large deposit of copper-gold ore that in size bids fair to rival the Britannia. The property is on Fitzsimmons Creek, about 40 miles inland from the head of Howe Sound. A group of six claims have been acquired by the United Verde

Syndicate. Further information relative to the syndicate and its property follows.

There are numerous mining properties scattered along the mainland coast and islands north to the northern boundary of British Columbia. Some of these are ore shippers on a small scale. A few of them give promise of becoming mines.

#### THE UNITED VERDE GROUP.

**P**ROBABLY the most important discovery of a large surface showing of mineral made on the Coast since the big outcroppings of ore at what is now the Britannia mine were found six or seven years ago, was that made late in the year on Fitzsimmons Creek in a locality distant about 40 miles from the head of Howe Sound. As yet the property has not been prospected to any considerable extent, but the immense showings of ore, an idea of which may be obtained from the accompanying illustration, which shows part of the big outcropping of mineralised rock, indicate the importance of this discovery.

At first two claims were located, viz., the St. Verde and the Bonanza, but later four more were added to the group, which now contains six claims.

From a brief report on the group the following has been taken: "These claims are situated about five miles from the proposed line of the Yukon Northern railway, which is to be built north from Vancouver to connect with the Grand Trunk Pacific. These properties are so situated that it will hardly be practicable to derive any profits from them until after transportation shall have been provided. They can, however, be developed and a good showing made at very little cost. Short cross-cut tunnels can be driven in different places along the ledge, which would prove the ore body and give an idea of the quantity of ore in sight. The samples assayed were taken from different parts of the property, and show the character of the ore."

The samples referred to gave assay returns of from \$2 to \$24.80 in gold, a little silver, and from 1.5 to 9 per cent copper. The five samples were assayed by Messrs. C. M. Bryant & Co., of Vancouver, and gave gross values ranging up to \$44 per ton. It is stated that so far as yet known the values occur in a heavily mineralised schist, similar to that found on several well-known mining properties on the Coast. The enormous exposures of ore are cliff-like in appearance. An examination of the illustration will show the relative sizes of the part photographed and reproduced herewith, and the man standing on the top of the mass of rock.

Upon being convinced of the great prospective value of the property, Mr. H. T. Ceperley, of Vancouver, secured it, and afterwards interested a number of Vancouver and New York men of means in it. A syndicate, named the United Verde Syndicate, Ltd., has been organised, with head office in New York, and Mr. Ceperley is its agent in British Columbia. The syndicate has provided funds for sufficient de-

velopment work to demonstrate to some extent the quantity of ore easily accessible. It is probable that after enough work shall have been done the claims will be Crown-granted and thereafter be held awaiting the provision of railway transportation facilities.

#### VANCOUVER ISLAND.

**O**N VANCOUVER ISLAND the year's mining has not been a favourable one. The coal mines together show a decreased tonnage for 1905, caused by the seven months' strike at the Western Fuel Co.'s collieries at Nanaimo. The Wellington Coal Co.'s Extension and Comox collieries show a combined increase in net output, but this was but a small set-off against the decrease caused by the cessation of production at Nanaimo. The coal measures of Vancouver Island were the subject of examination and enquiry on the part of Dr. Poole, of Nova Scotia, whom the Geological Survey Department sent out to gather and compile information on this subject.

The non-success attending the long-continued yet, thus far fruitless exploration for ore at depth in the Tye gold-copper mine, Mt. Sicker, Vancouver Island, is a matter of general regret among many on the Island. It seems singular that with so large and valuable a body of ore at and above the 200-ft. level no shoot of ore of importance has been found below that level. The output of the mine for the year was about 32,000 tons, the cash returns from which were \$97,000. The Vancouver Island Mining & Development Co., which also owns mining property on Mt. Sicker, similarly has met with little success in its efforts to discover at depth ore bodies of considerable size. At Koksilah Mountain, 12 miles from Mt. Sicker, a Victoria syndicate, known as the King Solomon Mines, has opened up a large body of ore that carries excellent values in copper, with a little gold and silver, and a commencement has been made to ship ore to the Crofton smelter.

