

BRITISH COLUMBIA
DEPARTMENT OF MINES

HON. WM. SLOAN, Minister.

R. F. TOLMIE, Deputy Minister.

W. FLEET ROBERTSON, Provincial Mineralogist.

GEO. WILKINSON, Chief Inspector of Mines.

BULLETIN No. 1, 1918

PRELIMINARY REVIEW AND
ESTIMATE OF
MINERAL PRODUCTION
1917

BY

WM. FLEET ROBERTSON, Provincial Mineralogist.



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To the Hon. William Sloan,

Minister of Mines, British Columbia.

SIR,—I beg to submit herewith a preliminary estimate of the mineral production of the Province for the year 1917, together with some notes on the progress of the mining and metallurgical industries during the year just closed; the information herein presented is, of course, subject to revision.

The object of this preliminary estimate and review is to give, as promptly as possible after the close of the year, an approximate statement of the condition of the mining interests, without waiting until the official returns from the mines have been received, and without the delay that of necessity must take place in carefully preparing the detailed information given each year in the Annual Report of the Minister of Mines.

The reviews herein given of the various mining districts have been submitted by the Resident Engineers of such districts.

I have the honour to be,

Sir,

Your obedient servant,

WILLIAM FLEET ROBERTSON,

Provincial Mineralogist.

Bureau of Mines, Victoria, B.C.,

January 3rd, 1918.

PRELIMINARY REVIEW AND ESTIMATE

OF

MINERAL PRODUCTION FOR THE YEAR 1917



HIS bulletin has been prepared before the receipt of the official reports for the year 1917 of the Gold Commissioners and Resident Engineers of the Province, and the customary returns of mineral production annually made by managers of mines and reduction-works; consequently, it must necessarily be regarded as being simply a preliminary review of the progress of the past year, together with an estimate of the quantities and value of the several mineral products of the Province, which it is believed will prove to be approximately correct.

The accompanying table shows an estimated mineral production during 1917 of a total value of \$37,182,570. It will be seen that the total value of the production of 1917 as estimated is \$5,107,892 less than that of 1916, equivalent to a decrease of about 12 per cent.

The decrease in total value of the 1917 mineral production as compared with that of the previous year would appear at first sight to show a very serious decline in the mining industry; this condition, however, was not due to any decline in mining itself, but to the cumulative effect of several adverse influences acting on the mining industry as a whole. It must be remembered that the year 1916 was a record one of high metal prices and of demand for metals, which therefore made that year a banner one for mining, not only for British Columbia, but for the whole American continent. In comparing the estimated 1917 production with any previous year excepting 1916, it is seen that the 1917 output easily exceeds any other; for instance, it is nearly \$5,000,000 greater than the former record year of 1912.

The adverse influences which retarded mineral production in 1917 may be summarized as industrial troubles, reduced metal prices in the last quarter of the year, a very much lessened demand for lead and zinc for munition purposes, and the economic conditions which severely handicapped the mining of gold.

Industrial troubles in 1917 were more frequent and extensive than usual; in the early months of the year a protracted strike in the Crowsnest district not only cut down the output of coal and coke, but forced the copper and lead smelters to close for lack of fuel, and, as a direct cause, stopped mining in the most productive parts of the Province. This strike was followed by another one at Rossland, which stopped production from the big gold-producers of that camp.

The great decrease in gold production this year is mainly due to the heavy falling-off in the Rossland output, which usually makes over one-half the yearly output of the Province. Early in November another serious strike occurred at the Trail smelter, which closed the whole plant until practically the end of the year; this in turn stopped productive mining during that time throughout East and West Kootenay.

The reduction in metal prices was confined mainly to lead and zinc, as the average price for copper was practically the same as for the previous year, while silver advanced in price. A larger production of lead, however, could have been made by the Trail smelter but for the inability to market the product, due to the curtailment of orders by the Imperial Munitions Board.

Gold-mining suffered also from increased costs of labour and supplies, with no corresponding increase in the value of the metal produced, thereby causing a smaller margin of profit, and, in many cases, making it unprofitable to mine gold.

But for these untoward circumstances the hope anticipated at the commencement of the year, that the mineral-output of the Province for 1917 would reach the \$50,000,000 mark, would probably have been realized. Taken in the aggregate, our mineral production and development in the year 1917 and the future prospects of the industry are conditions for congratulation at this time.

In 1914 the average market price of copper for the year was 13.6 cents; in 1915 it was 17.3 cents; in 1916 it was 27.2 cents; and in 1917 it was 27.18 cents. The "high-water mark" for the year was in February, when the high monthly average of 31.75 cents a pound was reached; a steady, although somewhat irregular, decline thereafter set in. In September the United States Government, after conferring with the representatives of the big copper-producers, fixed a price of 23.5 cents a pound, and since that time this price has prevailed as the standard on the New York market; the New York price in turn is standard for the American continent, as sales and ore-purchases are governed by it. This fixed price is apparently satisfactory to all, as the present supply and demand are about equal.

The lead market is at the present time in a very dull and featureless condition. The high price prevailing for lead during the first nine months of the year so stimulated production that the supply soon exceeded the demand, with the natural result that stocks accumulated and the price commenced to decline. In Canada the chief producer of lead is the Consolidated Company at Trail, which company delivered a large part of its output to the Imperial Munitions Board. Towards the end of the year, however, these orders were largely reduced, which caused the Trail Company to have difficulty in marketing its lead; as a result the company had to curtail lead production.

The average price for lead in January was 7.626 cents a pound in New York; in June it was 11.171 cents—the highest; and in December about 6.25 cents; the average for the year was about 8.78 cents (absolute figure not yet obtainable).

Silver was the one metal which did not rise in price in the early stages of the war, as it was not directly used in war munitions or materials. In time, however, a serious shortage of silver occurred owing largely to the heavy demands for currency, occasioned by the rapid expansion of the world's monetary systems, and the almost complete withdrawal by the Governments of gold as a circulating medium of exchange. As might be expected with a steady and even abnormal demand for silver, the price rose, gradually at first and afterwards more quickly.

The market price of silver in 1914 was 54.8 cents an ounce; in 1915, 49.7 cents; in 1916, 65.7 cents; and in 1917, 81.38 cents (December estimated). The highest monthly average reached was 100.740 cents, and sales at 115 to 120 cents were recorded. During the last three months the price has been fairly steady at somewhere about 85 cents an ounce.

The high prices paid for zinc in 1915 and 1916 resulted in such an increased production that the supply far exceeded the demand, with the inevitable result that the market price declined very materially in 1917. The present market price of zinc of from 7.5 to 8 cents a pound cannot be considered as being any better than the before-the-war price, when it is remembered that operating costs are correspondingly higher.

The average price of zinc for the year 1917 was 8.884 cents a pound (December estimated), which compares with 12.804 cents in 1916 and 13.23 cents in 1915. The Provincial output of zinc for the year 1917 is, however, only slightly less than in the previous year.

The various metals and their production are reviewed in detail later in this report, but it might be noted here that the following table shows the gross value of the metallic minerals recovered in 1917 as being \$27,663,786, which represents a decrease from the year 1916 of nearly \$5,000,000.

The value of coal produced in 1917 shows an increase of \$267,135 as compared with the previous year, but the coke production shows the large decrease of \$649,026. The coal production in the Coast District was considerably greater than in 1916, but labour troubles materially decreased the output in the Crowsnest of both coal and coke; it is in this latter district that most of the coke production of the Province is made.

As far as can be ascertained at present, there is a small decrease in the item of building materials, due to the cessation of building operations in the larger cities.

MINERAL PRODUCTION FOR TWO YEARS, 1916-1917.

The following table shows the quantities and value of the several minerals produced in the year 1916, and the estimated production in 1917. It may here be explained that the prices used in calculating the estimated value for 1917 of silver, lead, copper, and zinc are the average prices for the year, as published in *The Engineering and Mining Journal*, New York, less a deduction of 5 per cent. off silver, 10 per cent. off lead, and 15 per cent. off zinc.

MINERAL PRODUCTION FOR TWO YEARS, 1916-17.

	PRODUCTION, 1916.		ESTIMATED PRODUCTION, 1917.			
	Quantity.	Value.	Quantity.	Value.	Increase.	Decrease.
Gold, placer .....	...	\$ 580,500	...	\$ 550,000	...	\$ 30,500
Gold, lode	221,932	4,587,334	118 239	2,444,000	...	2,143,334
Total gold .....	...	\$ 5,167,834	...	\$ 2,994,000	...	\$2,173,834
Silver	3,301,923	2,059,739	3,069,021	2,372,353	\$312,614	...
Lead	48,727,516	3,007,462	38,661,811	3,054,283	46,821	...
Copper	65,379,364	17,784,494	61,416,617	16,693,037	...	1,091,457
Zinc	37,168,980	4,043,985	33,776,335	2,550,113	...	1,493,872
Total value of metalliferous .....	...	\$32,063,514	...	\$27,663,786	...	\$4,399,728
Coal	2,084,093	\$ 7,294,325	2,160,417	\$ 7,561,460	267,135	...
Coke	267,725	1,606,350	159,554	957,324	...	\$ 649,026
Total from collieries .....	...	\$ 8,900,675	...	\$ 8,518,784	...	\$ 381,891
Miscellaneous, building materials, etc. ....	...	\$ 1,326,273	...	\$ 1,000,000	...	\$ 326,273
Total value of production..	...	\$42 290,462	...	\$37,182,570	...	\$5,107,892

PRODUCTION OF VARIOUS MINERALS BRIEFLY REVIEWED.

In order to indicate in a general way the sources of the various minerals mined in the Province and to give an idea of some of the conditions that affected their production, and, incidentally, brief information concerning the larger known mineral deposits occurring in British Columbia, the next following comments are submitted.

Gold.

Placer Gold.—The recovery of placer gold for 1917 is estimated at \$550,000, of which practically all is obtained in the Cariboo and Cassiar Districts, only about one-tenth of the total coming from the other districts. An approximate apportionment is as follows: From Cariboo District, \$170,000; Atlin Division of Cassiar District, \$320,000; Stikine and Liard, \$15,000; remaining parts of the Province, \$45,000. It may be that a larger yield will be shown, but this cannot be definitely stated until after the final returns of the season's operations shall have been received. This estimated production for 1917 shows a decrease from the preceding year of \$30,500.

In hydraulic placer-mining, from which about 90 per cent. of the placer gold obtained in British Columbia is derived, it has been pretty well demonstrated that the gold-output is in direct proportion to the number of days in which water was available for pipping.

In the Atlin Division water conditions were normal, so far as is known, but the shortage of labour handicapped operations. So many men have left the district for active service in the war that not only were the larger companies short of labour, but also the number of individuals mining in a small way was materially less than in former years.

In the Cariboo District water conditions were good in the early part of the season owing to the heavy snowfall of the previous winter, which melted off gradually. This was followed by a dry summer, with some compensation by reason of heavy fall rains. The output for the Cariboo and Quesnel Divisions is expected to have been approximately the same as in 1916.

Gold-mining in all forms has suffered by the war, due to the fact that the cost of labour and supplies has materially increased, while the price of the product remains standard; hence operating costs are higher and profits lower.

Due to the greatly enhanced market price of the base metals, such mines operating on a sliding scale of wages, regulated by the prices of metals, have been paying abnormally high wages, which has drawn miners away from gold-mining, both placer and lode.

In addition to the increased cost of all supplies, etc., the war conditions have also rendered it almost impossible to obtain new equipment at any price. There has therefore been no inducement

ment for capital to enter into new placer-mining enterprises, either hydraulic or dredging. The development of new placer enterprises in the Cariboo and Atlin fields and elsewhere in the Province can therefore hardly be expected until the world war is over.

Lode Gold.—The quantity of lode gold produced in 1917 is very considerably less than in the previous year. The output, which is estimated at \$2,444,000, as compared with \$4,587,334 in 1916, is the lowest in the record of production since 1898. The explanation of this very serious drop in output is the large decrease in the lode gold produced in Rossland camp, the mines of which usually produce over 50 per cent. of the total gold production of the Province. This year the Rossland mines only made one-quarter of their usual production owing to the numerous industrial troubles which forced the total suspension of ore shipments for five months, and reduced below normal the output during the remainder of the year. Further details of this are given under the heading "Trail Creek Mining Division."

There is also a considerable decrease this year in the production from the Boundary-Yale District, due to a smaller tonnage of copper ore, carrying low gold values, being treated by the Grand Forks smelter of the Granby Company. The Crowsnest coal strike also adversely affected this company's operations by shutting off the supply of coke.

Nelson Division also made a much smaller output than in the previous year owing to no production having been made from the Sheep Creek camp.

A considerable increase from the Skeena District is anticipated, which is accounted for by the initial production from the Surf Inlet mine of Belmont Canadian Mines, Limited, and the increased tonnage of ore, carrying low gold values, treated at the Anyox smelter of the Granby Consolidated Company.

The following table shows the gold production of 1916 and the estimated production for 1917:—

	1916. Oz.	1917. Oz.
Rossland	129,790	32,416
Boundary-Yale	76,230	59,685
Nelson	4,107	1,284
Skeena	3,806	17,511
Coast	3,204	2,612
Lillooet	2,625	3,000
All others	2,170	1,731
Totals	221,932	118,239

The *Nickel Plate* mine, in the Osoyoos Division, is expected to have made approximately the same production as in the previous year—viz., 36,000 oz. of gold.

The *Yankee Girl* mine, near Ymir, recommenced shipments to the Greenwood smelter after not shipping for a period of nearly three years, during which time low-level development was carried on.

The Lillooet production comes from the Bridge River section and almost entirely from the *Pioneer* and *Lorne* mines.

The first production from the Surf Inlet mine since its acquisition by the present owning company is interesting and important, a considerable output being expected, the result of four months' operation. The property is equipped with a 250-ton mill which commenced milling in August; a considerable gold production in the future from this property seems assured.

Silver.

The quantity of silver produced is estimated to have been about 3,069,021 oz., worth \$2,372,353, a decrease from the production of 1916 of 232,902 oz., but, owing to the higher market value of silver, an increase in value of \$312,614. The increase in the market price of silver which commenced in the last months of 1915 continued throughout 1916, and on into 1917, steadily rising until in September the high monthly average of 100.74 cents an ounce was reached. Since then the price has dropped somewhat, the average for December being about 85.5 cents. The average for the year 1917 was approximately 81.38 cents an ounce, which compares with 65.66 cents in 1916 and 49.68 cents in 1915.

The approximate silver production of the various districts for the year is estimated to have been as follows:—

	Oz.
Slocan and Slocan City	1,722,269
Skeena	258,300
Boundary-Yale	251,911
Ainsworth	216,571
Fort Steele	192,387
Coast	128,648
Omineca	104,838
Trail Creek	51,508
All others	142,589
Total	3,069,021

The Slocan District is again far in the lead of all other districts in silver production, 56 per cent. of the total being credited to the Slocan. The figures for this year indicate an increased production for the Slocan, as compared with last year, of over 200,000 oz., which shows the beneficial influence of the high price of silver. The Slocan output would have been still larger but for the curtailment of ore shipments at different times throughout the year, caused by the inability of the Trail smelter to handle the ore.

The largest producer in the Slocan was again the *Standard*, with an output estimated at about 374,000 oz., followed by the *Van-Roi*, *Queen Bess*, and *Surprise*, each over 200,000 oz. The total number of shipping mines in the district was about thirty-five.

Ainsworth and Fort Steele Divisions both show decreases as compared with the previous year.

About 50 per cent. of the silver-output from the Boundary District comes from the Granby Company's mines at Phoenix. Other mines contributing are the *Mother Lode*, *Sally*, and *Union*.

The silver production from Trail Creek comes from the smelting of the gold-copper ores of Rossland camp, which carry about $\frac{1}{2}$ oz. of silver to the ton.

The Skeena production comes almost entirely from the Granby Company's *Hidden Creek* mine, at Anyox. The Omineca production is expected to be about the same as in 1916.

The Coast production of silver comes from the smelting of copper ores carrying low values in the precious metals. As a larger tonnage of copper ore was smelted, the silver-output shows an increase.

About 85 per cent. of the total Provincial output of silver comes from the treatment of silver-lead-zinc ores and the balance mainly from the smelting of gold-copper ores carrying silver.

Lead.

The total amount of lead produced in 1917 is estimated to have been 38,661,811 lb., valued at \$3,054,283. This represents, as compared with the previous year, a decrease in quantity of 10,065,705 lb., but owing to the higher market price of lead an increase in value of \$46,821. This 1917 output is in value the highest in the history of lead-mining in the Province.

The market price of lead rose and fell during the year; the average for January was 7.626 cents a pound; the high mark was reached in June with 11.171 cents a pound, after which there was a decline to about 6.25 cents in December. The average price for the year was about 8.78.

The following table shows the estimated production of lead according to districts:—

	Lb.
Slocan	13,667,762
Fort Steele	13,101,200
Ainsworth	6,877,377
Nelson	2,708,400
Windermere-Golden	1,528,600
Revelstoke-Trout Lake-Lardeau	410,700
Omineca	287,672
All others	80,100
Total	38,661,811

The Fort Steele production this year falls slightly below that of the Slocan District, which is due to a considerable decrease from Fort Steele, the 1916 output of which was 24,156,143 lb. The Fort Steele production comes almost entirely from the *Sullivan* mine, and during 1917 lead-ore shipments from this mine were greatly curtailed. This lessened output was partly due to industrial troubles at the Trail smelter, partly to excess of custom lead ore at the smelter, and partly owing to the fact that the efforts at the *Sullivan* were concentrated on getting out zinc ore.

The Slocan production shows a slight decrease (final figures may alter this) from the previous year, which is accounted for by the suspension of ore shipments during part of the year through inability to get the ore smelted. The heaviest contributor was again the *Standard*—which, however, did not make quite half of the previous year's production—followed by the *Surprise*, *Galena Farm*, *Slocan Star*, and *Queen Bess*, all with a production approximating 2,000,000 lb.

