

BRITISH COLUMBIA
DEPARTMENT OF MINES

HON. WM. SLOAN, Minister.
R. F. TOLMIE, Deputy Minister. W. FLEET ROBERTSON, Provincial Mineralogist.
JAMES MCGREGOR, Chief Inspector of Mines.

BULLETIN NO. 1, 1921

PRELIMINARY REVIEW AND
ESTIMATE OF
MINERAL PRODUCTION
1920

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 1920, 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.,

December 30th, 1920.

PRELIMINARY REVIEW AND ESTIMATE OF MINERAL PRODUCTION FOR THE YEAR 1920.



THIS bulletin has been prepared before the receipt of the official reports for the year 1920 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 1920 of a total value of \$35,580,625, which, it will be seen, as estimated, is \$2,284,312 greater than that of 1919, or equivalent to an increase of about 7 per cent.

It is extremely gratifying that British Columbia's mining industry has been so well maintained, notwithstanding the fluctuating metal market, and despite generally unsettled conditions, that it is possible to report an increase in 1920 over the value of the production of 1919.

It is to be remembered, too, that other mineral-producing sections of America have of late been announcing reductions in mineral-output, a fact which emphasizes the very satisfactory showing of this Province.

The gold production of the Province for the year 1920 amounted in value to \$2,707,698, a decrease from the preceding year of \$729,447. This might have been expected, as the mining of gold, with its fixed value, has in these times of high cost of labour and supplies for some years past offered little encouragement and even less at the beginning of this year, on the eve of what promised to be a period of unstable prices. With what is now an assured promise of lower costs of supplies and living, it would seem that gold-mining would again become profitable, and we may confidently look for an increased gold production in the near future.

With the other metals during the past couple of years it has been a battle of prices, of wild fluctuations in the market values of the metals, causing an uncertain market demand for ores, for smelters could not buy ores in the face of an impending drop in the market values of the contained metals and the subsequent loss.

To indicate how fluctuating the market has been, a chart has been prepared to accompany this Report, which shows the monthly fluctuations of metal-market prices from 1913 to date.

It is quite apparent, from the chart, that there has been a great drop from war-days in all metal prices, but, for all this, it is to be noted that the market prices even at the end of the year are not lower than the normal pre-war prices, at which profitable mining was carried on.

It is an admitted fact that, with the metal copper for instance, there is not a company in British Columbia, nor probably in the United States, that under present existing conditions can produce copper for within some cents a pound of the present market price of 13½ cents; the same is more or less true of the other metals.

This has resulted in the shutting-down of productive copper-mining, which cannot again be started up until the prices of the elements entering into and making up the costs of mining and treatment of ores are greatly reduced, or when the market prices of the metals are greatly raised, and with some assurance of continuance at such higher level.

As to the first of these alternatives, there seems to be a tendency to a material reduction in price of the essential factors making up the mining costs, which will eventually so reduce the cost of mining as to permit of operations being again profitably carried on.

As to the second alternative, a rise in metal prices, until these meet the cost of production, this is bound to come eventually when the world's markets again approach normal conditions, and when that will be depends upon how soon the world—particularly Europe, where our great market lies—settles down to pre-war industry and is able to buy our products.

These conditions apply particularly to the larger and lower-grade mines, necessarily working on narrower margins per ton, rather than to the high-grade ores produced in smaller quantities and with wider margins between costs of production and selling-prices.

It will be noted that during the year 1920 the prices of all the metals were held up to a fair and uniform price during the first nine months of the year, and then, about the end of August, all metal prices simultaneously dropped about 40 per cent. to the present prices, which are unreasonably low and below the cost of production.

This sudden collapse of prices was not due to any condition of mining or of the metal market, but was the reflex action of industrial conditions the world over, entirely apart from the mining industry.

It is reassuring to find, in the face of all these untoward conditions, that nevertheless the metalliferous mines of the Province, as a whole, still made an increase over the preceding year of \$105,157, making an estimated total output of \$20,142,155.

The fluctuations of the market, already referred to, have caused some strange anomalies, as shown in the accompanying table of production; for instance, the quantity of silver and of copper produced in 1920 is each greater than was produced in 1919, but the average yearly price of both metals was so much lower in 1920 that the value of the product of both these metals is less than in 1919.

On the other hand, we produced a much smaller quantity of lead in 1920 than in the preceding year, but the average selling-price of lead in 1920 was higher, with the result that the value of the lead product in 1920 shows an increase over 1919.

The very great increase in the quantity of zinc produced and in the value of this year's zinc product is entirely due to the increased operations of the Consolidated Mining and Smelting Company at the company's *Sullivan* mine in East Kootenay.

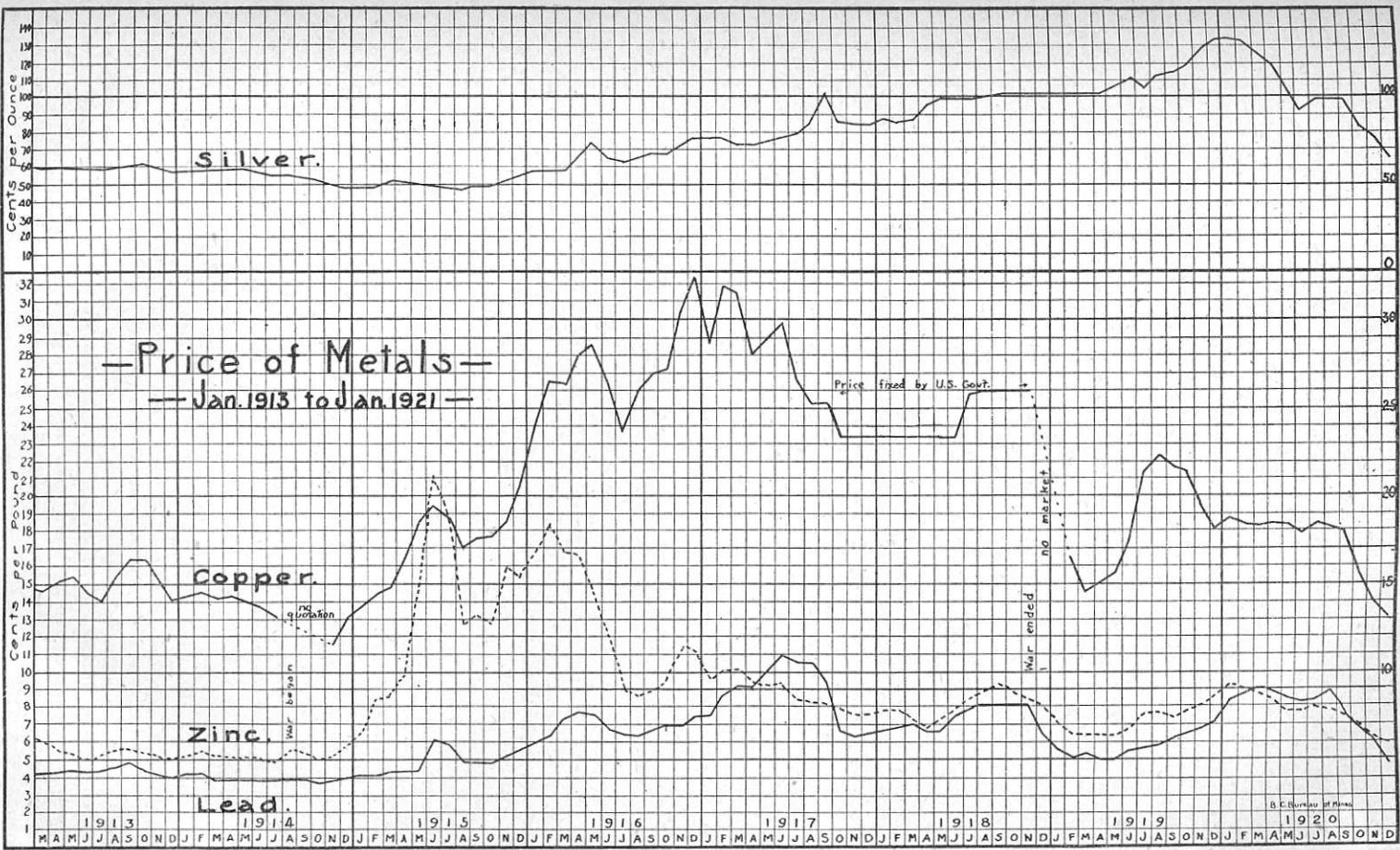
During the last half of the year, in other places there has been little or no market for zinc ore, and a very small volume of sales of the metal; several of the larger zinc mines and refineries in the United States closed down early in the fall.

The collieries of the Province have more than held their own this year, having made a net coal production of 2,712,228 tons, valued at \$13,561,140, and 68,190 tons of coke, valued at \$477,330. The total value of the colliery products for the year was \$14,038,470.

The net coal production for 1920 exceeds that of the previous year by 444,687 tons, and, as a matter of fact, it has only once been equalled in quantity—i.e., in the year 1910, when it was but slightly greater.

The old adage that "It's an ill wind that blows nobody good" is illustrated by the falling-off of the California oil-supply, thus causing a greatly increased demand for coal, particularly from the Coast collieries.

There was no coke made by the Coast collieries this past year; the Crowsnest Pass Colliery produced 68,190 tons, an increase over its last year's output.



MINERAL PRODUCTION FOR TWO YEARS, 1919-20.

The following table shows the quantities and value of the several minerals produced in the year 1919 and the estimated production in 1920. It may here be explained that the prices used in calculating the estimated value for 1920 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, 1919-20.

	PRODUCTION, 1919.		ESTIMATED PRODUCTION, 1920.			
	Quantity.	Value.	Quantity.	Value.	Increase.	Decrease.
Gold, placer.....oz.	14,325	\$ 286,500	13,250	\$ 265,000		\$ 21,500
Gold, lode.....oz.	152,426	3,150,645	118,176	2,442,698		707,947
Total gold.....		\$ 3,437,145		\$ 2,707,698		\$ 729,447
Silver.....oz.	3,403,119	3,592,673	3,404,926	3,265,324		327,349
Copper.....lb.	42,459,339	7,939,896	42,773,660	7,485,390		454,506
Lead.....lb.	29,475,968	1,526,855	21,545,047	1,540,471	\$ 13,616	
Zinc.....lb.	56,737,651	3,540,429	76,765,268	5,143,272	1,602,843	
Total metalliferous.....		\$20,036,998		\$ 20,142,155	\$ 105,157	
Coal.....tons, 2,240 lb.	2,267,541	\$11,337,705	2,712,228	\$13,561,140	2,223,435	
Coke.....tons, 2,240 lb.	91,138	637,966	68,190	477,330		\$ 160,636
Total collieries.....		\$11,975,671		\$14,038,470	\$ 2,062,799	
Miscellaneous and building material..		\$ 1,283,644		\$ 1,400,000	116,356	
Total production.....		\$33,296,313		\$35,580,625	\$ 2,284,312	

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 1920 is estimated at \$265,000, of which practically all is obtained in the Cariboo and Cassiar Districts, only about one-thirteenth of the total coming from the other districts. An approximate apportionment is as follows: From Cariboo District, \$80,000; Atlin Division of Cassiar District, \$150,000; Stikine and Liard, \$15,000; remaining parts of the Province, \$20,000. 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 have been received. This estimated production for 1920 shows a decrease from the preceding year of \$21,500, or about 7.5 per cent.

During the last four years the production of placer gold in the Province has steadily decreased. The chief reason is to be found in the economic conditions of high prices for labour and supplies, which made placer-mining less profitable than in former years. Shortage of labour also handicapped operations.

Definite information is not yet available regarding the Atlin Division, but it is known that the production was considerably less than in 1919, and that some of the former operating companies were closed down during the year.

Lode Gold.—The value of lode gold produced in 1920 is estimated at \$2,442,698, as compared with \$3,150,645 in 1919, a decrease of \$707,947, or 22 per cent.

The decrease in 1920 is due to a big reduction in output from the Boundary-Yale District, a decline of approximately \$355,000 as compared with 1919. During the year 1919 the Granby Company closed its mines and smelter in this district and therefore only made a small production, cleaning up the old smelter-site. The low-grade copper ore handled carries small gold and silver values, and in former years this gold production amounted to a considerable total. The *Nickel Plate* mine in this district also made a decreased production and closed down in November.

Formerly the Rossland mines contributed annually about half the Provincial output of lode gold, but in 1920 it only produced about one-eighth of such output, or about 60 per cent. of the 1919 output from that district.

The following table shows the gold production of 1919 and the estimated production for 1920:—

	1919. Oz.	1920. Oz.
Cassiar District	60,076	62,561
Rossland	50,229	30,230
Boundary-Yale	33,526	16,359
Coast (Southern)	5,514	6,312
Lillooet	2,506	120
Nelson	297	2,133
All others	278	461
Totals	152,426	118,176

From the above table it will be seen that the only districts to show an increase are the Cassiar, the Southern Coast, and the Nelson Districts; in the first two cases the increase is due to extended copper-mining and in the last case to a renewal of operations by the *Nugget* mine.

The *Surf Inlet* mine maintained its output, and the *Premier* mine, in Salmon River district, began production on a more extensive scale.

The production of gold in British Columbia during each of the last three years has only been about one-half that of those years before the war, and shows that gold-mining in this Province has, as elsewhere in the world, been adversely affected by the conditions of high costs and a standard price for the product. Nevertheless, from the developments now in progress it would seem that in a short time the annual production of gold in British Columbia should increase considerably.

Silver.

The quantity of silver produced is estimated to have been about 3,404,926 oz., worth \$3,265,324, an increase from the production of 1919 of 1,807 oz., but, owing to the lower market value of silver, a decrease in value of \$327,349.

The market price of silver gradually but steadily fell during the whole year of 1920; the average price for the month of January was 132.83 cents an ounce, while for the month of December the price was about 65.8 cents an ounce, with a falling market. The average price for the year, with December partially estimated, was 100.985 cents an ounce.

An accompanying diagram illustrates the fluctuations of market prices.

The following table shows the silver production for 1919 and the estimated production for 1920:—

	1919. Oz.	1920. Oz.
Slocan and Slocan City	1,556,714	919,390
Skeena	920,413	1,438,082
Fort Steele	205,500	193,000
Boundary-Yale	231,599	296,650
Ainsworth	167,453	243,150
Coast (Southern)	104,806	109,873
Windermere-Golden	68,634	53,030
Nelson	44,280	17,000
Omineca	72,573	105,000
All others	31,147	29,751
Totals	3,403,119	3,404,926

An increased total production of silver for the Province this year over the preceding year of 1,807 oz.

The above table shows an increase in the silver production from the Omineca, Skeena, Southern Coast, Boundary-Yale, and Ainsworth Districts, with decreases in all the others.

The greatest increase was made in the Skeena District and is accounted for by new shippers entering the lists. Two of these, the *Premier* and the *Dolly Varden* mines, give promise of swelling the silver production very materially during future years.

The greatest decrease is found in the Slocan District, where mining has been greatly retarded due to labour troubles with the O.B.U., and has nothing to do with the mines proper.

These differences, amounting each to about 500,000 oz., almost balance.

It is a pleasing surprise to find a very considerable increase in the Boundary-Yale District, despite the cutting-off of the production of the Granby and Canada Copper Corporation, which formerly produced 50 per cent. of the silver of the district.

The silver-output of this district this year is chiefly derived from the *Providence*, *Waterloo*, *Horn Silver*, *Sally*, and *Bell* mines.

Copper.

The amount of copper estimated to have been produced in 1920 shows, as compared with the previous year, a slight increase in quantity, but, owing to the lower market selling-price, a decrease in value. The production is estimated at 42,773,660 lb., which is 314,321 lb. more than the 1919 output; the value for this year is \$7,485,390, which, compared with \$7,939,896 made in 1919, shows a decrease of \$454,506.

The demoralized condition of the copper market during 1919 was referred to somewhat fully in the opening pages of the bulletin for that year, so that it is not necessary to discuss it here, further than to say that the market during 1920 continued to be unsettled, with but very slight sales; the market price was, however, maintained from January to September at between 18 and 19 cents a pound.

In October the monthly average price fell to below 16 cents, for November it was about 14¼ cents, and for December about 13.3 cents, and a falling market price. The average price for the year was about 17.47 cents a pound. The phenomenal variations in the market price of this metal is best shown in a diagram accompanying this report.

The following table shows the production of copper, according to districts, in 1919 and the estimated production in 1920:—

	1919. Lb.	1920. Lb.
Skeena	20,411,421	22,863,197
Coast (Southern)	17,062,100	18,295,034
Boundary-Yale	3,835,516	867,679
Trail Creek Division	1,112,133	742,750
All others	38,169	5,000
Totals	42,459,339	42,773,660

From the above table it will be seen that there are substantial increases in the two Coast districts, but decreases in other districts.

The great decrease is in the Boundary-Yale District, occasioned by the closing-down of the Granby Company's mines and smelter, while the Canada Copper Corporation plant at Allenby has not yet become an important producer.

The *Marble Bay* mine, one of the oldest of the steady producers, was not operated this past year.

Lead.

The total amount of lead produced in 1920 is estimated to have been 21,545,047 lb., valued at \$1,540,471. This represents, as compared with the previous year, a decrease in quantity of 7,930,921 lb., but with the higher market price of lead an increase in value of \$13,616.

Lead is the only one of the metals the market price of which was greater than in 1919, the average price for year 1920 being 7.944 cents a pound.

Immediately after the Armistice and during early part of 1919 the price of lead in New York fell to 5 cents, but by the end of the year had gradually risen to 8 cents, and remained at about that price until September, 1920, when, in company with all the other metal prices, it fell rapidly, and at end of the year had reached the pre-war standard of about 4 cents.

The following table shows the production of lead, according to districts, for the year 1919 and the estimated production for 1920:—

	1919. Lb.	1920. Lb.
Fort Steele	10,729,483	10,000,000
Slocan	12,156,845	6,154,034
Ainsworth	4,336,602	3,176,984
Windermere-Golden	1,659,279	1,175,562
Nelson	292,010	700,000
All others	301,749	338,467
Totals	29,475,968	21,545,047

From the above table it will be seen that the decrease in output was general in all districts, and shows that the different mines throughout the Province were forced to curtail their outputs.

Fort Steele Division again leads all other districts. The *Sullivan* mine contributes nearly all of this production as a rule, but this year nearly 2,000,000 lb. came from the *North Star*.

In the Slocan District the heaviest producer in 1920 was the combined Clarence Cunningham mines, followed by the *Bosun*, the *Silversmith*, and the *Standard*.

In the Ainsworth Division the largest producer was the *Florence*, with an output of about 1,400,000 lb., followed by the *Spokane-Trinket*, with approximately 450,000 lb., and about seventeen smaller shippers.

The lead production of Nelson Division comes mainly from the *Emerald* mine, and this mine produced very much more than in the previous year.

The production from Windermere-Golden was chiefly from the *Paradise* mine, with a production of about 1,250,000 lb., and four small shippers.

Zinc.

The quantity of zinc estimated to have been produced in 1920 amounted to 76,765,268 lb., which, compared with 56,737,651 lb. produced in 1919, shows an increase of 20,027,617 lb. This production is valued at \$5,143,272, which shows an increase, as compared with the 1919 value, of \$1,602,843.

The zinc market was not as much affected as the copper and lead markets by the transition period from war demands to peace conditions, with the result that the price of the metal did not fluctuate greatly and production continued uninterruptedly.

During the latter half of 1920, although the prices of the metal were sustained, there were but small sales and the market for zinc ore disappeared, while many zinc-smelting plants and mines on this continent closed down temporarily at least.

The average price in New York for the year was about 7.9 cents a pound; the market price at end of the year was about 5.8 cents.

The following table shows the production of zinc, according to districts, for 1919 and the estimated production for 1920:—

	1919. Lb.	1920. Lb.
Fort Steele	46,460,703	70,000,000
Slocan	10,015,624	6,157,075
Omineca	224,539	450,000
Ainsworth	36,785	158,193
All others .....	.....	.....
Totals	56,737,651	76,765,268

Some uncertainty is felt as to the estimated production of zinc this year, as labour troubles have been general in the zinc-producing districts and considerable ore has been shipped to the United States, of which account has not been received.

From the above table it would seem that most of the zinc ore mined in the Province this last year was from the Fort Steele District. The output in this district is made by the *Sullivan* mine, and the increase was due to a larger tonnage being sent to the Consolidated Company's electrolytic zinc-refinery at Trail, where the ore is treated.

In the Slocan District the heaviest shipper was again the *Standard*, with a production of nearly 3,000,000 lb., which, however, is 2,000,000 lb. less than in 1919. The next largest shipper was the *Idaho* mill, followed by the *Silversmith*.

The estimate for Ainsworth shows a greatly increased production, and final figures may bring the output for this Division up considerably higher.

The Omineca production is mainly a silver-zinc concentrate from the *Silver Standard* mine at Hazelton.

Other Minerals.

Iron.—So far there has been no iron produced in British Columbia, but 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.

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 "Bessemers limit" to supply ore for such a plant.

As far as reports so far received would indicate, there has been very small, if any, production this past season of platinum, molybdenite, or chromite.

Manganese.—Nearly 600 tons of manganese ore was shipped in 1920 from *Hill 60* property on Cowichan lake. During the latter part of the year shipments ceased and development-work only was carried on at this property.

Non-metallic Minerals.—About 7,500 tons of fluorspar concentrates was shipped from the *Rock Candy* group, in the Grand Forks Division. This property is owned by the Consolidated Mining and Smelting Company and is equipped to make steady shipments in the future. The growth of this property has been very interesting during the last two or three years. The property is now equipped with an efficient concentrating-mill, in which about 20,000 tons of ore was treated, producing nearly 7,500 tons of concentrates, carrying about 87 per cent. calcium fluoride and 6 per cent. silica, and having a total value of about \$175,000. The mineral is shipped to the Trail smelter and is used for making hydrofluoric acid, which is used in the lead-refinery, and to other points in Canada and to the United States.

Shipments of magnesium sulphate (Epsom salt) were made from Spotted lake, Osoyoos Division, but figures have not been obtained. About 1,100 tons of magnesium sulphate was said to have been shipped from deposits of this material near Clinton.

Deposits of hydromagnesite in the Clinton Division, which are reported to be large and of great purity, have attracted considerable attention during the past year. No shipments have been recorded.

A production of arsenic valued at \$15,000 was made by the *Nickel Plate* mine in 1920.

Talc.—Some 100 tons of talc was mined and ground in the Victoria Mining Division, for which product there appears to be a large demand.

Iron Pyrites.—At the *Sullivan* mine in East Kootenay some 4,300 tons of iron pyrites was mined and shipped to Trail.

Structural Materials, etc.

The output during 1920 of all structural materials, such as cement, lime, building-stone, sand and gravel, brick, and other clay products, will probably show a slight increase this year.

The output for 1920 is estimated at \$1,150,000, as against \$1,148,485 in the preceding year.

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 to about \$1,000,000 represents the steady yearly demand for these materials for repairs, renewals, etc., without new construction-work.

Portland cement is at present the most important item in the production of building materials, amounting this year, it is estimated, to about 300,000 barrels.

During the fall of 1920 an unexpected and unaccounted-for demand for Portland cement for export to the Orient developed, and the two cement plants on the Coast, which had been running on less than half-time, were obliged to get into operation to their full capacity.

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 2,818,821 long tons, of which 106,593 tons was made into coke, leaving the net production at 2,712,228 tons. These figures show an increase, as compared with 1919, of 409,873 tons gross and an increase of 444,687 tons net. The quantity of coke made was about 68,190 tons, which is a decrease of about 22,948 tons as compared with 1919. For purposes of comparison the following table is shown:—

	1920 (Est.)	1919.	1918.	1917.	1916.	1915.
Coal, gross..... tons, 2,240 lb.	2,818,821	2,408,948	2,578,724	2,398,715	2,485,580	1,972,580
Less made into coke..... "	106,593	141,407	276,479	248,740	401,487	361,451
Coal net..... "	2,712,228	2,267,541	2,302,245	2,149,975	2,084,093	1,611,129
Coke made..... "	68,190	91,138	188,967	159,905	267,725	245,871

In these figures for 1920 the output for the month of December has had to be estimated as an average of the preceding eleven months; consequently the final figures may vary from them slightly.

Summarizing the Provincial production of coal, the following table shows the estimated output for 1920:—

	Tons of 2,240 Lb.
From Vancouver Island collieries	1,801,731
From Nicola and Similkameen collieries	154,162
From Crowsnest District collieries	861,649
From Telkwa collieries	1,279
Total quantity of coal mined	2,818,821
Less made into coke	106,593
Net quantity of coal produced	2,712,228

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	Nil.
From Nicola and Similkameen collieries	Nil.
From Crowsnest District collieries	68,190
Total	68,190

As will be seen by the above figures, the net coal production this year is expected to be some 444,687 tons (2,240 lb.) more than it was in 1919; in fact, it is the greatest production made in any year except 1910.

Coke.—The production of coke in 1920 was about 68,190 tons (2,240 lb.), which is 22,948 tons less than the preceding year, a decrease of about 25 per cent.

The coal-mines of the Province have had a fairly good year.

VANCOUVER ISLAND COLLIERIES.

The Vancouver Island collieries made a gross output of about 1,801,731 tons of coal, or 102,383 tons more than 1919.

Canadian Western Fuel Co.—This company mined this past year about 697,260 tons of coal, an increase from the previous year of 58,695 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 Reserve Colliery is situated about 5 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.

Canadian Collieries (Dunsmuir), Ltd.—This company operates two collieries—Comox Colliery, situated at Cumberland, 70 miles north of Nanaimo, and Wellington-Extension Colliery at Extension, 6 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, which latter was not operated this past year.

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

The estimated gross output of coal for this colliery during the year is 459,779 tons (2,240 lb.), a decrease of 92,417 tons from 1919.

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

Three mines were operated during the year, Nos. 1, 2, and 3, entered by a tunnel 5,000 feet in length. The output for the year was about 199,558 tons, a decrease of 26,156 tons as compared with 1919.