On the west coast of the Island the outlook for developments is regarded as being promising. The iron properties situated near Port Renfrew, have been bonded to responsible men, who are stated to have also secured the hematite claims at Quatsino, the latter by purchase. It is understood that they plan the establishment before long of reduction works at Port Renfrew. The mining properties on Alberni Canal and its tributaries have been disappointing, but there are on several of them good showings of mineral which lead mining men to think that before long quantities of ore that will give profitable returns to the mine owners will be shipped to the smelter from this section. At Trout Creek men have been employed in opening up what looks like making a good mine. Considerable assessment work has been done in Clayoquot district, and claims on several of the tributary creeks have been Crown-granted. On Kennedy Lake, Deer Creek and Bear Creek there are numbers of properties believed to be valuable, only

awaiting the provision of capital for their opening up. As a rule, though, owners ask excessive prices, so many of the claims will probably remain idle until they shall be obtainable on terms that prospective buyers shall regard as reasonable. The Indian Chief group, which development has shown to well warrant the expenditure of sufficient capital to work it on an extensive scale, will, it is expected, be operated again next spring. It is proposed to put in a tramway to convey the ore from the mine to tide-water for shipment thence to the smelter. Returns from the last shipments made in 1905 were excellent.

The June group, on Quatsino Sound, is being worked under the direction of Mr. G. H. Grant. A tunnel to tap the principal surface showing, at a depth of 110 ft., is being driven diagonally across the mineralised zone. It is in about 200 ft., and will have to be driven about a similar distance to reach its objective point. The rock passed through shows



View of Comox Lake.

magnetite and copper, but not of economic value. The ground is hard and at present rate of progress it will probably be next May before the intended distance will be driven. In the mineralised zone the principal surface showing above mentioned is a body of magnetite about 50 ft. in width, with copper pyrites and a little bornite. About 5 ft. of this is stated to carry \$15 per ton in gold, silver and copper, and 16 ft. about \$10.

If the past year's mining operations on Vancouver Island cannot be said to have been entirely satisfactory there is every prospect of a marked improvement during the present year. It is well known that the Canadian Pacific Railway Co. proposes to engage in vigorous and comprehensive schemes for the opening up of the Island and the exploitation of its many rich resources. A branch railway in the Alberni district is one of the projects under consideration, and in the event of its being constructed, there will be a decided renewal of interest in the mineral deposits of that section.

## COAL MINES OF VANCOUVER ISLAND.

**N**EARLY 25,000,000 short tons is the aggregate production of coal in British Columbia to date, and of this quantity Vancouver Island collieries have produced nearly seven-eighths; the output of the Crow's Nest Pass Coal Co.'s collieries during the seven years they have been producing, having totalled about 3,400,000 tons. The steady increase in the output capacity of the latter, while it may eventually lessen the disproportion between their aggregate production and that of the former, will hardly interfere with coal mining operations on the Island, since the markets of the companies, respectively, are entirely different ones, the Crow's Nest coal finding a largely increased consumption in eastern Washington, Idaho, Montana and neighbouring states while that from Vancouver Island will continue to be consumed along the Pacific coast, from south-eastern Alaska to California.