The production from Ainsworth shows a decrease of about 1,000,000 lb. as compared with 1916, but the estimate on this Division is very approximate. The *Bluebell* is the heaviest shipper and is credited with having produced about 4,000,000 lb., followed by the *Highland* with 1,200,000 lb. and the *Florence* with 700,000 lb. About twenty shipping mines are listed in this Division.

The lead production of Nelson Division is estimated at 2,708,400 lb., as compared with 1,240,784 lb. in 1916, the increase being due to a larger production from the *Emerald* mine, which makes practically all the output of this Division.

The Windermere-Golden Division is expected to have produced nearly three times as much lead as in 1916, due to a largely increased production from the *Paradise* mine; the output of this mine was approximately 1,000,000 lb. Other shippers were the *Couverapec*, *Lead Queen*, and *Monarch*.

The Omineca lead production for 1917 is expected to have been a little larger than that of 1916. The *Silver Standard* is the largest producer, with half a dozen small shippers. The lead-output from this Division should be larger in the year 1918.

Copper.

The amount of copper estimated to have been produced during the year 1917 shows somewhat of a decrease as compared with the previous year, but considering the industrial troubles of 1917 the showing made is very satisfactory. A production of 61,416,617 lb., worth \$16,693,037, is estimated, as compared with 65,379,364 lb., worth \$17,784,494, in the preceding year. The 1917 output, however, is higher than any other year excepting 1916.

The market price of copper was subject to considerable fluctuations during the year. The New York average price for January was 28.673 cents a pound, and rose in February to 31.750 cents, thereafter gradually declining to 25.073 in September. On September 21st, 1916, the War Industries Board of the United States, with the sanction of the President, officially fixed the market price of copper at 23.5 cents a pound. This price has ruled ever since and apparently is satisfactory, as, according to the leading authorities on the copper market, the supply at present just about equals the demand. The average price of copper for the year 1917 was 27.18 cents, as compared with 27.202 in 1916.

The copper production from the several districts is expected to have been approximately as follows:—

	Lb.
Skeena Division	27,251,323
Southern Coast District	20,283,210
Boundary-Yale District	11,035,361
Trail Creek Division	1,658,080
Omineca Division	1,058,943
All other districts	129,700
Total	61,416,617

The *Hidden Creek* mines and the smelter at Anyox of the Granby Consolidated Mining and Smelting Company were operated continuously throughout the year, even although at times some difficulty was experienced from shortage of coke and labour. A larger tonnage was treated than

in 1916, amounting to approximately 775,000 tons of ore, and in addition 37,000 tons of quartz flux and 53,000 tons of limestone flux. With the increased tonnage handled there was a corresponding increase in the output of copper, approximately 27,100,000 lb. being produced, as compared with 23,890,896 lb. in 1916.

In the Boundary District the Granby Company's mines at Phoenix and smelter at Grand Forks were not operated continuously nor to full capacity throughout the year owing to the strike in the Crowsnest coalfield shutting off the supply of coke. Only a little over half the 1916 tonnage was handled, and, as the grade of ore remained practically the same, the copper-output shows a proportionate decrease. An output of approximately 7,000,000 lb. is expected to have been made, as compared with 13,795,151 lb. in 1916. Similarly, the British Columbia Copper Company (now absorbed by the Canada Copper Corporation) treated a smaller tonnage during the past year than in 1916, with consequent decrease in copper-output.

The *Britannia* mine had a very successful year, the tonnage of ore mined and milled being about 500,000 tons, containing 19,000,000 lb. copper, 112,000 oz. silver, and 900 oz. gold. The ore reserves at this mine are large—claimed to be about 17,000,000 tons—and it is expected the yearly tonnage treated will increase still further, as the ultimate plans of the company are to have milling capacity to handle 4,000 tons a day.

The copper-mines on Texada island are expected to have made about the same output as in 1916; the most important producer is again the *Marble Bay*.

Several small shipments of copper ore were made from Vancouver island and along the Coast. The high price of copper has stimulated the work of developing copper-showings on the Coast, and while this has not resulted in any great quantity of ore being shipped in 1917, it is likely that a considerable increase of production will take place in 1918.

The encouraging feature as regards copper in the Southern Coast District is the very satisfactory results being obtained from serious development, which as yet has not found expression in actual production, but argues well for substantial output in the near future. Development, to be successful, would seem to be so extensive as to be out of reach of any but strong companies.

The production of copper from Nelson Division during 1917 was very low, amounting to about 110,140 lb., mainly from the *Eureka* mine.

The Omineca Division produced slightly less copper in 1917 than in 1916, due mainly to suspension of shipments from the *Rocher Déboulé* mine during the early months of the year.

During the last three years copper-mining has attained the position of being the most important form of mining in the Province, and from all indications it should maintain this prominent place for years to come, as last year the value of the copper mined exceeded the total value of all other metalliferous minerals mined in the Province, and was also nearly double the combined value of coal and coke production. It formed about 60 per cent. of the total value of the metalliferous mines and 45 per cent. of the total mineral production. In the working of the large, low-grade copper-deposits and the subsequent smelting of the ores produced, a great number of men are employed and a large proportion of the money value is retained in the country in the payment of wages and purchase of supplies.

All the copper ores carry small amounts of the precious metals, and therefore any increase in the copper production also increases the output of gold and silver. The high price of copper during the past year has stimulated prospecting and the development of copper claims, and there is no doubt that the Provincial output will steadily grow in future years.

Zinc.

The quantity of zinc estimated to have been produced in 1917 amounted to 33,776,335 lb., which, compared with 37,168,980 lb. produced in 1916, shows a decrease of 3,392,645 lb. This production is valued at \$2,550,113, which shows a still further proportionate decrease, as compared with the 1916 value of \$4,043,985, due to the decreased market price of the metal.

The following table shows the zinc production from 1914 onwards:—

	Lb.	Value.
1913	6,758,768	\$ 324,421
1914	7,866,467	346,125
1915	12,982,440	1,460,524
1916	37,168,980	4,043,985
1917 (estimated)	33,776,335	2,550,113

The high market price of zinc which prevailed during 1915 and 1916, thereby greatly stimulating production everywhere, did not continue in 1917. The average price for the month of January was 9.619 cents a pound and in March 10.3 cents; thereafter a steady decline in price set in until an average for November of 7.847 cents was reached. The final average for December is not available, but it was about 7.5 cents. The average for the year is taken as 8.884 cents.

The following table shows the districts from which the zinc production of the Province for 1917 is made:—

	Lb.
Slocan	17,021,110
Fort Steele	13,860,000
Nelson	1,800,000
Ainsworth	859,041
Omineca	236,184
Total	33,776,335

These figures show, as compared with the year 1916, a very slight decrease in the Slocan, a decrease of about 1,000,000 lb. in Fort Steele, a decrease of nearly 50 per cent. in Nelson, an increase of about 200,000 lb. in Ainsworth, and an increase of 70,000 lb. in Omineca.

In the Slocan District the heaviest shipper is the *Standard* mine, which is credited with about 9,300,000 lb. of zinc, followed by the *Lucky Jim* and the *Surprise*, each with about 2,000,000 lb.; then the *Galena Farm*, *Van-Roi*, and *Slocan Star*.

The Fort Steele production comes entirely from the *Sullivan* mine; the ore is shipped to the Trail electrolytic refinery.

The Nelson production is a zinc-carbonate ore shipped to United States smelters for treatment, and comes from the *H.B.* group of mines, near Salmo.

The Ainsworth production comes mainly from the *Whitewater* and *Bell* mines, both credited with a production of about 400,000 lb.

The Omineca production comes from the *Silver Standard* mine and consists of hand-sorted ore shipped to United States smelters, carrying about 60 oz. silver to the ton and 40 per cent. zinc.

Other Minerals.

Iron.—The past year has seen a very great demand for iron and steel on the Pacific Coast, the normal demand having been greatly increased by the need for steel in ship-building and munitions work, while the usual outside sources have been monopolized by war needs in other parts of the world and the high freight rates have made the lack of local production more pronounced. Consequently, it has been strongly advocated in many quarters that the conditions are favourable for the establishment of an iron-smelting plant somewhere on the British Columbia coast. So far nothing definite has materialized, although there is apparently a prospect of such a plant being established on this Coast. As is well known, there is on the Coast, in the aggregate, an adequate supply of magnetite-iron ore, quite sufficiently free from impurities as to be within the "Bessemer limit," to supply ore for such a plant.

The magnetite-deposits of the Coast have therefore had some attention bestowed on them during the past year; this, however, was mainly confined to examination, with but little development. Bulletin No. 3, 1917, of this Department describes the more important magnetite-deposits of the Coast.

A small quantity of crude platinum is obtained from placer-mining operations in the Similkameen District, but, although such platinum occurs with the placer gold in the Dease Lake country, no effort has been made this last year to save any appreciable amount.

Molybdenite.—The urgent demand for war purposes for antimony, molybdenite, and tungsten continued throughout the year, but, so far as is known, the only one of these three minerals to be produced in the Province in 1917 was a small tonnage of molybdenite.

The *Molly* mine, on Lost creek, Nelson Division, shipped about 150 tons of ore carrying from 3 to 10 per cent. molybdenite. The New Hazelton Gold-Cobalt Company shipped a car-load of ore which is expected will run about 7 per cent. molybdenite. Some other small shipments may have been made, but no details are available.

At the *Molly* and *Index* mines and at Alice arm there are considerable tonnages of lower-grade ore, and if these mines were equipped with small but suitable concentrating-mills a regular production could be maintained.

Talc, etc.—There has been apparent a considerable demand during the year for talc and other fillers for pulp in paper-making; also iron pyrites for sulphuric-acid making, arsenic, manganese, chromite, and magnesite. Some talc was shipped from Lillooet Division, but details are not yet known.

A few hundred tons of magnesium sulphate (Epsom salt) was shipped from Spotted lake, Osoyoos Division, to the United States market.

For the first time in the history of the Province there was a production of arsenic; this was made from the *Nickel Plate* mine of the Hedley Gold Mining Company and amounted to \$20,000. The arsenic occurs as arsenical-iron pyrites in the concentrates shipped to the Tacoma smelter by this company. These concentrates have been going to the smelter for years, but until the recent installation of an arsenic-burner the arsenic content was not recovered.

Structural Materials, etc.

The output during 1917 of all structural materials, such as cement, lime, building-stone, sand and gravel, brick, and other clay products, will probably show a slight decrease from that of previous years.

The output for 1917 is estimated at \$1,000,000, as against \$1,299,553 in the preceding year, \$2,852,917 in 1914, and \$3,398,100 in 1913.

Since 1912, when a production amounting to \$3,435,722 was recorded, the output of building materials has steadily declined, due to the cessation of the building trade, brought about by the continued financial depression, and the war. It is probable that the figures have now reached a minimum, and that an output amounting from \$1,000,000 to \$1,250,000 represents the steady yearly demand for these materials for use in repairs, renewals, and various small demands, without any new construction-work. It may be expected, therefore, that the production will remain at about this figure until a period of active construction-work again commences in the Province.

Portland-cement is at present the most important item in the production of building materials, amounting this year to a little over \$500,000.

The outputs of building-stone, crushed rock, sand and gravel, and red brick have fallen to very low figures. A considerable quantity of firebrick and similar material is made, principally by the large plant of the Clayburn Company.

Coal and Coke.

It is estimated that the gross production of coal was 2,402,410 long tons, of which 241,993 tons was made into coke, leaving the net production at 2,160,417 tons. These figures show a decrease, as compared with 1916, of 83,170 tons gross and an increase of 76,324 tons net. The quantity of coke made was about 159,554 tons, which is a decrease of about 108,171 tons as compared with 1916. For purposes of comparison the following table is shown:—

	Est. 1917.	1916.	1915.	1914.	1913.	1912.
Coal, gross .....tons, 2,240 lb.	2,402,410	2,485,580	1,972,580	2,166,428	2,570,760	3,025,709
Less made into coke.. ..	241,993	401,487	361,451	355,461	433,277	396,905
Coal, net	2,160,417	2,084,093	1,611,129	1,810,967	2,137,483	2,628,804
Coke made	159,554	267,725	245,871	234,577	286,045	264,333

In these figures for 1917 the output for the month of December has had to be estimated, consequently the final figures may vary from them slightly.

Summarizing the Provincial production of coal, the following table shows the estimated output for 1917:—

	Tons of 2,240 lb.
From Vancouver Island collieries	1,698,235
From Nicola and Similkameen collieries	151,817
From Crowsnest District collieries	552,358
Total quantity of coal mined	2,402,410
Less made into coke (calculated)	241,993
Net quantity of coal produced	2,160,417

In addition to the above net production of coal, there was made the coke production shown in the following table:—

	Tons of 2,240 lb.
From Vancouver Island collieries	30,399
From Nicola and Similkameen collieries	<i>Nil</i>
From Crowsnest District collieries	129,155
Total	159,554

As will be seen by the above figures, the net coal production this year is expected to be some 76,324 tons (2,240 lb.) greater than it was in 1916, and again about reaches the figures prevailing before the war began.

This output would have been considerably greater had not the Crowsnest Collieries met with a series of misfortunes during the year that interfered with production, and in addition to this there was a serious shortage of labour—partly caused by the heavy enlistment of the younger men—and in the fall there were labour troubles.

All these contributed to occasion a shortage of both coal and coke, when the demand was most keen.

Coke.—The production of coke in 1917 was about 159,554 tons (2,240 lb.), which is 108,171 tons less than the preceding year, a decrease of 40.5 per cent.

VANCOUVER ISLAND COLLIERIES.

The Vancouver Island collieries made a gross output of 1,698,235 tons of coal, or about 205,474 tons more than in 1916.

Western Fuel Co.—This company mined this past year about 658,000 tons of coal, an increase over the previous year of 103,391 tons.

The Nanaimo Colliery, in the city of Nanaimo, is entered by No. 1 or Esplanade shaft, which is connected by underground workings with a shaft on Protection island and also on Newcastle island. The workings are at a depth of from 600 to 1,200 feet, and are very extensive, including a large submarine area. On the North side both the Douglas and Newcastle seams are operated; on the South side only the Douglas or Upper seam is worked. This property has been in operation since 1881, and is still the largest producing coal-mine in the Province.

The Reserve Colliery is situated about five miles from Nanaimo; the Douglas seam is reached through two shafts 950 feet in depth. This property became a producer in 1914; development has been retarded owing to faulted and much-disturbed condition of the seam.

The Harewood mine, which has been closed down for a number of years, was reopened during the year, and at the present time is producing about 600 tons of coal daily.

Canadian Collieries (Dunsmuir), Ltd.—This company operates two collieries—Comox Colliery, situated at Cumberland, seventy miles north of Nanaimo, and Wellington-Extension Colliery, at Extension, six miles south-west of Nanaimo.

The mines of the Comox Colliery are situated around Cumberland and are connected by a standard-gauge railway with the seaboard at Union bay, where are situated the loading-piers, a coal-washery, and a battery of 200 coke-ovens.

The mines operated during the year were Nos. 4 and 7 slopes and Nos. 5 and 6 shafts. No. 6 shaft, however, has not been producing coal since June.

The gross output of coal for this colliery during the year was 510,956 tons (2,240 lb.), an increase of 61,942 tons over 1916.

The mines of the Wellington-Extension Colliery are situated around Extension, and are connected by a standard-gauge railway with tide-water, and the E. & N. Railway at Ladysmith, where a coal-washery, bunkers, and loading-piers are situated.

Four mines were operated during the year, Nos. 1, 2, and 3, entered by a tunnel 5,000 feet in length, and No. 4 entered by shaft. The output for the year was 289,392 tons, an increase of about 32,440 tons over that of 1916.

A new slope known as No. 5 mine is being driven at South Wellington, which is expected to be a substantial producer before the close of 1918.

Pacific Coast Coal Mines, Ltd.—This company operated the Morden mine throughout the year; the South Wellington mine was closed down early in the year. The Morden mine is situated about six miles south of Nanaimo.

The output for the year was 150,517 tons, a decrease of 2,595 tons from the previous year.

The Suquash Colliery, situated on the north-eastern coast of Vancouver island and owned by this company, was not in operation during the year.

British Columbia Coal Mining Co.—This company was formerly known as the Vancouver-Nanaimo Coal Mining Company, and operated the East Wellington Colliery until October 6th, when it was necessary to seal up the mine owing to signs of fire. The output for the past year was 61,547 tons, a decrease of 16,896 tons from the previous year.

Nanoose Collieries, Ltd.—This colliery is situated at Nanoose bay, about ten miles north of Nanaimo, and commenced operations towards the close of 1916 in the Old Wellington seam. The output for this colliery during the past year was 27,822 tons, an increase of 27,192 tons from the previous year.

NICOLA-SIMILKAMEEN COALFIELDS.

These coalfields produced in 1917 about 151,817 tons, an increase over the previous year of 41,268 tons.

In the Nicola District three companies produced coal during 1917—viz., the Middlesboro Collieries, Limited; the Merritt Collieries, Limited; and the Inland Coal and Coke Company.

The Middlesboro Colliery produced 83,459 tons during the year, an increase of 34,454 tons over the previous year. The mines in operation were Nos. 4, 4 East, and 7.

The Merritt Collieries, Limited, operated the Diamond Vale mine throughout the year until the middle of December, when the mine was closed down. The production for this colliery was about 14,000 tons, an increase over the previous year of about 13,662 tons.

The Inland Coal and Coke Company operated the Coal Hill mine during the first three months of the year only. The production for this colliery was 7,439 tons, a decrease from the previous year of 23,856 tons.

The Pacific Coal Syndicate did not produce any coal during the year.

