

BRITISH COLUMBIA  
DEPARTMENT OF MINES

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

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BULLETIN NO. 1, 1919

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PRELIMINARY REVIEW AND  
ESTIMATE OF  
MINERAL PRODUCTION  
1918

BY  
WM. FLEET ROBERTSON, Provincial Mineralogist.



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AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

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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 1918, together with some notes on the progress of the mining and metallurgical industries during the year just closed; the information herein presented is, of course, subject to revision.

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

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

I have the honour to be,

Sir,

Your obedient servant,

WILLIAM FLEET ROBERTSON,

*Provincial Mineralogist.*

*Bureau of Mines, Victoria, B.C.,*

*January 4th, 1919.*



# PRELIMINARY REVIEW AND ESTIMATE OF MINERAL PRODUCTION FOR THE YEAR 1918.



HIS bulletin has been prepared before the receipt of the official reports for the year 1918 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 1918 of a total value of \$41,083,093. It will be seen that the total value of the production of 1918 as estimated is \$4,072,701 greater than that of 1917, equivalent to an increase of about 11 per cent.

Only once in the history of the Province's mineral statistics has this output been exceeded, and that was in 1916, when the year's mineral output amounted to \$42,290,462, only 2.9 per cent. greater than 1918; and it must be remembered that 1916 was a phenomenal year, with metal prices temporarily inflated, due to war conditions. As compared with earlier years, the production of 1918 shows up even more favourably, for it exceeds the next highest recorded production—\$32,440,800, made in 1912—by \$8,642,293, or about 26.6 per cent.

The value of the products of the metalliferous mines this year was about equal to the preceding year, exceeding it by only about \$3,687.

The great increase made is therefore almost entirely attributable to the products of the collieries, which show outputs, both of coal and coke, exceeding those of the preceding year; the increased output of coal being some 142,093 tons, while that of coke was 30,751 tons.

In addition to this, the price of the coal has been raised by the exigencies of the war, and these two factors combined have caused the value of the colliery products this year to amount to about \$12,794,932; an increase over the preceding year of \$4,310,589.

The increase in the selling-price of coal has been allowed at various times by the Dominion Government Fuel Controller, until, as nearly as can be calculated, the average price of coal for the year over the Province as a whole has been approximately \$5 a ton, and the similar average price for coke about \$7 a ton. What additional value this increased selling-price gave to this year's output of coal and coke may be realized by comparison with the average selling-prices assumed in former years of \$3.50 a ton for coal and \$6 a ton for coke. This additional value this year would amount to about \$3,628,758.

As regards the products of the metalliferous mines of the Province, as already noted, the combined values of these products as estimated shows an increase over the preceding year of some \$3,687; not a very great increase to be sure, but nevertheless an increase, which under the many adverse conditions prevailing is very encouraging.

The combined output of placer and lode gold shows an increase of \$695,705—a rather pleasant surprise considering the greatly increased operating costs and the fact that the selling-price of gold remains stationary.

Of these products, the placer-gold production shows a decrease of \$188,000, while lode gold shows an increase of \$883,705, attributable to more active work in the Rossland camp and to a full year's output from the Surf Inlet mine—a new producer.

The value of the silver production this year is greater than that of the previous year by about \$335,371, thanks to the materially higher market value of the metal, for the quantity of silver produced shows a decrease of 43,355 oz.

Conversely, the value of the production of both lead and copper are each lower this year than in 1917, although the quantity of lead and of copper produced are both materially greater than in 1917, the increase in quantity of copper over the 1917 production being 4,379,445 lb. This is accounted for by a lower average market value of each metal during the year than that prevailing during 1917.

Zinc apparently shows a considerably decreased production as compared with 1917, both in quantity of the metal and in value. This result may, however, be changed when the final figures are available, as it has been impossible as yet to obtain record of all shipments made to the United States.



The value of the miscellaneous metals produced this past year is estimated to be about \$50,000, while the value of the building materials of mineral origin is estimated to be about \$950,000, making a total for miscellaneous products of \$1,000,000, a somewhat lesser amount than the preceding year.

The war conditions existing and the uncertainty as to the future caused an almost complete cessation of all building, with the exception of wooden structures.