Labour difficulties between the Western Fuel Co. of San Francisco, owning the collieries at and near Nanaimo, long known as those of the New Vancouver Coal Co., and its miners, resulted in the suspension of coal mining in this company's mines for about seven months in 1905, consequently the Island production was less than for several previous years. The Wellington Colliery Co., on the contrary, increased its output over that of 1904, its Wellington (Extension) mines having produced about 372,000 short tons, and its Comox (Cumberland) mines about 429,000, a total of 801,000 short tons, gross output. This company had a fairly brisk demand for its coal and a consequent moderately good season. Its chief market is San Francisco. The Puget Sound trade is not easily obtainable, outside interests influencing this in favour of Washington collieries having railroad connection with the Sound. Some of the Alaskan towns and mines get most of their coal from Vancouver Island, and the Wellington Co. finds consumers for its coal at the Treadwell Co.'s mines on Douglas Island, Skagway, Juneau, Nome and other northern points

### WELLINGTON COLLIERY CO.'S MINES.

The purchase of the Esquimalt & Nanaimo railway by the Canadian Pacific Railway Co., led the Wellington Colliery Co. to hasten the completion of the "short line" it had previously been preparing to construct, so as to do away with the necessity otherwise existing for running its coal trains over about 10 miles of the E. & N. railway. The new coal railway gives the Wellington mines at Extension direct railway connection with their shipping port—Ladysmith—where the company has large bunkers, a coal washer, and ample facilities for loading vessels expeditiously. The provision made at Ladysmith for shipping purposes is more than adequate for even a considerably larger trade than has yet been done. The outlook for 1906 is decidedly favourable, the demand for coal being good and the prospects of increased consumption satisfactory.

Particulars of the year's operations at the Extension mines have not been received, but it is known that more men have been employed latterly than in the first half of the year, and that a gradual increase in numbers is being made as new places are opened in the mines for them to work at. Along the short line prospecting has been carried on at two points at which the company plans to open mines, but it will be some time, probably well into 1906, before development will have been sufficiently advanced to allow of much coal being shipped from these new mines.

Information concerning the Wellington Colliery Co.'s Comox mines, kindly supplied by the manager, Mr. John Matthews, is printed in another place in this issue.

#### WESTERN FUEL CO.'S MINES.

The Western Fuel Co. last year erected new surface works and installed new machinery at its Nanaimo colliery (No. 1 shaft, Esplanade) to replace those destroyed by fire earlier in the year. It also undertook the installation of a plant at Brechin, to operate the new workings which had been in hand for some time previously, these being in connection with the opening up of coal seams passing under the water from the Departure Bay neighbourhood to an adjacent island.

The new machinery, part of which was installed during 1905, included two Canadian Rand Drill Co.'s 500 h.p. compound steam, compound Corliss air compressors, these to supply air for various coal mining machines, pumps, etc., in the pits of these collieries.

The company's output of coal in 1905 is stated to have been 169,874 short tons. Its foreign shipments totalled 114,600 tons, of which nearly 99,000 tons went to San Francisco, California.

A newspaper report quotes Mr. Marshal Bray, Gold Commissioner for Nanaimo district, as authority for the following: Mining on Texada Island is in a flourishing condition. The Marble Bay Co. shipped 12,000 tons of dry ore during 1905. In 1904 it shipped 13,429 tons. The decrease is due to more time having been occupied in improving the mines. The lowest level yet reached is 671 ft. deep, which is 619 ft. below sea level. The shaft has been deepened 100 ft. and 340 ft. of drifting has been done beside 200 ft. of winzes. The company employed 50 white men and 12 Chinese, which was about the same number as in the previous year. The company reports that the gold values in the ore have been maintained and that the greater the depth reached the greater the copper values.

The use of the diamond drill for prospecting purposes is being more and more favoured by mine managers, who find it an economical and comparatively inexpensive means of exploring ground before driving or sinking in search of ore. That this is a fact was demonstrated last summer, when the Diamond Drill Contracting Co., of Spokane, Washington, had eight

drills in simultaneous operation in different mining districts. In British Columbia this company drilled as follows: At Rossland, for the Le Roi, Centre Star, War Eagle, and Jumbo mining companies; at Kimberley, East Kootenay, for the Sullivan Group Mining Co.; in the Boundary for the Wellington Copper Mining Co., Grand Forks; at near Hedley, Similkameen, for the Yale Mining Co., and on Copper Mountain, near Princeton, Similkameen, for the B. C. Copper Co. In several instances the drills located valuable shoots of ore. The Diamond Drill Co. has a machine shop at Coeur d'Alene, Idaho, where it is manufacturing its patent double-tube core barrel, which is used exclusively on its contract drills.