At Princeton, the Princeton Coal and Land Company produced 46,919 tons, an increase of 17,461 tons over the previous year.

EAST KOOTENAY COALFIELD.

There were only two companies producing in this field during 1917—the Crow's Nest Pass Coal Company, operating collieries at Coal Creek, situated five miles east of Fernie, and Michel, situated twenty-three miles north-east of Fernie; and the Corbin Coal and Coke Company, with its colliery at Corbin.

There was mined in the district during the year 552,358 tons of coal, a decrease of 329,912 tons from the previous year.

Of this tonnage, about 187,275 tons was used to make coke and yielded about 129,155 tons of the commodity; as compared with the 1916 output, these figures show the large decrease of 110,960 tons.

The early portion of the year gave promise of a much larger production than the previous year, but the output in this district was seriously affected from April until July, through a prolonged strike and other labour troubles, together with an explosion in No. 3 mine, Coal Creek Colliery, early in April, which cut off the production of that mine for the balance of the year; scarcity of labour was also responsible for some of the decreased production.

The mines which were in operation throughout the year at Coal Creek Colliery were Nos. 1 North, 1 South, 1 East, B North, and No. 2; the largest producing mine at the present time being No. 1 South.

Michel Colliery had two mines in operation throughout the year—viz., Nos. 3 East and New No. 8. Old No. 3 mine was closed early in the year owing to shortage of labour.

Corbin Coal and Coke Co.—The output of this company for the year was 101,083 tons, being an increase of 32,063 tons over the previous year. The major portion of this production was from the open-cut workings of No. 3 mine, or "Big Showing." No. 4 mine was also in operation during the year.

MINING DISTRICTS OF BRITISH COLUMBIA.

In order to give a general idea of the mineral deposits, mines, and reduction-works of British Columbia, a summary of these, together with an outline of the chief features of the operations during 1916, will now be presented. As the mining districts are numerous and cover a large area of territory, the information that follows is, necessarily, incomplete, for it is not practicable, in a preliminary review, to give particulars of all that should have notice. The various districts and their respective subdivisions will here be briefly dealt with in the preliminary reports submitted by the Resident Engineers of the various districts.

At the session of 1917 an Act was passed dividing the Province up into six Mineral Survey Districts, to each of which a Resident Engineer was appointed, with jurisdiction over that district. After the Act was passed—in March—it took necessarily some time before all the Engineers could be appointed and located, and as some of them were new to their districts, they necessarily were working under a handicap for this first season.

NORTH-WESTERN MINERAL SURVEY DISTRICT, No. 1.

PRELIMINARY REPORT BY GEO. A. CLOTHIER, RESIDENT ENGINEER.

(Headquarters, Prince Rupert.)

District No. 1 is the old Cassiar District and includes seven Mining Divisions of the Province—viz., Bella Coola, Queen Charlotte, Skeena, Portland Canal, Atlin, Stikine, and Liard. It has 300 miles of direct coast-line, from Seymour inlet to Portland canal, which forms the south-eastern boundary between Alaska and British Columbia. In this distance there are hundreds of islands, and thousands of miles of canals and inlets cutting into the Coast range, affording the best possible conditions for prospecting. Shipping facilities and transportation are, of course, ideal, and it is because of these natural advantages that the large mining companies operating on the Coast have engineers in the field in search of suitable properties. The prospector on the Coast has therefore the double advantage of comparatively easy prospecting and a ready market for a prospect of merit.

The district in 1917 produced about 830,000 tons of ore, of which amount, all, except about 1,700 tons, was treated at the Granby Company's smelter at Anyox; this company producing and treating from their own mines alone about 812,000 tons, which includes the low-grade quartz mined and shipped to the smelter for flux. The important new shipper added to the list this year is the Belmont-Surf Inlet Mines, Limited.

Bella Coola Division.

The Bella Coola Division has had no mining outside of a little prospecting and the recording of about forty claims. The only portion of the Division which I was able to visit was Seymour inlet, to look over some iron groups. I examined two properties and found some good surface showings of fine, clean magnetite, well located for economical production and handling.

Skeena Mining Division.

The Skeena Mining Division has made an exceptionally good record during the year 1917, due to the very successful operations of the Granby Consolidated Mining, Smelting, and Power Company.

It has added one more producing property to its list in the Belmont-Surf Inlet Mines. This company has expended upwards of \$1,000,000 in purchasing, developing, and equipping the quartz property on Princess Royal island. The placing of this property on a shipping basis presented some difficult problems, and credit is due to the staff of the company for the installation of the up-to-date plant now in operation, and which will be dealt with more fully in a later report. The concentrator was put in operation in October, and to date the company has shipped to the Tacoma smelter 700 tons of concentrates, which will give returns of between \$90 and \$100 a ton in gold, silver, and copper values. With the additional tube-mill now being installed, the

mill will treat 300 tons every twenty-four hours, producing between 800 and 900 tons of concentrates a month. The flow-sheet is partly water-concentration and partly oil-flotation, the latter using the Belmont-Jones type of machine. The saving is from 92 to 94 per cent. and will be improved.

The company has also under option and development a very promising-looking property, with similar ore to and adjoining its present holdings. The management expects to ship a total of 1,700 tons this year.

There are several groups of claims in the immediate vicinity on which there are said to be fine surface showings, but which I was unable to examine on account of the heavy snowfall.

I have been reliably informed that up Khutze, Aaltanhash, and Klekane inlets, off Graham channel, on the mainland, are several promising surface showings.

About twenty-five miles from Hartley bay, on the north-west side of Douglas channel, the Drum Lummon Copper Mines, Limited, a Vancouver company, is developing a property which shows bunches of high-grade copper ores of chalcocite, covellite, and bornite in quartz, which itself lies in more or less regular bunches, replacing the granite on either side of a fracture-zone through it. They have installed a very serviceable small equipment of gasoline-engine and compressor which will run a couple of hammer-machines, also an engine and fan for ventilating. Development to date consists of 365 feet of crosscut tunnel to the vein and 59 feet beyond, with 104 feet of drifting on the vein. The drift shows continuous ore for the whole distance, pinching in places to a foot in width and widening to 10 feet. The face at present looks very promising indeed, being 10 feet in width of quartz carrying disseminated high-grade copper sulphides which would concentrate probably 10 into 1, making a very high-grade product. I was unable to examine the surface on account of the snow. The Mines Department has assisted the company to build a wagon-road from the beach to the mine, a distance of about a mile. The property looks very promising and is just at the critical stage now, where the next few thousand dollars can be spent to the very best advantage. The company has just sent a trial shipment of about 8 tons to the smelter, of ore sorted from development-work.

There is a possibility of the revival of the old iron-sulphide property on the Ecstall river, a branch of the Skeena flowing in at Port Essington. A number of tons were shipped about fifteen years ago to the Victoria Chemical Company for the manufacture of sulphuric acid. It is controlled by Victoria interests and is, I understand, under bond to the Granby Company, which will diamond-drill it in the spring to prove its copper content.

Considerable prospecting and development work was done on mineral claims along the Grand Trunk Pacific during the past season, with very encouraging results. The same applies to the smaller islands adjacent to Prince Rupert, where a large number of new locations were made.

Farther north at Alice arm, up the Kitsault and Illiance rivers, several prospects are developing into mines, and with the completion of the railroad for twenty miles up the Kitsault valley and trails from the railroad up the main creeks, this district will be a mining centre in the near future. The principal company operating here, the Dolly Varden Mines Company, has had a very busy season, spent in railroad-building, underground development, and diamond-drilling.

It was the intention of the company to complete the railroad for fourteen miles this year and ship over it, hauling by team from the mine to the end of rail; however, the extremely heavy rainfall and the early heavy snowfall compelled them to abandon the plans and close all work down for the winter. The mine has plenty of good-grade milling ore in sight, and the company's plans for the immediate future include a 300-ton concentrator and a hydro-electric plant. The company has also taken over the *Wolf* group, after diamond-drilling it, about three miles above the *Dolly Varden*. The ores of the two properties are identical, and the concentrator will be so located as to treat the ores from both mines. This company will be a heavy silver-producer within the next year or two.

The Granby Consolidated Mining, Smelting, and Power Company at Anyox, B.C., has had a very satisfactory year in every respect. The tonnage of ore mined and smelted was about 775,000 tons, averaging 2.12 per cent. copper, the gold and silver amounting to approximately \$240,000. The tonnage of low-grade quartz ore mined and used as flux was about 37,000 tons, or a total of 812,000 tons. Improvements in all departments and the erection of a 100-ton experimental concentrator puts the company abreast of any on the continent. The company's

progressive policy in keeping engineers in the field has stimulated the prospector and put mining confidence in the Coast district.

Portland Canal Mining Division.

In the Portland Canal Mining Division the Stewart district is in a fair way to fulfill the predictions of the old-timers and a "come-back" looks reasonable.

The Granby Company has bonded the *St. John* group of claims, on the west side of Bear river, about three miles from Stewart. Winter camps have been erected and diamond-drilling will be carried on throughout the winter. A local syndicate has bonded the *Lakeview* group, on Glacier creek, and is driving a crosscut tunnel to tap the vein at depth. Farther up Bear river there are several very promising copper properties. Over the divide, on the Nass slope, some fine specimens of molybdenite were found last summer and some little work done.

The Salmon River valley has been given a great deal of attention the past summer. The *Bush* property, on which a New York company had done some 1,500 feet of development in tunnels and crosscuts and then quit, was taken over on a bond by Fernie-Spokane people, and with comparatively little work has developed a sufficient tonnage of high-grade milling-ore to justify an equipment of a power plant and concentrator. The ore is a silicified rock carrying iron pyrites with argentite, ruby silver, and, in places, native silver. The ore-zone varies in width from 50 to 140 feet. The most important work at present is the upper tunnel, which is prospecting the ground under the high-grade surface showing. This tunnel is now in over 300 feet, in ore all the way, the last 100 feet being high grade. Crosscuts have been driven at intervals of about 35 feet, the first one being 85 feet from the portal. The longest of these is 75 feet and has as yet encountered no wall. Several hundred tons of ore, taken only from development-work, are on the dump ready for shipment this winter. This ore will average over \$150 a ton in gold and silver values. Work has been started in the tunnel below, 250 feet lower than the upper tunnel, with the intention of making it the main working-tunnel. The face of the upper tunnel is now 175 feet vertically below the surface, making the main tunnel 425 feet. There is already in sight sufficient ore to feed a 100-ton-a-day concentrator for three years. A Government-assisted road was started from Eleven-mile to the mine to enable the company to haul out ore and take in some machinery this winter; the work had to be abandoned, however, on account of the abnormally bad weather. The manager, R. K. Neill, informs me that he intends raw-hiding the ore to Eleven-mile, and hauling from there on "double-enders" to the beach.

Adjoining the *Bush* on its lower boundaries, and doubtless containing the continuation of the ore-zone, lies the property of the old Cascade Mining Company.

About a mile beyond, on the opposite side of Cascade creek, are the holdings of the Indian Mines Company, Limited, on which has been done some 600 feet of development-work, consisting of two tunnels. The upper or main tunnel has gone through two small ore-bodies showing on the surface, and has apparently just encountered the ore from the larger surface showing for which the tunnel was driven. There are two crosscuts at the face exposing the ore-body for 14 feet in width, one wall only having been reached. Two sectional samples across the face averaged 16 per cent. zinc, 10 per cent. lead, 3.5 oz. silver, and \$2 gold a ton.

North of the *Indian* group, and adjoining it, lies the *Boundary* group, and just beyond that the *Big Missouri*, of thirteen claims. This property has been described by every engineer who has examined it as a most wonderful surface showing. The ore has been exposed by numerous shallow cuts for a width of at least 1,000 feet, and apparently extends for two claims in length. The ore-body lies in the greenstones and is a complex mineralization of iron, zinc, lead, and copper sulphides carrying small gold and silver values, the whole averaging from \$8 to \$12 a ton in all values. With the ore proven at depth by diamond-drilling, and a process devised for the separation and recovery of the different sulphides, this property will make one of the biggest producers in the Province.

North of the *Big Missouri* group are the *Yellowstone* and *Hercules* groups, each with big surface ore-exposures, but practically dependent on the future of the *Big Missouri*.

To the east of the *Big Missouri*, and occupying a contact-zone between the greenstones on the west and a slate belt on the east, are the four claims of the *Joker* group. It was discovered in the late summer and very little work had been done when I visited it. I took nine samples across 60 feet where the ore had been exposed by blasting off the surface rock, and obtained an average of \$30 a ton in gold and silver values. The ore is identical with that of the *Bush*

property, which lies three miles south. It is a remarkable surface showing. I have been informed that a half-interest has been disposed of and arrangements made to start work in March, when the hard crust on the snow makes fine transportation in the north.

The Georgia River Mining Company has been developing all summer the claims on Georgia river, about twenty miles south of Stewart, on Portland canal. This is a very promising-looking gold showing, but the company has been badly handicapped by lack of transportation. A trail was recommended by me and approved by the Department, but scarcity of labour and bad weather made it impossible to get anything done on it.

Stikine Division.

In the Stikine Division no mining operations occurred during the past year. I made a trip up the Iskut river, a tributary of the Stikine, flowing into it about six miles above the Boundary-line. The river is navigable for thirty-six miles to the canyon. Several claims have been staked from time to time, but only one group of eight claims and one group of four claims have been kept up by the owners, the Iskut Mining Company, of Wrangell. It is my intention to examine the country next spring as soon as weather conditions will allow. I was unfortunate this year in running into a snow-storm, which, of course, prohibited the examination of the higher ground where the claims are located. So far as I was able to observe, the district has the characteristic formation found along the contact-zone between the Coast granite and the older interior rocks.

Queen Charlotte.

The Queen Charlotte Division has had a regular shipper in the Ikeda Mines, which has produced 904 tons of copper ore containing 133 oz. gold, 1,560 oz. silver, and 135,720 lb. copper. A later shipment of 50 tons has been made, from which no returns have been received. I understand that the property may be equipped next summer with suitable power and concentrating plants.

The owners of the *Quinitsa* claim, on Copper island just outside of Jedway harbour, shipped 40 tons of copper ore to the Granby smelter, assaying 13.7 per cent. copper.

An Eastern company has bonded the *South Easter* group of claims, situated about a mile from Skidegate. They have done considerable hand development-work and are now installing drilling-machinery to give the property a thorough testing.

About twenty-two leases have been applied for for beach claims east and west of Rose spit. The leasers propose to work the black sand for its gold and platinum content, and to that end have done considerable prospecting-work, but to date have made no production.

No further developments in the oil situation on the west coast of Graham island have taken place.

Atlin Division.

The Atlin Division, though suffering under a handicap of labour shortage, produced about \$305,000 in placer gold, distributed as follows:—

Boulder creek was worked from May 15th to October 15th, employing on an average of about sixteen men, and producing: Miller, \$26,235; J. H. Black, \$5,700; a total of \$31,935.

Pine Creek: The Columbian Mines Company, operating from April 10th to October 25th, employing an average of forty-two men for three months and thirty men for the balance of the time, produced \$41,000.

Ruby creek: The Placer Gold Mines Company, operating from May 1st to October 14th, employing an average of seventeen men, produced \$77,550.

Otter creek: Mr. Maluin, operating from May 1st to October 30th, employing an average of nine men, produced \$15,000.

Spruce creek: Mr. Matthews, operating from January 1st to October 22nd, employing an average of thirty men, produced \$57,400; Morse, operating from January 1st to October 15th, employing six men, produced \$15,000; Foley, operating from October 7th, 1916, to November 5th, 1917, employing on average of four men, produced \$9,300; Tintinger, with three men, from January 1st to October 30th, produced \$5,300; Smith & Carlson produced \$3,400; *Tobacco Box* produced \$1,860; and Falconer, \$1,200. Total from Spruce creek, \$93,460.

Birch creek produced \$2,000.

Various properties employing from two to five men for different periods bring up the total number of men employed to about 250 and the total production to \$305,000, as mentioned above. No returns have been received from the *Engincer* mines, though producing all year.

Liard Division.

The Liard Division produced about \$5,750 in placer gold: From Boulder creek, Dease lake, \$1,975; from Dease creek, \$2,925; individuals, the balance.

In conclusion, I wish to express my thanks for and appreciation of the many courtesies extended me throughout the district, and also my regrets that I have been unable, because of shortage of time, to cover the district more thoroughly.

NORTH-EASTERN MINERAL SURVEY DISTRICT, No. 2.

PRELIMINARY REPORT BY JOHN D. GALLOWAY, RESIDENT ENGINEER.

(Headquarters, Hazelton.)

INTRODUCTORY.

Under the provisions of the "Mineral Survey and Development Act," which came into force about May, 1917, the four Mining Divisions of Omineca, Peace River, Cariboo, and Quesnel were made to constitute the North-eastern Mineral Survey District, with the permanent survey station and office at Hazelton. The Resident Engineer assumed office about the middle of June and at once commenced field-work in the district, continuing until the middle of October, when weather conditions made further examinations impracticable.

Applications for assistance in building roads and trails to mineral claims and mining camps, as provided for in the "Mines Development Act," were numerous in various parts of the district. Examinations and reports on these applications occupied nearly the whole of the field season; but when going into a section to examine a particular claim or group for road requirements, opportunity was afforded for the examination of most of the more important claims in that vicinity; and, generally, in visiting the different parts of the district where applications for roads and trails had been made, it was possible to acquire all the needed information regarding the active mining going on.

The field season in this district was particularly short this year owing to the snow of the previous winter remaining in the mountains above timber-line until late in July, and also to the fact that winter came unusually early, the mountains being covered with snow early in October, which remained for the winter. Had the season been longer opportunity would have been afforded for examination of several camps and districts of which at present but little definite information is available, but which are believed to be of some promise.