As has been noted, the fluctuations of the market prices of the various metals and ores has been an uncertain factor during the war, and now that the war is over this uncertainty is very much greater. It is impossible to predict what demand there will be for the metals in the immediate future, and the transition stage between war conditions and peace conditions leaves the metal market in an entirely unsettled state.

At present copper has a nominal market price of 26 cents a pound—the maximum selling-price fixed by the United States Government during the war—but since the armistice there has been no market and no buyers. Meantime stocks of copper are accumulating, and it is reported that the Allied Governments have excess stocks for a peace basis, so that the large copper-producers may soon be forced to materially curtail production.

The average market price for copper in 1918 was 24.74 cents (December estimated), as compared with 27.18 cents in 1917.

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

The market price of silver in 1914 was 54.8 cents an ounce; in 1915, 49.7 cents; in 1916, 65.7 cents; in 1917, 81.4 cents; and in 1918 it was 96.77 cents (December estimated).

The market outlook for silver is much better than for copper, lead, and zinc, and it seems reasonable to assume that the present price of about \$1 an ounce may be maintained for some time.

The lead market is in a similar condition to the copper market, being dull and featureless, with very few actual sales recorded. Since the armistice the nominal price has declined from about 8 cents to about 6 cents a pound. Large stocks of lead are reported in all the Allied countries, and it is apparent that it will be some time yet before the market demands will absorb these stocks.

Zinc is in much the same position as lead as regards market conditions. The nominal price declined from about 8¼ cents on November 12th to about 7½ at the end of the year. The market is becoming weaker from day to day and much uncertainty exists.

At present the market for what are commonly called "war minerals" is practically non-existent, and quotations cannot be obtained, as the future demand for such materials is unknown.

During the year 1918 labour troubles in the mines and smelters were not numerous. The most serious one was in the Crowsnest District, owing to a disagreement over the "single-shift" system of operating the coal-mines, and the mines were closed for about a month.

In the fall of the year the epidemic of Spanish influenza caused a dislocation of the staffs and working forces generally throughout the mines and smelters of the Province, and in many places seriously curtailed production.

The prospects for the coming year of 1919 are, when metal and mineral prices again become stabilized, that the mining industry in British Columbia should continue to prosper. The established producers are generally in good shape to continue production even at lowered metal prices, and when settled conditions arrive much new development should take place.

British Columbia has very large areas of undeveloped and unprospected mineral lands, and the return of peace will hasten the development of her mineral resources. There will be a considerable accession to the ranks of the prospectors and more capital will be available for legitimate mining development.

#### MINERAL PRODUCTION FOR TWO YEARS, 1917-18.

The following table shows the quantities and value of the several minerals produced in the year 1917, and the estimated production in 1918. It may here be explained that the prices used in calculating the estimated value for 1918 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, 1917-18.

	PRODUCTION, 1917.		ESTIMATED PRODUCTION, 1918.			
	Quantity.	Value.	Quantity.	Value.	Increase.	Decrease.
Gold, placer.....oz.	24,800	\$ 496,000	15,400	\$ 308,000		\$188,000
Gold, lode.....oz.	114,523	2,367,190	157,276	3,250,895	\$ 883,705	
Total gold .....		\$2,863,190		\$3,558,895	695,705	
Silver.....oz.	2,929,216	2,265,749	2,886,861	2,601,120	335,371	
Lead.....lb.	37,307,465	2,951,020	43,949,661	2,944,627		6,393
Copper.....lb.	59,007,565	16,038,256	63,387,010	15,681,946		356,310
Zinc.....lb.	41,848,513	3,166,259	36,149,894	2,501,573		664,686
Total metalliferous .....		\$27,284,474		\$27,288,161	3,687	
Coal.....tons.	2,149,975	\$7,524,913	2,292,068	\$11,460,340	3,935,427	
Coke.....tons.	159,905	959,430	190,656	1,334,592	375,162	
Total collieries .....		\$8,484,343		\$12,794,932	4,310,589	
Miscellaneous and building materials.....		\$1,241,575		\$1,000,000		241,575
Total production .....		\$37,010,392		\$41,083,093	\$4,072,701	