The new slope known as No. 5 mine is being developed at South Wellington, from which the output for the year was about 91,348 tons, an increase of 5,840 tons over 1919.

Pacific Coast Coal Mines, Ltd.—This company operated the Morden mine throughout the year; the mine is situated about 6 miles south of Nanaimo and produced about 100,108 tons during 1920, an increase of 34,265 tons from 1919 production.

The Squash 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.—The output for the past year was about 1,441 tons.

Nanoose-Wellington Coal Co.—This colliery is situated at Nanoose bay, about 10 miles north of Nanaimo, and is operating in the Old Wellington seam. The output for this colliery during the past year was 44,996 tons, an increase of 23,354 tons from the previous year.

Granby Colliery No. 1.—The new colliery of the Granby Company at Cassidy Siding produced about 207,236 tons of coal during the year, an increase of 134,351 tons over 1919 production.

NICOLA-SIMILKAMEEN COALFIELDS.

These coalfields produced in 1920 about 154,162 tons, an increase over the previous year of 5,120 tons.

In the Nicola District four companies produced coal during 1920—viz., the Middlesboro Collieries, Limited, the Fleming Coal Company, the Princeton Collieries, and the Coalmont Collieries.

The Middlesboro Colliery produced about 93,403 tons during the year, an increase of 15,853 tons over the previous year. The mines in operation were Nos. 4, 4 East, 7, and 8.

The Fleming Coal Company operated the Coal Hill mine during the year. The production for this colliery was about 31,190 tons, a decrease from the previous year of 7,920 tons.

At Princeton, in the Similkameen, the Princeton Coal and Land Company produced about 21,985 tons, practically the same as produced in 1919.

The Coalmont Collieries produced 7,584 tons, a decrease from the previous year of 2,605 tons.

EAST KOOTENAY COALFIELD.

There were only two companies producing in this field during 1920—the Crow's Nest Pass Coal Company, operating collieries at Coal Creek, situated 5 miles east of Fernie, and Michel, situated 23 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 861,649 tons of coal, an increase of 302,843 tons over the previous year.

Of this tonnage, about 106,593 tons was used to make coke and yielded about 68,190 tons of coke; as compared with the 1919 output these figures show an increase of about 11,123 tons of coke produced.

The mines which were in operation throughout the year at Coal Creek Colliery were No. 1 North, No. 1 South, No. 1 East, B North, and Nos. 2 and 3; the largest producing mine at the present time being No. 1 East. This produced approximately 431,646 tons.

Michel Colliery had three mines in operation throughout the year—viz., No. 3 East, New No. 8, and Old No. 3 mine. This colliery produced approximately 273,659 tons.

Corbin Coal and Coke Co.—The output of this company for the year was approximately 156,344 tons, being an increase of 76,597 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.

NORTHERN COALFIELD.

Telkwa Collieries Co.—Late in the fall of 1918 production on a small scale was started by this company. The colliery is situated 4½ miles from Telkwa, a town on the Grand Trunk Pacific Railway. About 1,279 tons was mined and shipped to Prince Rupert in 1920, and a continued production is expected.

MINING DISTRICTS OF BRITISH COLUMBIA.

NORTH-WESTERN MINERAL SURVEY DISTRICT, No. 1.

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

(Headquarters, Prince Rupert.)

This district is comprised of eight Mining Divisions—Bella Coola, Skeena, Queen Charlotte, Nass River, Portland Canal, Stikine, Atlin, and Liard—and includes all the coast, islands, and north-western portion of the Province north of the head of Vancouver island. The Portland Canal Division has been increased by a portion of the Nass River Division.

This year has been in this district, without doubt, a most progressive one for the mining industry. Prospectors are realizing the fact that the district affords unusual advantages for them in every way, and the increase this year in their numbers and activities has been apparent.

The number of field engineers in the district throughout the year is evidence that the larger mining companies are alive to the possibilities of this portion of the Province.

A greatly increased amount of development-work has been done by the owners of claims, the small mining operators, and the large companies, with an encouraging percentage of favourable results. The "broker mining operator" has had, with few exceptions, very little encouragement, the investing public wisely preferring to back up the property that has been investigated and reported upon by a reputable mining engineer, and whose development will be under the supervision of a competent mining man.

Further exploration of the properties that have come into prominence in the last year or two has been very gratifying, and the installation of plants is under way that will ensure their permanency as producers.

The following is an estimate of the output for 1920:—

Name of Property.	Location.	Ore mined.	Gold.	Silver.	Copper.
		Tons.	Oz.	Oz.	Lb.
Atlin (placers)	Atlin .....	.....	6,300	.....	.....
Stikine and Liard (placers)	Telegraph Creek }				
Granby Consolidated Mining, Smelting, and Power Co.	Anyox	818,534	9,160	439,238	25,304,400
Golskiesh Mines, Ltd.	Anyox	3,550	585	1,625	.....
Taylor Engineering Co. (Dolly Varden)	Alice arm	28,700	....	870,000	.....
Esperanza group	Alice arm	18	4	3,788	.....
Premier Gold Mining Co.	Stewart	850	2,701	92,183	.....
Patterson group	Porcher island ...	17	50	30	.....
Ikeda Mines, Ltd.	Ikeda bay	141	26	290	21,088
Drum Lummon Mines, Ltd.	Drum Lummon bay	32	31	540	39,600
Belmont-Surf Inlet Mines, Ltd. ...	Surf inlet (about)	100,000	50,000	30,000	800,000

The above returns are for the full year, with the exception of the Granby Consolidated Mining, Smelting and Power Company and the Taylor Engineering Company, whose outputs for December are estimated, but which will be very close to the final figures. Unfortunately, I have been unable to get the returns from the Belmont-Surf Inlet Mines, Limited, in time for this report, but they may be considered as equalling last year.

The tonnage mined has increased by nearly 200,000 tons, due to Granby and the *Dolly Varden* mines. Though Granby's gold production has nearly doubled, yet the shortage in placer gold holds the total about the same as 1919. Silver has increased over 500,000 oz., due to the splendid output of the *Dolly Varden* mines and the notable increase of nearly 100,000 oz. from Granby. Copper production is greater by about 5,750,000 lb., due to the Granby Company, the aggregate of the smaller shippers being about the same as last year.

There is every reason to believe that the above list of shippers can maintain their present outputs, and in the case of the Premier Gold Mining Company, Limited, greatly increase it when it gets into its shipping stride. With the probability that new shippers will be developed within

a year or two and the maintenance of the above production, the mining industry of this district is in a very substantial position.

The following short review of the mining situation will be taken up under the headings of the different Mining Divisions:—

Bella Coola Mining Division.

The yearly assessments have been kept up on the older locations, but I have no information as to any further activity. Mining engineers who have been in that country this summer claim that it is a very likely looking area for prospecting.

Queen Charlotte Division.

The mining situation is about the same as reported last year, the only work of any moment being on the west coast in Kootenay harbour. Otherwise very little development-work has been done. The only shipper on the islands, the *Ikeda*, closed down early in the summer.

The usual applications have been filed for prospecting oil lands on the west coast of Graham island. Shales, said to be saturated with oil, are reported from the interior of Graham island and are being investigated by oil company representatives.

The oil locations taken over by Lewthwaite & Wright on the east coast of Graham, and on which it was proposed to spend \$150,000, had about 30 feet drilled on them about 2 miles below Lawn Hill. No cap was needed for the "well."

Investigations were made of the black sands along the east coast of Graham island, but operations did not get any farther. Better success has been made of the beach placers on the east side of Masset inlet, of which more definite information will be available for the Annual Report.

South Easter Mining Co., Ltd.—This company has had a couple of men engaged in surface work during the summer, but there is no intimation of the resumption of work on a larger scale. Property was described in Minister of Mines' Report of 1918.

Producer Group.—This property has been under bond and development for about two years to Seattle interests, who ran a 375-foot crosscut tunnel to the vein and then drifted both ways on it. Some bunches of fair-grade copper ore were encountered, but the work as a whole did not disclose any ore sufficiently encouraging to continue, so the claims reverted to the owners. There is a good small equipment of compressor, etc., on the property. There is about a foot of fair-looking ore in the face of the south drift, and a little more work might prove that the ore rakes to the south from the surface and therefore is still ahead.

Ikeda Mines, Ltd.—This property, which has been a steady small shipper of copper ore for a number of years, closed down about the end of July. The shipping grade of ore is exhausted, but it was hoped by the manager, Mr. Ikeda, that sufficient capital could be interested for the purpose of exploring and developing several shoots of low-grade ore cropping on the claims and the later installation of a concentrator for its treatment. Capitalists from Japan, with their engineers, investigated the property to their satisfaction, and I am informed that negotiations are under way for its disposal. It is to be hoped that the *Ikeda* will be restored to the shipping class.

I am indebted to A. Ikeda for the following returns for the year's shipments: Total tonnage shipped to Anyox smelter, 141.4, yielding 21,088 lb. copper, 290 oz. silver, and 26 oz. gold, which is about half as much as last year's output.

Campbell Island.—In the absence of the owner, the only new work I could see was that the shaft has been sunk a further few feet. It was full of water, but, judging from the dump, the ore is chalcopryrite in a hornblende gangue. The chalcopryrite did not appear to be in sufficient quantity to sort to a shipping product. The island is very low and heavily overburdened and consequently the mineralization is hard to trace.

Copper Queen Group.—This group is situated overlooking Jedway harbour and is owned by J. S. McMillan. The showings have been sampled a couple of times this summer by engineers, but nothing further has developed.

Swede Group.—This is an old group located at Lockeport. The showing consists of an immense deposit of low-grade copper, chalcopryrite, and bornite, in diabase. Recent tests made on the ore show appreciable values in platinum, which might warrant a pretty thorough investigation of the property. It is ideally located on tide-water, has timber for all purposes, and ample water for power and other needs within a short distance of the claims.

Shuttle Island.—A little placer gold has been produced in the last year or two, but I am informed that practically nothing has been done this year.

Blue Mule Group.—This group consists of three claims—*Blue Mule*, owned by J. H. Jones, Skidegate; *Paystreak No. 1*, owned by E. P. Wiggs, of Queen Charlotte City; and *Paystreak No. 2*, owned by Geo. McRae, of Skidegate. The group is located about half a mile from the beach, in Kootenay harbour, which is about 30 miles south of Skidegate channel, on the west coast of Moresby island. The claims were staked only last fall, but a good comfortable cabin has been built at the beach and considerable work done on the showings by the owners.

The country-rock is a basic igneous rock, in which lie parallel shear-veins of brecciated quartz and country-rock, all more or less pyritized. The vein gangue varies from country-rock, in which are small veinlets of quartz, to almost pure quartz. Occasional specks of free gold can be seen in the quartz, and the pyritized portions carry good gold values where no free gold can be detected. Colours can be obtained by panning anywhere along the vein, and in places good values are shown. From the beach to the foot of the hill on which the claims are located is a broad belt of dark bluish limestone in which are veins and stringers of pure calcite.

Several parallel veins have been discovered in the igneous formation, only two of which have had any work done on them. The "lower vein," on the *Blue Mule* claim, lies about 100 feet north of the limestone-belt and has been exposed for over 400 feet in length by open-cuts and stripping; 26 inches across the vein in one of the cuts assayed \$10 gold and trace of silver to the ton.

The "middle vein" is a small one cropping in a few places, but has had no work done on it. The upper or "big vein" shows up for 600 or 700 feet along the surface and varies in width up to 6 feet in places. Specks of free gold can be seen and colours can invariably be obtained in panning. Good depth could be gained at one place, where the vein crops along the face of a bluff, with a short crosscut tunnel to the vein, and then by drifting both ways on it some idea could be gained as to the average values to be expected in actual mining. It is a strong, well-defined vein, and as such, with free gold showing and good gold values in the pyritized material, is worth investigation.

The work done on the old *Chapman* claims, now included in this group, does not expose anything very promising either in size or values. Some very rich ore was reported from there years ago, but the vein is very small and the values erratic.

Skeena Mining Division.

More interest has been taken by the prospector in the coast and islands this year than formerly, and quite a number of locations have been made.

Belmont-Surf Inlet Mines, Ltd.—This company, at Surf inlet, on Princess Royal island, has been under continuous operation all year, and, though no returns of the output is yet available, I believe it will show an increase over last year. Many additions and improvements have been made to the camp, until at present it is thoroughly up to date and one of the best camps in the country so far as working conditions and comfortable living-quarters are concerned.

Much development-work has been done, especially on the lower levels—that is, below the No. 4 level, which is the main working-tunnel—and an adequate reserve of ore maintained.

The company has acquired the *Pugsley* mine adjoining it. Over 2,000 feet of drifting has been done in drifting on the vein, in ore identical with that of the *Surf Inlet* mine.

Wells Claims (Surf Inlet).—This group is about three hours' walk from the Belmont-Surf Inlet camp over a fair foot-trail, rather steep in spots. The camp is at an elevation of 2,300 feet and the tunnel a short distance above the camp on the left side of the creek. The work done on the claims consists of a tunnel and some stripping along the vein-cropping. The tunnel has been driven about 300 feet, following a quartz vein lying in a shear-belt in the granite country-rock. The first 150 feet from the collar of the tunnel shows a small vein, varying in width up to 2 feet, of pyritized quartz. At this point the tunnel swings to the left and has been driven on a vein in the hanging-wall for the balance of the distance to the face, the last 60 feet being from 4 to 5 feet in width. The face now shows about 3 feet 6 inches of well-pyritized quartz which, judging by the Belmont-Surf Inlet ore, should be of fair grade.

Up the gulch and above the mouth of the tunnel the vein is seen cropping for a width of 10 feet—3 feet on the hanging-wall of banded quartz and gneissoid granite, then 2 feet of quartz, then 3 feet of gneissoid granite, and 2 feet of quartz on the foot-wall. Altogether it is a very

promising showing and justifies further development if the average values are sufficient to make it a milling-grade ore.

Mr. Wells, the owner, and one of the original owners of the Belmont-Surf Inlet property, certainly deserves commendation for the amount of exploratory work accomplished under such difficult conditions.

Whale Channel Mines, Ltd.—This company, whose head office is in Vancouver, owns three claims—*Moose*, *Moose 2*, and *Moose 3*—situated on the north end of Princess Royal island, just south of Rivers bight. The showings are about a mile from the beach at an elevation of about 450 feet. A quartz vein averaging about 6 feet in width has been traced on the surface for several hundred feet by open-cuts at intervals along it, and at its lowest cropping a tunnel has been driven about 70 feet. The first 25 feet of the tunnel follows the quartz on the strike of the vein, which here lies rather flat; then turns to the right for 45 feet, going through the quartz into the foot-wall country-rock. The vein strikes N. 70° E. and dips at about 40° north. The vein exposed in the tunnel shows very little mineralization. A short distance up the hill from the mouth of the tunnel a shaft was sunk on the vein about 12 or 14 feet, judging from the size of the dump, for the shaft itself was full of water. The quartz here shows a little mineralization of pyrite and chalcopryrite in small veinlets in the seams. Both the tunnel and the shaft are evidently old work.

Farther along on the vein two open-cuts have been put in this summer, showing the quartz to be more broken up and therefore considerably mineralized, but of a low-grade average copper content. I do not know what the gold values are. The upper of these two cuts shows the vein to be about 8 feet wide, fairly well mineralized, and badly broken and distorted. Indications on the upper end of the cut are that the vein splits up and disappears in stringers in the country-rock. There is no work above this to show the continuation of the vein. The enclosing rock formation seems to be more of a gneissic phase of the granite, due to intense shearing action, rather than a schist.

The work done shows that where the vein has been disturbed there has been infiltration of the mineral-bearing fluids and deposition of the iron and copper sulphides. Not enough work has been done to prove whether the ore-shoots are extensive enough or valuable enough to work.

Great West.—This claim is owned by W. Warner and is situated on the east side of Banks island, about opposite the anchorage on McAuley island. The showing on the claim is a quartz vein lying in a small band of diorite which cuts across a belt of gneissoid granite. Two or three open-cuts have been driven on the vein, opening it up for a length of about 50 feet and showing the vein to average about a foot in width. The dioritic dyke and the vein are apparently cut off or faulted at the upper end of the open-cut by the granite. Though there is some chalcopryrite showing in the quartz, I think the vein too small and too tight in the surrounding formation to become of any importance.

Payroll Claims.—These are two in number—*Payroll* and *Payroll No. 2*—owned respectively by Jas. Hickey, of Prince Rupert, and partner. They are situated at the head of Kiltuish inlet or Long inlet on the south side of Gardner canal, opposite Low point, and about 15 miles from Verney passage. There is a fine anchorage in the inlet. The rock formation in which the vein lies is hornblende-schist, which at this point must be close to its contact with the granite, as all the float-rock along the creek is granite. The showing consists of a quartz vein, about 6 feet wide, heavily mineralized with pyrrhotite, with a little chalcopryrite disseminated throughout the quartz and iron sulphide. The claims were staked this summer and the only work done is a few shots put in just above high-tide mark. The ore is evidently low grade, about 1 per cent. copper, and I find carries only a trace of gold and silver, but its location is such that a very low-grade ore would pay, and I therefore think that it would be worth while to open it up a little to get away from surface influences.

Up the hill at an elevation of 500 feet, and also in the schist formation, the owners have dug into the soft decomposed schists and disclosed a width of from 10 to 15 feet of graphite. It occurs in widths from 1 inch to 2 feet interstratified in the schist. If there is any market for such material, this is surely easy of access, and conditions for extraction and loading are ideal.

Drum Lummon Copper Mines, Ltd.—This property, situated on Drum Lummon bay, 26 miles above Hartley bay on the west side of Douglas channel, has been working all season. The work has been confined mainly to driving the main drift a distance of about 170 feet and two crosscuts.

This main drift has been on the vein all the way until the last 100 feet, when the vein cut out. The acidic dyke along which the vein makes has been followed for that distance. A nice bunch of ore was encountered in the vein just before it pinched and stopped out and milled this summer, producing 37 tons of concentrates, yielding \$620 gold, \$543 silver, and \$6,930 copper.

The *Bald Mountain* group, on Porcher island, has had a little stripping and trenching done this summer, but nothing new is reported.

The *Paterson* group also on Porcher island, has had a very creditable amount of work done on it this year. This consists of a deep open-cut on the vein, which is now opened up for a length of 80 feet or more, from which ore can be mined. There is now a considerable tonnage on the dump to be sorted and a small shipment has been shipped this summer, of which I have as yet no information as to tonnage or values.

Besides the mining-work, the owner has also done a lot of construction; a small ore-bin was built at the level of the lowest cut and a 300-foot tramway then built to take the ore from the bin to a level place on the side-hill below where an arrastra is being built to grind the ore. Power will be furnished by an overshot water-wheel. Water will be carried by a ditch over 1,000 feet in length, which has been dug around the side-hill from a small creek draining a small area on the eastern side of the mountain. A flume about 50 feet long carries the water from the ditch to the top of the water-wheel. This has all been done by one man this summer, Percy Sharp, and it is unfortunate that there are not more prospectors in the country like him. It is to be hoped that his scheme of concentration will prove a success. The showings were described in 1919 Report.

The *Eagle* claim, owned by Joe Dawson, had the yearly assessment-work done. There may have been further development-work done, but in the absence of the owner when I was on the property I was unable to locate it.

GRAND TRUNK PACIFIC SECTION.

There has been very little mining activity along the railroad this year. Several claims were staked on the opposite side of the Skeena river from Salvus by Phil Chesley and Doc. Stanwood. These cover a large area of granite which carries a small percentage of graphite. There is an immense tonnage if there is any market for this grade of graphite, which I would think might be of value for lubricants or some such use.

LAKELSE (THORNHILL MOUNTAIN) SECTION.

Yearly assessments have been done on all the old locations in the section and I have not heard of any new ground being staked. The Micaud Bros., of Terrace, have shown up some very fine-looking molybdenum on the *Ptarmigan* group, and Olsen & Dahl have done some more work on the *Lucky Seven* group, but have not taken out any free gold this year.

On the *Iron Hat* mineral claim, owned by A. Olsen, of Terrace, the tunnel has been extended to 70 feet and has every appearance of getting into the ore-shoot exposed on the surface. The face now has about 3 feet of quartz streaked with country-rock, all fairly well mineralized with iron sulphides, which carry the gold values. Free gold can be panned along the vein, and if the ore develops to any extent in the tunnel a small concentrator may be warranted later. There is water for power and milling for three or four months in the year on the property.

Golden Penny.—This claim is owned by Ernest Hault and adjoins the *Iron Hat* on the north. A tunnel has been driven 36 feet, following a small quartz vein about a foot in width in a schistose country-rock. It is a similar occurrence to the *Iron Hat*, but is not so well mineralized and contains a small percentage of chalcopyrite in spots. Rather small as yet, but worth prospecting.

KITSUMGALLUM LAKE SECTION.

Several prospects have been under development this year by the owners and several new prospectors have been going over the country. Two of them, Baldwin and partner, cut out a trail up Nelson Creek for a distance of 13 miles to get into that section to prospect. This is very commendable work and should be encouraged.

Treadwell No. 2.—Joe Belway and partners, the owners, were on the property all summer.

Motherlode Group.—There are three claims in the group, owned by Oscar Gendron and Jack Couture, with whom are associated Olander and Brodine. The claims are situated at the head of Falls creek, which flows into Kitsumgallum lake at the north-east end. A good horse-

trail has been built by the owners to this and other claims in that area from the head of the lake. The cabin had just been finished, elevation 5,200 feet, and work commenced on the claims early in August. The slide just above the cabin is covered with float consisting of schistose rock in which are bands of quartz mineralized with zinc-blende, galena, chalcopyrite, grey-copper, and occasionally native silver. If the amount of float is any criterion, there should be a considerable width of mineralization. I have not heard anything further of the property, but it was the intention of the owners to start a tunnel near the top of the slide and crosscut into the hill to try to pick up the vein.

Bear Group.—This group consists of four claims—*Bear, Hawk, Whistler, and Goat*—owned by Mat Allard, of Terrace, and associates. There is a good horse-trail from the lake to the claims, built by the owners. Most of the work has been done on the Bear claim and consists of open-cuts along the vein, exposing it for a distance of 600 or 700 feet. The country-rock formation is schist, striking N. 10° E. and dipping slightly east into the hill. The vein conforms to the strike and dip of the schists.

The vein is quartz and averages about a foot in width. The predominating minerals are iron sulphides and galena. A depth of probably 60 feet could be obtained by drifting from the lowest exposed part of the vein to underneath the highest showing. Very fine free gold can be panned all along the vein, especially in the honeycombed quartz enriched by the elimination of the iron sulphides. I believe that a small concentrating plant would be profitable, though the vein is small. There is plenty of water in Falls creek, about 600 feet below the showings, where a small mill could be located and from which transportation to the lake would be easy.

Sunlight Group.—There are two claims in this group—*Marmot and Sunlight*—owned by Egan & McKinnon, of Terrace. There is a branch trail from the *Bear* group trail to the foot of the hill below the claims. The rock formation is a banded blocky slate striking N. 80° E. and dipping about 30° to the north. The vein-filling is quartz, varying in width from a seam on the west end, where the tunnel is started, to 12 feet on the top of the cropping, and conforms to the strike and dip of the country-rock. Work done consists of an incline shaft 17 feet deep sunk on the vein, showing a vitreous quartz sparingly mineralized with iron pyrites and traces of chalcopyrite. There are a few inches on the hanging-wall of galena and zinc-blende assaying 40 per cent. lead, 20 oz. silver, \$2 gold, and 3 per cent. copper. A tunnel has been started at an elevation of 3,800 feet from a gulch on the west end of the vein. A 12-foot open-cut was made and continued a further 14 feet as a tunnel, following a seam of black gouge, to which the vein has pinched at this point. Another 20 feet would put the tunnel under a point on the surface, about 30 feet above, where the vein crops for a width of 12 feet. Although the values as yet are low, I think the size and strength of the vein warrant the driving of the tunnel under the main croppings.

Assessments have been done up Cedar river on prospects owned by Olander and others. The Kitsumgallum Lake country should not be overlooked by prospectors.

Nass River Mining Division.

The optimistic view taken last year of the mining outlook for this Division has been verified this year by the progress made in the development of a number of very promising prospects. The results obtained give one every reason to believe that several of them will be brought to the producing stage. The operation of the *Dolly Varden* railroad is a long step toward opening up a mineral-producing area up the Kitsault river, and the size of and the values in the veins being opened up give good reasons for predicting that this area will quickly develop into a very productive one.

The outposts of the two important producing properties make this the leading mineral-producing Mining Division of the Province. The Granby Consolidated Mining, Smelting, and Power Company, Limited, will exceed last year's output in gold, silver, and copper, and the Taylor Engineering Company, operating the *Dolly Varden* mines at Alice arm, will nearly double its last year's production of silver.

OBSERVATORY INLET SECTION.

Golskeish Mines, Ltd.—This company is capitalized for 50,000 shares at \$1 a share, with its registered office at 602-6 Pacific Building, Vancouver. Its holdings consist of four mineral claims—*Golskeish No. 1, Golskeish No. 2, Silver Cup Frac., and Silver Cup Frac. No. 4*—situated on Deep bay, 4 miles below Anyox. The property, under the management of H. Heidman, has

this year produced 3,550 tons of ore, yielding 585 oz. gold and 1,625 oz. silver. The Granby Company buys the ore for fluxing purposes, paying a minimum fixed price; any excess of values in the ore over that price is paid the owners.

The ore is a slightly pyritized quartz carrying gold and silver values averaging around \$4.50 a ton. Some very fine specimens of free gold in galena have been found in places. The vein averages about 6 feet in width and lies in an argillite rock formation. An open-cut has been mined out on the surface, 450 feet long and from 20 to 25 feet deep, showing the vein to be very regular in strike and dip. Last winter a crosscut tunnel was driven from a convenient height above tide-water to allow for loading into scows, 226 feet to the vein gaining about 90 feet of depth on the ore. Drifts have been run both ways from the tunnel on the vein, 100 feet to the left and 30 feet to the right, from which stopes are being opened, putting the mine in fine shape to mine and ship economically. Scows are moved both ways by the Granby Company.