The year 1905 just drawing to close, says the *Mining and Scientific Press*, has been one of the most prosperous for the mining industry that the country has ever seen. There has been a good and increasing demand for metals, and all of the most useful and common kinds are at an unusually high price. The year has also been largely free from the disturbances resulting from the conflict of capital and labour, and the outlook for the year 1906 is at this time certainly propitious.

The Fuel Report for 1905 of Mr. J. W. Harrison, San Francisco, California, states that the labour disturbances in British Columbia, which lasted for about six months this year, served to diminish the importations of coal to San Francisco from the Nanaimo section, and helped to increase the Colonial sections, both as to quantity and price. Favourable terms were reached in November last, and work has been recommenced and is now running harmoniously. About 80 per cent. of the coal trade is under the control and supervision of one firm locally. This is found to work with advantage to the buyers and sellers, as the material can be handled much more economically and prices are sustained more uniformly. There are six steamers now being utilized by this firm, transporting coal from British Columbia only; the last deliveries here by these steamers amounted to more than 24,000 tons, partially for steam purposes, and partially domestic grades.

The various sources from which we have derived our coal supplies are as follows:

	1904. Tons.	1905. Tons.
British Columbia .....	335,157	348,515
Australia .....	148,409	85,031
English and Welsh .....	64,644	65,087
Scotch .....	1,666	.....
Eastern ... ..	29,055	11,663
Seattle .....	139,063	84,965
Tacoma .....	182,313	81,480
Mt. Diabolo, Coos Bay and Tesla	96,520	114,930
Japan and Rocky Mountains....	54,245	40,219
Total .....	1,051,072	831,890

COMOX COLLIERIES, CUMBERLAND, VAN-  
COUVER ISLAND.

By John Matthews, M. E.

**C**UMBERLAND, the centre of the Comox mining district, and at which the local offices of the Wellington Colliery Co. are located, has enjoyed a year of unbroken prosperity. There have been on an average between 800 and 900 men employed in and about the mines during the year, and the number is being increased as the mines are further developed.

There are four mines being operated, viz., No. 4 Slope, No. 5 Pit (shaft), No. 6 Pit (shaft), No. 7 Slope.

fishing than this lake and its outflowing streams.

No. 4 mine is an extensive one, producing an average daily output of about 1,000 tons, which will be increased in the near future. The various levels and drifts have been energetically pushed during the year and development has proved a body of good coal in every direction. The mine has a bright future, and from present indications a long life before it. This is the mine that has built Cumberland up to its present prosperous condition, and from which most of the famous Comox steam and coke-producing coal has been mined. The mine is well-equipped mechanically, having a pair of powerful hauling engines, also an electric plant, consisting of three generators of 70, 80 and 100 h.p. respectively. They are continu-



Comox Collieries—Pit-head at No. 6 Shaft, Cumberland.

*No. 4 Slope.*—No. 4 Slope, or what is locally known as the Lake mine, owing to its situation, which is on the shore of the beautiful Comox Lake, a body of water unsurpassed in beauty and attractiveness, which has a length of 11 miles and averages in width from one to two miles. The lake presents a beautiful aspect with its banks stepping up in terraces of bare and wooded ridges, until they attain the dignity of mountains of 4,000 to 5,000 ft. elevation, capped by the grand and imposing glacier at the head of the lake. These ridges are ideal hunting grounds, deer being plentiful, with little underbrush to impede the movements or obscure the view of the hunter. Bears are also quite numerous in the vicinity of the adjacent streams and swamps. No body of water on Vancouver Island affords better trout

ous current 250-volt machines. The electric power developed is used for the purpose of lighting the extensive surface works and the interior of the mine and to operate the large electric pumps, of which there are eight, to pump water from the mine, a work of considerable magnitude owing to the long distances, nearly a mile and a half in some instances.