## 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 1918 is estimated at \$308,000, of which practically all is obtained in the Cariboo and Cassiar Districts, only about one-tenth of the total coming from the other districts. An approximate apportionment is as follows: From Cariboo District, \$82,000; Atlin Division of Cassiar District, \$200,000; Stikine and Liard, \$5,000; remaining parts of the Province, \$21,000. It may be that a larger yield will be shown, but this cannot be definitely stated until after the final returns of the season's operations shall have been received. This estimated production for 1917 shows the large decrease from the preceding year of \$188,000, or 38 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. Also shortage of labour handicapped operations. So many men left for active service in the war that the number of individuals mining in a small way was materially less than in former years.

No definite information is available regarding the Atlin Division, but it is known that the production was considerably less than in 1917, and that some of the former operating companies were closed down during the year.

In the Cariboo District about as many properties were working as formerly, but the supply of water for hydraulicking was less than in former years. Owing to the unusual weather conditions that prevailed during the hydraulic-mining season, the snowfall being only light to begin with, and the season very late, actual hydraulicking did not commence until about the end of May. Then there was a spell of very hot winds and rains that produced an abnormally high freshet for a couple of weeks, with the result that most of the water was rushed off in the freshet. The following dry season practically put an end to hydraulicking, and the fall rains did not help materially. Values kept up to average, but the yardage was so reduced that the actual production in the Cariboo Division was not much more than one-half of the previous year.

There are undoubtedly many deposits of gold-bearing gravels in the Atlin, Cariboo, and other districts, which, under normal conditions, will yet be worked either by hydraulicking or dredging.

The increased demand for gold and probably lowering of costs now that the war is over should cause renewed interest in placer-mining.

*Lode Gold.*—The quantity of lode gold produced in 1918 is estimated at \$3,250,895, as compared with \$2,367,190 in 1917, an increase of \$883,705, or 37 per cent. It must be remembered, however, that the 1917 gold production was abnormally low, the output for the years preceding the war varying from \$4,000,000 to \$5,000,000. The increase in 1918 over the preceding year is largely due to the entry into the producers' list of a new mine—the Surf Inlet property of the Belmont-Surf Inlet Mines—which made an output of about 43,000 oz. But for this added production the gold-output for 1918 would have been practically the same as in 1917.

The Rossland mines, which prior to 1917 contributed annually about one-half of the output of lode gold, made about the same production in 1918 as in the preceding year; during these two years about one-quarter the normal output was made. The mines were worked somewhat irregularly during the first six months of the year; after that, although development was continued, only small shipments were made.

The following table shows the gold production of 1917 and the estimated production for 1918:—

	1917. Oz.	1918. Oz.
Boundary-Yale .....	60,010	56,734
Rossland .....	33,290	38,096
Skeena .....	9,805	48,621
Coast (Southern) .....	3,793	5,800
Lillooet .....	3,092	2,140
Nelson .....	2,521	4,300
All others .....	2,012	1,585
Totals .....	114,523	157,276

From the above table it will be seen that there are increases in Skeena, Rossland, Coast (Southern), and Nelson Districts, while there are decreases in the gold production from Boundary-Yale and Lillooet Districts.

The increase in the Nelson Division is due to a larger tonnage from the *Yankee Girl* mine, near Ymir. The production from the *Nickel Plate* mine, at Hedley, is expected to have been about 35,000 oz., practically the same as in the previous year. The small decrease in the Boundary-Yale District as compared with 1917 is due to a smaller tonnage of copper ore carrying low gold values being treated at the Granby smelter.

#### Silver.

The quantity of silver produced is estimated to have been about 2,886,861 oz., worth \$2,601,120, a decrease from the production of 1917 of 42,355 oz., but, owing to the higher market value of silver, an increase in value of \$335,371.

The market price of silver gradually rose during the year, the average for January being 88.702 cents an ounce, while in December it was about 101.125 cents. The average for the year was 96.77 cents, the highest that silver has been for many years back. The prospect of silver maintaining its present price of about \$1 an ounce is good, and in this respect the silver market is in marked contrast to the other metals, the future prices of which are uncertain.