An important geological investigation was carried out during the season by Dr. J. J. O'Neill, of the Canadian Geological Survey. This consisted of the topographic and geologic mapping of a fifteen-mile sheet, taking in Glen, Nine-mile, and part of the Rocher Déboulé mountains and including the towns of Hazelton and New Hazelton. The topographic work was under the direction of S. S. Falconer, of the Survey staff, and Dr. O'Neill was assisted by V. Dolmage with the geological work, which included, as well as the areal geology, a special economic investigation of the ore-deposits in this district.

The North-eastern District is so large, nearly 100,000 square miles of territory, that for the purposes of this report and succeeding ones it is advisable to subdivide it into a number of smaller areas.

In the first place, it is already divided into the four Mining Divisions as already mentioned. The following subheads are proposed and will be used in this report:—

Omineca Division—Skeena River Sub-district; Hazelton Sub-district; Telkwa Sub-district.

Cariboo Division—Barkerville Sub-district; Fort George-Fraser River Sub-district.

Quesnel Division—Quesnel River Sub-district; Timothy Mountain Sub-district.

PRODUCTION OF DISTRICT AND GENERAL SUMMARY.

The mineral production of the North-eastern Mineral Survey District is not, as yet, very large, but it has steadily increased during the last four years. The lode-mineral production of the district comes almost entirely from the Hazelton-Telkwa section, while the bulk of the placer production is from the Barkerville section. Lode-mining in the vicinity of Hazelton and Telkwa has not progressed as rapidly during the last three or four years as had been anticipated in 1913, when the first ore shipments were made. The Grand Trunk Pacific Railway was completed in

1914, and it was expected that following this a rapid development of the mineral showings would ensue. While the boom predictions have not been realized, still it must be remembered that many reasons for this slow development can be advanced. Chief amongst these are the lack of capital for new mining enterprises owing to the war, and the fact that many of the showings in this district are not large enough to attract the attention of the large mining companies. Several properties in the district which have undoubted merit have been taken up by individuals or small companies which have lacked sufficient capital to carry out a vigorous development policy. Many properties are situated at some distance from the railway-line, and the transportation problem is therefore a difficult one to overcome. The vigorous policy of the Government in building, or assisting towards building, roads and trails to these at present inaccessible properties will undoubtedly within a short time give results in the shape of increased production.

As before noted, the placer production comes mainly from the Barkerville section of the Cariboo Division, although each year some production is recorded from Quesnel Division and the Omineca-Ingenika Sub-district. The production comes mainly from half a dozen hydraulic mines, the percentage of the total returns which is made by the aggregate of small-scale individual operators being small.

The official returns for the year 1917 are not yet available, but the following estimate it is believed will approximate the actual production:—

	OMINECA.		CARIBOO.		QUESNEL.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer	850	\$ 17,000	7,500	\$150,000	1,000	\$20,000
Gold, lode .....oz.	1,200	24,804	...	...	...	...
Silver .....oz.	104,838	\$1,040	...	...	...	...
Lead .....lb.	287,672	22,726	...	...	...	...
Copper .....lb.	1,058,943	287,821	...	...	...	...
Zinc .....lb.	236,184	17,832	...	...	...	...
Molybdenite ....lb.	...	2,500	...	...	...	...
Building materials..	...	3,000	...	3,000	...	3,000
Total values..	...	\$456,723	...	\$153,000	...	\$23,000

Total value of mineral production of North-east Mineral Survey District, \$632,723 (estimated).

It will be noted that in the above table Peace River Division does not figure at all; so far as is known, no mineral production has ever been officially recorded from this Division. Prospecting for placer gold has been done on the Peace river and tributary streams, and probably small amounts of placer gold have been taken out in this way; it is certain, however, that this has never amounted to more than a few hundred dollars in a season. As a hopeful sign for the future, it may be noted that fifteen dredging leases were taken up in this Division during the summer of 1917. Systematic prospecting of these leases, to test them for dredging possibilities, will be carried out next year by the lessees, Wadley & Galbraith.

The production of molybdenite came from the property of the Hazelton Gold-Cobalt Company. The production of zinc was entirely from the *Silver Standard* mine.

The copper production comes largely from the *Rocher Déboulé* Copper Company's mine. This property made a smaller production than in 1916 owing to shipments being suspended almost entirely during the first half of the year. Development during that time was successful in finding ore-bodies from which shipments were made in the latter months of the year.

The production of silver, lead, and zinc from the *Silver Standard* was about the same as in the previous year, but only represents operation on a small scale. During the latter half of the year practically no mining was done, as all the available labour was placed on the work of equipping the property with a new power plant and the new buildings of various kinds at the mine, and the building of a 50-ton concentrator to treat the ore. A much larger production from this mine next year is confidently expected.

A little over 75 per cent. of the lode-mineral production credited to the North-eastern District comes from the vicinity of Hazelton. Of the remainder most of it comes from the Telkwa Sub-district, with, this year, two shipments recorded from the Skeena River Sub-district.

In the following table is given a list of the shipping properties, with estimates of tonnage produced:—

Sub-district.	Mine.	Tonnage.	Character of Ore.
Skeena River	M. & K.	123	Silver-lead-copper.
"	Frisco	10	Silver-copper.
Hazelton	Rocher Déboulé	4,500	Copper.
"	Cap	28	"
"	Highland Boy	75	"
"	Silver Standard	825	Silver-lead-zinc.
"	Hazelton View	20	Molybdenite.
Telkwa	Santa Maria	234	Copper-silver
"	Cronin	79	Silver-lead.
"	Harvey	10	Silver-copper.
"	Higgins	12	Silver-lead.
"	Victory	20	"
"	Schufer	6	"
Total .....	.....	5,942	

It will be noted that as yet there are only two important shippers—viz., the *Rocher Déboulé* and the *Silver Standard*, both situated in the Hazelton Sub-district. The Telkwa Sub-district contains a larger number of shippers than elsewhere, but the tonnage produced is small. With the improvement of transportation conditions there is every reason to look for a larger production in the future from this sub-district.

Omineca Division.

SKEENA RIVER SUB-DISTRICT.

Cordillera.—This group of claims, situated one mile from Usk Station and owned by the Kitsalas Mountain Copper Company, was operated during part of the summer with a small force of men under the superintendency of A. J. Thompson. There are three or four veins on the property, only on one of which has there been much development. The veins are quartz-filled, but are extremely irregular in their nature, varying from a few inches up to 20 feet in width. The main valuable minerals present are bornite and chalcocite, but gold and silver values occur in the ore. It would seem that the filling of the vein with quartz occurred first, and that this quartz is barren; a second fracturing then occurred which allowed the circulation of solutions from which the copper minerals were deposited. Varying amounts of gold and silver accompanied these minerals, and occasional particles of free gold are found, occurring either in the bornite or in the quartz, close to a mass of the copper minerals, the distribution of which is very irregular and bunched.

The work done this past year consisted of driving a crosscut tunnel to strike the main vein; this will require to be several hundred feet in length to strike the vein, and as yet only about 100 feet has been driven. Two blind veins were struck in this work, and on one of them a short winze was put down which is said to have disclosed some nice ore. Work was discontinued in the late fall, but in a letter from the president of the company, J. D. Wells, on November 5th, he says: "We have things so arranged with the Kitsalas Mountain Copper Company that we can put in our compressor plant before spring." Timber and water are plentiful and the property is well situated for easy working, as it is only a few hundred feet above the railway-track.

Legate Creek.—Some activity was apparent on Legate creek during the summer, about eight prospectors being engaged in developing their claims. The *M. and K.* group, owned by Whitmore & Orr, was bonded in the fall of 1916 by J. J. Price, who extracted 130 tons of ore and shipped it in the early months of 1917. Later he threw up his bond on the property. During the summer, development by means of tunnels was carried on by the owners. The property gives promise of containing a fair tonnage of concentrating-ore as well as some high-grade, but will require capital for development.

The *Frisco* property was sold to Wm. Tuttle in the winter of 1916, and from it 10 tons of high-grade ore was shipped early in 1917.

Other properties in this camp, which is situated at the head of Legate creek, about ten miles above the town of Pacific, worked on during the year were: The *M. & M.* group, owned by Bell and partners, and the *Regina* group, owned by Jones, Brown, and partners.

Fiddler Creek.—The *Fiddler* group, situated about four miles from Dorreen Station, was fully reported on by the writer in the 1916 Annual Report of the Minister of Mines. In the fall and winter of 1916 a wagon-road was built to the property, a temporary camp erected, and a crosscut tunnel commenced, which is expected to cut the vein and from which the mine would be developed; this tunnel was driven in 100 feet in slide-rock, clay, and gumbo, and for a few feet into solid rock, when operations were discontinued. The property is under bond from the owner to the Fiddler Creek Gold Mining Company, an Edmonton syndicate. It was expected that work would be resumed this summer, but this failed to materialize, and now nothing will be done until the summer of 1918. The property has undoubted merit, and it is probable that the cessation of development was due to financial reorganization of the company.

HAZELTON SUB-DISTRICT.

Rocher Déboulé Mine.—This mine, situated on Rocher Déboulé mountain and distant about ten miles from Hazelton, is the most important productive mine in the district; it has been described at length in the Annual Reports of 1914, 1915, and 1916.

This year the low level, or 1,200-foot level, crosscut tunnel was completed to the point where it should have encountered the main vein, and was continued for some distance beyond, a total of over 3,000 feet. A fracture-zone was encountered which may or may not be the downward continuation of the main vein, but drifting on it to the east and west failed to reveal any ore. The management is apparently hopeful of still finding the main vein, and so a raise is to be put up from the 1,200-foot level to the 500-foot workings. This raise will be on the incline and will be a little over 900 feet in length. It will follow somewhat approximately the position wherein surveys indicate that the main vein should lie, and frequent crosscuts from it will be made. It is confidently expected that this work will reveal the whereabouts of the missing vein and the ore-shoots contained therein.

The 1,200-foot level has, however, proved very successful in developing other veins on the property. One of these, the No. 2 vein, gives promise of being quite as commercially important as the main vein. All the ore shipped from the mine in the last six months of the year came from this vein. In addition to the good shoots of shipping-ore exposed in this vein, a tonnage of concentrating-ore has been opened up which is nearly sufficient to warrant the installation of a small mill. The grade of shipping-ore from this No. 2 vein is the best that has been sent out from the mine, much of it averaging \$5 in gold and 10 oz. silver to the ton, with 10 per cent. copper.

The No. 3 vein as exposed in the main tunnel also shows promise of becoming productive, but development of it has not yet been carried very far. Generally, conditions at this mine are quite satisfactory and a considerable productive period seems reasonably assured.

The tonnage of ore shipped during 1917 was considerably less than in the previous year. Most of the 1917 production was made in the last six months of the year, when steady shipments were made, mining in the first six months being mainly confined to development.

Delta Copper Co.—This company, which owns or controls the *Delta*, *Highland Boy*, and other groups of claims lying to the east of the *Rocher Déboulé* mine, has not been able to do very much this year. Some favourable showings on the upper vein on the *Delta* group were exposed by means of surface cuts, but no other development of importance was carried out.

The property of the company is situated in a somewhat inaccessible place, with the result that transportation arrangements are difficult. A wagon-road was completed this year from the *Rocher Déboulé* main camp in Juniper creek to the terminal of the *Highland Boy* 2-bucket tram, and over this road ore will be hauled this winter.

In the *Highland Boy* workings from 1,000 to 1,500 tons of shipping-ore is blocked out, and further development may be expected to show much more ore. There are two main veins, known as the "Upper" and "Lower" veins, which are exposed on the surface for some distance and partially developed; both of these veins have indications of being of considerable value.

In general, it may be said that the property of the Delta Copper Company gives promise of becoming a productive mine if sufficient capital is forthcoming to carry out the necessary development.

New Hazelton Gold-Cobalt Co.—This company carried on steady development on its property during the year with a crew of from four to ten men. The main working consists of a long tunnel driven on the vein. Several raises and a winze from this level were made during the year.

An interesting occurrence during the year was the increased percentage of molybdenite occurring in the ore-shoots in the vein. The ore consists mainly of arsenical iron carrying gold values and varying percentages of cobalt, but the molybdenite content in some of the ore is sufficient to make it of importance.

A car-load of ore was packed down from the mine to Carnaby Station, on the Grand Trunk Pacific Railway, about four miles and a half distant, in November, but so far as is known has not yet been shipped to Ottawa, where it will go for treatment. It is expected that this shipment will carry from 6 to 10 per cent. molybdenite (MoS_2), and in addition some gold values. Another car-load of this ore is ready at the mine. A small force will be kept stoping during the winter, and it is expected that, besides the molybdenite ore, a car-load of high-grade gold ore will soon be mined.

Golden Wonder.—This property, which is situated close to the railway-track and within a mile of Carnaby Station, was acquired about a year ago by M. W. Sutherland from Harris, Comeau, *et al.* After some development-work had been done the showings were sufficiently favourable to induce J. B. Tyrrell to become associated with Mr. Sutherland in financing the development of the property. A contract for a shaft 100 feet deep was let and this work is proceeding. There are three veins on the property carrying chalcopyrite, arsenopyrite, and pyrrhotite in varying amounts; the arsenopyrite carries fair gold values and occasionally the pyrrhotite also carries a little gold. These veins are very similar to those of the *Rocher Déboulé* mine.

Cap Group.—This group has been worked intermittently during the year by the owners, Comeau & Johnson. A shipment of 30 tons was made, and the driving of a development tunnel is being proceeded with.

Silver Standard.—The steady progress of this mine during the last two years, under the superintendency of W. G. Norrie, has been most gratifying. The crosscut tunnel started last year to tap the 250-foot level of the main shaft has been completed, and much other development and general betterments to the property have been accomplished. The crosscut tunnel cut several veins before reaching the main shaft veins, and some of these give promise of being of considerable economic importance. The No. 4 vein especially is showing up well and contains some good shoots of high-grade ore.

In the fall of the year the conclusion was reached by the management that the mine had reached a stage of development which made it advisable to erect a concentrator to treat the milling-ore already blocked out in the mine. After some experimenting and consideration it was decided to erect a 50-ton plant on Two-mile creek about three miles from the mine. The Faust system is to be used, which is, in principle, a water-concentrator with some special features in the crushing-rolls, tables, etc. The plant will be run by steam-power, with cordwood as fuel; mill-water will be secured from Two-mile creek. The ore will be delivered at the mill by means of a 3-ton auto-truck, the road being sufficiently good for this means of transportation. Erection of buildings and installation of plant is being rapidly proceeded with, and it is expected that the mill will be in operation in February.

When the crosscut tunnel was completed the power-plant arrangements at the mine were changed. The old steam plant at the shaft was dismantled and taken away. A 75-horse-power distillate-engine and 6-drill compressor were installed at the tunnel. Blacksmith-shop, warehouse, power-house, ore-bins, etc., have been erected and new buildings put up at the main camp as well as at the new camp at the mill-site.

Mining operations were suspended during the last half of the year on account of the construction-work and various rearrangements. The only ore shipments made during this period were from the leasers who were at work hand-sorting old dumps. The production, however, for the year is approximately the same as in 1916, and will be greatly increased in 1918.

American Boy.—This mine lay idle during most of the year, but in November preparations were being made to again commence mining operations. An arrangement has been entered into with the Silver Standard Company whereby ore from the *American Boy* will be treated at the company's mill to the extent of 150 to 300 tons a month. A few hundred tons of ore on the

dumps will first be shipped, and after that the main vein, which is developed by a shaft to the 200-foot level, is expected to yield considerable milling-ore. It is hoped by the owning company, the Harris Mines, Limited, that these operations will provide sufficient funds to carry on the further development of the property. The distance from the mine to the *Silver Standard* mill-site is about two miles and a half, and the hauling charges on the ore should not exceed \$2.50 a ton.

Nine-mile Mountain.—None of the properties on Nine-mile mountain were worked to any appreciable extent during the year. The *Barber Bill* group was bonded to Mr. Carleton, but the bond was relinquished within a few weeks. The *Sunrise* group has a good showing of silver-lead ore and is well worth further development, but the property has remained idle for two or three years, apparently from lack of funds.

Higgin's Property.—This property is situated in the Babine range, about thirty-one miles from Hazelton, and is reached by the old Babine pack-trail. It is owned by Fred Higgin and is now under option to the Exploration Department of the Goldfields Consolidated Company, with J. B. Rowley in charge. Work was commenced in September, a camp erected, and a crew of six to eight men will be kept at work all winter.

The showings consist of several quartz veins varying in width from a few inches to several feet, which are exposed on the surface for considerable distances. Galena, zinc-blende, and grey-copper form the ore, and high silver values are associated with the grey-copper. The property apparently has promise, but is as yet undeveloped; but a winter's work will probably prove the veins to some extent.

TELKWA SUB-DISTRICT.

Santa Maria Mine.—During the summer the sleigh-road to this property was materially improved, and now it is a wagon-road to within about eight miles of the property. Mining operations were stopped at the property in the spring, but were resumed in August. The shaft has been sunk to the 120-foot level and drifting commenced. Up to the present the rich ore-shoots occurring from the surface to the 60-foot level have not been found below that level, although what is presumed to be the vein lying in the contact between andesite and quartz porphyry is well defined. Surface showings south of the shaft, however, indicate that further prospecting from the 120-foot level in a southerly direction may succeed in finding new ore-shoots, and this development is being carried out. The north drift on the 60-foot level shows ore, and further drifting on this level is being proceeded with; from this level ore will be stoped this winter. Development with a crew of a dozen men will be carried on during the winter. When sleighing comes some ore shipments may be expected. The property is well equipped now with a distillate-driven engine, hoist, small compressor, and comfortable camp buildings.