There has been considerable surface work done at this mine during the year. A brick building, used as blacksmith and machine shops, has been erected and a large addition has been made to the mule stable. There are 70 mules used in the mine hauling coal, their work being in addition to the mechanical rope haulage system.

*No. 5 Pit.*—Much work has been done during 1905 in No. 5 Pit (shaft) lower seam, which is found at



a depth of 600 ft., but owing to the great number of faults and wants encountered the results have not been as satisfactory as could be desired.

A pair of slopes, which are being driven in a N.E. direction, have "struck" the coal. These slopes have been in a fault or want during the year; they now, however, give much promise for the future.

The work of developing an upper seam, which is found at a depth of 280 ft. from the surface in this pit, was begun a few months ago, and a seam of good coal, averaging about 5 ft. in thickness, has been developed, which enhances considerably the prospects of this mine.

*No. 6 Pit*—No. 6 Pit (shaft) has improved greatly during the year. The upper seam, referred to above, has been more extensively developed in this mine. The south levels have been driven in this seam for a distance of about 1,200 ft., the coal averaging from 4½ to 5 ft. in thickness and being of good quality.

Coal mining machines have just been introduced in this mine and a Rand air compressor plant, to furnish power for their operation, has been recently installed. These machines are giving complete satisfaction.

*No. 7 Slope*.—No. 7 Slope is about five miles from



'No. 4 Slope,' Cumberland.

Cumberland in a northwesterly direction, and the workmen are run to and from the city on a special train. There has been much development work done here during the year, both in surface improvement and in the interior of the mine. The main slopes have, however, been in a fault for the past few months. It is satisfactory, though to be able to state that it is only a roll or want the slopes are passing through, as the continuation of the seam is proved by diamond drill holes, which have been recently bored ahead of the slopes, these proving the occurrence of a working seam of very good coal. This mine is noted for the superior quality of its coal. It is from it the anthracite coal is mined, for which the demand at present exceeds the supply. The writer feels safe in predicting that No. 7 Slope will in a few years be one of the greatest coal producing mines on the Island.

The Cumberland & Union Electric Light Co., whose plant is located in the town, has shown commendable enterprise, having installed a Pelton water wheel as an adjunct to its steam engine for driving the generators, of which there are two, each of 100 h.p., but it is not yet in a position to meet the increased demand for light. However, it contemplates introducing great improvements before next winter and hopes to be in a position to supply all demands by that time.

Relations between the Wellington Colliery Co. and its employees are most amicable. The mines are being steadily improved, and the promise for the incoming year is of a very encouraging nature. Cumberland can, therefore, with every hope of realization, look forward to an era of expansion and consequent prosperity.

*Dr. Barlow*, of the Dominion Geological Survey, recently secured during a visit to Cobalt a lump of mineral weighing 285 lb., the estimated value of which is about \$1,000. It was found by one of the workmen on the La Rose mine, when engaged in stripping and is declared by Dr. Barlow to be the richest specimen he has yet seen.

## TEXADA ISLAND.

By W. S. Planta.

**PROSPEROUS** year for Texada Island was 1905. Not less than four different corporations have undertaken development work. The lessees of the iron mine on the west shore, Mr. M. R. Hunt, manager; the Loyal lessees, Mr. C. H. Jacobs, manager; the Copper Queen lessees, known as the Trimetallic Mining Co., Mr. H. F. Wild, manager; and the lessees of the Cornell, known as the Cordillera Mining Co., Mr. A. Raper, manager.