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

	Oz.
Slocan and Slocan City .....	1,353,265
Skeena .....	306,422
Fort Steele .....	288,540
Boundary-Yale .....	248,085
Ainsworth .....	225,020
Windermere-Golden .....	139,250
Coast .....	115,120
Omineca .....	96,758
Trail Creek .....	58,484
All others .....	55,917
Total .....	2,886,861



The Slocan District is again far in the lead of all other districts in silver production, 47 per cent. of the total being credited to the Slocan. The figures for this year indicate a decreased production for the Slocan, as compared with last year, of about 12 per cent. A considerably lessened output from the *Standard* mine, at Silverton, accounts for some of this decrease.

The largest producer in the Slocan was the *Surprise*, followed by the *Queen Bess* and the *Standard*. There were nearly 40 shipping mines in the district in 1918.

The estimated figures for the year would seem to show small increases in output from Ainsworth, Boundary-Yale, Fort Steele, Coast, Omineca, and Windermere-Golden Districts, but the decrease in Slocan more than offsets all these small increases.

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

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

The Skeena production comes almost entirely from the Granby Company's *Hidden Creek* mine, at Anyox.

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

About 75 per cent. of the total Provincial output of silver comes from the treatment of silver-lead-zinc ores and the balance mainly from the smelting of gold-copper ores carrying silver.

#### Lead.

The total amount of lead produced in 1918 is estimated to have been 43,949,661 lb., valued at \$2,944,627. This represents, as compared with the previous year, an increase in quantity of 6,642,196 lb., but owing to the lower market price of lead a decrease in value of \$6,393.

The market price of lead rose and fell during the year; the average for January was 6.782 cents a pound; in July a fixed price of 8.05 cents was established, which was held until the armistice was signed. Since then the lead market has been very dull; the producers hold large stocks and very few sales are being made. The nominal price declined to somewhere about 6 cents at the end of the year. The average price for the year was about 7.44 cents a pound.

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

	Lb.
Fort Steele .....	19,340,800
Slocan .....	11,665,700
Ainsworth .....	7,157,400
Windermere-Golden .....	3,031,000
Nelson .....	2,146,581
All others .....	608,180
Total .....	43,949,661

The above figures show, as compared with the previous year, that the lead production in 1918 was increased in Fort Steele, Ainsworth, and Windermere-Golden Districts, and a very slight decrease in the Slocan and Nelson outputs.

Fort Steele Division again leads all other districts. The *Sullivan* mine contributes nearly all of this production as a rule, but this year over 1,000,000 lb. came from the *North Star*.

In the Slocan District the heaviest producer in 1918 was the *Surprise*, followed by the *Queen Bess*, the *Galena Farm*, and the *Standard*.

In the Ainsworth Division the largest producer was again the *Blue Bell*, with an output of about 3,000,000 lb., followed by the *Florence*, with approximately 2,000,000 lb.; the *Highland* and *Cork-Provence*, each with over 500,000 lb.; and about fifteen smaller shippers.

The lead production of Nelson Division comes almost entirely from the *Emerald* mine, and this mine produced about the same as in the previous year.

The production from Windermere-Golden is nearly twice that of the previous year, due to an increased output from the *Paradise* mine and a production of about 1,000,000 lb. from the *Couverapee* mine, at Field.

## Copper.

The amount of copper estimated to have been produced in 1918 shows, as compared with the previous year, an increase in quantity, but, owing to the lower market selling-price, a decrease in value. The production is estimated at 63,387,010 lb., which is 4,379,445 lb. greater than the 1917 output; the value for this year is \$15,681,946, which, compared with \$16,038,256 made in 1917, shows a decrease of \$36,310. It is most encouraging, however, that, notwithstanding lowered market prices, the Provincial production of copper shows an increase in the quantity of metal produced of about 7.4 per cent. over the previous year.

During the whole of 1918 the price of copper in the United States was controlled by the maximum price fixed by the United States War Industries Board. From January to July the fixed price was 23.5 cents a pound, and from July until the end of the year it was 26 cents, the average for the year being 24.74 cents.