Mr. Heidman has equipped the property with a good compressor and mine outfit and a comfortable camp on the beach. About fourteen men are steadily employed.

Granby Consolidated Mining, Smelting, and Power Co., Ltd.—This company has been operating steadily all year, employing an average of 1,277 men—mining, 368; smelting, 285; coke plant, 131; housings, 140; and service departments, 353. The output is substantially in excess of last year. There were smelted 818,534 tons of the company's own ores, which includes the Hidden Creek ores and the Granby Point quartz. The company also mined 14,763 tons of quartz for flux from the *Rambler* claim, but as it contains no values is not included in the above tonnage. There were received from the lime-quarries at Swamp point 47,177 tons of lime-rock, also used for flux.

The 818,534 tons of ores mined and smelted by the company yielded 9,160 oz. gold, 439,238 oz. silver, and 25,304,400 lb. copper, or an increase over last year of 4,296 oz. gold, 90,830 oz. silver, and 5,759,812 lb. copper.

The coke and by-product plant converted 126,000 short tons of coal, mainly from the company's coal-mines on Vancouver island, producing 77,290 short tons coke, 5,986 short tons breeze, 737,057 imperial gallons tar, 2,465,955 lb. sulphate, 1,203,954 cubic feet gas, and 121,734 imperial gallons refined benzol.

KITSAULT RIVER SECTION.

Black Bear or Esperanza Group.—This is what was known in the early days as the "Roundy property" and now owned by Salinas, Vaughan & Luffgren. Small tonnages of high-grade silver ore has been shipped from this property each year for several years. Pedro Salinas this year mined and shipped 18 tons, giving returns of 3.4 oz. gold and 3,788 oz. silver. A more thorough exploration of this property might disclose valuable shoots of ore. I understand that negotiations are under way for the sale of the property to Toronto interests.

Alice Arm La Rose Mining Co., Ltd.—This company was incorporated early this year to take over the *La Rose* group on Paul Kladuc creek. It is capitalized for 1,000,000 shares at \$1 a share, with its registered office at Prince Rupert. Some work has been done this summer by the new company under the supervision of Miles Donald, one of the original owners. The old shaft was retimbered and put in shape to continue sinking. A crosscut tunnel was driven 42 feet to reach the "big quartz-showing" that crops on the surface, striking N. 80° E. and dipping to the north at about 60°. This vein had just been broken into when the work was closed for the winter. Small values in silver (2.2 oz. a ton) with traces of chalcopyrite and galena were found, which is distinctly encouraging, as no values were found in the croppings.

Central Group.—Some work was done by the owners in extending the upper tunnel, but nothing new has been reported.

Ruby.—Work on this claim was continued this summer by J. C. Smith, of Seattle, Wash., who has it under bond. In the absence of Mr. Smith at the time I was in the camp this fall, I have no information as to the results of work.

Toric Group.—This group was bonded early in the spring and no work done until the expiration of the bond this fall. Some open-cutting was done in tracing the vein up the hill above the tunnel and native silver found.

Tiger Group.—This property was under bond to H. B. Price and considerable work done on it a year ago, by way of diamond-drilling and tunnelling. Unfortunately, in the absence of the owner, I was unable to get over the property to see what work had been done before the bond

was thrown up. Mr. Pickett seems to be in no way discouraged as to the merits of the property, but owing to ill-health has not done anything this summer on it.

Musketeer Group.—This group is now owned by A. D. Meenich, of Seattle, Wash., by purchase from the original owners. The work done consists of a tunnel driven for 72 feet, following along the wall of the vein, and at 54 feet a cut of 10 feet across the vein. Mr. Meenich claims very satisfactory values in this vein. A crosscut tunnel also was driven 72 feet and a north-and-south drift of 27 feet run from the end of it. Some bunches of ore show in the back and walls of the crosscut tunnel, but nothing in the north-south drift. For the amount of work done the showing is very encouraging.

Wolf Group.—This adjoins the *Musketeer* on the north. It is owned by the Taylor Engineering Company, whose plans call for its extensive development this winter. It is expected that a big tonnage of milling-grade ore will be developed.

Climax Group.—This group is owned by Olie Bisner, of Prince Rupert, and M. P. Olsen. Only assessment-work has been done this year.

Moose Group.—This group was owned by Don Cameron and associates and bonded this summer to Vancouver interests, who have incorporated under the name of the Moose Group Mining Company, Limited, with a capitalization of \$100,000 in 1,000 shares. Cameron has done considerable work on the claims in open-cutting, etc., and some very fine ore was found. Last winter he ran a tunnel under one of the most likely showings, but found that the vein was badly broken up at the point encountered.

The company had just completed two fine big log buildings when I was on the property this fall (October 23rd). Two tunnels are to be driven this winter on the vein, which should go a long way toward proving the property. From later information I believe that work being done in extending Cameron's tunnel is proving very satisfactory. The property has all the surface ear-marks of developing into a mine. P. W. Racey, of Vancouver, is consulting engineer on the property.

Last Chance Group.—This group, owned by McPhail, Morley & Kolbeck, of Alice Arm, was extensively explored last winter and this spring by H. B. Price, who had a bond on the property. Several diamond-drill holes were put in, but apparently the results were not satisfactory, as the bond was terminated, the claims reverting to the owners.

Columbia Group.—This group is owned by Pete Anderson, who has driven about 80 feet of tunnel on it this summer, packing everything on his back from the *Dolly Varden*. As stated in last year's report, there is a big strong quartz vein on the property, in which very little values were obtained on the surface. The 80 feet of drifting on the vein this summer has not exposed any commercial ore, the owner claiming to have had an assay of \$6 a ton in gold.

Mineral Claims Development Co., Ltd.—This company is capitalized for 1,000,000 shares at \$1 a share, with office at 1004 Standard Bank Building, Vancouver. The holdings consist of the *Homestake* group at the head of the Kitsault river, about 8 miles above the *Dolly Varden*. Little or no work has been done on the showings (except in Vancouver) since the property was acquired over a year ago. Wm. V. Somerville and associates are the principal owners. I understand that the payments on the property are being met.

The *Matilda* claim, owned by A. Smith, and the *Fox* claim, owned by Oscar Flint, and situated above the *Homestake* group, have had some work done on them this summer by the owners, who also built a trail to the claims from the *Vanguard* trail.

The *Vanguard* group was worked on all summer by the owners. I was unable to get up to the higher claims this year on account of the snow, but expect to do so early in the spring.

McLennan Silver Mines, Ltd.—This company, capitalized for 1,500,000 shares at \$1 a share and with offices in Vancouver, took over the *Royal* group of claims, adjoining the *Dolly Varden*, last winter. Work done was under the supervision of President McLennan and consisted of a little open-cutting and a lot of advertising, the most of the ore being found in the latter, for the vein, like Cassius, "hath a lean and hungry look." Announcements to the contrary, the wonderfully rich ore refused to be there and operations and the president ceased. No bunkers were built on the railroad.

Alice Arm Silver Mining Co., Ltd.—This company, operating the *North Star*, employed about ten men for eight months of the year. A good compressor plant was installed this summer, machines and other equipment provided for the mine, and the property is now in good shape to go ahead and make the work count. Work has been resumed and will go ahead all winter with

ten or more men employed. Very good ore is at present being broken in the tunnel and hauled to the railroad for shipment next spring. Jas. McAleenan is in charge of operations.

Taylor Engineering Co., Ltd.—The mines department of this company has been steadily operating the *Dolly Varden* mines all year under the management of C. B. North. For the past seven or eight months, while the railroad could be operated, shipments have averaged about 150 tons a day, the total tonnage for the year being 28,700 tons, yielding 870,000 oz. silver. To accomplish this the railroad had to be practically regraded, heavier rails laid for several miles, additions made to the rolling-stock, storage and loading bunkers constructed at the dock and a high line built to them from the main railroad, mine power and equipment increased, and mining systematized. In addition to this, the railroad-grade was extended nearly a mile beyond the mine towards its completion to the *Wolf*, about 2½ miles above the *Dolly Varden*. An hydro-electric power plant of 500-horse-power capacity was installed just below the *Wolf*. Ore-bunkers were built along the railroad and rails laid to them in preparation for driving No. 6 level this winter.

Little or no development-work has been attempted during the summer, but an extensive programme has been laid out for this winter. Several raises will be driven through from the No. 5 to the No. 4 level; No. 5 level will be thoroughly opened up for the extraction of the ore-bodies proven by diamond-drilling, between that level and No. 4. The new No. 6 level will be driven a distance of 300 feet or more and a raise put through from it to the No. 5 level, a distance of 450 feet. The completion of this work will enable all ore from any part of the mine being brought from the No. 6 level to the railroad bunkers.

ILLIANCE RIVER SECTION.

Reports from this section of the season's work are very favourable, and I am sorry that I was only able to examine the one property.

Bellevue Group.—This group consists of four claims and a fraction—*Bellevue*, *Bellevue 2*, *Bellevue 1*, *Snow Frac.*, and *Blenheim*, in the order named, up the valley. The claims were staked some years ago by John Stark, an old-time prospector, for Dr. W. T. Kergin, of Prince Rupert, and others, and are now under bond to the Alice Arm Consolidated Holdings, Limited, with A. J. Hughes in charge at the property. The company is incorporated in Vancouver with a capitalization of \$100,000 in 500 shares.

Good camps have been erected and a lot of surface prospecting done this season by way of open-cuts. A tunnel is being driven this winter under one of the best surface showings exposed in an open-cut. The rock formation appears to be an altered greenstone or porphyry more or less pyritized, in which are belts of schistose rock which are probably the results of shearing action. Within these schist-belts are lenticular-shaped bodies of quartz mineralized with pyrite, galena, and grey-copper. The main vein or mineralized belt on the property is from 25 to 50 feet wide and has been traced by stripping and open-cutting for a length of over 3,000 feet. The best showing is in an open-cut just on the south end line of the *Blenheim* claim, where the vein has been exposed for a width of 20 feet. On the hanging-wall there is 3 or 4 feet of quartz exceptionally well mineralized with galena and grey-copper, which could readily be sorted to a shipping-grade ore; the balance of the vein, so far as could be seen, is heavily pyritized, with stringers of galena running through the quartz, and I judge would make a good-grade milling-ore. As stated, a tunnel will be driven under this showing this winter, obtaining a depth of about 100 feet with 150 feet of tunnel. This is a very promising surface showing and may prove a valuable ore-shoot when drifted on from the tunnel-level. At any rate, the work will demonstrate whether the ore is confined to small lenses of quartz in the schist or whether the whole will be sufficiently mineralized to form a milling-ore.

The United Metals Mining Company, Limited, has not been operated this year.

Silver Star Group.—This group is owned by A. R. Hodgson and associates, of Anyox. Two men have been employed all summer and I am informed that the property is looking very well.

Silver Bell Group.—The owners have been working this group all summer.

Monarch Group.—No work done this year.

Reports from owners of claims on McGraw mountain, Lime creek, and Roundy creek are very optimistic. I intend inspecting them as soon as weather conditions will permit in the spring.

Portland Canal Mining Division.

This Division has had a very progressive year in mining. A great number of properties have been undergoing exploration and development, and, though there has necessarily been some disappointments, the percentage of those on which results have been favourable is encouragingly large. As was to be expected, there were many "broker and promoter operators" who incorporated companies last winter on anything with stakes on it, and in the majority of cases there was nothing but the stakes. It is worth noting that the public fought shy of promotions not backed by the report of a competent mining man, and therefore the "boom" for that type of mining did not materialize.

Owing to difficult transportation practically all the work is "hand-work," and therefore slow. Only one property was equipped with a compressor this spring, the *Spider*, enabling it to do over 1,000 feet of work as compared with from 100 to 200 feet on other showings.

The Salmon River wagon-road was extended over 2 miles this year, and next season should see it well into the upper basin. The Alaska portion of the road is being completed by the Alaska Government.

A great deal of diamond-drilling was done in this Division this year, and from results obtained it is a debatable question as to whether it is the most satisfactory method for initial exploration in this particular district or not.

A geological survey of the Salmon River area was completed this summer by the Department of Mines at Ottawa, with Dr. Schofield in charge of the party. This will be of great benefit to all prospectors and operators in the Eastern Contact Belt, and it is hoped that this report and accompanying maps will be available at an early date.

The Dominion Government built a dock early in the season at Stewart, which is connected with both Stewart and Hyder (on the Alaska side) by a highway put in by the Provincial Government. That this dock is proving altogether inadequate for the volume of freight is proof of the advancement of this section.

Taking everything into consideration, this Mining Division has made very material progress toward the building-up of a permanent mining camp at the head of Portland canal.

SALMON RIVER SECTION.

Premier Gold Mining Co., Ltd.—This company has had an extremely busy season, mainly on construction, installations, and development-work. Probably the most noteworthy feature of the whole section is the satisfactory results obtained in underground development and diamond-drilling, proving the continuity at depth of the high-grade ore-shoots exposed in the upper tunnel, and thus assuring the permanency of the property and section.

The management is vigorously pushing an extensive programme of equipping the property; a hydro-electric power plant has been installed; a compressor and mining machinery provided for the opening-up of the mine from the Plate tunnel; a 50-ton mill is under construction and will be completed early in the spring. Transportation facilities are being improved and everything is being done as quickly as possible to put the property in shape for big production.

Winter haulage is the only means at present of getting ore down from the mine to the beach, and for this purpose two Holt caterpillar tractors have been taken in for this winter. It is expected by this means to get out several thousand tons this winter.

This year the shipments amounted to 850 tons, which yielded 2,701 oz. gold and 92,183 oz. silver, or an average of approximately \$175 a ton. The property is under the management of Dale L. Pitt, with Bert F. Smith as assistant manager.

Bush Mines, Ltd.—This company has been working in a small way all summer, but work has been closed for the winter. Some spots of high-grade ore were found in No. 3 tunnel, but not in sufficient quantity to be of importance.

B.C. Silver Mines, Ltd.—I understand that the holdings of this company are under bond to Chas. A. Banks. The property adjoins the *Premier* on the north. Good camps were erected this summer and two short diamond-drill holes put in that did not prove very satisfactory. I am informed that extensive diamond-drilling is planned for next year.

International Group.—This group is situated south of the *Premier* and is owned by Pat Daly in association with Trite & Wood. Some further surface work was done this summer and the tunnel extended toward the vein. No new developments of note are reported.

Spider Group.—This group is under bond to the Algonician Development Company, Limited, of Belgium, under the local management of W. A. Meloche. A lot of work has been done at the mine this year under the supervision of John Hoveland. Supplies amounting to 150 tons were taken into the property from the beach, a distance of about 20 miles, last spring over the snow, with horses equipped with snow-shoes. Camps were built, a compressor taken in and installed, and mining-work started early in May.

Surface showings indicate four or five separate quartz veins lying in an augite-porphry rock formation. The North or No. 1 vein is probably the main and oldest fissure, as the others are seen to converge toward it and the No. 3 vein to cut through it. The main vein strikes S. 55° E. and dips 60° to the east; the other veins roughly parallel each other and, as stated, run into the main vein. No. 5 vein, on which the tunnel had been driven 650 feet (October 1st), strikes S. 68° E. and dips from 65° to 75° to the west, or away from the main fissure, and lies between the No. 1 and No. 3 veins.

Surface work consists of an open-cut along No. 3 vein for a length of 50 feet, showing up to 18 inches in width of ore assaying up to 300 and 400 oz. silver a ton. A crosscut will be run from the tunnel a distance of 135 feet to cut the No. 3 vein under this high-grade surface showing, obtaining a depth of approximately 150 feet. Four ore-shoots have been drifted through in driving the tunnel, showing them to be short lenses up to 50 feet in length. About 700 feet of diamond-drilling was done from the surface to prove the continuity of the veins at depth, and the work has proven very satisfactory.

A crew of fifteen men has been employed all summer and a comfortable bunk-house has been built, so that work can be continued all winter. Mr. Meloche states that it is his intention to ship sufficient ore this winter to furnish thorough metallurgical tests, and should the tonnage of milling-grade ore develop to expectations a concentrator will be erected in the spring.

Grant Mahood has eight claims about 4 miles north of the *Spider*, on which he claims 3 feet of good ore on the surface. It is about 12 miles from the *Spider* camp, with comparatively level going, across the Long Lake glacier to Tide lake, on the Nass slope of the range.

Silver Tip Mining Syndicate, Ltd.—This syndicate was formed last winter in Vancouver, with a capitalization of fifty shares at \$500 a share. It took over the *Silver Tip* group of claims from the owners and did considerable work on them this summer on the recommendation of P. W. Racey, M.E. The work consists of open-cuts, stripping, and a short tunnel driven from the bank of the creek on a small high-grade vein cropping on the lower claims of the group. Results here are reported as satisfactory. On the upper claims a lot of deep trenching, open-cutting, and stripping was done, following and exposing a coarse brownish-grey dyke striking north-south. The dyke has been crushed and shattered, the cementing quartz, forming small veinlets, cutting for the greater part diagonally across the dyke. These veinlets are more or less mineralized with galena, sphalerite, and silver sulphides, and contain some very high-grade ore. The dyke-rock itself carries no values; consequently the average values depend on the frequency and richness of the quartz veinlets. I have later been informed that average samples give satisfactory milling values. The concentrates should be very high grade.

Unicorn Group.—This group has been under bond to J. McDonald for over a year. A great deal of work was done on the surface a year ago with very promising results. This year a crosscut tunnel was driven 210 feet and a diamond-drill hole run a further 250 feet from the face of the tunnel. The tunnel was driven in barren greenstone with small cross-stringers of barren quartz. Of the drill-hole only the last 5 feet gave any encouragement, consisting of pyritized quartz. Diamond-drilling amounting to 300 or 400 feet was done at other places on the claims without results. Owing to snow I was unable to examine the surface cuts to which the tunnel was driven. The bond was thrown up this fall.

Hercules Mines, Ltd.—Work was resumed on this property, after lying idle since 1911, under the management of Major-General R. G. Edwards Leckie, with Joe Fall in charge of the work. The surface work done in the early days exposed several exceptionally good showings of ore carrying good values in gold, silver, and lead. The work this year was confined chiefly to driving a tunnel under one of the most promising surface showings. The results were disappointing, as it failed to pick up the ore at that depth. The length of the tunnel is about 200 feet. A shaft was also sunk 30 feet on another surface showing, the ore cutting off horizontally at a depth of about 15 feet. A good winter camp was erected with the intention of continuing work all winter, but it was later decided to close down and resume work in the spring.

Forty-nine Mining Co., Ltd.—This company has its head offices at 701 Rogers Building, Vancouver. The property worked all last winter under the supervision of Harry Howson, during which time about 280 feet of underground work was done under the croppings on the 49 claim and a tunnel driven 95 feet on the vein on the *Oxidental* claim. In the latter the first 50 feet from the mouth shows an average of about 8 inches in width of high-grade ore, the balance of the tunnel following the seam marking the vein and showing no ore.

The tunnel on the 49 claim was driven 132 feet along the south wall of the vein and a crosscut then driven both ways from the end of it. The first 72 feet in the tunnel is on the same bearing as the strike of the vein and from that point turns to the right about 20°, following the wall of a small stringer of fair-looking ore. The crosscut at the end of the tunnel was driven north 92 feet and south 27 feet, all in very much broken-up country, due to dyke intrusions plainly seen on the surface. Several bunches of good-grade ore were found in the crosscut, and from the broken nature of the ground is about all that could be expected. It seems to me that the crosscut might have been driven to better purpose under the main surface showing, from 75 to 100 feet in from the mouth of the tunnel. Two men were working on the claims during the summer, putting in some open-cuts on very promising showings north of the camp, on the *Million Dollar Frac.*

Lack of transportation to this property, the *Hercules*, and in fact the whole upper basin of the Salmon river is a very serious handicap.

Yearly assessment-work was done on a number of claims north of the 49, along the glacier and Summit lake.

Big Missouri Group.—This group has been under bond for the past two years to the Pacific Exploration Company, Limited (Sir D. D. Mann). Last year considerable diamond-drilling was done on the *E Pluribus* claim of the group, adjoining the *Mineral Hill* group, to test the surface showings which had been extensively exposed by open-cutting and trenching. While some ore was encountered in these holes, the results were not altogether satisfactory, and two or three flat holes were drilled from the creek. In the meantime a tunnel had been started from the creek-bank to cut under these croppings and exposures.

This spring the diamond-drill was moved to the old "big showing" on the *Province* and other claims.

Last winter the tunnel, started on the *E Pluribus* claim, was continued to a total length of 360 feet on a bearing of N. 50° E., or a little north of the "east-west fissures." No values of note were found in the tunnel. No crosscutting was done.

The diamond-drilling on the "big showing" consisted of four holes—three of 300 feet each and one of 150 feet, or a total of 1,050 feet—and proved to the satisfaction of the bonders that the showings, which crop over a width of 1,500 feet or more, are entirely superficial, as no values were found below a few feet on the surface. No further work was done and the property reverted to the original owners, Dan Lindeborg, of Hyder, Alaska, and partners.

Payroll Group.—Only assessment-work was done this year.

Indian Mines, Ltd.—This company is one of the "early-day" incorporations and has 600 or 700 feet of underground work done. The affairs of the company are in good shape, only about 25 per cent. of the treasury stock having been used. The registered office of the company is in Prince Rupert. This year considerable surface work was done in open-cutting and tracing the vein through from the "big cut" to the end line of the claims. The work shows a good width of vein, from 6 to 14 feet, all the way through, with fair values in gold and silver and, in places, considerable galena. The galena is uniformly low in silver values, about a third of an ounce to the unit of lead. The consistency of the gold values carried in the pyrites gives reason to expect that the continuation of the upper tunnel will possibly open up a continuous body of milling-ore.

The *Woodbine* and *Kitchener* claims, *Northern Light* group, and *Cobalt* group were explored this summer by the Algonic Development Company by diamond-drilling, but, as none of the options were exercised, I judge that results were not sufficiently favourable.

Pittsmont Group.—This group adjoins the Indian Mines claims on the south-west. Some surface work was done on the claims after my trip and fair showings are reported.

Glacier Group.—This group consists of six or seven claims lying between the *Boundary* and *Pittsmont* groups and the Salmon River glacier. The claims were staked last year and are owned by Jancowski & Scoville. The showing is a quartz vein 3 or 4 feet wide, though where

it is exposed, lying flatly along the side of a gulch, it has been entirely eroded in spots, giving it a patchy appearance. The quartz is mineralized with pyrite and some chalcopyrite. High silver values, up to 70 and 80 oz. a ton, suggest silver sulphides, though none were noticed. High gold values also were obtained in picked samples. The croppings are about 100 feet above the glacier, showing the vein to strike S. 80° E. into the hill and dip 46° to the south. This is a very encouraging-looking showing and could be easily opened up by drifting on the vein from the surface, obtaining good depth.

Several properties on the Alaska side of the boundary-line are showing up well with development.

BEAR RIVER SECTION.

Notwithstanding the serious handicap under which this section was placed by the destructive freshets in the early summer, good progress was made by the owners on the different prospects and on properties under bond to others. It was unfortunate for the section that the Portland Canal Short Line Railway, which had been repaired by the Algonican Development Company under arrangement with Sir D. D. Mann, was washed out in places and put out of commission before any use could be made of it. The Government wagon-road was also badly damaged and is yet of little service.

Bayview Group.—This group originally consisted of two claims, owned by W. A. Cameron and Geo. Cameron, of Stewart, but ten additional claims have been staked by the present bonders and included in the Bayview Syndicate holdings. The property was very inaccessible until this year, when a very serviceable horse-trail was picked out and built by Geo. Cameron, for the syndicate, from the Bear River bridge to the camp-site, at 3,400 feet elevation, a distance by trail of about 5 miles.

The rock formation in which the veins occur is metamorphosed sedimentaries, lying between the main granite range on the west and a spur from it on the south-east. There are two quartz veins on the property, the lower one varying in width from a seam up to 2 feet and the upper showing in places a width of 6 feet or more. The lower lies along the contact of the granite and the altered sedimentaries, striking N. 30° E. and dipping 65° W. into the hill and away from the granite. A contract was let for a 100-foot tunnel to be driven, at an elevation of 3,700 feet, to cut this vein at a depth of about 80 feet. This work was being done at the time of my examination, and I have since been informed that the vein, or at any rate mineral, was not located. The upper vein is the important showing and should have had the work done on it. From the little that can be seen on the surface, I judge it to be a shear-vein in the schist consisting of long, thin lenses of mineralized quartz, sulphides, and country-rock. The mineralization is pyrrhotite, zinc-blende, galena, and grey-copper, from which samples have been picked assaying over 300 oz. silver to the ton. It lies about 600 or 700 feet west of the lower vein and could be attacked by a crosscut tunnel from a bench a couple of hundred feet below it. The croppings, at an elevation of 4,500 feet, occur at intervals only through the decomposed schists and are decidedly interesting.

Mobile (Gibson) Group.—This group has had a little work done on it this year. One open-cut shows a 4-foot vein, of which 3 feet is good-looking ore and the balance oxidized material. In another small cut in the same vein a sample across a foot of the best of it gave \$134 silver to the ton, while from a small cut below \$104 silver to the ton was obtained. Further work on this vein might open up a worth-while shoot of ore. Its location for packing is good, being about half a mile from the *Portland Canal* mine.

Lakeview Group.—Fetter & Carlton, of Seattle, Wash., have had this group of claims under option for a year, during which time work has progressed steadily under the supervision of Al. Harris. There are two veins on the property and both are well explored. The big or main vein was found by further work in the tunnel, which had been driven previously for this purpose without success. Drifting and raising on it proved it to be as strong as on the surface, but the values were disappointing.