*Iron Mine*.—Mr. Hunt took charge of the part of the Puget Sound Iron Co.'s property known as the Lake and Paxon mines—so named and distinguished from other massive croppings—in the latter part of June, and soon thereafter commenced stripping the Lake cropping, uncovering a massive deposit of high-grade magnetite, superior in quality to any of the other known deposits, carrying 15 per cent hematite as well as the magnetite, and only a trace of sulphur. Several hundred tons were won from this work. Mr. Hunt is now at Irondale, Washington, superintending the complete overhauling of the furnace, making it an up-to-date plant, installing automatic feeders, etc., and expects to be manufacturing pig iron before the coming summer. A gravity tram is to be constructed, the survey having been made to tide water, about 3,000 ft., where bunkers of 1,500 tons capacity will be erected on a substantial wharf.

*Loyal Lease*.—This property is situated three miles from Van Anda, owned by Mr. H. W. Treat. The croppings are similar to the well-known Marble Bay mine, bornite and chalcopyrite occurring in the line, supported by felsite dykes. From a surface point of view this property excels any other known deposit on Texada Island. The development work done by

the lessees consists of a 200-ft. shaft, several drifts, and about 50 ft. of winzes. Some high-grade ore was encountered at the 100-ft. level and it holds out in the winze. The management propose drifting at the 200-ft. level and raising to the winze in the upper drift. A serviceable hoist has been installed, and, taking the Marble Bay as a criterion, the Loyal may be expected to become a steady shipper ere the close of 1906.

**Copper Queen.**—This mine has the credit of producing the highest grade ore of any on the Island, running as high as 10 per cent copper, 1.5 oz. gold and 15 oz. silver to the ton, smelter returns, in cargo lots. The present operators, who are New York men, are working the lower levels, which are 80 ft. from the surface. New ore bodies have been encountered by drifts further north and west than any of the older bodies. This bespeaks a great deal for the mine, as they may hold out to a high level, therefore winning profits at an advantage over the usual dead-work system of sinking, etc. The main shaft is down 500 ft., and from it, a level at about 150 ft. taps the working winze, which is 180 ft. deep. The ore is handled by a small hoist run by air, then trammed to main shaft. There have been shipped to local smelters since the middle of September some 500 tons, all won from drifts. When stopping shall be commenced large monthly shipments will be made.

**Cornell.**—The management of this mine were confronted with the task of unwatering from the collar, and are still pumping, therefore little can be said at this writing. The Cornell has in the past produced many thousands of tons of \$25 copper-gold ore, and the lessees have in view deposits in the old workings which were overlooked, and as many new ore bodies have been by accident discovered in this and other workings on the Island, it looks very feasible that this mine will stand further prospecting; in fact, practically no prospecting at the end of old stopes has been done. It was a case of get ore all the time.

Owing to incomplete returns from the year's shipments, the publication of particulars of the operations of the Marble Bay mine—the backbone of the Island—also those of the lime kilns, owned by the same company, must be deferred until later.

## SOME 1905 MINING STATISTICS.

FROM recently published statistics of mineral production, etc., in British Columbia during the year 1905 the following have been taken. Where figures appear in brackets they show, for purposes of comparison, the production in 1904:

**East Kootenay.**—The St. Eugene mine's production of silver-lead ore and concentrates was, in round numbers, as follows: Ore milled, 130,000 tons (73,000 tons); concentrates shipped 30,000 tons (15,000 tons); lead produced, 40,000,000 lb. (21,000,000 lb.); silver produced, 1,000,000 oz. (541,500 oz.). Of the ore and concentrates produced, 11,708 tons were shipped to Europe and the remainder to the lead smelters at Nelson and Trail, in British Columbia. Development work consisted of 2,029 lin. ft. of sinking and raising, and 5,744 lin. ft. of cross-cutting and drifting, making a total of 7,773 lin. ft., and bringing the aggregate footage of development in the mine up to about 42,000 ft. or 8 miles. The net earnings for the year were about \$500,000. Four quarterly dividends, each of 2 per cent, were paid, making 16 per cent in all to date, and representing a total on the issued stock (\$3,202,000), of \$512,320 of distributed profits.