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

	Lb.
Skeena Division .....	30,925,928
Southern Coast District .....	19,470,760
Boundary-Yale District .....	10,324,992
Trail Creek Division .....	2,043,560
Omineca Division .....	562,000
All others .....	59,770
Total .....	63,387,010

The *Hidden Creek* mines and the smelter at Anyox of the Granby Consolidated Mining and Smelting Company were operated practically continuously throughout the year, although closed for a short time by a strike, which was soon settled. A larger tonnage was treated than in 1917, amounting to approximately 828,000 tons, together with quartz and limestone flux to the extent of some 80,000 tons. With the increased tonnage handled there was a corresponding increase in the output of copper, approximately 30,400,000 lb. being produced, as compared with 27,661,301 lb. in 1917.

In the Boundary District the Granby Company's mines at Phoenix were unable to supply the smelter at Grand Forks with sufficient ore to run the smelter at capacity. The ore reserves of these mines are approaching exhaustion, so that the large-scale production of former years cannot be maintained. Also the high operating costs during 1918 left but little margin of profit in working the low-grade ores at Phoenix. Or, to quote the Granby Company's annual report: "The old Phoenix mine has been run more from patriotism than hope of profits." The tonnage mined and smelted was approximately 444,000 tons, containing about 6,200,000 lb. copper (recovered content), which is a small decrease from the production figures of 1917; the 1917 output was only about one-half that of former years.

The Canada Copper Corporation, operating the *Mother Lode* mine and smelter at Greenwood, treated a slightly smaller tonnage than in 1917. About 165,000 tons was handled, from which approximately 2,200,000 lb. of copper was recovered, together with low gold and silver contents. Towards the end of the year the smelter was closed, the ore-reserves at the *Mother Lode* mine being exhausted.

The *Britannia* mine had a very successful year, approximately 750,000 tons of ore being milled, the production of copper from which is estimated at 18,250,000 lb. This is nearly 2,500,000 lb. greater than the 1917 production.

The *Marble Bay* mine, on Texada island, made about the same production as in 1917; the output is estimated at 740,000 lb.

Half a dozen smaller shippers are listed from the Southern Coast District, but the total copper from this source only amounts to 500,000 lb.

The Omineca Division produced less copper than in 1917; the output is estimated at 562,000 lb.

Copper-mining is now firmly established as the most important form of mining in the Province, and from all indications it should maintain this place for years to come. In 1918 the value of the copper mined exceeded by over \$4,000,000 the combined values of all other metals mined, and it formed 38 per cent. of the total value of the mineral production for the year.

It is also to be noted that 80 per cent. of the copper-output is produced on the Coast, which has become the centre of the copper-mining industry, thus replacing the Boundary District, the old centre.

On Vancouver island the amount of copper produced has been very small comparatively, but there are under development at present at Jordan river and near Quatsino sound two properties on which active development has been carried on with such success as to indicate a large production within a couple of years.

#### Zinc.

The quantity of zinc estimated to have been produced in 1918 amounted to 36,149,894 lb., which, compared with 41,848,513 lb. produced in 1917, shows a decrease of 5,698,619 lb. The estimate on zinc-output, however, may be low, as it has been difficult to get information regarding shipments to the United States. This production is valued at \$2,501,573, which shows a still further proportionate decrease, as compared with the 1917 value of \$3,166,259, due to the decreased market price of the metal.

The price of zinc on the New York metal market did not fluctuate greatly during the year. The average price for January was 7.836 cents a pound, and in November 8.491 cents. Since the armistice the market has been inactive, with practically no sales, so that quotations have been nominal. At the end of the year the price had declined to about 7.5 cents a pound.

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

	Lb.
Fort Steele .....	22,000,000
Slocan .....	13,601,954
Omineca .....	327,940
Ainsworth .....	220,000
Total .....	36,149,894

These figures show, as compared with 1917, an increase in the Fort Steele production of a little over 1,000,000 lb., and a decrease of about 5,000,000 lb. in the Slocan output.

The Fort Steele production comes entirely from the *Sullivan* mine. The ore is treated in the electrolytic zinc plant at Trail.

In the Slocan District the heaviest shipper was again the *Standard*, with a production of about 7,000,000 lb., which, however, is 3,500,000 lb. less than in 1917. The next largest shipper was the *Surprise*, followed by the *Lucky Jim* and the *Galena Farm*.