Attention was then turned to the upper vein, a small quartz vein from which high-grade ore had been extracted on the surface by the owners. A 10-foot open-cut was made, a tunnel driven on the vein for 25 feet, and a shaft sunk at the open-cut to a depth of 57 feet. Values proved satisfactory for a depth of 25 or 30 feet, then becoming spotted and disappointing. The owners refused to give any extension of time for payment due at the time and the bonders decided to abandon it.

Dunwell.—Stewart Bros. and W. Noble are the owners of this claim, situated on Glacier creek. A lot of work has been done, by way of ground-slucing and open-cutting, that has shown up the vein splendidly for 300 feet or more in length. The rock formation is argillite and the vein the typical, brecciated quartz, and country-rock variety of that area. The vein strikes N. 70° W. and dips flatly to the south-east at 38°. The upper cut is probably the best-exposed part of the vein, which here shows a width of about 6 feet, of which 4 feet on the hanging-wall is mainly quartz heavily mineralized with pyrites, galena, and zinc-blende, the remaining 2 feet containing more argillite and less quartz and also well mineralized. I had not time to sample the vein and have no information as to the values, but its size and mineralization make it well worth investigating.

The *Columbia* and *Evening Sun* claims have been worked all summer by the owner, W. W. Rush, who also worked on the *Excelsior* and *Eagle* claims, which were reported on last year.

Prince John Group.—Work continued on these claims this summer by the owners, Nesbitt & Archie.

Royal Irish Group.—This group is owned by P. M. Miller, F. S. Clements, *et al.*, of Prince Rupert, and is comprised of six claims lying along the Portland Canal Short Line Railway, west of Bear lake, and extending north across Bear River canyon at the railway-bridge to Goose creek. The rock formation appears to be a broad belt of quartz porphyry, or an acidic phase of the granite which forms a belt a couple of miles wide through here, in which are intrusions of granite and diorite. In this silicified belt is a wide vein, or probably several smaller parallel veins, of quartz seen cropping along the railway below the canyon and in the low bluffs on the opposite side of the canyon. Some work has been done by the owners in open-cutting these croppings of quartz, which, so far as yet opened up, has proven barren or practically so, the highest assay obtained being 80 cents gold to the ton, and consequently not very encouraging to further work.

On account of the size of the belt it would take an immense amount of work to obtain any conclusive information. Diamond-drilling would seem to be about the only possible means of attacking it, but the lack of values which, from the nature of the deposit, would be distributed, if there were any, does not recommend such expenditure.

Aztec Group.—This group of four claims, situated opposite Bitter creek on the west side of Bear river, is owned by Geo. Cameron, of Stewart, W. A. Pratt, and J. Watt. There are two veins on the claims, the "iron vein" and the "copper vein." The iron vein crops at an elevation of 2,300 feet, where an open-cut shows it to be 9 feet wide, of heavy iron sulphide with a little chalcopryrite. An average sample across the vein assayed \$4.70 gold, 0.8 oz. silver, and 1.3 per cent. copper. There are 3 or 4 inches of heavier chalcopryrite on the hanging-wall, assaying \$5.20 gold, 1.4 oz. silver, and 2.7 per cent. copper. The vein has been exposed farther down the hill and shows the same heavy iron content. The copper vein crops farther up the hill in the greenstone formation, and appears to average 2 or 3 feet in width, of brecciated country-rock and quartz mineralized with chalcopryrite and in places showing a little magnetite. The mineralization occasionally extends into the wall-rock for 2 or 3 feet. The first outcrop is at 2,600 elevation and shows a vein width of 3 feet across which a sample assayed \$1.40 gold, 2.3 oz. silver, and 0.3 per cent. copper. About 40 feet beyond this, and higher up, the mineralization is about 6 feet wide, of which a foot on each wall is fairly solid iron and copper sulphides, a picked sample assaying 16 per cent. copper and a trace of gold. About 150 feet farther along the vein it is 2½ feet wide, of fairly solid sulphides, which assayed 3.2 per cent. copper and 2.2 oz. silver to the ton. There are out-croppings again at 3,600 feet elevation, apparently the same vein, but not positively traced through on account of the rugged bluffs. At 3,850 feet elevation, the highest showing, an open-cut 12 feet long shows 2 feet of 13-per-cent. copper ore and is the best showing on the vein. In all, this is rather a promising showing and could profitably be worked if closer to the railway. It has good possibilities of improving with a little more development.

Vetron Group.—This consists of three claims—*Vetron 1*, *Vetron 2*, and *Vetron 3*—owned by two "old-timers" of Stewart, Ben Erickson and W. Forrest. The claims are situated on the north side of Bear river, opposite the George copper-mine and about 6 miles up from the end of the railway at the *Red Cliff*. The prevailing country-rock is McConnell's Bear River formation, consisting of greenstone, agglomerates, breccia, etc. At an elevation of 3,000 feet, or about 2,200 feet above Bear river, a quartz vein has been traced along the hillside for about 3,000 feet

by open-cuts. The slope of the hill is very steep and good depth could be obtained anywhere on the vein by means of short crosscut tunnels. The quartz is well mineralized with pyrite, some chalcopyrite, and a little magnetite. The vein strikes N. 60° E., about paralleling the Bear River valley, and dips rather steeply into the hill. There are some good bunches of chalcopyrite showing in the cuts and a drift in the vein at depth might easily open up a workable shoot of ore. Several felsitic dykes can be seen cutting the vein at right angles, but they do not seem to affect it in any way.

Comet Group.—This group, consisting of two claims—*Comet No. 1* and *Comet No. 2*—and situated above the *Vetron* group, is also owned by Ben Erickson and associates. The trail from the river to the *Comet* camp serves both groups and is a “heart-breaker” to anything but a mountain-goat, and I did not see any of them on it either. The one camp at the edge of timber-line serves both groups. The vein gangue is quartz and calcite, mineralized chiefly with arsenical iron, with, in places, considerable galena, carrying values in gold and silver. Values in gold up to \$32 a ton have been obtained in the arsenical iron. The vein lies in Bear River formation, strikes N. 20° E. up the hill, and apparently stands about perpendicularly. An interest was given in the property this year to Mr. Bryan for a certain amount of work, which consisted of sinking a shaft 14 feet deep on the vein-cropping on a steep side-hill. A drift-tunnel 20 feet long would have attained the same depth, but I suppose it is a good idea to follow the ore down. The vein is exposed here for a width of 10 feet, which is evidently not its full width, as it is about 40 feet in width a short distance above this on the surface. It is a splendid showing and gives every reason to believe that a big tonnage could be developed very easily, as the situation is ideal for tunnel-mining. The elevation at the shaft is 4,675 feet and at the highest croppings 4,750 feet.

Another quartz vein, known as the “blue vein,” lies several hundred feet to the west of the big vein and strikes diagonally towards it. It is from 6 to 18 inches wide, carrying galena and copper sulphide, with silver values of over \$100 a ton. It crops in an overhanging cliff about 1,000 feet above the glacier, and I was therefore perfectly content to take the prospector's statement regarding it.

Red Top Group.—This property has been under bond to G. Seiffert, of Seattle, Wash., and associates since last spring. Under the supervision of Mr. Seiffert, a considerable amount of work has been done in a very miner-like manner. Conditions in the spring, due to high water, were anything but encouraging for this part of the district. However, roads and trails were repaired and improved, supplies taken in, and mining-work finally got under way at least a month later than under normal conditions. The old foot-trail from the Bear-Nass trail to the camp, a distance of a mile or more, was improved to a fair horse-trail, and a good horse-trail built from the camp to the upper tunnel.

There are two showings on the property, occurring in the Bear River formation. At an elevation of 3,850 feet, about 400 feet above the camp, a fine showing of galena has been exposed in an open-cut. The vein is about 5 feet wide, of quartz and calcite gangue, with inclusions of greenstone country-rock, mineralized with galena and pyrite. On the hanging-wall are about 18 inches of banded quartz in which are small bunches of galena; the balance of the vein is a coarse conglomerate of quartz, galena, pyrite, and greenstone, the whole assaying, I should judge, about 20 per cent. lead. The silver content is shown as 16.8 oz. a ton in an assay of 70.7 per cent. lead. The vein strikes east-west and dips, with the hill, at about 55° to the south. It has been traced diagonally down the hill for several hundred feet. At a convenient point on the steep side-hill, at an elevation of 3,510 feet, a crosscut tunnel is being driven on a bearing of N. 30° W. to tap the vein. It is estimated that it will require from 210 to 240 feet of tunnel. I have been later informed by Mr. Seiffert that 188 feet had been driven when it was necessary to quit on account of the heavy snow. There are indications of the proximity of the vein in the face of the tunnel. This is a very promising showing and, from the topography of the hillside, I think is being opened up in the best possible way.

At the camp another crosscut tunnel is being driven to get under a copper-showing, briefly described in 1919 Report. It is 178 feet horizontally from the mouth of the tunnel to the showing, but as the dip of the vein is into the hill it will require a longer tunnel. It has now been driven 132 feet, of which the first 80 feet, through slide-rock, required timbering and therefore was slow work. Although this tunnel is expensive for exploratory work, I think Mr. Seiffert's judgment sound in getting the depth, especially considering the bumpy and distorted

nature of the surface showings. The results of the extension of both tunnels in the spring will be of interest and importance to the remainder of this area.

George Copper-mines.—The owners of this property did some work on the surface, but the greater part of the season was spent in building a trail from the Bear-Nass trail up to the upper camp, and which I am informed was not completed. It is under option to the Algonican Development Company and the trail-work is preparatory for extensive development next year.

L. L. & H. Group.—This group was staked in the earlier days by Lydden, Lade & Hartley and has had considerable work done on it by the owners. The claims are situated on Hartley gulch, on the north side of Bitter creek, about 8 miles from its mouth. The property is now under option to Mr. Tubman and associates, of Victoria. This season's work consisted of repairing and building new trail up Bitter creek and from the Bitter Creek trail up to the camp, building a new cabin, putting in a trail from the camp to the workings, and some surface work. Everything is now in good shape to go ahead with the development of the showings.

There are three parallel fissures lying in a somewhat broken and distorted country-rock of argillite, which is intruded by greenstone. They strike about S. 70° E., paralleling the gulch, and dip 60° N.E. into the hill. The vein-filling is partly quartz and partly ground and broken-up country-rock, all mineralized with arsenical iron, and small amounts of galena and chalcopyrite in-place.

The upper vein has been exposed on the surface by open-cuts and also has been cut by a 35-foot crosscut tunnel. The vein, where cut in the tunnel, shows about a foot of black, plastic mud on the foot-wall; then 16 inches of quartz; then about 16 inches of black, ground-up argillite mineralized with some iron pyrite. The quartz is mineralized with pyrite, disseminated and in bunches, zinc-blende, and a little galena, and carries fair values in gold with a little silver. Picked samples of the heavy, coarser sulphides assay very well in gold. From here to the face, about 7 feet, is a greyish rock disseminated with pyrite which probably is part of the vein. The elevation of the tunnel is 3,700 feet. About 300 feet lower another tunnel has been driven 232 feet, crosscutting the lower vein and cannot be very far from the middle vein. An open crevice was cut in the tunnel, from which there is a heavy flow of water. There is a width of about 45 feet of a more or less silicified and pyritized rock that would be well to investigate for milling-ore. About 4 feet of this, next to the hanging-wall, is mineralized quartz averaging, it is claimed, \$44.60, mainly in gold.

To eliminate the difficulties of getting supplies, timber, and other materials up the steep side-hill from the creek-bed to the tunnel, Mr. Tubman proposes to start work at the creek higher up, pick up the veins there—possibly a short crosscut tunnel will be necessary—and drift on them. This work would obtain good depth on the veins and be very convenient. Altogether the property is looking very promising.

MARMOT RIVER.

The Marmot river has been prospected considerably this summer and a number of claims staked, mainly on the North fork.

Montana Group.—This group is situated about 5 miles from salt chuck up the Marmot and is owned by Bruggy & Magee. It was under option to the British Columbia Exploration Company, Limited, 706 North West Building, Vancouver. Several students and a miner were employed for two or three months this summer, and I am informed that an extension of time has been granted for further exploratory work.

Several prospectors spent the season in the Georgia River basin and report very favourably on the prospects.

No work of any note was done on any of the properties along Portland canal proper.

UNUK RIVER SECTION.

Reconnaissance parties sent into this section last summer by the Department of Mines report an area similar in every way to that at the head of Salmon river, but that it is practically impossible to get in under present conditions. The route over the Salmon River glacier is long and difficult and altogether impracticable for prospectors to pack in supplies on their backs. The route up the river is not impossible for expert rivermen and is fairly easy early in the spring, before the melting snow raises the water, when poling and lining along the bars and river-banks is possible. However, for the ordinary prospector this trip is too dangerous and

too expensive, since he must provide a good river-boat and take in sufficient supplies to last for four or five months, from low water in the spring to low water in the fall. The only solution to the situation is the construction of a good horse-trail from tide-water, at the head of Burroughs bay, up the north side of the river. From this point it is 24 miles to the boundary-line and in 3 or 4 miles farther the eastern border of the Coast Range granites. East of this there is an immense area of the "Eastern Contact Belt" that can be made accessible with trails up the main river and its principal tributaries.

Stikine and Liard Mining Divisions.

Some little mining interest was taken in these Divisions this year, mainly in the Dease Lake section, due to the success of Geo. Adam's hydraulicking operations on Thibert creek.

Work done last winter on Deloire creek, a tributary of Thibert creek, on leases acquired by Captain Barrington and associates, proved very satisfactory, and it was expected that operations would be extended this year. However, the scarcity of labour, there being hardly sufficient men for Adams's operations, and the extremely high cost of everything pertaining to mining in that country prohibited operating this summer.

On account of the shifting of the side-hill and the flume with it, Geo. Adams was forced to move his pressure-box and pipe-line about a mile farther up Thibert creek and open up a new pit about that distance above where he so successfully cleaned up last fall. This ground has proved disappointing and his clean-up this fall was discouragingly small, about 100 oz.

A syndicate of returned men, who had acquired leases on Mosquito creek, about 12 miles up Thibert creek, a year ago, went in early this spring to open up their ground. Assistance was given them by the Provincial Government by way of a first-class outfit, but, lacking a leader experienced in this class of work, the venture was inevitably a failure. They had some very likely ground and, with one or two exceptions, were a bunch of men willing and able to work, and it is regrettable that with the assistance given they were unable to take advantage of it.

Geo. Adsit, sluicing near the mouth of Mosquito creek, took out 20 oz. Bryan & Hankin, on Dease creek, also took out 20 oz. With additional small amounts taken out by prospectors, the total output is estimated at 200 oz. for these Divisions.

Several prospectors have been in the hills along the Stikine river this summer, and at least one party went up the Iskut river. This is a starter for a prospecting area big enough for hundreds of men.

Atlin Mining Division.

There has been a little more mining activity this year than for some time, and it now looks as if the affairs of the *Engineer* mine would be adjusted and allow work to be resumed. It is most unfortunate that such a property should be lying idle when its active operation would mean so much not only for the property itself, but for the whole Atlin country.

Reports and samples from the property on Fourth of July creek being developed by J. Ruffner give reasons to expect that it will open up to a producer of high-grade silver-lead ore.

The Alaska Government has been making extensive repairs and improvements on the wagon-road from Haines into the Rainy Hollow section. There is a big mineral-belt in here and this road will be a boon to the prospector and operator. I have no information yet as to the extent of the mining activity in this section during the summer.

I am indebted to J. A. Fraser, Gold Commissioner, for the following placer returns for the year: Spruce creek, \$33,000; Pine creek, \$27,000; Ruby creek, \$20,000; Boulder creek, \$12,000; Otter creek, \$11,000; Birch creek, \$2,800; O'Donnell creek, \$2,500; Wilson creek, \$1,000; Wright creek, \$1,000; a total of upwards of \$110,000.

NORTH-EASTERN MINERAL SURVEY DISTRICT, No. 2.

PRELIMINARY REPORT BY JOHN D. GALLOWAY, RESIDENT ENGINEER.

(Headquarters, Hazelton.)

GENERAL REMARKS.

During the first half of the year 1920 the mining industry made satisfactory progress in the North-eastern Mineral Survey District, but in the last half of the year a gradual decline set in. The year 1920 commenced with conditions favourable to the development of new mineral areas, but before the year had advanced far financial depression and the lowered market price of all the more important metals caused a curtailment in all mining development

and production throughout the American continent. Considering these adverse conditions, the progress made in the North-eastern District during 1920 was satisfactory.

The production of the district for the year 1920 is expected to have been somewhat greater than in the preceding year. The output of silver, lead, and zinc for the district comes mainly from the *Silver Standard* mine at Hazelton, and this year this mine nearly doubled its shipments as compared with 1919. Practically no copper ore was mined in the district this year, but when an improvement in the copper market takes place some of the copper properties on Rocher Déboulé mountain and in other parts of the district should again make a production.

The placer gold production, which comes almost entirely from the Cariboo and Quesnel Mining Divisions, is expected to be about the same as last year. Placer-mining in the Cariboo, Omineca, and Peace River seems to be about ready for a period of renewed activity during the next few years, as many prospective enterprises are about to be launched. The recent changes in the "Placer-mining Act" would seem to have been beneficial in encouraging development, and the impending era of lower prices, which automatically effects a higher relative price for gold, will undoubtedly stimulate the search for the yellow metal.

The following table shows the estimated mineral production of the North-eastern Mineral Survey District for the year 1920, together with the corresponding figures for the year 1919:—

	1919.	1920.
Placer gold (oz.)	3,900	4,000
Lode gold (oz.)	147	275
Silver (oz.)	72,573	105,000
Lead (lb.)	180,455	190,000
Copper (lb.)	16,205	.....
Zinc (lb.)	224,539	450,000
Coal (tons)	1,752	1,400
Miscellaneous (dollars)	4,000	3,000

It seems probable that the near future will see extended development of the coal areas of this district. The ever-increasing price of fuel-oil and its scarcity in the world's markets is causing renewed interest in all promising coalfields. The Telkwa river, Morice river, Zymoetz (or Copper river, as locally known), Peace river, and Groundhog fields have attracted attention this year and large-scale development may be expected before long. Undoubtedly these areas contain large quantities of good-grade coal and but for the admitted transportation difficulties they might now be in the productive class. Some coal was mined by the Telkwa Collieries this year and a short distance from this property a new seam is being opened up. This seam contains some high-grade blacksmith-coal and a small output will soon be marketed.

During the year grants were made from the Mines Development Fund to assist in building, improving, extending, or repairing a number of mining roads and trails in the district. Among the more important of such works were: Extensive repairs to the Cronin sleigh-road and the building of 1 mile of new road, linking this road up to the main road; extension from the McCabe trail on Driftwood creek to the *Victoria* group; extension from McCabe trail to the *Silver King* group; completion of Schufer trail on Hudson Bay mountain; trail from *Empire* group to Dahl Siding; continuation of work on Tahtsa River trail; extensive repairs to roads serving *Silver Standard* mine and mill; repair-work on the Manson-Fort St. James trail; laying-out of trail from Barkerville to Keithley Creek; repairs to Grouse Creek road; and a number of small grants where necessary.

Under the plan arranged by the British Columbia Department of Mines for assisting returned soldiers to prospect, five returned soldier prospecting parties were at work during the season in this district. Two parties examined country along the Skeena river, two parties were in the Peace River Division, and one party east of Ootsa Lake. One party in the Peace river reported a successful season in finding some promising coal-seams, but no great success rewarded the efforts of the other parties.

Omineca Mining Division.

SKEENA SECTION.

Usk.

In the vicinity of Usk there was a considerable amount of mining activity during the season. In addition to certain mining-work, there were quite a number of prospectors out in the hills,

and some new locations were made. During the season two of the returned soldier prospecting parties spent some time prospecting in this locality, but no important finds were made.

Kitsalas Mountain Copper Co.—This company has for four years been developing the *Cordillera* group, situated 1 mile in a southerly direction from Usk. There are several quartz veins on the property which carry in places pay-shoots of bornite and some free gold. The property has been fully described in previous Annual Reports.

Late last year the construction of a small concentrating-mill was practically completed, but operations were suspended during the winter. This summer the mill was run for a time with, it is claimed, satisfactory results. Ore from surface cuts was treated in the mill, but as yet no ore has been stoped from the underground workings.

The mill consists of a jaw-crusher, Gibson grinder, amalgamating-plate, and a Wilfley table, on which the tailings from the amalgamating-plate are treated. Mercury for amalgamating the free gold in the ore is put into the Gibson grinder and most of the amalgam is caught on baffles in the grinder, the remainder being caught on the plate. The Wilfley table makes a high-grade concentrate of bornite. The Gibson grinder looks like, and grinds similarly to, a large pestle and mortar; it has a rated capacity of 30 tons in twenty-four hours. About 200 tons of ore was treated this summer in the mill. The mill is housed in a good building, and there are, as well, a tool-house, blacksmith-shop, and concentrate-bin, and a fan-house at the mouth of the main tunnel. A covered tramway runs from this tunnel to the top of the mill building.

Development of the mine has been carried on all summer with a force of from six to eight men. The main vein, which was cut at a point 360 feet from the portal of the crosscut tunnel, is being drifted on in both directions, and a blind vein, also cut in the crosscut tunnel, is being developed. The ore runs apparently in shoots with barren places between, so that considerable development will be required before much tonnage is blocked out.

Kleanza Co.—This company continued the work started last year of prospecting the *Golden Crown* group, which property is held under option. A number of claims contiguous to the *Golden Crown* group and extending to the top of Kleanza mountain were staked by the company. On this ground there are a number of quartz veins of a similar type to those on the *Golden Crown* group carrying gold values apparently associated with arsenopyrite.

Development-work during the season consisted of open-cutting and stripping of the veins and the driving of some tunnels, including the driving ahead of tunnels previously started on the *Golden Crown*. The results of this work as a whole show that the gold values are somewhat irregular. Sufficient work has not yet been done to determine whether or not the ore runs in definite pay-shoots. The management of the company considers that the showings are satisfactory and prospecting development will be continued next season.

Peerless Group.—This group, owned by O. T. Lindland, J. D. Wells, and partners, lies at the head of Kleanza Creek, about 20 miles from Usk. A small amount of development was done on the property during the year, consisting of a large open-cut and the commencement of a tunnel. This work shows a vein which carries in places streaks of solid chalcocite and bornite. The showing is promising and warrants further development.

The trail to the head of Kleanza creek from Usk has been in bad shape for the last three years, so a start was made by the Public Works Department this summer to improve it. Six miles of new trail was laid out and about half of this was constructed. There are a number of properties in this section which should attract some attention, but owing in part to the bad trail but little or nothing has been done on them. The showings consist of sheared and sheeted zones, giving rise to vein-like deposits, in which there are found copper minerals, principally chalcocite and bornite. For a more extended account see the 1914 and 1917 Annual Reports of the Minister of Mines.

Other Properties.—Other properties in this section on which work was done during the year were the *Hazel* group, owned by J. D. Wells and partners, the *Continental* group, and the Baxendale property.

Legate Creek.

Early this spring a number of claims at the head of Legate creek were secured by option and purchase by the British Columbia Exploration Company, of Vancouver. The more important properties thus secured were the *M. & K.*, *M. & M.*, and *Independence* groups.

A number of men were employed all summer, and while but little actual development-work was done, a pretty thorough examination and sampling of all the properties were made. K. D.

Woodworth was in charge of the work and an assayer with the necessary equipment was kept busy all summer at Pacific. Professor W. L. Uglow, of the University of British Columbia, spent a month or six weeks on the properties, examining and reporting for the company.

As a result of the summer's work certain options held by the company were dropped, but others were retained. It was intended at one time to proceed with development of the *M. & K.* and *M. & M.* properties this winter, but since stopping work in the fall nothing has been done, and the future plans of the company are unknown.

HAZELTON SECTION.

Glen Mountain.

The *Silver Standard* concentrating-mill was operated from early in the spring until the end of October. The year's operations were satisfactory and a larger tonnage of ore was milled than in any previous year. It had been hoped that production would have been continued all winter, but the management decided that this would be inadvisable. The difficulty of marketing silver-zinc concentrates, the lowered market price for silver, and the recent excessive rise in freight rates were the factors which caused the decision to close down. Marketing conditions have reached the point where the best policy is to leave the ore in the ground. Doubtless these conditions are but temporary and a resumption of operations may be expected in the spring.

During last winter a low-level crosscut tunnel was started, and this work proceeded with but few interruptions until the mine was closed in October. This tunnel will cut all the veins at a considerable depth below the present workings and eventually will be the main entry of the mine. So far this tunnel has been driven about 1,000 feet and three veins have been cut by it and some stringers. The present objective of the tunnel is the *No. 4* vein, which should be reached in a further distance of about 380 feet. This vein contained some excellent shoots of ore in the 200-foot crosscut-level workings, which are expected to continue at depth. Still farther ahead in the mountain lies the main vein, from which much good ore was extracted from the old shaft-workings and the 200-foot level.

The production for the year is estimated to have been 600 tons zinc concentrate and 270 tons lead concentrate, containing about 200 oz. gold, 100,000 oz. silver, 190,000 lb. lead, and 450,000 lb. zinc. The tonnage of ore milled was about 5,600 tons.

Nine-mile Mountain.

The *Sunrise* group of claims on Nine-mile mountain was secured under option last winter by the American Smelting and Refining Company. Work was commenced in January and a small force of men was employed steadily until August. This work consisted mainly of surface-stripping and crosscutting, and one shaft which was sunk about 40 feet. The company finally decided that the property did not give promise of producing a large tonnage of milling-ore and therefore the option was relinquished. The development disclosed one shoot of silver-lead ore, and it is probable that at some time in the future the property will be further developed.

On many other claims in this locality annual assessment-work was done.

Four-mile Mountain.

Development of the *Era* group, owned by Mr. Kinman, of Vancouver, was recommenced during the summer. The last work on this property was prior to 1914, when two shafts were sunk and a crosscut tunnel driven 200 feet. From the shaft-workings some good-grade shipments of silver-lead ore were made.