Cronin's Mine.—During the year an excellent sleigh-road was constructed to this property by the Public Works Department, a distance from Telkwa to the mine of thirty miles. This road forms a main trunk road opening up one section of the Babine range, and will, in time, be gradually improved until it is a good wagon-road. The main property served at the present time is the Cronin mine, but other properties in process of development will use the road for taking in supplies and hauling out ore.

The mine was developed steadily all year until November, when operations were temporarily suspended. In October, before the completion of the sleigh-road, 79 tons of hand-sorted ore was packed out from the mine to Smithers by way of the trail over the Driftwood Creek divide. This ore shipment was in the nature of a test to see what grade the ore would average. The property has reached a stage of development where a fair tonnage of concentrating-ore has been proven, and the installation of a small mill is being considered. This would seem to be the best policy, as the ore contains considerable zinc and hand-sorting cannot produce a shipping silver-lead product sufficiently low in zinc for the present smelter requirements. The machinery for the mill will probably be taken in over the sleigh-road this winter, and a considerable production from this mine in the future may be expected.

Other properties in this section which were worked on a small scale this year, and from which small ore shipments were packed out, are the Harvey & Higgin's claims.

Cassiar Cronin Copper Co.—The property of this company is situated on Grouse mountain, about eighteen miles from Telkwa. During the last two years the driving of a crosscut tunnel to prospect the surface showings at depth has been proceeded with. Owing to the failure to locate the ore-body where it was expected, a good deal of lateral drifting and crosscutting was

done, which it is now apparent was wasted work. The company's finances were reorganized this summer and new management put in; careful surveys were made which showed the errors in the past work, and a fresh start was made. The tunnel was deflected at a considerable angle from its previous course, and a crew of three men put to work to drive ahead. It was reported in November that the tunnel had entered into some low-grade ore, and as the drift is now in over 1,000 feet, if appreciable ore-bodies exist they should soon be encountered. The property is equipped with a 1-drill gasoline-driven air-compressor.

Wilson Property.—D. M. Haynes, acting as agent for the Tonopah Mining Company, has acquired the group of claims owned by Wilson and partners, situated about three miles from Knockholt Station, some thirty miles from Telkwa. Work was commenced in August with a crew of half a dozen men, a temporary but comfortable tent camp was erected, and the sinking of a shaft commenced. It is expected that development will be continued all winter. The ore is mainly chalcophyllite, and carrying, in addition to the copper, some values in gold and silver.

Bussinger Property.—This property, situated within half a mile of the Home ranch, has been leased by the Chisholm Bros., who are extracting ore and hope to ship one or two car-loads this winter. The main values are in copper, together with low values in gold and silver.

Hudson Bay Mountain.—Several properties on this mountain, including the *Victory* and *Mamie* groups on the southern slope and the Schufer and Carroll properties on the north-western slope, were worked in a small way during the year. A small shipment was made by Schufer, and it is believed a car-load was sent out from the *Victory*. Work was stopped on all when winter weather set in.

Emerald Group.—This property is situated on Sweeney mountain, in the Sibola district, some sixty miles south of Houston, on the Grand Trunk Pacific Railway. It was reported on by the writer in the 1916 Annual Report, and during the past summer was further developed and examined by several engineers for intending purchasers. In November the property, together with an adjoining group, was secured under lease and bond by James Cronin, the well-known silver-lead operator, who is acting as agent for New York capitalists. Development will be commenced as early in the spring of 1918 as is practicable. Several parties of prospectors were in this district during the season.

Cariboo Mining Division.

FRASER RIVER SUB-DISTRICT.

Tertiary Gravel Co.—The Killam gravel-mine at Cottonwood canyon, about eighteen miles above the town of Quesnel, was acquired during the year by a Chicago syndicate, the deal being effected by S. J. Marsh. Work was commenced in the summer.

This gold-bearing deposit is a cemented gravel lying on bed-rock and carrying values throughout a thickness of 10 to 12 feet. Development has been by a tunnel with lateral drifts from it, and the workings total several hundred feet; the gravel-deposit is of considerable size, but the gold values may be variable throughout it.

This deposit of cemented gravel is so hard that it cannot be successfully worked by ordinary placer-mining methods. The system to be used is to mine the ground as in a lode mine, using compressed-air driven drills, and then the product will be treated in a mill in much the same manner as gold-bearing quartz. This mill consists essentially of a jaw-crusher, ball-mill, and Pearce amalgamators, together with accessory bins, elevators, screens, etc.

The company has put in a sawmill, gravel-treatment mill, camp buildings, etc., and built two miles of wagon-road. It is believed the mill was in operation towards the end of the year, but no information as to results has been received.

Bar diggings on the Fraser river are worked intermittently by individuals each year.

BARKERVILLE SUB-DISTRICT.

The hydraulic placer mines in the vicinity of the old town of Barkerville made about the same production this year as in 1916. The production as a rule varies directly with the supply of water, and this year the water-supply was a little better than usual. A heavy snowfall during the previous winter provided a plentiful supply of water for the first part of the season, which was in part offset by a dry fall. The ground handled was of about the same grade as in former years.

Hopp Mines.—The mines operated by John Hopp—viz., *Lowhee*, *Stouts Gulch*, and *Mosquito Creek* mines—were worked as usual, and from them comes the major portion of the production of the district. The *Stouts Gulch* mine was not worked as much as in former years, as it has been worked up to nearly the head of the gulch; the ground still remaining to be worked lies on benches and tributary gulches. *Mosquito Creek* again yielded some very rich ground; the water-supply on this mine is small, which prevents any large-scale operation. *Lowhee* mine was operated at full capacity throughout the season and made a good return, some of the ground being richer than usual.

Point Mine.—This property, owned by Loo Gee Wing, of Vancouver, was worked during the season under Chinese management, and made about the same output as in former years.

Chisholm Creek.—The Cariboo-Chisholm Creek Mining Company, operating on Chisholm creek just above the town of Stanley, continued development during the year.

Hydraulicking was continued along Chisholm creek, the surface gravels being sluiced off. Shortage of water handicaps this work.

The drifting-work which was started some time ago to prospect an old channel on one side of Chisholm creek was continued. On breaking into the rim of the old channel a heavy water-pressure was encountered, which caused some difficulties for a time; these, however, were successfully overcome. Development was being continued, but nothing has been heard as yet regarding the results attained.

Small-scale individual placer operations were carried on as usual.

Proserpine Mountain.—Gold-quartz claims on Proserpine mountain, owned by Armstrong, Baker, Tregillus, Blair, and others, attracted attention during the year, and prospecting of the claims was carried out by the owners. The properties were examined by two or three prospective purchasers, but no deals were effected.

The quartz veins are large—from 10 to 30 feet—and carry small quantities of pyrite, arsenical iron, and galena. The gold values are variable and extensive sampling would be required to ascertain average values. The writer examined a number of the more important showings in August, and is of the opinion that these claims are worthy of serious investigation, as it is probable that at least some portions of the veins carry sufficient gold to pay to work. The quartz is partially oxidized on the surface, and small lots of gold are taken out by Armstrong working with a rocker.

Quesnel Division.

QUESNEL RIVER SUB-DISTRICT.

Very little information is available about the mining operations in this section, which consist entirely of placer-mining. Small-scale work as in previous years was probably carried on.

The Quesnel Hydraulic Mining Company, which a few years ago constructed a very elaborate and expensive water system to handle ground on Twenty-mile creek, Quesnel river, continued operations on a small scale. The work carried out in 1912 and 1914 on this property showed that the hydraulic plant worked excellently, but that the gravel handled contained but little gold. Since 1914 the company has been engaged in carefully prospecting its holdings in order to determine where pay-ground is situated, and this prospecting was continued during the past season. The manager says this work is turning out satisfactorily.

TIMOTHY MOUNTAIN SUB-DISTRICT.

A few years ago a number of claims were staked on Timothy mountain by Ryan, Foster, and others. This mountain is distant about thirty miles in a north-easterly direction from Lac la Hache Post-office, which latter is 103 miles northerly from Ashcroft, on the Cariboo road. The claims were staked on small showings of copper ore and a fair amount of development was done. Considering their remote location and low grade of the ore, these claims are not considered by the writer to be of value.

During the past summer, showings of molybdenite were discovered, and these, while as yet quite undeveloped, may prove to be of some importance. The molybdenite occurs, in part, disseminated through a granitic rock, along joint planes and fractures in an irregular manner. There is a possibility of there being a considerable tonnage of low-grade ore. Some of the molybdenite also occurs as stringers of the pure mineral in quartz veins which cut the granitic rock; these stringers vary from $\frac{1}{4}$ to 2 inches in width, and, although not close together, appear to be

numerous. A shipment of 800 lb. of the pure mineral was packed out in the fall, but the commencement of the winter's snow prevented further operations. It seems likely that these claims will be prospected during the coming summer, either by the owners or some one else.

CENTRAL MINERAL SURVEY DISTRICT, No. 3.

PRELIMINARY REPORT BY R. W. THOMSON, RESIDENT ENGINEER.

(Headquarters, Kamloops.)

I herewith enclose the reports from the Mining Recorders of the seven Mining Divisions in this district.

I have very little to add which will be of assistance to you in making up the preliminary estimate, as my work has been almost entirely connected with non-producing properties, my own information on the producing mines being obtained from the reports of the Mining Recorders in the different Divisions. At present I am working on the report of my summer's work for the Annual Report of the Minister of Mines, 1917.

A few notes which may be of interest.

Lillooet Mining Division.

On account of a considerable amount of staking having been done about twenty miles from Bridge river up Gun creek, it was recommended that a trail be built up this latter stream; work was started in the autumn and about six miles has been constructed. The balance will be completed in the spring. The output return from this Division has not yet been received.

The following notes have been received from the Mining Recorder of the Division:—

"I expected milling returns from the *Pioneer* and *Lorne* mines, Bridge river, this week. Owing to a break-down in connection with the Pacific Great Eastern Railway, the mail service in consequence will be delayed eight days. The returns are somewhat later this season, as the unexceptional mild fall and the continued duration of same in this section enabled the stamp-mills to operate much longer. I am sorry that I am unable to comply with your request at the present date of writing.

"Several new discoveries of ore-bodies were reported during the year, but no development to speak of was undertaken. I shall be pleased to communicate with you later on, and so soon as I get some information from reliable miners and prospectors."

Clinton Mining Division.

I have nothing to report further than the notes of the Mining Recorder of the Division, which are as follows:—

"In reply, I am enclosing herewith the form supplied, from which it will be seen that no shipments have been made during the year. With regard to general development in this Division, I regret to point out that it is very small. Certain prospecting has been done, and one or two placer claims on creeks tributary to the Fraser river have been worked on a paying basis. The only new development is that in connection with a lake situated about half a mile south of Clinton, which was recently staked as a soda-deposit. A considerable quantity of Epsom salts is being extracted, and I am informed arrangements are being made for shipment to the Seattle Chemical Works."

Kamloops Mining Division.

The *Fortuna* group of claims, situated about ten miles east of Louis Creek Station, Canadian Northern Pacific Railway, and owned by G. N. Richmond, of Philadelphia, is being operated under the superintendence of W. J. Smith. The ore on these claims is iron pyrites, said to contain between 0.2 and 0.3 oz. a ton of platinum. A syndicate with headquarters in the United States has taken an option on 100,000 tons, agreeing to pay \$20 a ton f.o.b. Louis Creek Station, and depositing \$5,000 as security for ore "in transit."

The ore is to be shipped to Republic, Wash., U.S.A. A trial shipment of 20 tons was made during the summer. Arrangements are now being made to start shipping early in the year. This is a synopsis of a verbal report by Mr. Smith, the superintendent.

The following notes are provided by the Mining Recorder of the Division:—

"A very large amount of development-work has been in progress in this district during the year 1917, and while the *Iron Mask* is still the only claim on a producing basis, there are other claims which bid fair to become producers of merchantable ore in the near future.

"The Iron Mask Company, in addition to shipping 2,674 tons of ore (which shipments would have been considerably increased if the Trail smelter had not closed down part of the year owing to coke shortage), has done a considerable amount of diamond-drill work, with very satisfactory results.

"The Granby Consolidated Company, Limited, has been working on the *Copper King* and *McLeod* groups of copper claims, situated on Grace mountain, Seymour arm, doing over 180 feet of tunnelling. These claims have splendid showings; there is a large body of good ore in sight; the main difficulty, however, is the need of about twenty-three miles of road from the camp to the head of Seymour arm.

"The *Queen Bess* group, at Black Pool, North Thompson river, has been optioned to a Seattle syndicate and development is actually in progress. These are silver-lead and zinc properties. It is proposed to erect a concentrating plant, and the claims are expected to be in active production during 1918.

"The *Lydia* group of copper claims, owned by G. Fennell *et al.*, of Chu Chua, has been bonded to W. H. Aldridge, of New York, the conditions being immediate and continuous development of the properties. Shipments on a large scale are also expected to be made during 1918."

Vernon Mining Division.

Some prospecting has been done in the Garnet valley, eight miles west of Summerland, on silver-lead indications; also some work is being done twelve miles up Mission creek from Kelowna on a molybdenite-gold showing.

Nicola Mining Division.

The Mining Recorder's report covers this Division. Interest is reviving in the Stump Lake vicinity.

The following is the report of the Mining Recorder:—

"While there does not appear to have been any great activity in this district, there has been a great deal of quiet prospecting, over 130 new claims being located, and assessment-work to the value of \$14,000 completed on old claims.

"Great things are still expected from the *Aberdeen* mine, which was the largest shipper from here in 1916, and a large amount of money is being spent in developing this property. The shipments up to date this year are 330 tons, but no returns are at present available.

"The *Donohue* mine, in which considerable capital has been invested, is scrapping its machinery, intending to replace same by a heavier plant.

"The *Lucky* mine, which is a shipper for the first time this year, is a silver and copper proposition; 21 tons sent to Trail as a sample shipment resulted in a return of 4.6 per cent. copper and 3 oz. silver to the ton. This claim has been bonded by the owners, O. Schmidt *et al.*, to the North-western Mines, Limited, of Spokane, who propose commencing mining operations on March 1st, 1918.

"There are a number of hematite-iron claims near Nicola, owned by W. McNeil *et al.*, which have attracted the attention of a Japanese syndicate, which has secured an option on same, the particulars of which are not yet to hand. As there is a large body of this ore in sight and any big move to handle it would considerably benefit the town of Nicola, there is locally quite a little excitement."

Yale Mining Division.

This is covered by Recorder's report, which is as follows:—

"Assessment and development work has been carried on generally throughout the Division, particularly at 23-Mile, Coquihalla valley, Siwash creek, and Gold creek. The only ore shipments were made from the *Emancipation*, owned by Merrick, Beech & Thomson, situated in the Coquihalla valley, which sent some 61 tons to the Tacoma smelter, netting a little over \$21,000. A small stamp-mill has been bought for this property and will shortly be installed.

"Fagan Bros. are also installing a small mill on the *Emigrant* group, on the South fork of Siwash creek. I understand they intend to bring out a few tons of ore for a smelter test.

"On the *Pittsburg* group, which adjoins the *Emancipation* group, on Ladner creek, John O'Connell has taken in a winter's supplies and is running a tunnel. Fritz, Robinson & Bears and others have done considerable work on their claims at 23-Mile, Princeton trail. McDonald and the Miller Mining Partnership have had a small crew at work all summer and intend to

continue until April next at least, when they hope to cut their lead by a tunnel on their *Admiral* group, on Gold creek, opposite Spuzzum.

"There have been some 178 new locations recorded during the year. Placer-mining seems to be at a standstill."

Ashcroft Mining Division.

Considerable interest is being taken in the Highland Valley neighbourhood, not only in the immediate vicinity of the *O.K.* mine, but also on the northerly side of the valley along the line of the *Glossy*, *Highland*, *Transvaal*, *Keystone*, and *Snowstorm* groups. Improvements to the wagon-road from the main Ashcroft road to the *Highland* and *Transvaal* have been carried out.

The following is a report received from the Mining Recorder of the Division:—

"I enclose copy of report received from the Highland Valley Mining Company, the only company which is shipping ore in this district. Apart from this particular mine, the usual development-work has been done, but no shipments made, and the general situation regarding the district remains the same."

The following report is from the Highland Valley Mining Company:—

"Gross value of product shipped during the year ending October 31st, 1917, was \$93,512. This has been shipped since January 1st, 1917, and consists for the most part of concentrate, only a very small amount of ore having been shipped direct. The total tonnage shipped during the same period was 1,039; total tons (wet) mined, 10,550.

"Estimates on November and December production are as follows:—

	November.	December.
Tons from mine (wet weight)	1,276	1,200
Tons concentrate to smelter	141	150
Gross value of shipments	\$12,775	\$13,580 "

SOUTHERN MINERAL SURVEY DISTRICT, No. 4.

PRELIMINARY REPORT BY PHILIP B. FREELAND, RESIDENT ENGINEER.

(Headquarters, Grand Forks.)

Grand Forks Mining Division.

The greatest activity in mining development in this Division for 1917 was shown up the Granby river (North fork of Kettle), prospects which have lain idle for a great many years having received the attention of their owners and some of the old workings cleaned out and samples taken. The *Union* mine has shipped approximately 690 tons (dry) to the Granby smelter at Grand Forks.

The *Original* claim, also up the Granby river, has shipped some 38 tons.

The owners of the *Maple Leaf* claims, adjoining the *Union* on the north side, have stripped off an area on the surface about 200 feet wide, from which a small amount of native copper intermingled with the country-rock was found. On driving a tunnel about 20 feet into the formation the native copper has disappeared, giving place to sulphides. The owners have purchased a second-hand 50-ton furnace and intend to smelt their own ores, thereby saving transportation one way.

The Inland Mining Company has done a small amount of development-work on the *Berlin* claim, four miles east of Paulson, and have shipped one car-load of high-grade silver and gold ore to the Grand Forks smelter.