The estimate for Ainsworth is only about one-quarter of last year's production, but final figures may bring the output for this Division up considerably.

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

#### Other Minerals.

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

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

A few hundred tons of bog-iron ore was shipped from a deposit near Mons, on the Pacific Great Eastern Railway, to Irondale, Wash., where it was smelted in conjunction with mill cinder and scrap. This ore ran from 40 to 50 per cent. of iron, but was above the Bessemer limit in phosphorus.



Some magnetite ore was also shipped from Texada island to the Irondale furnace.

During the summer months the Provincial Government engaged Dr. Alfred Stansfield, of Montreal, to make a report on the commercial feasibility of smelting British Columbia magnetites in an electric furnace; the abnormal price of iron due to war conditions offering a seeming field for that class of smelting. Dr. Stansfield's report will soon be made public.

*Platinum.*—The very insistent demand for platinum for war purposes caused a most exhaustive search to be made for it in commercial quantities by the Dominion Government officials. The well-known fact of its wide distribution throughout the Province in connection with our placer-gold deposits giving reasonable hope for such investigations. In connection with this search a number of drill-holes were sunk in the Similkameen District, the final results of which are not yet available.

A small amount of crude platinum was saved as a by-product from placer-gold workings, the exact quantities not being known.

*Molybdenite.*—The urgent demand for molybdenite for war purposes continued throughout the first half of the year, but gradually the market fell away. Since the armistice the market is dormant, like other metal prices, but nominal quotations vary from 75 cents to \$1 a pound.

During the year a car-load of molybdenite ore, carrying also gold, cobalt, and arsenic, was shipped from the *Hazelton View* mine, Hazelton, to the Ottawa Mines Department for treatment. Returns on it have not yet been received. A small shipment of molybdenite was made from the *Golconda* claim, Osoyoos Mining Division. No other molybdenite shipments have been reported.

*Chromite.*—About 800 tons of chromite ore, carrying from 30 to 45 per cent. chromic oxide, was shipped from the *Mastodon* claim, Grand Forks Division; and a deposit on *Scotty creek*, near Clinton, was opened up, but no shipments made.

With the end of the war the market for chromite has temporarily collapsed, as large stocks are available, with no purchasers in sight.

*Manganese.*—Fifteen car-loads of ore, containing from 35 to 50 per cent. manganese, was shipped from the *Curle Manganese* group, near Kaslo.

A large deposit of good-grade manganese was discovered during the summer near *Cowichan lake*. No shipments were made.

*Non-metallic Minerals.*—One hundred tons of fluorspar 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 being equipped to make steady shipments in the future. The mineral is shipped to the Trail smelter and is used for making hydrofluoric acid, which is used in the lead-refinery.

Shipments of magnesium sulphate (Epsom salt) were made from *Spotted lake*, Osoyoos Division, but figures have not been obtained. One hundred and seventy tons of magnesium sulphate was 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 \$20,000 was made by the *Nickel Plate* mine in 1917, and although no figures have been received, a similar production is expected to have been made in 1918.

#### Structural Materials, etc.

The output during 1918 of all structural materials, such as cement, lime, building-stone, sand and gravel, brick, and other clay products, will probably show a slight decrease from that of previous years.

The output for 1918 is estimated at \$1,000,000, as against \$1,204,546 in the preceding year, and \$1,299,553 in 1916.

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

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

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

#### Coal and Coke.

It is estimated that the gross production of coal was 2,572,811 long tons, of which 280,743 tons was made into coke, leaving the net production at 2,292,068 tons. These figures show an increase, as compared with 1917, of 174,096 tons gross and an increase of 142,093 tons net. The quantity of coke made was about 190,656 tons, which is an increase of about 30,751 tons as compared with 1917. For purposes of comparison the following table is shown:—

	Est. 1918.	1917.	1916.	1915.	1914.	1913.
Coal, gross..... tons, 2,240 lb.	2,572,811	2,398,715	2,485,580	1,972,580	2,166,428	2,570,760
Less made into coke..... "	280,743	248,740	401,487	361,451	355,461	433,277
Coal, net..... "	2,292,068	2,149,975	2,084,093	1,611,129	1,810,967	2,137,483
Coke made..... "	190,656	159,905	267,725	245,871	234,577	286,045

In these figures for 1918 the output for the month of December has had to be estimated, consequently the final figures may vary from them slightly.