The work this year consisted of driving ahead the crosscut tunnel to reach the vein. The tunnel is now in 450 feet and it is expected that the vein will be struck in another 50 feet. With the advent of winter weather in November the work was stopped until next spring.

Further development of the *Comet* group was carried out during the year with fairly satisfactory results.

Rocher Déboulé Mountain.

In December, 1919, work was recommenced on the property of the Delta Copper Company and was continued for a couple of months. The work was then stopped, but during the summer arrangements were made whereby a definite development programme was laid out. It was decided to carry out further development by means of diamond-drilling, and a contract was let

to a Spokane firm to do this drilling. A drill was taken up to the property and all arrangements made to start, when an early and heavy snowfall necessitated the stopping of the work until next spring.

TELKWA SECTION.

Babine Range.

Babine-Bonanza Mining and Milling Co.—The property of this company, better known as Cronin's mine, was steadily developed during the year. For several years past the development of this property has been steadily proceeded with under the management of James Cronin, the principal stockholder in the company. This work had been successful in proving considerable tonnages of ore from the surface down to a depth of about 150 feet. Last year a long crosscut tunnel was started to tap the ore-bodies at a depth of 400 to 450 feet below the surface.

This tunnel is now in about 1,000 feet and has been successful in striking one ore-body. Whether or not this is the main contact ore-body exposed in the upper workings is not yet definitely ascertained. The ore-body encountered has a width of 6 to 12 feet of good milling-ore, with many streaks of nearly solid sulphides. The ore is a mixture of galena and zinc-blende occurring in a quartzose gangue and carries from 1½ to 2 oz. of silver to the unit of lead. The last part of the tunnel is a drift on the ore-body, showing it to be continuous for a couple of hundred feet or more.

It was expected that the work would be stopped for the winter about the end of the year, but next spring the question of equipping the property with a power plant, tramway, and concentrating-mill will be considered, as Mr. Cronin now considers that the mine has passed the prospect stage.

Silver King Group.—This group, owned by Patrick J. Higgins and partner, is situated at the head of Driftwood creek and distant about 17 miles from Smithers. A Seattle syndicate secured a lease and bond on the property in December, 1919, and work was started and continued until May, 1920. From two to four men were engaged under the superintendency of S. A. D. Davis. During the summer the Steamship Mining Company was formed to take over the option held by the syndicate on the property, but up to the present time work has not been resumed.

A drift-tunnel has been driven in 100 feet on a quartz vein which varies in width from a few inches up to 3 feet. It is mineralized with galena, zinc-blende, grey-copper, and some silver sulphide and native silver.

Other Properties.—During the last two years several groups of claims have been staked in this locality. Most of them show ore carrying values in silver and copper. Little development has been done on any of these properties, but the high-grade ore occurring on them should make them worth investigation. The Kelly & Carson properties are typical of these new locations.

Hudson Bay Mountain.

There was not a great deal of mining activity on Hudson Bay mountain this year, but it seems possible that certain propositions that were under negotiation this year will go ahead in 1921. Among these are the Aldrich, Carroll, and McLean properties, on which deals are pending.

Further development was carried out on the *Empire* group, owned by Donald Simpson, and the Schufer property. Both these have showings of silver-lead-zinc ore.

Telkwa Collieries.

The coal-mine of the Telkwa Collieries was worked more or less regularly throughout the year, the shipments of coal for the year being estimated at 1,400 tons. Owing to the work of the Grand Trunk Pacific Railway at Telkwa in changing the railway-yard, the shipping-bunker for this coal was taken away, and at present the company cannot ship coal to Prince Rupert or other points as was being done. Meantime local shipments are being made, and as soon as the bunker is replaced the regular shipments will be commenced again.

The property is now being worked by J. M. Gillespie, formerly manager for the company, who has a lease on all the holdings.

Mr. Gillespie also has a lease on the Aveling coal property, which is situated about 6 miles up the Telkwa river from the town of Telkwa and about 2 miles distant from the property of the Telkwa Collieries. Arrangements have been made to open up a seam of coal on the Aveling property and mining has been commenced. Part of this seam contains a band of high-grade

blacksmith-coal, and it is the intention to mine and ship this. By submitting samples to Vancouver, orders have already been received for car-load shipments of this blacksmith-coal, and it is hoped that a considerable market for this class of coal can be secured. Analyses of this coal show it to be low in ash and high in fixed carbon.

BURNS LAKE SECTION.

Taltapin Mining Co., Ltd.—During the year 1919 the *Silver Fox* group, situated 28 miles in a north-easterly direction from Burns lake, was acquired under option by the Taltapin Mining Company. Work was started late in the fall under the management of A. Wood, and continued until May of this year.

Twelve miles of sleigh-road were built, connecting the property to the half-way point on the Burns Lake-Babine Lake road. A cook-house, bunk-house, stables, blacksmith-shop, powder-house, and two bridges across Anderson creek were erected at the property. A shaft was started in the bed of the creek to develop the "High-grade" vein and a tunnel was driven 100 feet to prospect another vein.

The veins, of which there are several on the property, outcrop in the walls of a canyon on Anderson creek. They are quartz-filled fissures carrying varying quantities of galena, zinc-blende, and pyrite. It is apparent that most of the veins as shown by the surface exposures are quite low grade, but high silver values are reported from the "High-grade" vein. In addition to this latter vein, it is quite possible that development will prove the existence of milling-ore in the other veins.

No work was done on the property during the summer, but late in the fall a small force of men was put to work.

SIBOLA SECTION.

There was no mining activity in this section during 1920, but a number of prospectors were busy in the hills and some new finds have been reported.

A rough geologic reconnaissance of the country around Eutsuk and Whitesail lakes was made during the season by the Geological Survey of Canada, the party being under the guidance of R. W. Brock.

Cariboo Mining Division.

TETE JAUNE SECTION.

The Mica Syndicate.—An interesting development during the year was the work commenced at Tete Jaune by the Mica Syndicate, a Calgary company. The syndicate has taken up a group of claims, on which mica-showings occur, on Mica mountain and distant about 7 miles from Tete Jaune, a station on the Grand Trunk Pacific Pacific Railway 184 miles east of Prince George.

Owing to the short season and the necessity of building roads and trails to get access to the property, not much actual mining was accomplished before the coming of snow stopped the development until next season.

The syndicate has taken up the question of marketing the mica pretty thoroughly and has submitted large samples to prospective buyers. Favourable reports on these samples have been received, together with offers to purchase the output, so that it is believed that when ready to mine no difficulty will be found in marketing the product. The mica is muscovite (white mica) occurring in considerable quantities in pegmatite dykes. Crystals or "books" ranging from 4 by 4 to 12 by 12 inches occur in the dykes, together with masses of fine crystals. This mica has a fine basal cleavage and is easily split into as fine sheets as is desired. It is expected that next year the syndicate will commence to make an appreciable output of mica.

BARKERVILLE SECTION.

Hopp Mines.—Of the placer properties controlled and operated by John Hopp in the vicinity of Barkerville, only two were operated this year, these being *Lowhee* and *Stouts Gulch*. Operations were in no way different from former years and about the same yardage and grade of ground was handled as last year, so that the returns were about the same. The early part of the season was unsatisfactory on account of adverse water conditions. An unusually late spring made it late in the season before hydraulicking could be started, and then the available water went off with a rush and in a short time operations had to be curtailed on account of a shortage

of water. This was compensated, however, by better water conditions in the last half of the season, as an unusually heavy rainfall extending from late summer right through the fall supplied an abundance of water.

Waverly.—This hydraulic mine, situated on Grouse creek, was operated throughout the season under the management of E. Moore. A large amount of dead-work was done this year in opening up a pit to gain access to the pay-channel, but it is believed that this will be reached now in a short time. This is an old property taken up two years ago by Moore and associates, and it was realized that the opening-up of the property in a new place would take considerable preliminary work.

Other Placer Properties.—The *Point* mine on Slough creek was operated as usual throughout the season under the management of Joseph Wendle. A satisfactory clean-up is reported.

The Lightning Creek Hydraulic Mining Company's property, situated 2 miles up Lightning creek from the town of Stanley, was operated during the season under the management of Lester Bonner. It is not known what success was attained.

On the property of the Lightning Creek Gold Gravels and Drainage Company on Lightning creek, at Wingdam, work was continued during the winter on the new shaft started in the fall of 1919. Owing to the heavy pressure of water the shaft was lost and the attempt to reach bed-rock at this point had to be abandoned. A manager and some workmen have been on the property all year, but no further plan of development has as yet been inaugurated.

A successful season is reported by Sparks & Felker, who operate a small-scale hydraulic plant on Perkins gulch. D. D. Fraser joined the partnership this season and the plant was extended to give a better water-supply.

Small-scale work by individuals on several creeks and on bars of the Fraser river were carried on as usual during the season.

Proserpine Mountain.

The bonding of two groups of quartz claims on Proserpine mountain last fall by a Toronto syndicate led to the hope that productive quartz-mining would soon be inaugurated in this section, but unfortunately these hopes have not yet materialized. The properties bonded were those owned by E. E. Armstrong and Tregillus and partners. R. A. Bryce, of Toronto, was in charge of the work, and from October, 1919, until February of this year from forty to sixty men were kept at work. A considerable amount of surface crosscutting and stripping of the veins was done and a number of shallow tunnels were run. Hundreds of samples of the quartz and associated schist were taken, and apparently the syndicate considered that a pretty thorough examination of the properties had been made. The decision arrived at was that the properties did not give promise of yielding a large tonnage of low-grade gold ore which could be mined and milled at a profit. As a payment on the bonds was coming due in March, the option was therefore allowed to lapse. The owners were negotiating with other parties during the year to take up the properties, and are still quite confident that they will be able to arrange another deal.

Some further work was done on quartz veins on the mountain during the summer by individuals.

Quesnel Mining Division.

QUESNEL MINING SECTION.

Cottonwood River.

Some promising dredging-ground has been located on the Cottonwood river and a number of leases changed hands this year. It is expected that testing of the ground will be commenced next year, with the possibility of one dredge being installed in the near future.

Quesnel River.

The Cariboo Gold-Platinum Extracting Company commenced operations this spring on its leases on the Quesnel river, some 15 miles up the river from the town of Quesnel. The necessary machinery for a drag-line scraper type of dredge was taken in and erected on the ground. The equipment at the plant consists of: A one-yard Sauerman cableway excavator, double-drum donkey engine, 32-horse-power boiler, 8 by 10 centrifugal steam-pump, amalgamator and concentrator (Marsh patents), cables, etc. The necessary buildings, towers, etc., have been erected.

A test run of about two weeks was made late in the fall before closing down for the winter season and it is said that satisfactory results were obtained.

The primary object of this company is to engage in the business of extracting gold and platinum values from the black sand occurring in the placer-gravels. S. J. Marsh, promoter of the company, has experimented with this matter for some years past and now has a patented process for extracting these metals. Furthermore, as a result of his investigations, Mr. Marsh claims that at many places on the Quesnel and Fraser rivers and their tributaries the gravels do contain black sand containing appreciable platinum values. These values, together with a certain amount of flour gold, are not recovered in the ordinary processes of hydraulic mining or dredging, and Mr. Marsh therefore believes that his process will open up a new field of activity in mining in the district.

The company plans next year to erect a plant on 2-Mile Flat at Quesnel, which will treat the black-sand concentrates from any placer-mining enterprise in the district. In order to have something to start on and also to demonstrate the possibilities, the company has erected the drag-line scraper plant previously referred to, and will mine the gravels for the black-sand content as well as any coarse gold that may be recovered.

It is known that the black sand of the Quesnel river and some of its tributaries do contain varying and irregular amounts of black sand, especially where a natural concentration of the gravels has taken place. It is therefore encouraging to have an attempt made to mine some of these gravels for the platinum content.

After organizing the company Mr. Marsh succeeded in interesting Minneapolis capital in his project. Herbert E. Crosby, of Minneapolis, who is vice-president of the company, visited the property this fall while the test run of the scraper plant was being made, and expressed himself as being well satisfied with the progress so far made. It is planned to continue operations on a larger scale next season.

Hydraulic.

The big hydraulic plant of the Quesnel Hydraulic Gold Mining Company at Hydraulic, on 20-Mile creek, was operated throughout the season. As in the last three years, the work was mainly the testing on a large scale of certain parts of the gravel-deposits with the hope of finding a pay-channel. It is reported that the season's operations were more successful than in former years and that a fair clean-up of gold was made.

KEITHLEY SECTION.

The *Kitchener* placer mine on Keithley creek, owned by Harrison & Worth, was acquired this year by a syndicate formed by some of the directors of the Quesnel Hydraulic Gold Mining Company. K. C. Laylander, manager of this company, was also in charge of the work at the *Kitchener* mine.

Harrison & Worth had worked this property since 1914 as a drift-digging and were mining in an old high channel of Keithley creek. Last year they were particularly successful, as, having reached a rich part of the old channel, they took out good pay and made a good clean-up for the season.

On acquiring the property the new owners decided to work it as an hydraulic mine, as the conditions are nearly ideal for this method of working. The overburden is not excessive, there is ample fall for a dump, and Keithley creek can be utilized to supply an abundance of water for hydraulicking for a long season.

During the summer the necessary equipment for an hydraulic plant was taken in, including a portable sawmill to saw lumber for the flume. The pipe-line, flume, and all necessary plant was erected and a short run was made before closing down for the winter. It is expected that this property will be an important producer next year.

HARPERS CAMP.

Keystone-drilling.—The prospecting by Keystone-drilling of certain placer-gravels in the vicinity of Harpers camp was commenced in December, 1919, by the British Columbia Department of Mines. The drilling was continued until April of this year, when it was stopped pending the arrival of new casing and other equipment. Drilling was recommenced early in August and is still being carried on.

The drilling done from December to April was mainly on ground controlled by the International Dredging Company, on which a number of holes were put down ranging from 30 to 50 feet in depth. The results of this work, while showing values in certain places, did not lead the International Dredging Company to carry on further dredging during the present season. It was not considered that the average grade of ground was such as to yield a profit by mining it with drag-line scraper plant with which the company has operated during the past two seasons.

The drilling campaign commenced in August had for its objective the possible discovery of an extension of the rich gold-bearing area which was worked in former years, known as "Ward's Horsefly." Many theories have been advanced regarding the possibility of there being an old channel of the Horsefly river which fed this rich area, which channel would be expected to carry good pay values. So far as the drilling has been carried out, the results give no indication of such a channel. A consideration of all available data lead to the opinion that the rich ground in Ward's Horsefly was formed by a natural concentration of the stream-gravels which were carried over a high sloping bed-rock at a bend in the stream of the present Horsefly river. These conditions would result in a relatively small rich area, with the values decreasing in all directions going away from the central point. The drilling now in progress may be successful in outlining certain portions of the deposit, not previously worked, which could be profitably mined.

CENTRAL MINERAL SURVEY DISTRICT, No. 3.

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

(Headquarters, Kamloops.)

INTRODUCTION.

The mineral production for the year for District No. 3 has had a considerable proportional decrease as compared with 1919. The only minerals in which increased production is recorded are coal and magnesium sulphate (Epsom salts).

The following table gives the estimated production for 1920, with estimated increases or decreases as compared with 1919:—

Product.	Estimated Production, 1920.	Estimated Increases compared with 1919.	Estimated Decreases compared with 1919.
Gold, lode	340 oz.	.....	2,818 oz.
Gold, placer	125 "	.....	350 "
Silver	1,700 "	.....	7,552 "
Copper	220,000 lb.	.....	336,500 lb.
Lead	5,000 "	.....	29,059 "
Coal	136,700 tons	5,352 tons	.....
Magnesium sulphate (crude)	1,800 "	1,162 "	.....

The decrease in the gold-output is almost entirely due to the closing-down of the *Pioneer* mine in the autumn of 1919.

Although there are no important silver-mines in the District, the *Mary Reynolds* mine, near Stump Lake, shipped over 6,000 oz. of silver during 1919; also the *Queen Bess* mine, on the North Thompson, produced about 1,000 oz. from silver-lead ore. Neither of these mines have been operating during the year 1920.

The decrease in the copper-output is accounted for by the closing-down early in the year of underground work at the *Iron Mask* mine, this being the principal producer of metalliferous ore in the district.

Lead.—The principal producer during 1919 was the *Queen Bess* mine. This, as stated above, has not been operating during the present year.

Coal.—This has maintained its production and will probably show a slight increase over 1919. Practically the whole output is from the Nicola coalfields in the vicinity of Merritt.

Increasing activity has developed during the year in the production of magnesium sulphate. The shipments from the Clinton lake were sent to Oroville, Wash., for treatment; those from Basque were sent, some to the Eastern market direct, and some to Vancouver for cleaning in the company's refining plant there.

The production to date of this district as a whole is small compared with the total production of the Province, but the outlook for the future is most promising, considering the potential resources as indicated by the results of prospecting-work being carried on. Geologically, the district is highly favoured so far as range of formation is concerned. In the eastern part of this district there are exposures of the Pre-Cambrian rocks in the Shuswap terrain which have scarcely yet been scratched. The northern central area, consisting largely of an elevated plateau is largely composed of ultra basic volcanic rocks not favourable generally to the deposition of valuable metalliferous ores. Development has been proceeding, however, on occurrences of hydromagnesite, magnesium sulphate, sodium carbonate, also chromite, and there is no doubt that some of these will develop into successful commercial propositions. It may be mentioned here that there are possibilities in this north-central area in the way of discoveries in the line of the semi-precious stones. Hyalite, a form of opal, but colourless and of little commercial value, is known to exist in considerable amounts in the vicinity of Hihium lake. Specimens of turquoise of commercial grade have been found by Geo. McDonald, of Kamloops, but, as the district in which they were found is very difficult of access, nothing has been done in the way of further investigation since the discovery was made.

In the west, south, and east of the district, where the granitic intrusives have reached their greatest development, we have the occurrences of the more pronounced metalliferous ores, the mineralization occurring not only in the granite, but also in the overlying volcanics and sedimentaries. I shall only mention here a few of the promising areas on which work is being carried out, giving more detail in the later descriptions under the heads of the respective Mining Divisions. The Taseko (Whitewater) limonite-deposit reported on by Wm. Brewer last year has been investigated more fully by the Department of Mines during the present year. The Canadian Geological Survey also had a party under J. D. MacKenzie making a geological survey of this particular district. Assessment-work only has been carried out in the Gun Creek and Tenquille Creek areas. The Cadwallader Creek gold area has been very quiet during the past year. The 23-Mile camp on Skagit river, south of Hope, continues to show increasing indications of large bodies of copper, ore and galena, also small high-grade silver ore. The Ladner Creek-Siwash Creek gold-bearing argillite-belt has had considerable prospective value added to it as a result of work done by the Liberator Mining Company, Limited, operating the *Emancipation* mine. As this belt extends from north of the Fraser river south-easterly across Siwash creek, the Coquihalla river, and 23-Mile camp to beyond the International Boundary of the Skagit, there should be some potential importance accruing to the Hope vicinity as a future supply-point for mining requirements.

An area which should prove of considerable interest is that lying to the south-west of North Barriere lake. The country-rock surrounding the north half of the lake is granite; that surrounding the southern half is a schist, the contact between the two running in a north-westerly direction.

The Government work being carried out in the Highland valley has shown that a very large area of mineralized ground exists in the vicinity, the boundaries having not yet been fully determined.

Clinton Mining Division.

Magnesium Sulphate (Epsom Salts) Lake.—About 1,000 tons of crust was shipped in the early part of the year from Clinton to Oroville, Wash., for treatment.

Watson Bar Creek Placer.—It is estimated by the Gold Commissioner, Clinton, that \$2,000 of gold was taken out during the season.

Goodenough Lake (Carbonate of Soda).—This lake lies just to the west of Meadow lake, about 24 miles from the 59-Mile House, Cariboo road. Work largely of an experimental nature has been going on all summer under the direction of Mr. Silverton, of Vancouver, for the purpose of finding the most efficient method of producing the sodium carbonate in crystal form.

Taseko (Whitewater) River Iron-ore Deposits.—F. J. Crossland, under instructions from the Department of Mines, has been carrying out investigations in this limonite area during the summer. J. D. MacKenzie, of the Canadian Geological Survey, with his party, also spent the season in this vicinity.

Lillooet Mining Division.

Little of importance has taken place in this Division during the year.

In the Cadwallader Creek area the *Pioneer* mine has remained closed.

The *Lorne* mine has continued development in a small way and produced a small amount of gold from development rock.

The *Wayside* and *Ida May* also did some development-work.

Aid to Prospecting by Returned Soldiers.—Two parties of two men each worked in this Division during the season. One party operated in the vicinity of the headwaters of McGillivray and Cadwallader creeks; the other in the vicinity of the headwaters of Cayuse and Texas creeks. No particularly interesting discoveries were reported and no claims were staked, but considerable valuable information was secured which will be incorporated in a separate report.

Copper Mountain, Gun Creek.—Assessment-work only has been carried out on this property during the year.

Tenquille Creek Area.—Assessment-work on the several properties in this area has been carried out.

Kamloops Mining Division.

Iron Mask.—Underground operations were suspended in this mine during the early part of the year, but a considerable force of men has been kept at work repairing, making additions to surface plant, and putting in a plant to pump water from the Thompson river to the mine. The main shaft has been retimbered; new concrete foundations to the head-gear put in, and the head-gear practically rebuilt; a new belt-conveyor from head-gear to mill installed and increased storage for treatment liquids provided. Work is proceeding on the pumping plant previously mentioned.

Chu Chua Coal Mining Syndicate.—Trustees, W. H. Glass, 1507 North Thirty-ninth street, Seattle, Wash., and H. W. Schuett, 400 Central Building, Seattle, Wash.; Local Secretary, C. E. Max, Kamloops, B.C. This syndicate has secured options on approximately 5,000 acres of coal lands about 2 miles south of Chu Chua. A compressor operated by a 50-horse-power steam plant has been installed, a road built to a siding on the Canadian National Railway slightly over a mile away, and camp buildings erected to accommodate about twenty men. Production has been started, working on a 3-foot seam of excellent coal. About 1,200 tons are expected to be shipped by the end of the year.

Lynx.—Situated about a mile south-westerly from North Barriere lake; owner, Charles Loucks, Barriere. The formation in which this is situated is referred to in the introduction. Two samples were taken from a short tunnel on the property which gave small results in copper and silver. The mineralization continued underneath the section sampled, as the face and bottom of tunnel were all in mineralized ground.

On the *War Colt* group and others in the Thunder creek vicinity considerable work was done during the summer with very encouraging results, but the distance from transportation prevents work being conducted on an extensive scale.

Ashcroft Mining Division.

Basque Chemical Production Company.—J. G. Miller, Manager, 415 Bank of Nova Scotia Building, Vancouver. Operating Epsom Salts lakes near Basque. The management is working up a market that argues well for the success of this company. Approximately 800 tons has been shipped during the year, part of which was treated in their refining and classifying plant in Vancouver.

Snowstorm Group, Highland Valley.—During the past season work has been confined to surface operations on the *Iona* sub-group as a preliminary to drilling operations. As the work of test-pitting advanced the area of mineralized ground continued to increase until an area approximately 1,000 feet across and 3,000 feet in length has been proven to exist. Surface values vary from roughly 0.5 per cent. copper to 2 per cent., with the lower values predominating. The averages from a few pits run as high as 6 and 10 per cent.

On the Deadman Creek diamtomaceous earth deposits nothing has been done in the way of opening up this large and good-quality deposit. This is another case of transportation difficulty only.

Nicola Mining Division.

The principal output from this Division continues to be coal. The Middlesboro Collieries and the Fleming Coal Company have both been operating steadily during the year and will probably have an increased output of several thousand tons over 1919.

STUMP LAKE AREA.

Donohoe Mines, Stump Lake.—This property operated during the early part of the year, shipping a car of ore, but closed down again during the latter part. This was the only property operating in the Stump Lake area this year.

ASPEN GROVE.

Some diamond-drilling was carried out in the southern part of this camp early in the year, but the results were not particularly encouraging. The same interests, however, which held an option on the field last year have turned their attention to the northern part, and intend doing some drilling in this section at an early date.

Bentonite.—This is a material of rather unusual occurrence. There is a deposit of this near Quilchena associated with the coal formation. In appearance it is a light-buff coloured, fine-grained, compact rock with a structural appearance which might be described as being between a hard clay and a chalk. When water is added it breaks down into a slimy mud. It is locally known by the name of soap-clay. There is an occurrence of this in Wyoming, where it is being worked on a commercial basis, the material being used largely in the manufacture of paper as well as in the manufacture of certain kinds of cloth.

Vernon Mining Division.

There has been little doing in this Division in the way of metalliferous production. A company has been formed, however, for the purpose of working up the clay-deposits which exist at Okanagan Landing. It is organized as the Lakeside Clay Products, Limited; manager, Louis J. Ball, Vernon, B.C.

During the summer a plant has been installed for the commercial production of brick and some kilns fired. It is the intention of the company to go into the manufacture of drain and hollow tile as soon as developments warrant.

Yale Mining Division.

The principal developments in this Division during the year has been the operations carried out by the Liberator Mining Company, Limited, operating the *Emancipation* mine. Dr. E. T. Hodge, Manager; Gradford W. Heyer, Secretary-Treasurer, 1522 Standard Bank Building Vancouver.

A 50-horse-power Fairbanks-Morse oil-engine and compressor has been installed near the Kettle Valley Railway track, where a siding has been put in. An air-pipe line 3,700 feet in length connects the power-house with the mine, where two drills are being used for development and stoping purposes. Ore is being sacked for shipment, and results of development indicate increasingly large reserves of ore of a milling grade which is being left in the mine.

The encouraging results of this work mean much for the whole of the Ladner Creek properties.