The *Molly Gibson* mine was leased by the company to two Swedes, who threw up their contract after a few weeks' work.

The lime-quarries at Fife have been shipping fairly regularly to the Trail smelter for a flux, no estimate of tonnage having been received up to date.

Waterloo Claim, Lightning Peak.—This claim is being developed under difficulties owing to a lack of transportation. A few hundred pounds of high-grade silver ore has been packed out on horses to Edgewood, on the Arrow lakes, a distance of approximately thirty miles over the trail.

West Fork.—This claim has also shipped a few hundred pounds of fairly high-grade silver-lead ore over the same trail as the *Waterloo*.

B.C.—This old property has been leased by the Canada Copper Corporation, of Greenwood, to A. Luciani, of Phoenix. About 609 tons of second-grade copper ore has been shipped.

Oro Denoro.—This mine has shipped about 243 tons of low-grade ore carrying gold, silver, and copper values.

Emma.—About 36,102 tons of ore has been mined and shipped from this mine to the Trail smelter. This ore carries gold, silver, and copper values, and also a fairly high percentage of iron. The mine is not in operation at this date, December 12th, owing to the strike at Trail.

Greenwood Mining Division.

Granby Consolidated Mining, Smelting, and Power Co., Phoenix.—This company has shipped approximately 500,000 tons of ore to the smelter at Grand Forks. This tonnage is considerably below the output for 1916 owing chiefly to labour troubles in the Crowsnest coalfields, which created a shortage in coke at the smelter, thereby causing the closing-down of the mines at Phoenix.

Canada Copper Corporation.—The *Mother Lode* mines have been running steadily throughout the year, with the exception of a few weeks on account of coke shortage at the smelter at Greenwood. The *Mother Lode* has shipped 174,500 tons of copper ore (mine-run) and 3,941 tons of sulphides to December 1st. The *Sunset* mine shipped 2,180 tons.

The *Big Copper* mine has been under lease to J. Poggi, who shipped 683 tons of copper ore—some to Grand Forks and some to the Greenwood smelter.

The *King Solomon*, which adjoins the *Big Copper*, shipped 267 tons of high-grade copper ore to Greenwood smelter.

The *Surprise No. 3* mine, about two miles west of Phoenix, is under lease to Mike Kanex, Joe Cunningham, and Axel Gustafsen. The lessees opened up a copper-ore body averaging about 2 feet wide, by stripping, and sunk a shaft on the ledge 40 feet in ore. Some assays from the shaft showed values to the extent of 1 oz. silver and 7 per cent. copper. This seems to be a promising prospect, and has shipped 7 tons to Grand Forks averaging 6 per cent.

The *Elkhorn*, near Greenwood, has been leased for some months to Rowe & Matthews. The lessees have shipped 8 tons of silver ore to Trail.

The *Prince Henry* mine was leased for a few months to Johnson, Sorturne, Nelson & Christensen, of Phoenix. Seven tons of gold and silver ore was shipped to Trail.

The *Tip-top* shipped 25 tons gold and copper ore to Greenwood.

There has been considerable activity in Wallace mountain, Beaverdell, owing to the high prices of silver and lead.

The *Sally* has been leased to Geo. Hambly, and about 117 tons of medium-grade silver-lead ore taken out and shipped to Trail smelter and Grand Forks.

The *Bell* is also under lease to Oliver & McIntosh, and 192 tons of mixed-grade silver and lead ores has been shipped to Trail and Grand Forks.

The *Kokomo* claims, owned and worked by C. M. Barrett, also silver-lead, shipped 24 tons to Trail.

The *Standard* claim, owned by W. H. Rambo, Beaverdell, shipped 41 tons of fair-grade silver-lead ore to Grand Forks smelter.

The *Bounty Fraction* shipped 17 tons to Grand Forks.

Several other prospects in the vicinity of Wallace mountain have been developed, including the following: *Scandia*, 40 feet of tunnel; *Rambler*, open-cuts; *Standard Fractional*; *Standard*, tunnel; *Naponce* group, tunnel and open-cuts; *Black Diamond*, tunnel and open-cuts; *Beaver*, tunnel and open-cuts; *Revenge* and *Sunset Fractional*, *Bell Fractional*, tunnel and open-cuts.

Two miles in a south-westerly direction from Carmi, some work has been done to develop the *Inyo* claim, a tunnel having been run 65 feet, also a shaft 10 feet, showing a good lead of silver-lead ore.

The *Nipper* claim has had considerable development-work done upon it, though no ore in-place has been discovered as yet.

The *Blue Jay*, near Phoenix, has shipped 26 tons of second-class gold ore to Grand Forks smelter.

Osoyoos Mining Division.

Spotted Lake.—The Stewart, Calvert Company, Inc., Industrial Chemists, of Oroville, Wash., U.S., has been operating during the year at Spotted lake. Some 412 tons of magnesium sulphate has been shipped to the company's chemical-works at Oroville, Wash., U.S. This amount represents the tonnage for 1917 up to December 1st. The company estimates that about 350 to 400

tons will be shipped during December, providing weather conditions allow for transportation. This tonnage has been moved by means of motor-trucks.

Nickel Plate.—This mine, bonded to the late M. K. Rogers in the fall of 1898 for \$60,000, has been in steady operation since. In 1900-1 a concentration and cyanide plant was installed. Up to 1916 the concentrates were shipped to Tacoma smelter for treatment and the tailings cyanided. This proved expensive, latterly, owing to the increased baseness of the ore with depth, which in turn increased the tonnage of concentrates and lowered the grade. To offset this the company commenced to treat its ore by total cyanidation, dispensing with concentration, and up to the present time this method has proved most satisfactory.

Oregon Group.—This group consists of the *Oregon*, *Winchester*, *St. Barnard*, *Savage*, *Two Sisters*, *Oregon Fraction*, and *Winchester Fraction*. The Granby Company had a bond on the property during the year and has done considerable development to try and locate a continuance of the ore-body. Assays as high as 3.9 per cent. copper, 3.40 oz. silver, and 0.12 oz. gold have been obtained across the ledge.

Copper King Group.—This group consists of the *Copper King*, *Copper Hill*, *Mountain Lion*, and *Copper King Extension*, and is owned by H. Northey, Olalla, and leased and bonded to A. Hagelberg. Tunnels were driven in this property to develop the ore-body at depth. At the time of writing this report no ore had been struck. Surface showings contained fair values in copper sulphides.

Golconda.—This mine is owned and worked by Dan and Archie McEachern, of Olalla. During the year, 4,390 lb. of molybdenite was shipped from this mine, containing 751.1290 lb. of MoS_2 ; also a few hundred pounds of copper sulphide.

Dolphin.—This claim, owned by C. W. Jordan, of Olalla, shipped about 72 tons of gold and copper ore to the Granby smelter at Grand Forks.

Horn Silver-mine.—This mine has been producing silver ore periodically since September 10th, 1915, and has shipped eighteen car-loads to Grand Forks smelter. One of the car-loads assayed as high as 390 oz. silver and some gold. The owners have been handicapped considerably owing to the lack of proper means to develop and transport their ore. If the high price of silver should continue and proper machinery be installed, there is little doubt but that this property will become a steady producer.

Camp McKinney.—A revival of interest was shown in this camp when a number of people from Rossland and Trail restaked and bought some thirty-odd claims in and around the old camp. It is generally understood that the high-power electric line from Greenwood will pass through this camp in the near future, which may offer better conditions for power for operating purposes. In the next year or so some development may be looked for.

Similkameen Mining Division.

Canada Copper Corporation, Ltd.—This company, formerly known as the British Columbia Copper Company, has been absorbed by the Canada Copper Corporation, Limited, during the last few months. This new corporation intends to spend the necessary amount to put its group of mines on Copper mountain on an operating basis.

The work of blocking out the ore-bodies, also driving a working-tunnel at a lower elevation, the building of a sawmill, and concentration plant are already under way. A railway up to the mine has also been surveyed. A new bunk-house has been built, and every facility for carrying on the work in a modern way has been considered.

This company expended approximately \$1,250,000 on development up to November 1st, 1917. This included diamond-drilling, 118,000 feet; tunnelling, 90 per cent. of which is 9- x 10-foot tunnels, 12,800 feet; raising, 3,000 feet; sinking, 936 feet; surface trenching, 32,000 feet.

In connection with the above company, the old cement plant near Princeton has been put into use for experimental purposes and ascertaining the possibilities of nodulizing concentrates from the company's plant. Up to date these experiments were satisfactory, coal-dust being used for fuel instead of oil.

Treasure Mountain.—A considerable amount of interest has been shown in the vicinity of Treasure mountain, the high price of silver and lead attracting several operators to the locality. Some good leads of silver-lead were uncovered in R. Stevenson's claims whilst doing the assessment.

Princeton Coal and Land Co.—This company has been operating steadily during the year, at about 200 tons of coal per diem.

Tulameen River.—The high price of platinum has stimulated a certain amount of work in the placer claims in the Tulameen river. No large amount of the metal has been taken out up to the present time.

There has been some activity in the coalfields in the Tulameen coal-basins during the year, and it is probable that these fields will be put on an operating basis in the near future.

Osoyoos Coal Co.—This company has opened up a good-sized seam of coal six miles south-east of Princeton.

EASTERN MINERAL SURVEY DISTRICT, No. 5.

PRELIMINARY REPORT BY A. G. LANGLEY, RESIDENT ENGINEER.

(Headquarters, Revelstoke.)

This district includes all of both East and West Kootenay.

Golden Mining Division.

At Field.—Mr. Adkins, the owner of the *Couverabee* mineral claim, adjoining the *Monarch*, has shipped 272 tons of silver-lead ore during the year.

Monarch.—A small shipment was made from this property, but work has been discontinued.

Tarheel Group.—This group is situated on the Middle fork of the Spillimacheen river. C. J. Lincke, of Golden, has been endeavouring to interest capital in order to carry on further prospecting-work. The ore is chalcopryite associated with a quartz gangue, but as yet no ore-body of commercial importance has been developed.

Last summer a small camp was established at Spruce Tree camp, and some work was done on the trails leading up to the old workings.

Tennessee Group.—This group adjoins the *Tarheel* and is owned by J. W. Conners, of Golden. A tunnel 18 feet in length was driven along the vein, but so far the showings have not been in accordance with expectations. The character and occurrence of the ore are similar to the *Tarheel*.

I.X.L. and Condor.—These claims are situated near Castledale and are owned by R. McKee-man and A. W. Logan. Very little work has been done, but according to reports there is a strong surface showing of low-grade ore. Assays received show the ore to run as follows: $\frac{1}{2}$ to 1 oz. silver, 4 to 6 per cent. lead, with zinc values varying from 3 to 37 per cent. The owners anticipate work being done on this property next spring.

Windermere Mining Division.

Paradise.—Robert Randolph Bruce has recently bought this property from the Hammond Estate and is now the sole owner. During the year, 2,100 tons of ore has been shipped to the Trail smelter. The typical ore is what is known as "sand carbonates." The average values of the shipments are approximately 30 oz. silver and 30 per cent. lead.

BOULDER CREEK.

Sitting Bull Group.—F. W. Wonn, of Seattle, and associates are operating this property. E. D. Smith is in charge of the mine. According to latest reports, the development which is being carried on is giving encouraging results, but so far no ore has been shipped. Assay returns indicate that the ore, which, generally speaking, is a fine-grained galena, will average about 46 oz. silver and 45 per cent. lead. A light aerial tramway is under construction, and arrangements have been made for carrying on work at the mine during the winter. Six or seven men are employed.

Relief Group.—This property is situated on Boulder mountain at an elevation of between 9,000 and 10,000 feet, just over the ridge above the *Sitting Bull* group. Mr. Chamberlain, of Wilmer, and partner have been working this property under a lease and bond. Twenty tons of ore has been packed and hauled down to Wilmer. The ore is similar to that at the *Sitting Bull*.

In order to appreciate the difficulties that have to be contended with in these outlying districts, the following facts may be of interest: This ore had to be packed down a steep mountain-trail from an altitude of 9,000 feet to Boulder creek; then again packed over a rough trail for a distance of about nine miles to a wagon-road; then hauled for eight miles to Wilmer.

Delos Group.—This group, consisting of three Crown-granted mineral claims, is located on the Boulder Creek trail and is easily accessible. The property is controlled by E. J. Scovil, of Golden. The ore is principally chalcopryite associated with a quartz gangue. Assays on selected ore from surface cuts ran 0.8 oz. silver and 27.6 per cent. copper. It is a prospect worthy of further exploitation.

Mabel R., on Law Creek.—Frank Anderson, the lessee, has about 20 tons ready for shipment. The ore is said to run 8 to 12 oz. silver and 80 per cent. lead.

Lead Queen, on Frances Creek.—Tom Brown and two men are working and expect to get out two car-loads this winter.

Isaac, on Frances Creek.—This property belongs to H. E. Forster, who reports that there is 80 tons ready for shipment. The property is now closed down for the winter. The ore is an argentiferous galena.

Fort Steele Mining Division.

Stemwinder, Ontario, and North Star.—These properties have been bonded to the Federal Mining and Smelting Company. This company intends to systematically exploit the mountain-side with the diamond-drill, and is reported to have two drills working at the present time. The ore at the *Stemwinder* is a fine-grained mixture of galena and zinc-blende, occurring in quartzite, and resembling the *Sullivan* ore in composition and occurrence.

Burton.—Situated at Elko. A syndicate principally composed of Calgary people has financed the development of this property. The ore consists principally of copper carbonates. Small shipments made to Trail are said to have assayed approximately 6 per cent. copper. Latest reports would indicate that recent development-work is being continued.

The *Park* group, on Luke creek, owned by W. A. Chisholm, is being worked by Spokane interests under-lease and bond.

At Skookumchuck a new find has been reported. It is said to be a large surface showing of pyrrhotite and pyrite, carrying native copper in seams and druses. The owners intend putting in a winter's work on the property.

Victor.—Situated at Fort Steele. Elmer Abernethy has been actively engaged in the development of this property, and reports that they will make shipments to Trail as soon as the strike is settled. A sample of the sorted ore for shipment ran: Silver, 21.5 oz.; lead, 43 per cent.; zinc, 9 per cent. Six miles of new road has been built, connecting the mine with the main road to Steele. A small compressor and gas-engine have been installed at the mine. Four or five men will be working this winter.

St. Eugene.—Situated at Moyie. During the year approximately 2,000 tons has been shipped to Trail.

Sullivan.—Situated at Kimberly. This mine, which is by far the largest producer in the Kootenays, shows a production for the year of 110,000 tons. The ore runs about as follows: Zinc, 20 per cent.; lead, 15 to 20 per cent.; silver, 5 to 10 oz. Work is being continued on the long adit tunnel, which is being driven from Mark creek to tap the ore-body at about 700 feet below the upper workings. The tunnel was commenced in 1915, and when completed will be over 8,000 feet long, and will connect the mine-workings with the bins at the railway on Mark creek, thus greatly reducing the present cost of handling the ore.

Both these properties are operated by the Consolidated Mining and Smelting Company, of Trail.

Ainsworth Mining Division.

NEAR AINSWORTH.

Albion.—During the year some work has been done on this property. Shipments to Trail, 44 tons.

Florence.—Under the management of G. R. Wolfe, the mine has been operating steadily during the year. The new mill has given satisfactory results. Tonnage shipped to Trail, 852 tons concentrates.

Gallagher.—Four men are being employed at the property, which is being operated by A. D. Wheeler. Shipments to Trail, 31 tons concentrates.

Highland.—Operated by the Consolidated Mining and Smelting Company. The shipments to Trail show 1,480 tons concentrates.

Banker-Maestro.—A little work has been done on this property. Shipments to Trail, 27 tons.

Little Phil.—This property has been worked under a lease. Shipments made, 34 tons.

Silver Hoard.—A small concentrating plant has been installed at this property and mining has been carried on during the year. Shipments to Trail, 84 tons concentrates.

The Spokane-Trinket Trail receipts show 136 tons.

Eden and Crescent.—This property is situated at Coffee creek. Systematic development-work has been carried on under the supervision of Yolen Williams. It is the intention of the company to install a compressor plant this winter in order that the work can be carried on to better advantage.

Skyline.—Development-work has been done on a fairly large scale during the summer, but latterly the property has been closed down, pending the settlement of labour troubles.

AT RIONDEL.

Bluebell.—This mine has been operating steadily during the year and has produced the largest tonnage in the district. Tonnage shipped, 4,178 tons concentrates.

Comfort.—This property adjoins the *Bluebell* and has been worked during the year by A. D. Wheeler. Shipped 51 tons.

Silver Hill.—This mine is situated near Crawford bay. Last winter a little work was done under the direction of R. McAllister, and a small trial shipment was made to the Trail smelter, which gave a net return of \$64.35 a ton. It is an old property on which extensive mining and development work has been done. The old workings are in good condition and there is a considerable tonnage of ore exposed underground, besides the second-grade ore on the old dumps, which are roughly estimated to contain between 2,000 and 3,000 tons. The vein lies almost flat, having a dip of only 10 degrees. The mineralization consists of tetrahedrite, chalcopyrite, iron pyrites, and galena, the galena predominating. The gangue consists principally of quartz.

WOODBURY CREEK.

Sacramento Group.—This property has been worked under lease and bond by C. F. Caldwell, four men being employed. Cabins have been erected and everything is in readiness to commence operations next season. The ore carries lead and high silver values.

Sun.—This property has been worked by B. H. Nellis. Shipment to Trail, 34 tons.

Lavina Group.—Three or four men have been working on this property.

St. Patrick Group.—This property is being developed by the British Alberta Mining Company, of which A. J. Flood, of Vulcan, Alberta, is president and W. R. Allen, of Nelson, secretary. Active development-work has been carried on and substantial camp buildings erected.