Summarizing the Provincial production of coal, the following table shows the estimated output for 1918:—

	Tons of 2,240 lb.
From Vancouver Island collieries .....	1,666,582
From Nicola and Similkameen collieries .....	174,278
From Crowsnest District collieries .....	731,951
Total quantity of coal mined .....	2,572,811
Less made into coke .....	280,743

Net quantity of coal produced ..... 2,292,068

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 .....	24,653
From Nicola and Similkameen collieries .....	Nil
From Crowsnest District collieries .....	166,003
Total .....	190,656

As will be seen by the above figures, the net coal production this year is expected to be some 142,093 tons (2,240 lb.) greater than it was in 1917, and again about reaches the figures prevailing before the war began.

**Coke.**—The production of coke in 1918 was about 190,656 tons (2,240 lb.), which is 30,751 tons greater than the preceding year, an increase of about 19 per cent.

The coal-mines of the Province have had a fairly good year, interruptions to production being less frequent than in 1917. A strike at Fernie closed the mines during September, but work was started again on October 5th, with the introduction of the single-shift system.

The epidemic of Spanish influenza caused an acute temporary shortage of labour, which curtailed production for a time.

In making comparisons with the values of the productions of former years, it must be borne in mind that the selling-price this year is greatly in excess of that used in former years, when coal was taken at an average price of \$3.50 a ton and coke at \$6 a ton.

During the war the Dominion Government appointed a Fuel Controller, who has allowed at various times increases to be made in the selling-prices of coal, until in September, 1918, he allowed for bunker coal on the Coast a maximum selling-price of \$8.25 a ton.

As near as can be calculated, the average selling-price for the year for the Province as a whole has been approximately \$5 a ton, and the similar average price for coke has been about \$7.

The additional value given to the Provincial product for 1918 by these increased prices would amount to about \$3,628,758.

#### VANCOUVER ISLAND COLLIERIES.

The Vancouver Island collieries made a gross output of about 1,666,582 tons of coal, or 29,139 tons less than in 1917.

*Western Fuel Co.*—This company mined this past year about 731,922 tons of coal, an increase over the previous year of 73,475 tons.

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

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

The Harewood mine, which has been closed down for a number of years, was reopened during 1917, and at the present time is producing about 1,000 tons of coal daily.

The New Wakesiah shafts, which were sunk during 1918 on the Five-acre Lots, should produce coal at an early date.

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

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

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

The gross output of coal for this colliery during the year was 538,362 tons (2,240 lb.), an increase of 30,305 tons over 1916.

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

Three miles 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 224,577 tons, a decrease of 64,814 tons from that of 1917.

The new slope known as No. 5 mine is being developed at South Wellington, from which the output for the year was about 28,787 tons.

*Pacific Coast Coal Mines, Ltd.*—This company operated the Morden mine throughout the year; the mine is situated about six miles south of Nanaimo and produced about 82,629 tons during 1918.

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

*British Columbia Coal Mining Co.*—This mine was reopened in August after being closed down owing to a mine fire, since October 16th, 1917. The output for the past year was about 4,716 tons.

*Nanoose Collieries, Ltd.*—This colliery is situated at Nanoose bay, about ten miles north of Nanaimo, and is operating in the Old Wellington seam. The output for this colliery during the past year was 30,436 tons, an increase of 2,614 tons over the previous year.

*Granby Colliery No. 1.*—The new colliery of the Granby Company at Cassidy Siding was opened up during the year. About 17,625 tons of coal was mined and shipped to Anyox.

#### NICOLA-SIMILKAMEEN COALFIELDS.

These coalfields produced in 1918 about 174,278 tons, an increase over the previous year of 23,035 tons.



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In the Nicola District two companies produced coal during 1918—viz., the Middlesboro Collieries, Limited, and the Fleming Coal Company.