B.C. Silica and Tale Company.—Executive offices, 204-6 Crown Building, Vancouver; David McMaster, Manager. The property consists of five claims situated along the north side of the Canadian Pacific Railway between Chaumox Station and the Nahatlatch (Salmon) river. A good road has been constructed from Chaumox Station to the principal tale and silica occurrences. I have no record of the year's shipments.

23-Mile below Hope, on the Skagit.—The assessment-work on the *Diamond* group continues to show increasing bodies of ore. Also work on *Mammoth* group shows interesting mineralization of scheelite in combination with pyrrhotite.

Strontianite is found on *Defiance* group, across the valley from the *Mammoth* group.

SOUTHERN MINERAL SURVEY DISTRICT, No. 4.

PRELIMINARY REPORT BY PHILIP B. FREELAND, RESIDENT ENGINEER.

(Headquarters, Grand Forks.)

The above district comprises four Mining Divisions—i.e., Grand Forks, Greenwood, Osoyoos, and Similkameen. There is a considerable decrease in the total tonnage for the district for 1920, owing to the cessation of work on the Phoenix properties by the Granby Company and the delayed operations of the Canada Copper Corporation at Copper mountain, near Princeton.

While there was a greater activity amongst the operators of the higher-grade silver-lead properties early in the year on account of the price of silver being between \$1 and \$1.35 an ounce, a decline to 65 cents an ounce during the latter part of the year made successful operation difficult. Unless the price of silver advances or the cost of operation decreases, it is probable that most of the smaller mines will be obliged to close down.

There have been four new discoveries in the district, the news of which only came to hand after the snow-fall prohibited an examination. One of the most attractive of these claims is situated close to Osoyoos Customs-house and adjoining the International Boundary-line, being an extension of the old *Submarine* group of claims staked in the United States. Another, situated about 2½ miles west of Hedley, shows a fairly large outcrop of copper sulphides. Another group, also copper, was found on the Roach river, about 16 miles beyond the end of the Trans-Provincial Highway. Information regarding these discoveries was obtained from a reliable source.

The South Kootenay Power Company has completed the new high-power electric line from Greenwood to Copper mountain and is in a position to supply power to any legitimate concern in the vicinity of the line.

The Provincial Government commenced diamond-drilling upon the *Glouster* and *G.H.* claims in the Franklin camp in June and finished in October. Altogether 2,888 feet of drilling was accomplished.

The tonnage in the different Mining Divisions is as follows: Grand Forks, 28,925; Greenwood, 1,861; Osoyoos, 39,684; Similkameen, 37,000. Total tonnage is 107,470 for 1920, as against 252,106 tons in 1919.

Grand Forks Mining Division.

Rock Candy.—This mine has operated steadily throughout the year, except for an occasional shut-down on account of forest fires and a broken cable. An average of thirty men was employed. Continuous development has been carried on in the intermediate and lower tunnels on the strike of the deposit. The ore-body in the lower tunnel is split by small tongues of alkali syenite, which, though hampering the development-work, can be used as pillars to support the ground above. A new bunk-house has been constructed to accommodate the men.

Rock Candy Mill.—Two Wilfley tables have been added to the plant to treat the fines from No. 3 kiln. The concentrates are then elevated and dumped into the hot product from No. 1 and No. 2 kilns, and thus most of the moisture is eliminated before screening. About 18,500 tons of fluorite was treated, from which about 7,100 tons of concentrates was obtained.

Emma.—The Consolidated Mining and Smelting Company operated this mine during the greater part of the year. About 100 tons of ore a day was shipped to Trail smelter, chiefly for fluxing purposes. Only a small amount of development-work was done on the lower level. About 10,000 tons of ore was shipped.

Little Bertha.—Between 300 and 400 feet of tunnel has been driven by A. Savage on this property, under contract. No values have been encountered up to the present time, other than a few mineralized stringers.

PAULSEN.

Molly Gibson.—This property, situated about 4 miles south-west of Paulsen, has been developed by the owners in a small way during the year. The old shaft was sunk farther and, it is understood, a larger ore-body uncovered. The extreme hardness of the rock is a great handicap to development.

EDGEWOOD.

Waterloo.—Rendall, Borg & Hammersley, the owners of this mine, spent three months during the summer breaking and seeking ore from the intermediate tunnel. The weather conditions were so bad that only 8 tons of ore, a high-grade silver-lead, was packed out on horses.

FRANKLIN CAMP.

Union.—Development of this mine by the owners, L. Johnson, Pat. McGinnis, and J. McDonald, was carried on in the winter of 1919-20. In No. 2 tunnel they crosscut about 10 feet of ore averaging 0.40 oz. in gold and 7.40 oz. in silver, and in the lower tunnel about 7 feet of ore averaging 0.40 oz. in gold and 12.60 oz. in silver. A rough survey of the ore-body

showed that there is probably 25,000 tons of ore between the lower and upper tunnels. Whether this ore can be profitably handled with silver at the present price remains to be seen. The owners have decided to stock the mine and carry on operations. Unless a higher grade of ore is encountered, it will be well for the operators to proceed carefully along lines of development rather than commence a construction programme. Before building a mill it is necessary to block out enough ore to pay for the mill and give a margin of profit to the shareholders.

Maple Leaf.—A contract for 100 feet of tunnel was let and completed during the year. The ground in the vicinity of the lower tunnel seems to be considerably fractured and faulted. In the minor faults and slips there appears to be a certain amount of mineralization, and hand samples taken by the owners from these slips gave fairly good results in copper and gold. It seems advisable to sample the lower tunnel thoroughly before deciding upon any future programme of development.

Glouster and G.H.—A part of these claims was diamond-drilled by the Provincial Government during the year. Owing to the International Diamond Drilling Company withdrawing their drill outfit early in October, the work on the claims was not completed.

Greenwood Mining Division.

PHOENIX.

Granby Consolidated Mining, Smelting, and Power Co.—All work of dismantling the underground and surface plant at the mines in Phoenix finished in the early autumn, and the town is now practically deserted. Such tonnage as remained in the mine was distributed in such a way as to make the mining of it expensive, and this, together with the high cost of operation and the falling price of copper, brought about a condition which made it impossible to obtain any profit. The concentration of the ores was considered, and it was found that after an outlay of over \$75,000 for new plant the cost would average about 18.70 cents per pound of copper produced. The company's smelter at Grand Forks is being dismantled at the present time.

GREENWOOD.

Providence.—The three-year lease held by Al. Morrison & McGillis, of Greenwood, expired on November 14th, 1920. The owners, represented by C. Madden, of Chicago, are considering the possibility of operating the mine. Development-work for the year consisted of 250 feet of drifting on the lead, 135 feet of upraising, and the installation of part of the surface plant. An average of twenty-eight men was employed and the tonnage amounted to 945 tons (dry). The total contents are as follows: Gold, 575 oz.; silver, 149,000 oz., lead, 30,000 lb.

Skylark.—This property was leased by Duhammel & Bryant and 46 tons shipped to the Trail smelter. Three separate stringers of ore were found about 25 feet east of the old workings, carrying gold and silver.

Crescent.—A lease was taken on this mine by Geo. Thompson, of Greenwood, and 7 tons of silver-lead ore shipped to the smelter.

Last Chance.—James Poggi, of Greenwood, took a lease on this mine and shipped 27 tons of ore to Trail.

WALLACE MOUNTAIN.

Bell.—The owners, Dunc. McIntosh and Pat. Crane, installed a small compressor and engine on this property in the early autumn. A motor-truck was purchased to haul the ore to Beaver-dell Station and bring in supplies for the camp. Several hundred feet of tunnels and open-cuts were driven and about 265 tons of silver-lead ore shipped to Trail.

Sally Group.—Most of the work was done during the year on the *Rob Roy* claim, which adjoins the *Sally*. Some new outcrops were discovered and a considerable amount of extension tunnels run. About 360 tons of silver-lead ore was shipped to Trail.

Rambler.—This property was worked by the owner and 10 tons of silver-lead ore shipped to Trail.

Wellington.—Jas. Sutherland *et al.*, of Greenwood, leased this property and uncovered some fairly high-grade silver-lead ore. About 105 tons of ore was shipped.

Highland Chief.—About twenty years ago this property was prospected by tunnels and open-cuts in an endeavour to discover some high-grade ore. Not until 1920 did Ed. Maloney, of Penticton, develop a small lead of silver-lead ore that carried sufficient values to make the

property attractive. Very little development-work has been done to date to prove the extent of the find.

CARMÍ.

Carmi.—The construction-work on a 75-ton mill commenced in 1919 has not been completed yet. It seems a pity that the money spent in attempting to construct a plant was not used for developing some ore, which may be badly needed when operation commences.

LIGHTNING PEAK.

Rampulo.—Development-work was continued throughout the summer, and the owner, A. Cortiana, is working a crew of men this winter on the lower tunnel.

OSOYOOS Mining Division.

SIMILKAMEEN.

Horn-silver Mine.—Development-work consisted of 500 feet of tunnels. Whilst drifting on the lower tunnel the lead was lost in a slide near the surface. A crosscut tunnel driven beyond the slide about 50 feet encountered the vein in-place and 4½ feet wide, carrying values of 41 oz. in silver and 0.12 oz. in gold. The average number of men employed was seventeen, and 1,630 tons of ore was shipped, having a total content of 152 oz. in gold and 65,000 oz. in silver.

Indiana and Fairview.—These claims have been staked by Joe Armstrong, of Chopaka, Wash., and are situated on the Indian reserve about 14 miles south of Keremeos. No work, except a little stripping, has been done on the property. The lead, about 6 inches wide, contains native silver, pyrrargyrite, argentite, and other sulphides of silver and iron in a gangue of quartz, and occurs as a fissure in a granitic rock. The lead has evidently been badly fractured and its commercial value cannot be decided upon until some development-work is done. A picked sample gave 0.02 oz. in gold and 82.50 oz. in silver to the ton.

HEDLEY.

Hedley Mining Co.—The company operated the mine and mill until the autumn, when work ceased on account of conditions which cut down any margin of profit to a minimum. It is probable that some development-work will be done in the near future.

FAIRVIEW CAMP, FAIRVIEW.

The high-power electric line, now in operation, passes through this camp. With this means of acquiring electric power for operation purposes, it seems likely that the old *Stemwinder* and *Morning Star* groups of claims will once more command attention. The gold-quartz leads on both groups are strong and well defined.

OLALLA.

Copper King.—This property was leased to A. Hagelberg and the assessment-work done.

Gotconda.—The development of the lower tunnel was carried on this season and the owners hope to strike the ore-body developed in the upper workings.

KEREMEOS.

Dallas, Independence, St. James, and Terminal.—These claims are situated about 6 miles from Keremeos on the old Fairview-Keremeos wagon-road. The vein-matter is chiefly quartz and the ore occurs in segregations in the quartz. The peculiar brass-yellow colour of the ore, together with its exceedingly high content of gold, probably places it in the telluride class, possibly krennerite. Unfortunately, as far as development shows, the segregations of mineral are somewhat rare. The country-rock is schist.

Hidden Treasure Group.—This group adjoins the *Dallas* claim and is owned by J. Pitman, of Oroville. Several large quartz veins have been prospected by tunnels and shafts, and at the time of writing this report only low values in gold and silver had been found.

ASHNOLA RIVER.

Prince.—This claim is situated about 5 miles up the Ashnola river and is owned by Dunc. Campbell & Thomas, of Keremeos. The lead, which is mainly quartz, varies from ½ to 18

inches and carries values up to \$5 in silver and lead to the ton. The country-rock consists of greenstone and quartzite intruded by porphyry.

Similkameen Mining Division.

PRINCETON.

Canada Copper Corporation.—The electric power from the South Kootenay power plant at Bonnington falls, Nelson, was supplied to the mine on Copper mountain on October 19th. Sixty thousand volts are delivered at the mine sub-station and transformed to 2,200, 550, and 110 volts. All machinery, track, etc., necessary for active operation was installed by October 19th, when the first car-load of ore was shipped to the mill at Allenby. After some alterations in the mill, such as the addition of another jaw-crusher on account of the extreme hardness of the ore, good results were obtained by concentration. Owing to the price of copper dropping to 14 cents a pound the company on December 9th decided to cease operations for the present. Twelve new cottages were built at the mine. About 37,000 tons of ore was treated in the mill and the concentrates sent to the Trail smelter.

Copper Farm.—The owners of this mine, situated 4 miles from Princeton, have installed a compressor and boiler and built a new bunk-house and kitchen. Future development will consist of driving the lower tunnel ahead about 100 feet and connecting the upper and lower workings by an upraise.

Princeton Coal and Land Co.—This company operated steadily throughout the year on its coal lands at Princeton. About 26,550 tons (short) was shipped.

ROACH RIVER.

Knob Hill Group.—This group is situated on the west side of the Roach river about 16 miles from the end of the Trans-Provincial wagon-road. In driving a crosscut to develop an outcrop an entirely new ore-body was found, about 10 feet wide, and well mineralized with chalcopyrite and chalcocite. It seems probable that the ore lies in lenses in the schist.

Red Star Group.—Development-work continued during the year on the lower crosscut tunnel, showing no change in the ground. It is probable that the owners will have to drive about 20 feet farther before striking the ore. Both this group and the *Knob Hill* show promise, and should the Trans-Provincial Highway be extended it is very probable that a considerable amount of copper ore will be shipped.

WHIPSAW CREEK.

Lucky Pair Group.—This group is situated about 22 miles south-west of Princeton and is owned by Chas. Day. Several open-cuts have been excavated on the group and a good deal of stripping done, also a tunnel about 492 feet. The open-cuts show segregations of lead carbonates and a considerable amount of stain through the schist. The tunnel is driven on a lead varying in size from 3 inches to 1 foot and carries values up to 6.60 oz. in silver, 19 per cent. lead, and 8.50 per cent. zinc to the ton.

S. & M. Group.—These claims are approximately 21 miles from Princeton on the north-west side of Whipsaw creek. The owner, Sam Spencer, has done a lot of development near the surface in a fractured zone heavily stained with lead carbonates and iron oxides, with a few nodules of galena, which carry high values in silver. It seems probable that the vein has been crushed and leached, causing an extensive discoloration of the surrounding schist. Until the vein is found in-place the owner will have difficulty in attracting capital.

Marion Group.—This group adjoins the *S. & M.* to the south and belongs to the same owner. Development-work consists of 45 feet of tunnel and a shaft 12 feet deep, also several trenches and open-cuts. The lead is about 6 feet wide near the contact of the schist and granite, and carries 0.08 oz. in gold, 3.80 oz. in silver, 0.20 per cent. copper, and 18 per cent. zinc, in a gangue of calcite with epidote, sericite and crushed country-rock.

COALMONT.

Coalmont Collieries.—Under the management of Messrs. Johnson and McLean, this company has developed the coal areas on their property, about 2.82 miles south-west of the town of Coalmont, on the Kettle Valley Railway. During the year a new opening has been made in the mine and different seams blocked out. A new bunk-house and dwelling-houses have been built and

an aerial tram 15,000 feet long, with a capacity of 60 tons an hour, installed; also a tippie and screens at the railway and a plant to generate electric power for the mine and town.

TULAMEEN RIVER.

Tulameen Placers.—Chas. F. Law employed three men on the old *Swan* placer-diggings near the mouth of Slate creek during the summer. An old shaft was unwatered and retimbered and a new tunnel driven in the face of the bluff in an attempt to strike bed-rock. The results of the development are not to hand.

Other parties were working on the Tulameen River placers in a small way.

SUMMIT CAMP, TULAMEEN.

The *Mountain View*, *Blue Bell*, *Sutter No. 1* and *No. 2* claims have been acquired by W. H. Hess, of Tulameen. A good deal of surface prospecting has been done and the lead traced for about 1,500 feet on the *Mountain View*. A tunnel is being driven under this outcrop at the present time. The lead, striking about N. 80° W., contains some galena and iron in a gangue of calcite and quartz. High silver values were obtained from hand samples. Future development on this property is looked forward to with great interest, for in other parts of the camp several strong leads containing lead, silver, and zinc have been partially developed, but nothing done to try and place the camp on an operating basis.

EASTERN MINERAL SURVEY DISTRICT, No. 5.

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

(Headquarters, Revelstoke.)

INTRODUCTORY REMARKS.

The mineral industry of the district has suffered during the year from the scarcity of labour, which in some cases has been accentuated by strikes called by the O.B.U. Early in May a strike called by this union in the Slocan Mining Division greatly curtailed the operations of the leading mining companies, with the one exception of the Silversmith Mines, Limited, which company saw fit to accept the terms of this union. Labour is now more plentiful and the Slocan is getting back into its stride once more. It is reported that from about November 15th the various mines have had full crews working and that the strike has been definitely broken.

The outstanding feature governing this year's production of lead and zinc has been the continuous operation of the great *Sullivan* mine by the Consolidated Mining and Smelting Company. Under adverse conditions this mine has greatly exceeded last year's output, and has been able to supply the smelter with a steady stream of ore, thus offsetting the decrease in tonnage from other sources.

In view of the high cost of labour and supplies, conditions cannot be considered ideal for the mining of gold ores; it is therefore encouraging to note that there have been new and important developments in this direction during the year, which leads to the conclusion that as soon as conditions become more normal, and the ounce of gold represents a greater purchasing power than at present, even greater activity will be witnessed among the gold properties.

Mining operations on a small scale have not been seriously affected by the labour situation, and it is safe to say that the past season has been an exceptionally busy one in the hills for the small operator, leaser, and prospector. To my knowledge, many results obtained among the prospects have been very encouraging, and it is fully anticipated that next season will see a number of new names on the shipping-list.

In this district during the season three soldier prospecting parties were assisted by the Government. Two of these chose the Big Bend district north of Revelstoke, and a third the Golden Mining Division.

Captain B. T. O'Grady was appointed Assistant Resident Engineer on June 1st. His time was mostly employed in the Slocan, Nelson, and Ainsworth Divisions, and many applications for assistance on road and trail construction received attention which otherwise would necessarily have been neglected through lack of time.

The season was a busy one both in the East and West Kootenay; numerous applications were received for examinations and assistance on road and trail construction, and altogether about eighty-five properties were visited.

Golden Mining Division.

The shortness of the open season greatly curtailed the field-work in this Division, and time did not allow as many examinations as was anticipated. Prospecting has shown signs of revival, though not commensurate with the scope that this large and well-mineralized area affords.

The principal producer is the *Monarch-Couverapee* property at Field, which, under the management of Mr. Adkins, has shipped between 500 and 600 tons of lead ore and concentrates during the year.

Rose and Daisy.—Situating on the ridge between the Columbia and Spillimacheen rivers at a point almost opposite Castledale. The property was bonded to C. H. Rowley last fall, and 100 feet of tunnelling was done in an effort to develop some small surface showings. The results did not come up to expectations and the work was abandoned. Elsewhere on the property there is a strong surface showing of low-grade lead ore, on which work recently done by the owners is reported to have given excellent results. R. W. McKeeman, of Castledale, is the principal owner.

Castledale.—Consisting of two claims, owned by W. Logan. Considerable tunnelling was done on this property by C. H. Rowley. In these workings the vein does not show continuity, and only a few small pockets of quartz mineralized with chalcopyrite were encountered. It is now reported that the owner has found more ore at another showing, on which he has confined his attention during the season.

Prospecting was energetically carried out by Captain F. P. Armstrong and his partner, J. G. Webster, under the returned soldier prospecting scheme put into effect this year by the Provincial Government. The areas prospected included the ridge between the Spillimacheen and the Columbia rivers and Vermont creek. Three claims were staked.

Captain Armstrong is also interested in the *Giant* mine near Spillimacheen, where there is a large deposit of barytes and low-grade lead ore. It is reported that Eastern capitalists have taken an option on the property and intend to mine the barytes on a large scale.

Eclipse Group.—Situating on Warren creek and owned by A. F. Macauley, of Spillimacheen. This property was examined by B. T. O'Grady, Assistant Resident Engineer. A good showing of high-grade copper ore is exposed by surface workings. A sample across 16 inches of the vein ran: Gold, trace; silver, 0.4 oz.; copper, 19.2 oz.; iron, 25 per cent.

Marie Group.—Situating near Palliser. Preliminary prospecting-work done by the owner, O. W. Wiedman, consists of an open-cut on the vein, in which several quartz stringers carrying galena have been exposed. Some of the sorted ore ran: Silver, 2.4 oz.; lead, 66 per cent.; zinc, trace.

Windermere Mining Division.

The renewed interest which became awakened in this Division last year has been manifested this year by an increase in general mining activity.

Paradise.—Mining operations were continuous during the year, but development was impeded and the output considerably curtailed by shortage of labour. A 5-ton White motor-truck was used for hauling ore from the mine to Invermere.

Ptarmigan.—Early in the year about 250 tons of ore was hauled from the old dump at the lower tram terminal and shipped to Trail. The cost of the long haul to the railway absorbed the margin of profit after smelter costs had been deducted, and E. Watson, who had a lease on the property, abandoned the project.

Iron Cap Group.—Situating at the head of McDonald creek. This property was worked under lease by J. L. McKay and G. Larrabee. A car-load of silver-lead ore is reported to have been shipped during November, partly from this property and partly from a near-by claim called the *Helldriver*.

Nip & Tuck.—Situating in the same mineralized zone and in close proximity to the *Iron Cap*. This property has been bonded by a Vancouver syndicate. R. H. Perry, a mining man of the Boundary District, is in charge of the work. It is understood that development-work will be continued during the winter.

Isaac.—This property was acquired by Paul Dernhart last year from H. E. Forster, of Wilmer. A shipment of 72 tons of silver-lead ore was made to Trail. It is recently reported that parties interested in the *Nip & Tuck* have acquired this property.

Lead Queen.—During the year the lower crosscut was continued and the vein tapped at an additional depth of 75 feet. The drift along the vein at this level is reported to have a nice showing of ore in either face. Work has been suspended for the winter, but, according to the manager's statement, will be continued next spring.

Tatler Group.—Owned by R. W. Gallop and located at the head of the South fork of Horse-thief creek. A few men were employed during the year at development-work. The principal values are in copper and silver, although some fairly high-grade lead ore has been found on certain of the claims.

Mineral King.—Situating near the confluence of Toby and Jumbo creeks. Development of a large surface showing of silver-lead ore was actively pushed during the season by the Toby Creek Mining Company, in which Vancouver people are principally interested. The results obtained are said to be very encouraging, and it is anticipated that work on a larger scale will be carried on next year.

Bunyan Group.—Situating near Invermere. This property was recently bonded by Captain E. J. Fader, who, instead of developing the ore-body as exposed by the old workings in accordance with usual mining practice, decided to indulge in a little spectacular mining and blow off the face of the bluff with one big blast. The result was evidently satisfactory, for it is reported that a 600-foot tramway has since been built, an ore-bin erected, and improvement made to the road. Two car-loads of ore have been hauled by Packard trucks to the railway at Lake Windermere and shipped to Trail. The values are in copper and silver.

Fort Steele Mining Division.

This Division easily leads all others in tonnage produced for the year, and yet it has only three or four properties on the shipping-list. One of these properties—namely, the *Sullivan*—is responsible for the bulk of the production and is one of the greatest deposits of zinc-lead ore on the continent. It is interesting to note that previous to the operation of this property one of the largest producers of silver-lead ore the district has ever had was the *St. Eugene* at Moyie, which is situated at a distance of 32 miles in a south-easterly direction from the *Sullivan*.

The *North Star*, situated close by the *Sullivan*, is the only other large shipper at the present time.

The fact that such large deposits have been found to exist upon the development of ordinary surface showings tends to increase the possibilities of prospects in adjoining areas where geological conditions are similar.

There are a great many prospects scattered throughout this Division, but in the majority of cases not enough work has been done to prove the persistency of the veins or the definite boundaries of the ore. It is gratifying to note that this year has witnessed increased outside interest in the Division, and general activity among the prospects has been more pronounced. The Prospectors' Association, under the secretaryship of J. F. Hucheroft, has been active in giving useful information and advice regarding various properties and best way to reach them.

Sullivan.—Good progress has been made by the Consolidated Mining and Smelting Company in development and mining operations. The lower tunnel is now in over 8,000 feet, and is still being continued to strike the ore proved by the diamond-drilling done from the upper workings. A raise connecting the upper and lower workings has been completed. Labour was scarce during the summer and early fall. Shipments were curtailed during the first four months of the year owing to a strike called by the O.B.U. Shipments up to November 26th were as follows: Zinc ore, 240,000 tons; lead ore, 13,500 tons; iron pyrites, 4,300 tons.

North Star.—This property, which is the second largest producer in the East Kootenay, has been operated steadily during the year, and up to the middle of November had made shipments of about 8,000 tons of silver-lead ore, principally consisting of carbonates.

Federal Group.—Situating near Skookumchuck at a short distance from the railway. Mining and development operations have been carried on by the Globe Mining Company, of which D. A. McIntosh, of Cranbrook, is president and manager. The ore so far encountered is principally native copper, which has been deposited in thin layers and groups of aborescent crystals in a soft iron-stained talcose material. At the time of examination this had been followed by a winze from a point near the edge of the creek to below the bed of the creek, and water was impeding the work. Latterly a new compressor and pump were installed and work is reported to be progressing favourably.

St. Eugene.—Situated at Moyie. This property has been operated since May 1st by the Consolidated Mining and Smelting Company. The approximate tonnage produced is 800 tons of lead ore and 300 tons of zinc ore.

Society Girl.—Situated near Moyie. After many years of unproductive activity it is now reported that a nice shoot of silver-lead ore has been struck and a car-load shipped to Trail. It is to be hoped that this will mark the beginning of a period of prosperity for the owners, who have been so persistent in their endeavours to make a mine of the property.

Evans Group.—Situated on Whitefish creek, a tributary to St. Mary river. Prospecting-work was carried on by Evans Bros., who have been interested in the property for many years. The ore is principally chalcopryite, with which good silver values are often associated.

Prospecting-work was continued on the *Yellow Metal* group on Perry creek by W. van Arsladen and partner. Work was also done on other gold-quartz properties on this creek and several examinations were made by visiting engineers.