The Crow's Nest Pass Coal Co.'s three collieries produced 835,623 tons of coal (742,210 tons) gross. Of this quantity some 450,000 tons were made into coke, producing 261,933 tons of the latter (245,118 tons). The coal exported, almost altogether to the north-western United States, amounted to 246,267 tons (132,364 tons) and the coke to 115,289 tons (109,411 tons). The greater part of the remaining 139,000 tons was consumed in Canada. The standard number of employees at the company's three collieries was: At Coal Creek, 900 (897); Michel, 600 (618); Carbonado, 245 (223); total, 1,745 (1,738). The payrolls for the year totalled \$1,511,430.95 (\$1,419,795.30). The foregoing figures for 1905 include a close estimate for December, but may be slightly varied when exact returns are received. Among the improvements made during 1905 were a modern steel trestle and tiple 832 ft. long, having a capacity of 4,000 tons per day, and costing, with machinery and coal handling appliances, more than \$200,000.

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*Rossland.*—Rossland mines together produced about 314,048 tons of ore in 1905 in the following proportions: Le Roi, 113,694 tons; Centre Star, 94,550 tons; War Eagle, 61,117 tons; Le Roi No. 2, 22,035 tons; Jumbo, 10,729 tons; Spitzee, 4,809 tons; White Bear, 4,329 tons; Velvet-Portland, 1,955 tons; several small mines, 830 tons; total, 314,048 tons. The Rossland *Miner* places an average value of \$12 per ton on a production of 315,000 tons, giving a total of \$3,780,000. While this valuation may be a fair statement of the value of the metal contents of the ores of some of the mines, it will probably be found too high as an average of all the ore produced. There appears to have been a falling off in the output of the camp, for the tonnage shown in the annual report of the Minister of Mines for 1904 was 312,991 long tons, or about 350,600 short tons. This would make it appear that the output was 35,000 tons less in 1905 than in 1904, but the difference is probably accounted for in the much smaller tonnage of low-grade ore sent to the concentrators in 1905 than in 1904.

*Boundary.*—The ore output of Boundary mines in 1905 has been variously stated at from 930,000 to 950,000 tons. The tonnage obtained by the writer when in the district about the middle of December, with the output of that month estimated, was as follows: Granby Co.'s mines, 654,000 tons; British Columbia Copper Co.'s mines, 189,000 tons (Mother Lode, 180,000 tons, and Emma, 9,000 tons); Dominion Copper Co.'s mines, 88,000 tons; Oro Denoro, 3,000 tons; sundry small mines, 5,000 tons; total, 939,000 tons. A general average value of the ores of the mines that shipped the great bulk of the above stated tonnage is 1.3 per cent copper and \$1.50 to \$2 gold and silver combined, so that a total value of more than \$5,000,000 may be placed upon the output of the Boundary for 1905. It may be, though, that this exceeds the recoverable value of the ores smelted. The 1904 tonnage and value, as given in the Annual Report of the Minister of Mines, was 801,925 long tons valued at \$4,110,366, but this included the output of the Nickel Plate mine, in the Similkameen—about 10,000 tons at from \$12 to \$15 per ton—which mine is not in what is usually regarded as the Boundary district, so its 1905 output has not been taken into account in the foregoing figures for that year.

*Vancouver Island.*—Late information indicates that the output of the collieries of Vancouver Island was about 770,000 long tons of coal, less some 20,000 tons made into coke, leaving a net production of about 750,000 tons of commercial coal. The gross output was considerably larger, but after making allowance for losses in coal washing, etc., that result is arrived at, and will probably be found to represent about the actual tonnage of marketable coal.

In metal mines the only production of which information was made public was that of the Tye mine, at Mount Sicker, which produced about 32,000 tons of ore, that brought in, after payment of freight and refining costs of matte, about \$97,000.

The director of the mint estimates the production of gold and silver in the United States during the calendar year 1905 to have been \$86,377,000 of gold and 58,938,355 fine oz. of silver.