Silver Gable.—This property is situated half a mile north of Duncan lake. Development-work has been carried on under the direction of W. R. Smith, of Kaslo.

Argenta.—This property is situated on Hall creek. Two men have been working here during the season.

NEAR KASLO.

Cork-Provence.—Systematic development and mining work has been carried on with satisfactory results, and the future prospects are encouraging. An addition to the mill is being made with the view of installing a selective flotation plant for the separation of the concentrates carrying lead and zinc. Shipments to the Trail smelter total 410 tons.

Gibson.—This property is situated about two miles up the creek from the *Cork-Provence* mines. Active development has been carried on under the direction of D. K. May, and encouraging results have been obtained.

Index.—This property is being developed under the supervision of C. F. Caldwell. Four men are now employed.

Gold Cure Group.—Some development-work has been done on this property by a company organized by C. F. Caldwell.

Flint and Martin.—A little development-work was done during the season. Shipment to the Trail smelter, 7 tons.

Revenue.—Two men were employed at this property.

Manganese Group.—This property is owned by A. J. Curle, of Kaslo, and A. G. Larson, and is situated on the Kaslo & Nakusp Railway, six miles and a half from Kaslo. Very little development and mining work has been done as yet. Some 600 sacks are ready for shipment, and the owners claim that a considerable tonnage is available for extraction at low cost. Average

assays run as follows: Manganese, 42.06 per cent.; iron, 1 per cent.; moisture, 13.12 per cent.; silica, 4 per cent.; phosphorus, 0.01 per cent.

The limited exploratory work done would indicate that the ore occurs as a blanket deposit lying on or near the surface and having a thickness of from 1 to 3.5 feet. This property has possibilities and further work should be done to determine the extent and character of the deposit.

Utica.—The work on this property has principally been confined to driving a long crosscut to tap the ore-body at a greater depth. Eight men have been employed. Shipment to Trail, 396 tons.

Helen.—This property, which has been lying idle for some years, is now being developed on a small scale by W. English, of Kaslo. It is a silver-lead ore carrying high silver values.

Bell.—This property is being operated by the Jackson Basin Zinc Company. Shipment to Trail, 569 tons.

Whitewater.—Ten men have been working at this property during the year under lease. Shipment made, 900 tons.

Charleston.—This property is situated above the *Whitewater*. A. J. Harris is doing some development-work.

Eureka.—This property is being developed by J. C. Ryan.

Slocan Mining Division.

SANDON CAMP.

The Surprise Mining Company, which has been an active shipper during the year, has recently acquired the *Bosun* mine, near New Denver. The old workings are being cleaned out and the property is being systematically developed, with the result that a considerable quantity of zinc ore is now available for extraction. This ore runs high in silver values.

It is estimated that there is 15,000 tons of ore on the old dumps; the average values of numerous samples taken run as follows: Silver, 10 oz.; lead, 2 per cent.; zinc, 7 per cent. The ore from this property will be treated at the Roseberry mill, which has recently been leased by the company. Improvements are now being made at the mill and a flotation plant is being installed. The flotation units will consist of a K. & K. and a Hynes machine.

The ore from the *Surprise* mine is being milled at Sandon.

Noble Five Group.—Development-work in the lower tunnel has proved the existence of ore in commercial quantities at a depth of 3,000 feet below the apex of the veins. This, being the deepest exploratory work done, is of great importance to the whole camp, as it throws a new light on the character of the ore-shoots and proves their continuity with depth.

A four-compartment vertical raise is now being started from the lower tunnel to connect with the upper workings. The length of this raise will be 1,300 feet, and it will consist of two chutes, a manway, and a skipway. At every 200 feet hopper-bottom pockets will be built to break the fall of the ore.

Clarence Cunningham, who has been actively engaged during the year, has done a lot to resuscitate mining in the Sandon and Silverton camps, and reports that satisfactory progress is being made at the various properties which he controls. He is now operating the following properties: The *Queen Bess*, *Idaho-Alamo*, *Sovereign*, *Wonderful*, *Van-Roi*, and *Hewitt*.

An aerial tramway is now nearing completion to transport the ore from the *Idaho-Alamo* and *Queen Bess* to the railway at Alamo. An important strike was made at the *Queen Bess*, when a little crosscutting from the old workings disclosed a large high-grade ore-shoot. Mr. Cunningham has about 250 men on his pay-roll.

Carnation Group.—This group is being reopened and systematically exploited by George Clarke, of Sandon. Good trails have been constructed to the property, and a camp with accommodation for twenty men has been built near the mine. Five men are at present employed.

Ruth.—Development-work has been confined to the driving of a long crosscut to tap the vein at a greater depth.

Payne.—W. H. Burgess, of Kaslo, is working this property under a lease, and has had six men steadily employed during the season; 21 tons of silver-lead ore has been shipped, and there is now 30 tons of zinc ore ready for shipment at Sandon.

Sunset.—The Jackson Basin Zinc Company has a lease and bond on this property, and reports that there is a car-load of silver-lead ore at Sandon ready for shipment.

Soho.—J. C. Ryan is carrying on development-work at this property.

Echo.—Development-work has been carried on with satisfactory results. A new camp has been established with accommodation for forty men. The present development-work consists principally of driving another tunnel along the vein at a vertical distance of 130 feet below the upper workings. A shipment of 79 tons has been made to Trail.

The following is a list of the principal shippers of this Division, giving the approximate tonnage shipped by each property during the year:—

Name of Property.	Lead Concentrates.	Zinc Concentrates.	Ore.
<i>Silverton Camp.</i>			
	Tons.	Tons.	Tons.
Standard Silver Lead	5,200	11,000	...
Galena Farm	1,307	1,490	...
Van-Roi	1,739	...	...
Hewitt	157	200	...
Lucky Thought .....	...	...	923
Echo .....	...	...	79
<i>Sandon Camp.</i>			
Surprise Mining Co.	1,830	2,523	...
Slocan Star	1,660	800	...
Queen Bess .....	...	...	2,225
Rambler-Cariboo	902	...	...
Lucky Jim .....	...	2,600	...
Ivanhoe	770	...	...
Wonderful .....	...	...	250
Sovereign .....	...	...	169
Idaho-Alamo .....	...	...	164

Slocan City Mining Division.

Although there has not been any pronounced activity in this district during the year, the production compares very favourably with that of the previous year.

The following shipments were made to Trail during the year: *Ottawa* group, 182 tons; *Black Prince*, 17 tons; *Meteor*, 14 tons; *Enterprise*, 112 tons.

Nelson Mining Division.

YMR CAMP.

Yankee Girl.—The Hobson Silver Lead Company, of which W. T. McDowell is manager, has been actively engaged in the mining and development of this property during the year, with results that apparently are highly satisfactory. The work done during the year consists of approximately 450 feet of drifting on the vein and 185 feet of crosscutting.

The manager reports that an ore-body consisting of lenses of heavy sulphides was developed near the end of the drift, and stoping was commenced on this at a distance of 35 feet from the face. The stope at present extends 65 feet above the drift and is 55 feet long. The ore, which is reported to have a width of 6 feet, runs about 8 per cent. zinc, 25 per cent. pyrite, and pyrrhotite carrying gold and silver values, which show average returns of \$17.50 a ton. Since September 18th fifty-five cars having a total dry weight of 2,300 tons have been shipped to the Canada Copper Corporation at Greenwood.

HALL'S SIDING.

Lost Cabin Group.—This property is under lease and bond to Frank Stoner, of Chokeville, Wyoming. Mining operations have been carried on under the direction of F. H. Shoemaker. Two men have been steadily employed and work will be carried on all winter. Average assays across a 20-foot width of vein on the surface are said to show a value of \$50, the principal values being in gold and silver.

Monarch Group.—This property is being prospected by J. E. Fisher and S. E. Coulter, of Rossland. The ore so far discovered is a low-grade copper ore, carrying small quantities of gold.

SHEEP CREEK CAMP.

H.B.—This property has shipped a considerable tonnage of zinc ore during the year, but latterly has been closed down.

Emerald.—This property has been a steady producer during the year, and has shipped more ore than any other property in the district. Good judgment has been displayed in the development of this mine, and there is a considerable amount of ore available for shipment. The company is also doing some work on the *Jersey Lily* group. About forty-five men have been steadily employed. Shipments to Trail, 4,371 tons.

Ore Hill.—This property is being developed under the direction of Mr. De Witt. A small 2-stamp mill is installed near the mine, which promises to become a producer in the near future. The ore is galena, carrying gold and silver values. Eight men are employed at the mine.

Aspen.—P. Horton is developing this property and intends shipping during the winter. Assay returns of sorted ore for shipment ran as follows: Silver, 123.4 oz.; gold, 0.68 oz.; zinc, 6 per cent.

Southern Bell Group.—C. E. Wilson, of Salmo, has done a considerable amount of work on this property and is reported to have a good showing. The ore is argentiferous galena.

Relief.—This mine is situated at Erie. A. D. Westby, the manager, reports that mining and development work have been carried on during the year. The cyanide plant has been closed during 1917 owing to the inability of being able to secure cyanide, zinc shavings, and other chemicals. New equipment, including a concentrating and sliming table, an amalgamator, and a 45-horse-power gas-engine, has been recently purchased, with the idea of saving the free gold and shipping the concentrates until such time as they can again operate their cyanide plant. Nine men are working.

OTHER PROPERTIES.

Orinoco.—M. Egan and partner made a shipment of 66 tons to the Greenwood smelter. The assay values ran as follows: Silver, 0.73 oz.; copper, 2.5 per cent.

Monarch Group.—This property is situated at Falls creek and is being operated by the Spokane Mining and Development Company, of Nelson. Development-work will be proceeded with during the winter months. The ore is a fairly low-grade copper, carrying small values in gold and silver.

California.—Six men are employed at the property. Twenty-seven tons was shipped to Trail during the season.

Spokane Group.—This property is situated on Wall mountain, in what is known as the Bayonne section. The original owners, with Laib Bros., are continuing with the development-work, which consists principally of two drifts on the vein. The upper drift has been driven along the vein for a distance of 120 feet and the lower drift for 285 feet. The vertical distance between the two drifts is 135 feet. The vein shows continuity, has a uniform dip of 80 degrees and an average width of 2.5 feet. There is a considerable quantity of ore exposed in the two drifts. The average values at present prices of metals would run about \$22 a ton in gold, silver, and lead, the principal values being in gold and silver. It is a promising prospect, which at present is handicapped by lack of transportation facilities.

Iva Fern Group.—This property is situated on Cultus creek, at a distance of six miles from Kootenay lake. J. Mulholland, the owner, who has been developing the property during the year, has now bonded it to the Consolidated Mining and Smelting Company.

Eureka.—Work is being carried on under the direction of J. Malone, of Nelson. Shipments will probably be resumed this winter. Shipping facilities have been greatly improved by building a short tramway to connect the mine with a new road leading to the terminal of the *Granite-Poorman* tramway. One thousand two hundred and forty tons was shipped to Trail last spring.

Granite-Poorman.—This property was operating all summer, but closed down in the fall. The ore was treated by a 20-stamp mill. Eighty-four tons of concentrates was shipped to Trail.

Trout Lake Mining Division.

Circle City Mines, Ltd.—The head office of this company is in Seattle, the company being incorporated under the laws of the State of Washington. George Brown is president and N. Ross is secretary. The properties being operated are a group of claims near Circle City, at a distance of seven miles and a half from Ferguson.

Present work is being confined to the development of the *Elsmere* group. The ore is galena, carrying values in silver, and occurs replacing the limestone near and along the contact between the limestone and the schist. The development-work, which has been steadily carried on during the year, will be continued during the winter months. A new trail was built to the mine from Circle City; permanent camp buildings have been erected; a small compressor plant has been purchased, and is on the ground.

Eight to ten men are working at the mine. The management reports that it is the purpose of the company to purchase a concentrating plant and aerial tramway this winter, with a view of making the installation as early as possible next spring.

Old Gold Group.—This property is owned by Conaway & Birch and is situated on the Duncan River slope at a distance of six miles from Circle City. A considerable amount of development-work has been done on this property, and some high-grade silver-lead ore was packed out last fall. The ore has to be packed over a divide and down to Ferguson, a distance of about thirteen miles. The formation consists of slates and graphitic schists, with intermittent bands of limestone. The ore occurs in the graphitic schists along the contact of and replacing the limestone. The mine is now closed down, being inaccessible in winter. Eight to ten men were working during the season.

True Fissure.—This mine is situated near Ferguson. Active mining and development work was carried on during the year under the management of A. Huston. It is reported that the mine is now closed down. I understand that ten to twelve men were working steadily during the season.

Triune.—Mr. Battey has been carrying out the development of this property, but I have no information as to the number of men employed or the nature of the work.

The *Copper Chief*, near Trout lake, was operated for a short time by Mr. Featherstonhaugh.

Arrow Lake Mining Division.

The *Millie Mack*, near Burton City, is the only property in this vicinity on which any work will be done this winter. Two men are working and expect to rawhide out 30 tons. The ore is an argentiferous galena.

Lardeau Mining Division.

Multiplex Mining, Milling, and Power Co., Ltd., of Revelstoke.—This company, of which O. T. Bibb is president and F. G. Wrightson is secretary, reports that progress is being made with the development-work, which is giving satisfactory results. They are contemplating the erection next spring of a concentrator, which will also treat customs ore. The property is situated on Poole creek, at a distance of one mile and three-quarters from Cambourne, and is easily accessible. Eleven men are working at the mine.

Winnipeg Group.—This property is situated near the end of the Cambourne wagon-road, and has been operated by Arthur Evans, who is reported to have about 20 tons of high-grade silver-lead ore ready for shipment.

Goldfinch Group.—Three men are reported to be working at this property, the work at present being confined to development.

Trail Creek Mining Division.

ROSSLAND CAMP.

The production of the Rossland mines for the year 1917 is far below normal owing to labour troubles at the mines, combined with smelter troubles, caused by a shortage of coke during the Fernie strike, and latterly by the smeltermen going on strike, which forced the closing-down of the works at Trail for a little over a month; the result being that no shipments were made from the Rossland mines during five months in the year.

It may be of interest to point out that during the previous four years the average annual gold production of the camp is nearly 60 per cent. of the total annual gold production of British Columbia.

The following table gives a comparison of shipments made during the last two years:—

	1916. Tons.	1917. Tons.
Centre Star	163,000	37,431
Le Roi group	130,000	50,464
Josie group	15,800	7,777
Velvet	124	...
White Bear .....	...	1,540
Totals	308,924	97,212

The Mountain Chief Group.—This property is situated at Renata. A considerable amount of prospecting has been done, disclosing irregular ore-bodies in a limestone formation. The average value of the ore is \$14 a ton, the values being in copper and silver.

TRAIL SMELTER.

The unstable conditions of the lead market in Canada, brought about by the Imperial Munitions Board being unable to place any more lead orders, caused the Consolidated Mining and Smelting Company to take drastic steps in the beginning of October to curtail lead-ore shipments to the smeltery.

A circular letter was sent to all the shipping properties, informing them that lead ores containing more than 4 per cent. zinc would not be acceptable to the smelter. This meant the closing-down of numerous properties and the outputs of others being greatly diminished.

The situation had such serious aspects that a meeting of mining men was called at Nelson on October 24th to discuss the matter with the representatives of the Consolidated Mining and Smelting Company, who finally consented to accept shipments after November 1st. This meant the immediate resumption of shipments, and everything appeared to be running smoothly, when a strike was called on about November 15th, and the smelter was again forced to close down until the middle of December. At a meeting of the lead-mine operators and the officials of the Consolidated Mining and Smelting Company, held at Nelson on December 27th, the company agreed to again accept shipments on and after February 1st, limiting the amount to be shipped each month by the various mines to the average of last year's monthly shipments. The silver contents and 25 per cent. of the lead contents will be settled for according to the terms specified in the circular issued by the company on November 5th. The remaining 75 per cent. of the lead contents will be stored and settled for only after the lead now on hand has been sold. As far as can be ascertained, the present situation will continue to exist until more lead is required for munition purposes.

Revelstoke Mining Division.

BIG BEND DISTRICT.

Mastodon.—This property is situated on La Forme creek, which enters the Columbia river nineteen miles north of Revelstoke. During the year a good trail has been built for a distance of six miles to connect the mine with the main trail up the Columbia river. Development-work, which has been actively carried on through the year, will be proceeded with during the winter months. About 20 tons of ore is sacked and ready for shipment. A sample of the ore sorted for shipment carried the following values: Silver, 36.8 oz.; lead, 60 per cent.; zinc, 7.6 per cent.

J. W. Evans, the manager, reports that he is well satisfied with the season's operations, and that recent development-work has disclosed a nice showing of ore near the shaft and at a depth of 110 feet below the surface. New cabins have been built at the mine. Six men will be employed this winter.

Montgomery Group.—Situated on Downie creek, which flows into the Columbia at a distance of thirty-six miles north of Revelstoke. The property consists of eight claims and is owned by J. C. Montgomery, of Revelstoke. The Granby Consolidated Mining and Smelting Company hold an option on this property, and during the summer had a gang of men stripping and trenching the surface. From reports received there is a large showing of pyrrhotite, carrying values in copper and gold. No definite information is to hand as to whether the Granby Company will continue the work next year or not.

The Government road which is being built up the Columbia river to the 19-Mile post is now completed to the 16-Mile post, and is already proving to be a great benefit to the miners and prospectors in the Big Bend country.

Lanark.—Situated near Illecillewaet, on the main line of the Canadian Pacific Railway. This mine has been working steadily during the year under the management of W. B. Dornberg, of Revelstoke. A little over 200 tons of concentrates has been shipped to Trail. It is reported that there is a good showing of ore in a 130-foot winze sunk from the bottom of the old workings, and that the ore runs: Lead, 10 per cent.; silver, 9 oz.; zinc, 7 to 8 per cent.