Victor.—Situated on Maus creek near Fort Steele. Development has been actively pushed on this property and a 50-ton concentrator is now nearing completion. The ore is galena, with which is associated zinc-blende.

PLACER-MINING.

Placer-mining has been fairly active throughout this Division. On Wildhorse creek the Gamble Mining Company, which was operating a monitor on some virgin ground, had a successful run, which unfortunately was limited to a very short period owing to a break in the pipe-line and shortage of water. Improvements have been made which should allow them a full season's run next year.

The *Wildhorse Dredging Company*, which has also been operating on this creek, ceased operation for some time pending a reorganization of the company. It is reported that this has been accomplished and it is expected that the company will be operating next season.

On Perry creek A. J. Palmquist has completed the flume and installed the monitors. A preliminary test is said to have yielded a nice return of fine gold.

COAL.

Robert Strachan, the Senior Inspector of Mines, reports that work has been steady throughout the Crowsnest coalfields, with the exception of a two-week strike in October at Coal Creek and Michel.

At Coal Creek and Michel the mines are all in good condition and no new developments have been made.

At Corbin work has been continued fairly steadily, the large portion of the coal coming from the Nos. 3 and 4 mines, while some preliminary work has been carried out at Nos. 5 and 6, which are new mines. During the greater part of the year labour has been scarce.

Indications of fresh developments in the Upper Elk coalfield have been in evidence during the past few months, a party having started to reopen the holdings of the Northern Coal Company, but owing to lack of labour the work was discontinued until next spring.

The total coal-output for the year is estimated at 827,670 long tons, which shows an increase over that of 1919 of 258,864 tons. The coke production totals at 54,492 tons, which is a slight decrease as compared with that of last year.

Ainsworth Mining Division.

AINSWORTH CAMP.

Florence.—Under the management of H. Hewer, this mine has been worked continuously during the year, although, in common with other properties, operations were somewhat curtailed owing to scarcity of labour. The tonnage mined and milled will probably compare favourably with that of last year.

No. 1.—Operated by the Consolidated Mining and Smelting Company. Shipments for the year amount to about 700 tons. The property has recently been leased to Thos. Haws and associates.

Highland.—Operated by the Consolidated Mining and Smelting Company. The mine was closed down in March. Some 201 tons of silver-lead ore was shipped to Trail.

Spokane-Trinket.—Steadily operated during the year under the management of J. McDougal. Approximate tonnage shipped, 400 tons.

Krao.—Some exceptionally high-grade silver ore was shipped from this property. The total production for the year will be approximately 200 tons.

Skyline.—Operated under lease by J. Sime and associates. Ore was extracted from some of the old stopes near the surface and along the outcrop. During the winter it is the intention of the leasers to do some mining and development work from the lower tunnel. Since operations began in the spring some 150 tons has been shipped.

Ruth.—Work was continued by W. A. Smith and associates on the old tailings-dump, from which they have shipped about 150 tons.

Other properties which have made small shipments are *Twin* lease, *Tariff*, *Maestro*, *Little Phil*, and *United*.

RIONDEL CAMP.

Bluebell.—Mining operations during the summer months were largely confined to mining ore from the glory-hole and surface of the hillside. In this connection it is peculiar that in the early history of the property much oxidized ore lying at and near the surface was overlooked, when it could have been used to good advantage at the old Pilot Bay smelter. S. S. Fowler has been able to ship large tonnages of this material at a time when the ore from the lower levels was unobtainable on account of water. In order to cope with the water in the lower levels additional pumping plant has been installed, and it is reported that satisfactory progress has been made towards unwatering this part of the mine. According to present figures, this year's output will exceed that of last year.

Kirby Group.—Situating at a short distance from the *Bluebell*. This property was systematically prospected by surface and underground work by A. J. Curle and R. Guthrie. Some nice showings of galena have been exposed and the property has now reached the stage where work on a more extensive scale would appear justifiable.

Phyllis and Gwennie.—These claims are also in the vicinity of the *Bluebell*. The preliminary prospecting-work done by B. L. Eastman and R. D. Hearn, both of the *Bluebell* staff, demonstrates that the property has possibilities.

Tam O'Shanter.—A little work has been done on this property and a shipment of 56 tons made to Trail.

DUNCAN RIVER DISTRICT.

Bonaventure Group.—Situating near Howser Lake. This property has been worked during the year by the owners, LeBlanc & Senff, who have been busily engaged in driving a crosscut to tap the vein at depth.

Dary Group.—Situating on Bear Creek, a tributary to the upper Duncan river. The property is being developed by Tapanila Bros., of Kaslo. The ore is galena. A good trail is being constructed from the Duncan river to the property.

Bannockburn Group.—Situating on Hall creek. Alex. Smith, the owner, has had a few men employed at development-work.

Old Gold.—Situating at the head of a tributary to the West Fork of the Duncan river. This property has been worked in a small way for many years, and some high-grade silver-lead ore has been packed out over the divide to Ferguson, a distance of 13 miles. During the present season a few men were employed.

POPLAR.

Bullock Group.—Situating near Poplar and operated by the Bullock Gold Mines, Limited. A small crew has been employed during the summer at prospecting and development work. New cabins have been built and a good trail constructed.

Crowned King Group.—Situating near the Bullock Gold Mines' property. It is reported that this property has been purchased by C. Hanson, of Poplar, and W. H. Rhomberg. It is understood that a little work was done and good gold values are reported to have been recovered from some of the schist.

Mobb's Mine.—Situating near Poplar. Recent work has been confined to driving a crosscut to tap the vein at a vertical depth of about 200 feet below a showing of galena in an old shaft. The workings are within a short distance of the railway and less than 700 feet above the track.

Among others who have been mining and prospecting around this district are: J. McDonald, who has a property at Gold Hill; P. Kelly, who owns the *Telluride* group near Poplar; A. Hanson, who is interested in the *Rio Tinto* and other properties; Dick Roberts, who has been interested in claims on Canyon creek for many years; and Osten Foss, who has properties up the Duncan river.

SOUTH FORK OF KASLO CREEK.

Silver Bell.—Mining and development work has been steadily carried on during the year and some 200 tons of high-grade silver ore shipped to Trail.

Silver Bear.—This property adjoins the *Silver Bell*. It was acquired during the year by M. S. Davys and associates. The season's work is reported to have been satisfactory and a small tonnage of high-grade ore has been shipped.

Index.—The long crosscut has been continued and other development-work carried on. A small shipment was made to Trail.

Revenue.—After lying idle for a few years this property was bonded by S. A. Williams, E. J. Edwards, and O. McDougal. The claims are situated at a distance of about 2 miles from the 16-Mile point on the wagon-road up the South fork. The trail was widened and repaired and a small crew of men was put to work. The vein is of the fissure type in granite; it is well defined and remarkably persistent in strike and dip. The ore, which occurs in small shoots, is galena and zinc-blende; the average silver values of previous shipments was about 70 oz. a ton.

Gold Cure Group.—Recently acquired by the Marsh Mines and Development Company, of Kaslo. A small crew was employed at the property this summer.

Black Bear Group.—Development-work has been carried on by Hansen Bros. A new trail and a short bridge across the South fork have been constructed, which give the property access from about the 6-Mile point on the wagon-road.

It is to be regretted that there was no activity at either the *Cork-Province* or the *Gibson* properties this year.

RETAILLACK.

Whitewater.—Mining operations were carried on principally by leasers, and a number of men were employed at winning ore from the old workings. Reports on hand show that 635 tons of ore was shipped, averaging: Silver, 80 oz.; lead, 27 per cent.; and 195 tons averaging: Silver, 15 oz.; zinc, 50 per cent.

Charleston Group.—This group was acquired by the Keystone Development Company from the original owner, A. J. Harris, who is in charge of the development. The claims are located near the *Whitewater* mine.

Meacher Group.—Situated at the head of *Whitewater* creek. The owner, Michael Wargo, put in a season's work at the property.

Wellington.—The Standard Silver Lead Mining Company put a crew of men to work at cleaning out the old workings, preparatory to making a thorough examination of the mine with a view to doing further development-work.

Mitford Group.—Situated on Goat creek. Recently bonded by A. J. Harris to the Mitford Mine Units Company, of Spokane. A few men have been employed at drifting on the vein below the old workings.

Fletcher Group.—Situated on Lyle creek and owned by A. H. Watkins. The old *Ibex* trail was reopened in view of proposed development. According to recent reports, a consolidation of the *Phoenia* and *Fletcher* groups has been effected and the properties bonded to Spokane interests.

Lincoln.—The development of this property has been continued by J. H. Thompson, of New Denver.

Helena Group.—Further work has been done on this property by the English Bros. and a new trail to Blaylock is being constructed.

Utica.—During the early part of the year this property was worked under lease by A. J. Poyntz and associates. A very rich shoot of ore was encountered in the old workings, the high silver values being in grey-copper and native silver. The leasers are said to have done exceedingly well.

Slocan Mining Division.

As previously stated in this report, the strike called by the O.B.U., which took effect on May 1st, greatly curtailed the production and hampered the operations of the various mining

companies. The Rosebery-Surprise Mining Company, which has been one of the leading producers during recent years, operated the *Bosun* and *Surprise* mines and the *Ivanhoe* and *Canadian* groups from the first of the year until May 1st, since which time they dropped their options on the two latter properties and have only done a small amount of development at the *Surprise*, where the No. 4 level is being advanced.

At the *Bosun* work was resumed in a small way on June 1st and has been gradually increased, the number of men employed at present being twenty-five. A raise connecting the No. 6 and No. 4 levels has been completed and a No. 5 level started from half-way up the raise. Drifting and stoping from this level have been carried on with good results. This ore will be treated at the company's mill at Rosebery, which has only been run intermittingly during the season.

The estimated production is as follows: *Surprise*, 2,162 tons; *Bosun*, 2,360 tons; *Ivanhoe*, 45 tons; *Canadian* group, 105 tons.

Clarence Cunningham reports that little progress has been made since May 1st and does not look for any marked increase in activity at the various properties operated by him until next spring. The estimated production of the *Queen Bess* and his other properties is: Crude ore, 762 tons; lead concentrates, 888 tons; zinc concentrates, 1,152 tons.

Silversmith Mines, Ltd.—This company operated steadily during the year. The continuity of the large ore-body which was developed last year on the 1,000-foot level has been proven on the 500-foot, 800-foot, and 1,100-foot levels. In places the stope from the 800-foot level is between four and five sets wide. Shipments for the year will probably exceed 1,800 tons of silver-lead ore and concentrates.

Noble Five.—Under the management of Paul Lincoln, work at this property during recent years has been confined to the development of the vein system at depth, connecting the lower with the upper workings by means of a 1,000-foot raise and establishing intermediate levels. The erection of a 100-ton concentrator was started last year and completed during this summer. Other improvements include the erection of a modern bunk-house and buildings, which provide excellent accommodation for the men. Being short of men in the mine on account of the strike, the mill was started up on ore from one of the old dumps, and the first car-load of silver-lead concentrates was shipped to Trail in the fall.

Rambler-Cariboo.—This property was also hard hit by the strike, and consequently its production will show a marked decrease.

Carnation.—Situated near Sandon. Development-work was carried on under the management of G. W. Clarke, who had a few men employed until the strike closed down operations temporarily. The results so far obtained are said to be of a very satisfactory nature.

Payne.—It is reported that the Pacific Mines Development Company has taken a bond on the property, following an examination made by W. J. Elmendorf. It is understood that the preliminary work will be confined to the lowest level of the mine.

Among the numerous activities of leasers and small operators around Sandon the following have been reported: *Washington* and *Silver Reef* groups, worked by M. Monahan and partner and one car-load of ore shipped; *Last Chance*, worked under lease by R. Canning and 27 tons of ore shipped; *Victoria*, worked by J. Worgan, the owner; *Cinderella*, worked by G. Dean; *Black Colt*, worked by Geo. Petty. Leasers have also been active in the old workings of the *Payne*, *Hope*, *Rosemarie*, and *Mowitch*; from the last two properties small shipments have been made.

Molly Hughes.—Situated on Slocan lake near New Denver and owned by H. Clever. Forty-seven tons of high-grade ore shipped to Trail.

California group, near New Denver, was worked under lease by W. Eccles and George Doyle.

Marion.—Alec Ferguson, the owner, continued development-work.

LONDON RIDGE.

This ridge, rising to an elevation of 7,000 feet, forms the divide between Seaton creek and the North fork of Carpenter. The ores from this locality, unlike the characteristic ores of the Slocan, are "dry ores," carrying high silver values and little, if any, lead. Many old locations were made over this area, from which high-grade ore has been extracted from time to time. Among those upon which recent work has been done and which are now being developed are the following:—

McAllister.—Situated on the North fork of Carpenter creek and operated by the Slocan Silver Mines, Limited. Although hampered by the strike, this company managed to keep on a small crew during the greater part of the year. The work accomplished approximates 500 feet of drifts and raises. Plans for a concentrator have been prepared, the erection of which is contemplated for next year. A trial shipment of 31 tons of high-grade ore was made early in the year. This is reported to have yielded 9,708 oz. of silver. Three miles of wagon-road have been constructed up the North fork from Three Forks.

Miner Boy.—This property, which is situated on the summit of the ridge above the *McAllister*, has been idle for a number of years; it was acquired last year by Thos. Trenery, of Rosebery. Rails and equipment were taken up to the property and development started.

Milton Group.—Situated at a short distance to the north of the *McAllister*. Development-work was continued by R. McPherson, who has been interested in the property for many years and has accomplished a phenomenal amount of development-work single-handed.

Panama.—Situated on the Seaton Creek slope of the ridge. The owner, H. Giegerich, of Kaslo, is reported to have had several men working.

Silver Glance.—This property, which is also situated on the Seaton Creek slope, is owned by J. W. Power. A small shipment was made to Trail.

SILVERTON CAMP.

Near Silverton there has not been the usual activity. The Standard Silver Lead Mining Company has curtailed its operations and only had a small crew employed at development and exploratory work.

At the *Hewitt* a long crosscut tunnel was driven to tap the vein at depth, but since the strike was called in May there has not been much activity at the property; the same applies to the *Van-Roi*.

Ed. Shannon put in a season's work at the *Anaconda* group, which is a new prospect. Stripping and open-cut work has disclosed a strong showing of low-grade silver-lead-zinc ore.

Small shipments have been made from the *Galena Farm* and *Comstock*.

Slocan City Mining Division.

The season has witnessed about the same amount of activity among the various properties in this Division as last year, although no doubt the labour situation had its adverse influences.

Ottawa.—Worked under lease during the early part of the year by A. L. McPhee and P. Macguire. Over 500 tons was shipped to Trail, the bulk of which came from the old dumps. During the summer L. H. Biggar took over P. Macguire's interest in the lease. According to recent reports, a 50-ton concentrator has been erected on Springer creek and a tramway connecting the mill with the mine is about to be built.

Meteor.—Owned by W. A. Buchanan. Development-work has been steadily proceeded with.

Black Prince.—Operated by T. J. Tipping, who has been interested in the property for many years. The result of this year's work has not been reported.

Anna Group.—Worked under option during the early part of the year by E. Hyde and about two car-loads of ore shipped to Trail. The property is now being worked by K. Zimmerman, the owner.

L.T.—A small shipment was made by the owner, D. B. O'Neil, of Slocan City.

Republic.—A shipment of 19 tons was made from this property early in the year.

Evening Star.—Active development-work was carried on during the year under the management of W. Moore, of Nelson. Satisfactory results are reported.

Barnett Group.—Situated on Lemon creek. A few men were employed under the management of R. G. McLeod, of Vancouver. A trial shipment of 24 sacks was packed out. The ore carries values in gold and silver.

Nelson Mining Division.

The activity both by the larger mining companies and the small operators has shown a decided increase as compared to that of last year. Should the results of the present developments come up to expectations, the output of the district for next year will show a decided increase, more especially in gold and silver.

Yankee Girl.—Situated at Ymir. Following an extensive examination by A. W. Newberry, the Mining Corporation of Canada took an option on the property from the Hobson Silver-Lead Company and a programme of development-work was planned. This has been steadily continued during the year. Results obtained are said to be highly satisfactory. The ore is an intimate mixture of pyrite, fine-grained galena, and zinc-blende in a quartz gangue. The principal values are in gold and silver.

Nugget Gold Mines.—The long crosscut driven from the fifth level of the old *Motherlode* workings tapped the *Nugget* vein at a distance of 1,165 feet. This gives a vertical depth on the vein of 625 feet below the *Nugget* workings, or about 1,000 feet below the apex of the vein. Good values were obtained at the point of intersection and a shoot of ore nearly 200 feet long was developed by drifting. Stopping was commenced and the large and well-equipped *Motherlode* mill was started up in July. Operations, though severely handicapped by labour-shortage, were maintained during the balance of the season, until it was necessary to close down the mill early in November for the winter. It is understood that stopping and development-work will be continued at the mine with a view to having everything in readiness for continuous operations next season.

Emerald.—The 50-ton concentrator installed at the property last year was remodelled by W. de Witt and is now giving good satisfaction. The mine has been operated steadily, about fifteen men being employed. Ore and concentrates shipped to Trail amount to about 900 tons.

The *Molly Gibson*, owned and operated by the Consolidated Mining and Smelting Company, was closed down on March 1st. Some 300 tons of silver-lead ore was shipped.

California.—Development-work has been steadily continued during the year and extensive improvements made to the *Athabasca* mill, which has been taken over by the California Mining Company.

Perrier.—This property is conveniently situated on the Great Northern Railway within a few miles of Nelson. Some of the first work done on the property was the sinking of an incline shaft for a distance of about 100 feet on the vein. A drift 130 feet long was driven along the vein in a northerly direction. From these workings about \$3,500 in gold was recovered in a small concentrator consisting of a Huntingdon mill, copper amalgamating-plate, and a Frue vanner. The vein is persistent with depth and increases in width near the bottom of the shaft. The values also show an improvement with depth. The principal value is in gold, with which is associated a little silver. A number of samples taken down the shaft indicate the average value of the ore to be about \$14.75 and the width of the vein to be 17.5 inches. The property has recently been acquired by the Perrier Gold Mines, Limited, of which C. E. Crossley, of Nelson, is president and W. M. Cunliff secretary.

Eureka.—After advancing the long crosscut for a distance of 1,200 feet from the portal, the Vincent Development Company dropped their option on this property in the spring.

Aspen.—Situated on Deer creek, near Salmo. P. F. Horton has been busily engaged at the property. A small shipment of a high-grade ore was made to Trail.

Spokane Group.—Situated on Canyon creek, in the Bayonne district, Laib Bros., the owners, who have been doing development-work for some years, spent the latter part of the season in slashing a trail down Canyon creek to Kootenay lake. The property has suffered from lack of transportation facilities, and this in their opinion is the best route over which to take ore.

Among other properties at which there has been some activity are the following:—

Gold Hill.—Situated on 49 creek. Worked under lease by George Gormley. Over a car-load of high-grade gold-copper ore has been extracted ready for shipment.

Arnold Group.—Situated on the North fork of Salmon river. Worked by W. Connolly, the owner.

Birdseye Group.—Situated near Nelson. A few men were employed and development was carried on under the management of H. J. Wilson for an English syndicate.

Mayblossom Group.—Situated near Ymir. J. F. Harbottle, the owner, has been employing seven men and expects to ship ore this winter.

Monarch Group.—Situated near Hall. Further prospecting and development has been done by J. Fisher, the owner.

Reno Group.—Situated on Fawn creek. W. B. Pool, the owner, put in a season's work at the property.

Noonday Group.—Situated on Sitkum creek. During the summer months prospecting work was carried on and a small Gibson mill was installed. The property is owned by Radcliff & Johnston, of Nelson.

Ore Hill.—It is understood that a couple of men are being employed driving a crosscut, under contract, to tap the vein at greater depth.

Second Relief.—Situated near Erie. Two car-loads of concentrates were shipped to Trail. These came from the mill which was burnt last year.

A little prospecting was done on several groups of claims up the North fork of Salmon river. It is also reported that further work was done on the *Southern Belle* on Wilson creek.

Arrow Lakes Mining Division.

Millie Mack.—Situated near Burton City. A new adit-tunnel was driven and 10 or 12 tons of ore extracted. The ore runs high in silver and often carries good gold value. The light tramway by which the ore is taken from the mine to the trail some distance down the steep mountain-side has proved very satisfactory. H. E. Forster spent the best part of the season at the mine. Two or three men were employed.

Chieftain.—This property is situated on Cariboo creek almost opposite the *Millie Mack*, but at a much lower elevation. It was staked many years ago by G. W. Clark, of Sandon, who is the principal owner. No work has been done for a number of years and the old cabins have become very dilapidated. High values in silver and gold have been obtained from a quartz vein which has been partially developed by two adit-tunnels separated by a vertical distance of about 60 feet. It is a property on which further prospecting, both underground and on the surface, would appear to be fully justifiable. No doubt quite an appreciable tonnage of high-grade ore could now be extracted from the present workings by careful mining. A sample of cobbed ore from the lower tunnel ran: Gold, 0.40 oz.; silver, 208 oz.; lead, 0.5 per cent; zinc, 6 per cent.

It is reported that J. Prow and J. Rymer cut out the trail to the *Canadensis* group, situated about 3 miles farther up the creek from the *Chieftain*, and put in a season's work on the property. J. Reveler and J. Rymer did further work on the *Tillicum* group.

Trail Creek Mining Division.

ROSSLAND CAMP.

Shipments from the Consolidated Mining and Smelting Company's mines were greatly curtailed and operations were principally confined to development and permanent improvements; of the latter, the concreting of the *Centre Star* shaft was probably among the most important. No ore was shipped from March 1st to July 15th, as the copper-furnaces at Trail were not in operation during that period. The total shipments for the year will be between 40,000 and 50,000 tons.

Le Roi No. 2.—This mine has been operated steadily during the year and about 11,000 tons shipped to Trail.

Velvet.—Worked under lease by E. Nordman and associates. About 300 tons shipped to Trail.

White Bear.—In April the surface plant of this mine was destroyed by fire, with the exception of the transformer-house.

At Trail it is reported that preparations are well under way for the erection of the large concentrator for the treatment of the Rossland ores. The capacity of the copper-refinery is being increased to about 65 tons a day and the construction of a rod-mill has been started. Arrangements have been concluded by the Consolidated Mining and Smelting Company with the Canada Copper Corporation by which the concentrates from the large mill at Allenby will be treated at the Trail plant.

In glancing through the list of shipments received by the smelter for the year, it is at once evident that the bulk of the tonnage is supplied from this district; other sources of supply being the Boundary district and the now famous *Mandy* mine in northern Manitoba, while smaller tonnages are received from the Hazelton district and the Yukon Territory.

Mountain Chief.—Situated at Renata, on the Arrow Lakes. The property is temporarily closed down. It is understood that the company is endeavouring to interest more capital in order to carry out its plans of development and exploratory work.

Revelstoke, Lardeau, and Trout Lake Mining Divisions.

The unusual shortness of the season in this northern part of the district greatly limited the time for prospecting and mining activities at the higher altitudes. No new developments of importance have been reported from among the prospects, although in most cases results have come up to expectations, while mining operations on a larger scale have not been very active, with possibly the one exception of the old *Lanark* mine near Laurie, on the main line of the Canadian Pacific Railway, where a crew of eighteen men was steadily employed during the summer months. Work was confined to the development and stoping of the new ore-shoot encountered on the No. 4 level. Two car-loads of silver-lead concentrates was shipped to Trail. It is understood that during the winter months further tunnelling will be done under contract. The mine is operated by the Lanark Mining Company, of Yakima, of which W. B. Dornberg is president and manager.

Crystal Group.—This group, adjoining the *Lanark*, was bonded by B. E. Taylor, of Nelson, from the Kennedy Estate and J. McKinnon, of Revelstoke. Prospecting and development work was done during the season. Results are said to have been encouraging and work will be continued next spring.

Waverly-Tangier Group.—This property is situated near the head of the North fork of the Illicillewaet river, at a distance of 30 miles from Albert Canyon, on the main line of the Canadian Pacific Railway. G. H. Walters, of Spokane, who acquired the property in 1918, had a couple of men cleaning out the old tunnels preparatory to doing further mining and development work.

Two parties of returned soldier prospectors were sent out by the Provincial Government up the Big Bend district north of Revelstoke. One party devoted their time to prospecting around Goldstream and Smith creeks; the other went up Downie creek. In all seven claims were staked.

In the Lardeau work at the *Beatrice* mine was steadily carried on by a crew of three or four men, under the supervision of H. E. Bodine, for the New Era Mines, Limited, of Vancouver. The property is situated at a distance of about 7 miles by trail from Camborne. Some nice showings of ore were uncovered in the old workings. The ore, which is an intimate mixture of galena and zinc-blende, carries high silver values. By careful sorting Mr. Bodine hoped to obtain a good grade for shipment, by eliminating that high in zinc.

At the *Berniere* group, which is situated near Camborne, preparations were made to provide accommodation and facilities for a small crew of men by J. A. Darragh, representing Eastern capitalists, who have recently bonded the property from C. Menhinick, the owner.

Geological survey work was done during the season in the Trout Lake and Lardeau Divisions by M. F. Bancroft and party, of the Canadian Geological Survey Department.

In the Trout Lake Division mining activities did not show any marked improvement over those of last year.

From the *Nettie L.* a small tonnage was shipped by leasers.

S. Cavanaugh was working under a lease at the *Silver Cup.*

At the *Parrsboro*, which is situated near the latter property, the crosscut tunnel started last year by two men, under contract, to tap the vein at depth reached its objective in the fall. There is reported to be a nice showing of ore at the intersection.

At the *Crescent*, which is situated near the head of 8-Mile creek, the development of the vein with depth is reported to have met with satisfactory results. M. Leahy, of Trout Lake, is in charge of the work.

Mrs. Jowett, of Trout Lake, who, as usual, spent part of the summer prospecting in the hills, claims to have found some sperrylite.

WESTERN MINERAL SURVEY DISTRICT, No. 6.

PRELIMINARY REPORT BY WM. M. BREWER, RESIDENT ENGINEER.
(Headquarters, Nanaimo.)

INTRODUCTION.

The following report is merely a brief summary of the most important features incidental to the conditions and progress of the mining industry in District No. 6 during the past year. No attempt has been made to describe properties or operations in detail.

Under the regulations of the policy of the Provincial Government to aid returned soldiers in prospecting, about thirty days of the writer's time from the middle of May last was occupied in selecting fifteen parties of returned soldiers, each party being made up of two men who had been in service overseas, one an experienced prospector, the other inexperienced. There were in all about 120 applicants in this district.

The administration of the "Iron-ore Supply Act" also occupied considerable time during parts of the season when otherwise the writer would have been engaged in the field, so that his work of making examinations has been somewhat curtailed and he was thereby prevented from visiting the most northerly section of the Nanaimo Mining Division as he had made arrangements to do.

METALLIFEROUS MINING.

During the past year the results from development of the several proven metalliferous mines in this district has been as satisfactory as could be expected under existing conditions, although the progress has not been as extensive as was expected early in the year. The failure to carry out the programme of last summer and begin construction of concentrating plants is explained by the high cost of supplies and labour, together with the fact that manufacturers of machinery refused to guarantee prices or to deliver orders within any reasonable period. The Consolidated Mining and Smelting Company of Canada therefore delayed the building of two concentrating plants, one in the Quatsino Mining Division and the other in the Victoria Mining Division. Development-work on the mines controlled by this company in the Mining Divisions mentioned has been carried on systematically and with satisfactory results, so that it is gratifying to state that the development-work in the mines has demonstrated that the tonnage of "actual ore" developed has been increased in both the *Old Sport* and *Sunloch* mines.

The reconstruction of the concentrating plant by the Tidewater Copper Company, owners of the *Indian Chief* mine at Sidney inlet, on the west coast of Vancouver island, the development of water-power plant, and the installation of electricity for motive power were completed early last summer, but owing to the abnormally dry season the plant was not operated until the middle of September.

Some notable changes in the personnel of the heads of several mining companies in District No. 6 have taken place during 1920. J. W. D. Moodie resigned as general manager of the Britannia Mining and Smelting Company, Limited, and was succeeded by E. J. Donohue, who had been secretary-treasurer of the company for several years past. H. B. Price resigned as manager of the Tidewater Copper Company to resume his former position as manager of a big gold-mine in Guatemala; he was succeeded by S. F. Silverman, who had been purchasing agent for the company; while D. M. Drumhiller, Jr., the superintendent of the mine, was appointed assistant manager. Henry S. Fleming resigned as president of the Canadian Collieries, Limited, and was succeeded by J. M. Savage, who has been general manager of the company for the past several years. Jack Hanna resigned as superintendent of the *Sunloch* mine and was succeeded by G. H. Kilbourne, who has been on the mining engineering staff of the Consolidated Mining and Smelting Company for several years.

The following is a list of groups of metalliferous mineral claims in District No. 6, in addition to the properties already mentioned, on which more or less extensive new development-work has been done in 1920:—

Nanaimo Mining Division.—*Venus* group, Lasqueti island; *Bluebells* group, Frederick arm; *Shot* group, Price creek; *Cougar* and *Law* groups, Myra creek; *Amethyst* group, Phillips arm; *Wanderer* group, Quadra island; *Radiant* group, Staamus river.

Vancouver Mining Division.—*Lillie* group, Jervis inlet; *Opporgol* group, Howe sound; *Attorney* group, Howe sound; *Horseshoe* group, Howe sound; *Sun* group, Seymour creek; *Copper* group, Treasure mountain, Jervis inlet.

Victoria Mining Division.—*Scotch* group, Mount Sicker; *Gabbro* group, Jordan river.

Clayoquot Mining Division.—*You* group, Bedwell river; *White* group, Deer creek.

Quatsino Mining Division.—*Caledonia* group.

The smelting facilities on the Coast are in the same condition as has prevailed for the past several years, and there does not appear to be any relief in sight within the near future. The management of the Ladysmith Smelting Corporation, Limited, reports that at the present time there is no prospect of the production of sufficient metalliferous ore that could be contracted for to warrant operating a custom smelter. That although on the mining property on Latouche

island, Alaska, owned by the company, a large tonnage of "actual ore" has been blocked out, it is considered that the installation of a concentrating-mill is advisable rather than to ship ore direct to the smelter. Following this decision the management, considering that the present smelting plant at Ladysmith is not well adapted for treating concentrates, decided to postpone reconstructing the plant, but to continue the mining-development work the company was engaged in.

Prospecting by Returned Soldiers.—In May last fifteen parties of returned soldiers, with two men in each party, were selected under the conditions of a policy adopted by the Provincial Government to aid returned soldiers and to encourage prospecting. Only eight men, or four parties, desired to prospect in District No. 6. Of these, two parties went to the west coast of Vancouver island; one party to Jervis inlet, on the mainland coast; and one to the vicinity of Narrows arm of Sechelt inlet, also on the mainland coast. The writer received reports from each party as regularly as was possible and visited the two parties on the west coast of Vancouver island during August. So far as the writer was able to judge, each of the parties worked faithfully and prospected quite extensive areas. The results as shown by the number of mineral claims staked and recorded might not be considered very satisfactory if judged from that standard, as only four mineral claims were recorded altogether, one by each of the parties on the west coast and two by the party which prospected the mountains in the vicinity of Jervis inlet. The party which went to the head of Narrows arm, Sechelt inlet, were badly handicapped by starting late, August 21st, and experiencing exceptionally wet weather, but from the report the men made they evidently prospected a considerable area, and reported having secured a lot of valuable information about the district of which but little has been known on account of its inaccessibility and its high altitude and ruggedness.

A party of five civilian prospectors was prospecting in the practically unexplored country northerly from the head of Narrows arm, along the Tyzoone river, where they staked and recorded about seventy mineral claims. In addition to the prospecting just recorded, the country in the neighbourhood of Nootka sound, also Cowichan and Nitinat lakes, on Vancouver island, was prospected. Prospectors were also working in Quatsino Mining Division.

Production.—During 1920 the estimated production from the metalliferous mines in Mineral District No. 6 is slightly greater than the actual production during 1919, as shown in the following table:—

	1919.	1920 (Estimated).
Tons of ore treated	650,292	716,450
Production of gold (oz.)	5,514	6,312
Production of silver (oz.)	104,806	109,873
Production of copper (lb.)	17,062,100	18,295,034

This production is practically all from the *Britannia*, which has been the only regularly producing mine in the district during 1920, the results showing that for the present year the *Britannia* property is in a most satisfactory condition.

During the late fall of 1920 the Tidewater Copper Company, Limited, operating the *Indian Chief* group of mineral claims on Sidney inlet, began shipping concentrates, the tonnage and values contained in which are included in the above table.

The production of coal from the collieries on Vancouver island during 1920 is estimated as follows:—

	Long Tons.
Canadian Collieries (Dunsmuir), Ltd. (Comox)	459,779
Canadian Collieries (Dunsmuir), Ltd. (Extension)	199,558
Canadian Collieries (Dunsmuir), Ltd. (South Wellington)	91,348
Canadian Western Fuel Co., Ltd. (Nanaimo)	697,260
Granby No. 1 Colliery (Cassidy)	207,236
Nanoose-Wellington Coal Co. (Nanoose)	44,996
Pacific Coast Coal Mines, Ltd. (Morden)	100,108
British Columbia Coal Mining Co. and Old Wellington	1,446
	1,801,731

Some shipments of talc, about 100 tons, were made from a deposit on Wolf creek near its confluence with Leech river, Vancouver island.

Alberni Mining Division.

Progress in the mining industry in the Alberni Mining Division during 1920 has been disappointing, because, except so far as doing the statutory annual assessment-work on mineral claims, there has been but little activity.

The *Big I.* group of mineral claims, which was bonded by the Consolidated Mining and Smelting Company of Canada during 1919, has been the base of work of a party of that company's mining engineers and surveyors preparatory to the initiation of systematic exploratory work later. The extension of the Alberni Division of the Esquimalt & Nanaimo Railway to the foot of Great Central lake will improve the transportation facilities to some extent between the *Big I.* group and the commercial centres.

The *Monitor* group of mineral claims on Alberni canal, on which development-work was suspended in 1918, and which became the subject of litigation, has been idle during 1920, but as the litigation was settled during September, 1920, there is a prospect that work may be resumed during the coming year.

Clayoquot Mining Division.

The most important work in this Mining Division is that on the *Indian Chief* group of mineral claims, the property of the Tidewater Copper Company, Limited, on Sidney inlet; there has been continuous activity during 1920, both in extending development-work in the mine and reconstruction of the concentrating plant, which was completed during the past summer. A water-power plant was developed and electric motive power was installed as substitute for steam in the mill, electric light, and air-compressor plants. Owing to unusually dry season and consequent shortage of water the concentrating-mill was not operated until the middle of September, at which time there was a tonnage of "actual ore" blocked out in the mine by working-openings to guarantee a supply of 300 tons a day for two years at least.

Other mining-development work in the Clayoquot Mining Division was done on the *You* group of mineral claims near the head of Bear river, on Big Interior mountain, by J. B. Woodworth, of Vancouver, who proposes to build a small stamp and concentrating-mill to treat the ore, the value in which is principally gold, much of which is free milling.

On the White group of mineral claims on Deer creek, Tofino inlet, owned by McMillan & Walton, the development-work was extended during 1920 with satisfactory results.

Quatsino Mining Division.

This Mining Division has received more attention from prospectors during the season of 1920 than any other on Vancouver island. The country adjacent to Cape Cook and the mountains near the head of Kokshittle inlet of Kyuquot sound were explored by two parties of returned soldiers, who staked two claims on Kokshittle inlet. Other prospectors during the past few seasons also explored along the Kokshittle river.

The important mining-development work done during 1920 in the Quatsino Mining Division is on the *Old Sport* group of mineral claims, owned by the Coast Copper Company, Limited, a subsidiary to the Consolidated Mining and Smelting Company of Canada. Under the superintendence of Wm. Clancy, development-work has been carried on continuously during 1920.

On the *Millington* group of mineral claims near the head of the West arm of Quatsino sound, the Spooner Bros. and associates have continued the work previously done in the mine, and extended the main Holberg-Cape Scott road to their camp, also building a bridge across Spruce river. In this road-work and bridge-building the Provincial Government assisted under the terms of the "Mineral Survey and Development Act."

On the *Caledonia* group of mineral claims near the head of Kokshittle inlet of Kyuquot sound, the owners, McDonald, Dernberger & Nordstrom, have done some development-work which has exposed occurrences of copper ore carrying about 3 per cent. copper. The owners also staked several more claims during the summer of 1920 in addition to the fifteen contained in the original group which was examined on February 29th, 1920.

The *Morris* and other mineral claims owned by the San Juan Mining and Milling Company, Limited, as well as the *Monteith* and other mineral claims owned by the Alunite Mining and Products Company, Limited, on the peninsula between Kokshittle inlet and Easy creek or cove, were examined by P. B. Freeland, Resident Engineer of Mineral Survey District No. 4, in company with the writer during the latter end of February, 1920, and early part of March,

but the reports could not be made to the Hon. the Minister of Mines until about September last owing to the time required for independent chemists to check the analyses of samples made by the Provincial Government assayers. The properties remained idle until in November last, when a party of workmen in the employ of the San Juan Mining and Milling Company, Limited, was taken to the property to erect a plant for treating the alunite rock, repair the wharf, and build a larger camp preparatory to restarting operations.

Victoria Mining Division.

The progress in the mining industry in the Victoria Mining Division during 1920 has been marked by a systematic extension of development-work on the *Sunloch* and *Gabbro* groups of mineral claims on Jordan river, about 42 miles from Victoria, also on the talc-deposits occurring on Wolf creek. Prospecting-work on the *Scotch* group of mineral claims on Mount Sicker has been carried out by the Ladysmith Smelting Corporation. The property known as the Robertson silver-mine near the headwaters of the Koksilah river was bonded during 1920 to a Victoria syndicate, which carried on some work of an exploratory nature.

Hill 60 group of mineral claims near Cowichan lake was the scene of considerable activity during the early part of 1920, when an aerial tramway was built to connect the mine-workings with the spur on the Cowichan Lake branch of the Esquimalt & Nanaimo Railway. Shipments of about 575 tons of manganese ore were made during the past summer, but these were discontinued and further development-work was found necessary.

The continuance of the track-laying on the Canadian National Railway towards Cowichan lake will undoubtedly prove an incentive to prospectors to more thoroughly explore the country tributary to this line, which traverses a section of Vancouver island where promising occurrences of copper ore were located some years ago.

Prospecting in the Victoria Mining Division has been carried on with greater energy by experienced prospectors during 1920 than has been the case for some years past. The fields chiefly favoured by these prospectors have been the country north-westerly from Jordan river; the mountainous sections tributary to the creeks which flow into Cowichan and Shawnigan lakes; Leech and Koksilah rivers; Mounts Sicker and Brenton.

Vancouver Mining Division.

The *Britannia* mine retains its position as the most important copper-mining property not only in the Vancouver Mining Division, but in the Province, and during 1920 all of the copper-gold-silver production from this Mining Division came from the glory-hole and stopes above the 1,800-foot level in that mine. During 1920 the production from the *Britannia* mine of copper, silver, and gold will show a substantial increase over the production for 1919, notwithstanding the low price of copper since early in November last. The concentrating-mill at Britannia Beach was closed down on November 30th and the pay-roll of the company reduced to about 40 per cent. of the ordinary amount. At present the Britannia Mining and Smelting Company is carrying on development-work only in the mine, from which a small tonnage of ore is taken out during that development-work. This ore is being brought to the stock-piles at the mill on the beach by the aerial tramway, the incline tramway and electric railway being tied up for the winter. The only work being carried on at the beach since November 30th last is continuing the raise from the main adit known as the 4,100-foot level. This adit is driven at an elevation of about 200 feet above high water, with its portal at a slightly higher elevation than the grizzly floor at the top of the mill. This adit is about 4,000 feet long, 9 feet high, and 13 feet wide, and is being driven to be utilized eventually as the main haulage-adit for the transportation of ore from the upper levels of the mine to the concentrating-mill.

In addition to the operation carried on by the Britannia Mining and Smelting Company, Limited, during 1920, there has been development-work of a more or less extensive nature carried on at four other points on Howe sound, viz.: On the *Horseshoe* group of mineral claims on McDonald creek, on the westerly side of Howe sound nearly opposite Britannia Beach; on the *Oppercol* group of mineral claims on Howe sound, about 5 miles from Whytecliff, the present terminus of the North Vancouver branch of the Pacific Great Eastern Railway; on the *Bowena* group of mineral claims on the south-easterly corner of Bowen island; and on the *Attorney* group of mineral claims near Alberta bay, Howe sound.

Other development-work done in the Vancouver Mining Division during 1920 is on the *Copper* group of mineral claims on Treasure mountain, Jervis inlet; on the *Lillie* group of

mineral claims near Mount Diadem, on the westerly side of Jervis inlet; on the *Sun* group of mineral claims near the head of Seymour creek; on the *Iron King* and other groups of mineral claims on the Pacific Great Eastern Railway near Alta lake; on the *Radiant* and *Bruce* groups of mineral claims near the Staamus river.

Prospecting for oil has been continued in an energetic manner near Burnaby lake by the Spartan Oil Company, which installed a standard drilling-rig that bores a hole 15 inches in diameter, and on December 1st last had reached a depth of 1,300 feet.

Prospecting for metalliferous minerals was carried on during the past summer in the mountains adjacent to both sides of Jervis inlet, also near the heads of Narrows and Salmon arms of Sechelt inlet and on the Tyzoone river, which empties into Narrows arm at its head.

Although the iron and steel industry was the subject of much newspaper discussion during 1920 and some demonstrations were made in Vancouver in a small experimental electric furnace designed and operated by J. D. Shipton, the year 1920 closed without any appreciable progress towards establishing the industry on a commercial scale. Mr. Shipton treated magnetite ore from the Lake mine on Texada island in his experimental furnace successfully, and expresses his intention of erecting a furnace with a capacity to turn out 5 tons of pig-iron per day in the near future.

During the autumn of 1920 Walter D. Rock, an English engineer, paid a second visit to British Columbia in the interests of English iron and steel capitalists to investigate the conditions with regard to establishing the industry on a large scale in the Province, but unfortunately died suddenly in Vancouver before his investigations were completed.

Late in the autumn the Coast Range Iron and Steel Company, with an authorized capital of \$15,000,000, was organized in Vancouver.

New Westminster Mining Division.

The mining industry in the New Westminster Mining Division has not been as progressive during 1920 as indications suggested early in the year. One reason for this was the failure of the Guggenheim interests to exercise the bond on the *Lucky Four* group of mineral claims near Laidlaw, on the Canadian National Railway. In consequence there was but little activity on the *Lucky Four* group or on other adjoining groups of mineral claims on Granite basin and Ford creek, on the southerly slope of the Cheam range.

During the summer of 1920 a Vancouver syndicate started prospecting-work on Fire mountain near the head of Harrison lake, in which section considerable mining activity was in evidence during 1897 and 1898 owing to the discovery of gold-bearing quartz veins. At that time a Huntington quartz-mill was installed on the *Money Spinner* group of mineral claims, but, being found unadapted for the treatment of the ore, operations were abandoned and there has been no activity in that section between 1898 and last summer.

The town of Abbotsford and vicinity has been considerably advertised during 1920 by promoters of oil companies, but although some drilling has been done no satisfactory results have so far been obtained.

The Geological Survey of Canada has given substantial attention to the Fraser River delta during the seasons of 1919 and 1920. A very elaborate detailed map has been made by the topographical branch of the Survey and the geology has been examined by Mr. Johnson, who is preparing his report, which, when published, should give valuable information with regard to the possibilities of finding oil in the delta.

The Clayburn Company, Limited, is the only manufacturer of firebrick and sewer-pipe in the Vancouver Mining Division. During 1920 the plant at Clayburn was enlarged and a full detailed description will be published in the Annual Report of the Minister of Mines for 1920.

Nanaimo Mining Division.

Coal-mining Industry.—On account of being the centre of the coal-mining industry on Vancouver island, the Nanaimo Mining Division enjoyed a degree of prosperity during 1920 unequalled in any other part of the Province, and conditions were good, especially in the towns of Nanaimo, Cumberland, and Ladysmith.

The total amount of the regular pay-rolls from the following named collieries: The Canadian Collieries (Dunsmuir), Limited, the Canadian Western Fuel Company, the Granby Consolidated

Mining, Smelting, and Power Company, the Pacific Coast Coal Mines, Limited, and the Nanoose Wellington Coal Company, represents more than \$500,000 monthly. The area covered by the properties of the above-named companies is a comparatively narrow belt along the easterly side of Vancouver island, extending from Ladysmith, the southerly boundary, to Cumberland, the northerly boundary. The distance between these points in an air-line is approximately 70 miles, but by railroad or auto-road about 90 miles.

Each of the collieries is connected with deep-water shipping facilities by privately owned railways, except that at Cassidy, owned by the Granby Company, and that at Nanoose, owned by the Nanoose-Wellington Coal Company. The former of these two exceptions transports the coal via the Esquimalt & Nanaimo Railway from the colliery at Cassidy to a deep-water shipping-port about 1 mile southerly from Ladysmith, while the last-named exception has no need of a railway because the mine-workings, tipple, washery, and storage-bins are within a few hundred feet of the company's wharf.

The notable events connected with coal-mining on Vancouver island during 1920 are as follows:—

The Jingle Pot mine was closed down as worked out early in the year after producing approximately 800,000 tons of coal from an area of about 70 acres. The mine was opened in 1907 and owned by the British Columbia Coal Mining Company, Limited, since about 1915.

Henry S. Fleming resigned as vice-president of the Canadian Collieries (Dunsmuir), Limited, during the autumn, and J. M. Savage, general manager, was promoted to the position previously occupied by Mr. Fleming, as well as being elected a member of the directorate, but continues to fill the position of general manager in addition to taking over the other duties and responsibilities.

The Canadian Collieries (Dunsmuir), Limited, under the supervision of Thomas Graham, general superintendent, completed in Tsaable River section near Cumberland during 1920 a total of 7,453 feet of diamond-drilling and 37,400 feet of roadways. Two diamond-drills were in operation. In the Wellington-Extension field the company had one drill in operation and bored 1,000 feet on the Haslam flats.

The Granby Consolidated Mining, Smelting, and Power Company completed the equipment at the Blainey loading-dock near Ladysmith by installing a rubber belt-conveyor 1,300 feet long which connects the small storage-bins with the hold of a vessel at the wharf. In the coal-washing plant at Cassidy seven Overstrom concentrating-tables have been installed for the purpose of more thoroughly cleaning the slack coal than was possible with jigs alone. A new radial drill, a shaper, and other equipment have been added to the machine-shop. The main slope has been extended about 1,000 feet during 1920, thus reaching a total length of 3,500 feet, passing through that part of the field in litigation and into that section the title of which is not in dispute. The output from the mine has been very considerably increased during the last six months. A Dorr thickener is being installed near the washing plant; the tank of the thickener is 75 feet in diameter by 13 feet high on a concrete foundation. The ventilating equipment at the mine has been enlarged by the installation of a Sirocco fan with a capacity of 150,000 cubic feet of air a minute.

The East Wellington Coal Company is a new organization that has secured a lease on a royalty basis from the Canadian Collieries (Dunsmuir), Limited, of a tract of approximately 2,800 acres of land adjoining the old Jingle Pot mine and extending to the northward. This tract of land is for the most part virgin territory, presumably underlain by the Wellington coal-seam, but also includes the old East Wellington mine, which it is proposed to unwater. Up to the present time the work being done consists of clearing 10 acres for mine buildings, driving a new slope 611 feet, counter-slope 86 feet, crosscuts 155 feet, sump 6 by 12 by 30 feet, and erecting buildings for machinery. A more detailed report of the mine and equipment will be given in the Annual Report for 1920.

The Canadian Western Fuel Company, Limited, which operates the No. 1 or Esplanade, Reserve, Harewood, and Wakesiah mines, Nanaimo, has increased the production during 1920 by approximately 60,000 tons over the 1919 production of 638,565 long tons.

Brick-making.—The Gabriola Island Shale Product Company, Limited, has been operating the brickyard on Gabriola island near the entrance to Nanaimo harbour during 1920 practically continuously. The capacity of the brick-making plant is about 18,000 red bricks a day.

Metalliferous Mining Industry.

The Nanaimo Mining Division is the largest in area of the several Mining Divisions in the Western Mineral Survey District No. 6, but metalliferous mining during 1920 has not progressed in as marked a degree as could be desired. One reason for this lack of progress is the fact that a very large proportion of the Division lies within the Esquimalt & Nanaimo Railway Belt, or "Dunsmuir" concession, in which all of the coal and base metallic minerals are owned by the Canadian Pacific Railway Company, while the precious metals only belong to the Crown. In consequence of this fact and the difficulty of securing any title to the minerals owned by the railway company, prospectors have little incentive to explore within the boundaries of the concession.

Operations in metalliferous mining on Vancouver island have in consequence been confined to the north-westerly portion of the Nanaimo Mining Division, outside the Railway Belt, and to the several islands lying between Vancouver island and the mainland.

On Myra and Price creeks, which flow into the southerly end of Buttle lake in Strathcona Park, active operations were carried on by the Paramount Mining Company on three groups of mineral claims located on these creeks. Last summer about 2,000 feet was bored with diamond-drills as well as several open-cuts made, and a wide zone of low-grade copper ore carrying some silver and gold values was found to occur.

On Texada island the development-work was confined to the *Marble Bay* mine, where very considerable diamond-drilling on and below the 1,750-foot level was carried on, but no shipments of ore were made. The past season is the first since 1898 in which no shipments have been made from this mine.

On Lasqueti island, about 5 miles west from the southerly end of Texada island, recently prospecting and development-work was started by Henry Lee, M.E., of Vancouver, and associates on the *Venus* group of nine full-sized mineral claims and a fraction. The property was examined by the writer on November 11th and 12th, 1920, when he was impressed by the systematic and businesslike manner in which the operations were carried on, and which will be described in detail in the Annual Report.

A body of sulphide ore carrying gold-silver-copper values occurs at the contact of diorite-porphry with diorite, and is exposed on the bench near the mouth of a small creek. This vein is from 3 to 4 feet wide where it is exposed in a drift-adit about 100 feet long. Samples taken from the dump representing shipping-ore assayed: Gold, 0.60 oz.; silver, 3.5 oz. a ton; copper, 17.2 per cent.; and gold, 0.38 oz.; silver, 1.8 oz. a ton; copper, 14.4 per cent.

On the surface it is shown by open-cut prospecting that the ore-body possibly extends for about 2,000 feet along the strike, with the peculiarity that there are no natural outcrops of ore exposed, and the only successful method of prospecting is by finding first the contact between the diorite-porphry and diorite and then making open-cuts and trenches.

On Quadra island there has been no activity on the *Ingersoll* group of mineral claims during 1920, but on a group owned by Ross & Hamilton near Deep bay development-work has been carried on, and considerable prospecting has been done about the centre of the island, where discoveries of copper-sulphide ore are reported.

At Frederick arm of Cardero channel the Ladysmith Smelting Corporation has been carrying on prospecting and sampling on the *Blue Bell* group of mineral claims, also on the *Dawn* group on East Thurlow island.

Prospectors staked a considerable number of mineral claims near the headwaters of the Klinaklini river in the north-westerly corner of the Nanaimo Mining Division. These claims were staked because of the occurrence of deposits of iron ore, according to the statements made by the prospectors on their return.

The Tatlayoko Gold Mines Company, Limited, was operating its property near Tatlayoko lake, and J. T. Morris, the manager, states that it is the intention of the company to install a concentrating-mill during 1921.