Mr. Dornberg is planning to add to the mill, thereby increasing the capacity to 150 tons. The additions will include a ball-mill, three tables, and a Zeigler flotation plant. The installation of a water-power plant is also being contemplated. Twenty-five men have been employed during the season, but very little work will be attempted during the winter months.

Key of Wealth Group.—Situated near the headwaters of Cariboo creek, which flows into the Illecillewaet river at Flat Creek Station, on the main line of the Canadian Pacific Railway. W. A. Thomason, of Revelstoke, has been doing some work on this property.

D. Woolsey is developing some claims up Silver creek not far from Albert canyon. A trail has been built to the property, which is approximately seven miles from the Canadian Pacific Railway.

WESTERN MINERAL SURVEY DISTRICT, No. 6.

PRELIMINARY REPORT BY W. M. BREWER, RESIDENT ENGINEER.

(Headquarters, Nanaimo.)

Under an Act passed by the Provincial Legislature during the 1917 session, that section of the Province which had heretofore been included in the Minister of Mines' Reports under the "Coast District" is now known as the "Western Mineral Survey District," and consists of the following Mining Divisions: Vancouver, New Westminster, Victoria, Nanaimo, Alberni, Clayoquot, and Quatsino, with the headquarters of the Resident Engineer at the city of Nanaimo.

Vancouver Mining Division.

The operations carried on by the Britannia Mining and Smelting Company, Limited, on Howe sound, about twenty-eight miles from the city of Vancouver, during 1917 reached a record both with regard to the amount of development-work performed in the mines and the quantity of ore treated in the mill at Britannia Beach. The tonnage of ore sent to the mill is estimated to be greater than in any previous year, and would have exceeded 500,000 tons but for the fact that during the early fall there was only a limited supply of water for power purposes, and the further fact that on the night of November 19th a freshet damaged the incline tramway to such an extent as to compel the company to close down the plant for several days for repairs, using only the aerial tramway in the meantime for transporting ore from the mine to the mill. This reduced the tonnage transported from 2,100 tons a day to about 700 tons.

In addition to the extensions of the development-work in the mines, the company had diamond-drilling plants boring on adjacent mineral claims near the headwaters of Seymour creek. As a result of this prospecting-work the Britannia Company during 1917 acquired by purchase several mineral claims in that locality.

Some idea of the great extent of the underground workings can be formed when it is considered that such aggregate approximately twenty miles, and are connected up by a system of main and transfer raises between the levels from the 2,200-foot level, at an elevation of 2,100 feet above sea-level, to the surface glory-holes at an elevation of 4,350 feet above sea-level.

The new adits, one on the 2,700-foot level or 500 feet lower elevation than the 2,200-foot level, and the other, known as the 4,100-foot level, or at an elevation of about 250 feet above sea-level, and on the same level as the top of the concentrating-mill, have been advanced, until each is now about 3,000 feet in length.

Eventually the lower adit, which is 9 x 13 feet in dimension, will be the main haulage-adit for transporting ore from the mine to the mill, and would have been advanced still farther during the past year but for the shortage of water in the fall, which curtailed the power.

The hydro-electrical plant has been very much increased during the past year, and a great deal of concrete-work has been done on the tunnel that carried the water from Furry creek, on the South Valley side of the Britannia Company's property.

The "glory-hole" system of mining was very considerably extended during 1917, until the total length of the main glory-hole is about 400 feet and the maximum width about 175 feet. The depth is 250 feet, or from the surface to the 250-foot level, from which the broken ore

passes into a "bulldozing" chamber, and down the system of rock raises to the 2,200-foot level, the main haulage-level at the present time.

The adit on the 2,200-foot level is 9 x 13 feet in dimension and 4,712 feet in length. The haulage system is by electric motors, which haul trains of loaded cars either to the rock-house at the upper terminus of the aerial tramway on the 2,200-foot level, or along the switchback railway to the upper terminal of the surface incline, which is equipped with skips having a capacity of 18 tons of ore each. This incline is one mile in length and extends from the 2,700-foot level, or about 1,600 feet above sea-level to the top of the mill, or 250 feet above sea-level.

OTHER PROPERTIES.

Except at the Britannia mines, there was comparatively little serious mining development in the Vancouver Mining Division during 1917, but there was quite considerable prospecting-work carried on, and, due to the improvements made by the Department of Mines to some of the main trails, prospectors extended their investigations.

The *Bowena* mine, on Bowen island, was worked during a portion of the past year.

The most extensive prospecting done was on Jervis inlet, about thirty-five miles from Britannia in a north-westerly direction, where the following named operators did serious work:—

Hy. W. Treat, of Seattle, had a force of miners working on the *Treasure Mountain* group of mineral claims the entire summer.

R. J. MacLean and associates worked on the *Norman* group, owned by the Norman Copper Company, of Vancouver. This group is situated on Britain river, which empties into Jervis inlet at the head of Prince of Wales reach.

The *Jolley* group and the *Baramba* group, on Hotham sound, an arm of Jervis inlet, were well prospected during 1917, the first named by Geo. A. MacLeod and associates, of Vancouver, and the last named by the Baramba Mining Company, of the same city.

In addition to this work, there was considerable prospecting done in the mountains that border the Jervis inlet and neighbouring waters, especially by E. Prendergast, of Vancouver, and Thos. Lillie, of Pender Harbour.

Seymour and Lynn creeks and Indian river, all of which flow into Burrard inlet on the north side, were popular fields for prospectors and received more attention than for several years past, which resulted in numerous mineral claims being staked.

New Westminster Mining Division.

The greatest activity in the New Westminster Mining Division during 1917 was in the vicinity of Jones lake, in the Cheam range of mountains, about eighty miles east of Vancouver City.

A group of mineral claims was located in the summer of 1915 by a party of prospectors from the town of Hope, owing to the discovery of outcroppings of high-grade chalcopryite ore. The group of claims was bonded to the Foley, Welch & Stewart interests in 1916, and a diamond-drilling plant was installed and prospecting commenced. This work was carried on more extensively during the past season, and was only suspended when the snow interfered, but will be resumed next spring, when it is expected that a transportation system will be installed to connect the mine-workings with the Canadian Northern Pacific Railway at St. Elmo Station.

A discovery of molybdenite ore was reported during the summer at a point about seven miles east of Agassiz Station, on the Canadian Pacific Railway, and about one mile and a half from the railway-track.

The operations at the *Empress* group, situated about three miles east of Agassiz, were suspended during last summer on account of litigation, after shipments of about 100 tons of high-grade ore had been made to the Trail smelter.

Prospecting-work was performed near the head of Pitt lake during the past season on five groups of mineral claims by Paul Briant, of Vancouver.

Mineral-bearing outcroppings near Elkins point, on Gambier island, Howe sound, were prospected by James N. Carlyle during the summer of 1917.

Victoria Mining Division.

There have been several noticeable features in the progress made in the mining industry in the Victoria Mining Division during 1917, chief among which are the following:—

Sunloch Group.—This group of mineral claims, located on the Jordan river, about two miles from the British Columbia Electric Railway Company's power plant, by Geo. E. Winkler in 1916,

was bonded during the spring of 1917 by R. H. Stewart and associates, who have carried on systematic development-work and opened up a very wide shear-zone in the "Metchosin volcanics" country-rock near the contact between that rock and the Sooke and Carmanah sandstone and conglomerate. In this main shear-zone there occur several zones mineralized with chalcopyrite. The width of each of the mineralized zones is so great as to give promise of possibly developing into a big mine. The fact that the workings are located within about two miles from the power-station, and within about 6,000 feet of the end of a logging-railway, ensures cheap power and transportation.

On the southern slope of Mount Maguire, on the East Sooke peninsula, O. H. Gurle and associates have been developing the ore-bodies on the *Margaret* group of mineral claims and have made several shipments of chalcopyrite of commercial grade to the Ladysmith smelter. Development-work has demonstrated that at the point where the mine-workings are located there is an ore-body of about 250 feet in length which is exposed for a maximum width of about 40 feet and a minimum width of about 12 feet by a depth of about 25 feet, with all indications pointing to the depth continuing persistently.

Late in the fall of 1917 the *Willow Grouse* group, at East Sooke, was bonded by the Ladysmith Smelting Company, from which property ore had been shipped to the Tacoma smelter.

About one mile from the southerly shore of Cowichan lake and about six miles from its outlet, the *Blue Grouse* and *Sunnyside* groups of mineral claims have been worked during 1917. From the former about 1,400 tons of chalcopyrite ore has been shipped, and some shipments were made from the last-mentioned group, but most of the work done on that group is of a development nature.

Nanaimo Mining Division.

Outside of the old-established colliery companies, there has been considerable activity in the coal-mining district on Vancouver island, all of which are located in the Nanaimo Mining Division.

The most important new work done is that performed by the Granby Consolidated Mining, Smelting, and Power Company, Limited, in the vicinity of Cassidy's Crossing, on the Esquimalt & Nanaimo Railway, about eight miles from the town of Nanaimo, where several diamond-drill holes were made on tracts of land secured from old settlers, and late in the fall the construction of buildings for a permanent camp was commenced.

Diamond-drill borings were also made by Hy. Whitney Treat and associates on the foreshore near the mouth of the Chemainus river.

At Nanoose, about ten miles north-westerly from Nanaimo, the coal-mining property known as the "Old Jack" property was acquired by the Nanoose Collieries, Limited, and opened up early in 1917, when shipment of coal to outside markets was commenced and has been continued on an increasing scale during the year.

The collieries operated by the Western Fuel Company at Nanaimo; the Canadian Collieries (Dunsmuir), Limited, at Extension and Cumberland; the Pacific Coast Coal Mines, Limited, at South Wellington; and the Vancouver-Nanaimo Coal Mining Company, which operates the Jingle Pot mine, near Nanaimo, produced a greater tonnage of coal than during 1916, but the two first-named companies were considerably handicapped by a shortage of coal-miners and the limitation of the production of the old mines. The last-named company was compelled to seal up their mine, the Jingle Pot, in November owing to the breaking-out of a fire.

The Western Fuel Company reopened the old Harewood mine, south of Nanaimo, during the summer of 1917, and also carried on extensive diamond-drilling operations, with a view of locating advantageous positions at which to sink new slopes, in order to increase the output of coal to meet the greater demand that has suddenly arisen owing to the shortage of fuel-oil.

The Canadian Collieries (Dunsmuir), Limited, opened a new slope at South Wellington in the fall of 1917, near the old Alexandra mine, which has been closed down for the last fifteen years, and will commence shipping coal after the railroad is built to connect the new mine with the Esquimalt & Nanaimo Railway tracks.

The metalliferous-mining industry in the Nanaimo Mining Division is principally confined to Texada and Quadra islands, but there has been some further prospecting-work carried on in the mountains adjacent to the many inlets and fiords that penetrate the mainland as far north as Seymour inlet, the most southerly arm of Queen Charlotte sound, and also near the headwaters of Little Campbell river and on Adams river, in the north-easterly portion of Vancouver island.

On Texada island the *Marble Bay* mine has been a regular shipper during 1917, and the company has opened stopes on the ore-bodies exposed by diamond-drilling below the 1,300-foot level, and in addition has extended the development-work on the 1,400- and 1,500-foot levels. It is encouraging to note that the ore-bodies at these depths maintain the same average values as those nearer the surface.

The *Retriever* mineral claim, near the west coast of Texada island, was bonded in the spring of 1917 by Wm. H. Lee and Wm. McDonald, of Vananda, the owners, to B. F. Raymond and associates, of Puyallup, Wash. Since then the property has been actively operated and developed by several hundred feet of working openings. On this property there occurs a system of fissure-veins in porphyrite country-rock. The vein-filling is quartz carrying some galena, iron, pyrites, chalcopyrite, and sphalerite.

Late in the fall of 1917 the *Loyal* mineral claim, one of the properties owned by the bond-holders of the old Vananda Copper and Gold Company, was leased, and the lessees commenced serious prospecting and development work. This property was first worked by the Vananda Company in 1899, when a considerable tonnage of bornite and chalcopyrite ore was shipped to the old Vananda smelter; later the *Loyal* mineral claim was leased to Charles Jacobs, of Seattle, but it has lain idle since about 1906.

On Quadra island steady shipments were made by Jones & Rant, of Victoria, for most of the year 1917, from the *Ingersoll* group of mineral claims, the property of the Valdes Island Company, but during the fall the property was worked by the owners, who extended the development-work and commenced systematic prospecting in an endeavour to determine more fully the conditions at greater depth than the ore has yet been found.

Quatsino Mining Division.

The development-work commenced in 1916 by the Coast Copper Company, a subsidiary company to the Consolidated Mining and Smelting Company, of Trail, on the *Old Sport* group of mineral claims was continued through 1917, and a survey was made for a railway from Elk lake, near the shore of which the mineral claims are located, to the South-east arm of Quatsino sound, a distance by survey of sixteen miles. An incline winze has been sunk 480 feet deep below the main adit level, and long drifts driven on the ore-body from a station which was made at the 430-foot level.

The water-power on the Marble Canyon creek has been developed and furnishes the power to drive the compressor plant, hoist, and pumps, and the mining camp has been enlarged to accommodate the increased force of miners.

The Granby Consolidated Mining, Smelting, and Power Company commenced prospecting with a diamond-drilling plant on the *Tecta River* group of mineral claims, located on the west side of the South-east arm of Quatsino sound, about three miles above *Yreka* landing. This group of claims contains an occurrence of quartz, apparently of considerable extent and carrying low-grade values in gold, silver, and copper. It is being developed to furnish a siliceous flux for the smelters of the company at Anyox.

At the *Yreka* group of mineral claims a new wharf, bunkers, and aerial tramway were erected during the spring of 1917, and a shipment of about 1,000 tons of ore was made, but later all work was suspended owing to some trouble between the owners of the mine and N. S. Clarke, of Seattle, who held an option on the property, and Sam Silverman, of Seattle, who built the wharf, bunkers, and tramway.

There was considerable prospecting-work done during the season of 1917 in the mountains in the vicinity of the West arm of Quatsino sound, and also in the neighbourhood of Holberg, where some specimens of high-grade bornite ore were found.

Clayoquot Mining Division.

The most notable event in connection with the mining industry in the Clayoquot Mining Division during 1917 is the installation of a concentrating-mill on the *Indian Chief* group of mineral claims, on Sidney inlet, on the west coast of Vancouver island. The Tidewater Copper Company, of which Sam Silverman, of Seattle, is manager, has had a force of miners employed continuously on development-work in the mine in order to open up as much ore as possible to supply the concentrating-mill to its capacity.

Except the work being carried on at Sidney inlet, and some investigations made by the B. L. Thane Exploration Company, of Seattle, into the deposits of magnetite in Nootka sound, as

well as examinations made by mining engineers representing various mining and smelting companies searching for copper properties, there has not been any marked activity in the Clayoquot Mining Division during 1917.

Alberni Mining Division.

In the Alberni Mining Division the most important development-work done during 1917 is that which has been carried on at the *Monitor* mine, on Alberni canal, where under the management of J. A. Skene an ore-body was discovered outcropping close to high water on the canal. This was developed by a drift-adit about 200 feet in length, with crosscuts at frequent intervals.

The results from this work were sufficiently satisfactory to Samuel Ryder, of England, for him to purchase outright the *Monitor* as well as the adjoining *Happy John* group of mineral claims, and to have a bunker, wharf, and compressor plant installed.

The *Marble Cove* group of mineral claims, owned by George E. Smith and associates, of Alberni, was partially developed by the owners during the summer of 1917, and later bonded, when the development was continued and a wagon-road constructed connecting the mine-workings with the beach.

The *Canadian* mineral claim, on Alberni canal, was further prospected by Wm. Hutton for the owners—himself and Geo. Dickson—who went overseas with a battalion in 1916, and a considerable tonnage of chalcophyrite ore of a good grade mined ready for shipment.

PROFITS OF MINING COMPANIES.

The following statement shows the dividends declared by operating metalliferous-mining companies during the calendar years 1913, 1914, 1915, 1916, and 1917:—

Name of Company.	1913.	1914.	1915.	1916.	1917.
British Columbia Copper Co., Greenwood Consolidated Mining and Smelting Company, Trail	\$ 88,756 348,264	\$... 464,376	\$... 493,425	\$... 841,050	\$1,258,438*
Standard Silver-Lead Min'g. Co., Silverton Co., Grand Forks	899,911	449,955	449,955	1,049,896	\$1,874,210†
Hedley Gold Mining Co., Hedley	360,000	300,000	300,000	240,000	240,000
Le Roi No. 2, Ltd., Rossland	43,830	...	58,440	...	29,199
Rambler-Cariboo Mines, Ltd., Three Forks	...	...	35,000	70,000	35,000
Standard Silver-Lead Min'g Co., Silverton	650,000	475,000	250,000	600,000	300,000
Utica .....	...	...	...	...	64,000
Totals	\$2,390,761	\$1,689,331	\$1,586,820	\$2,800,946	\$3,800,847

* This includes \$261,935 earned and declared in 1917, but payable January, 1918.

† This includes \$374,362 earned and declared in 1917, but payable January, 1918.

The amount of \$3,800,847 shown above as distributed profits for the year 1917 by no means represents the total of net profits earned during that year. A glance at the published accounts of several of the companies for their respective last fiscal years will make it clear that in these several instances there was as well a substantial sum placed to the credit of Profit and Loss Account.

For instance, the annual report of the Granby Company for the fiscal year ended June 30th, 1917, shows net profits for the year of \$4,196,529, and a total surplus of the company as being at that time \$9,434,039. Similarly, the net profits of the Consolidated Company for the year are greater than the dividend disbursements.

Profits accruing to small companies and individual mining enterprises as a rule are not given publicity as dividends as is the case with the large companies, so that no record of these profits, which in the aggregate are considerable, is available.

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