The Middlesboro Colliery produced about 100,000 tons during the year, an increase of 16,542 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 31,000 tons, an increase over the previous year of 23,704 tons.

At Princeton, the Princeton Coal and Land Company produced about 38,778 tons, a decrease of 8,148 tons from the previous year.

#### EAST KOOTENAY COALFIELD.

There were only two companies producing in this field during 1918—the Crow's Nest Pass Coal Company, operating collieries at Coal Creek, situated five miles east of Fernie, and Michel, situated twenty-three miles north-east of Fernie; and the Corbin Coal and Coke Company, with its colliery at Corbin.

There was mined in the district during the year 731,951 tons of coal, an increase of 180,200 tons from the previous year.

Of this tonnage, about 240,697 tons was used to make coke and yielded about 166,003 tons of coke; as compared with the 1917 output, these figures show an increase of 36,504 tons.

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

Production in the Crowsnest District was curtailed by a strike in September, and later by the epidemic of Spanish influenza, which made a labour shortage.

Michel Colliery had three mines in operation throughout the year—viz., Nos. 3 East, New No. 8, and Old No. 3 mine, which was reopened during the summer.

*Corbin Coal and Coke Co.*—The output of this company for the year was 125,972 tons, being an increase of 24,907 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 production on a small scale was started by this company. The colliery is situated four miles and a half from Telkwa, a town on the Grand Trunk Pacific Railway. About 500 tons was mined and shipped to Prince Rupert, and a continued production is expected. This is the first commercial output of coal in northern British Columbia.

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## MINING DISTRICTS OF BRITISH COLUMBIA.

In order to give a general idea of the mineral deposits, mines, and reduction-works of British Columbia, a summary of these, together with an outline of the chief features of the operations during 1918, will now be presented. As the mining districts are numerous and cover a large area of territory, the information that follows is, necessarily, incomplete, for it is not practicable, in a preliminary review, to give particulars of all that should have notice. The various districts and their respective subdivisions will here be briefly dealt with in the preliminary reports submitted by the Resident Engineers of the various districts.

At the session of 1917 an Act was passed dividing the Province up into six Mineral Survey Districts, to each of which a Resident Engineer was appointed, with jurisdiction over that district.

### NORTH-WESTERN MINERAL SURVEY DISTRICT, No. 1.

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

(Headquarters, Prince Rupert.)

District No. 1 is comprised of eight Mining Divisions of the Province—viz., Bella Coola, Queen Charlotte, Skeena, Portland Canal, Nass River, Stikine, Liard, and Atlin. The Nass River Division is a new one created this year, and is that portion of the Skeena Division north of the watershed between the Nass and Skeena rivers from the mouth of Portland Inlet just south of Pearce Island, and having its Recording Office at Anyox.

There are many features of the district which make it probably the most desirable one in the Province from a prospecting and mining standpoint. The innumerable islands and miles of waterways cutting into the mainland furnish unlimited and very accessible areas for the prospector and eliminate the serious handicap of poor transportation. Prospecting is the least expensive and attended with less hardships than any district I know. Because of these ideal conditions for mining and transportation there is always a market for a property of merit. Geological conditions must be favourable, as is evidenced by the discovery of such properties as the *Hidden Creek* mines at Anyox, the *Dolly Varden* at Alice arm, the "Bush" property at Stewart, the *Ikedo* on Queen Charlotte islands, the *Surf Inlet* mines on Princess Royal island, all of which are practically on tide-water.

The output of the district for the year will approximate \$37,200 tons, producing 30,908,300 lb. of copper, \$980,000 in gold, and \$282,000 in silver. This is a considerable increase over last year, due to the greater production of the Granby Consolidated of copper, while the increase in gold and silver is accounted for by the very successful year of the Belmont-Surf Inlet Mines, Limited. The output of placer gold will, however, be considerably less than last year.

The outlook of this district for the coming year is exceptionally good, for it is almost a certainty that the railroad troubles of the *Dolly Varden* will be adjusted and it will become an important producer. There is every prospect of several smaller properties in that section also shipping during the coming summer. The Portland Canal section will have a shipper in the "Bush" property this winter, with several other properties showing up well with development. These sections will greatly increase the gold-silver production of this district. The *Engineer* mines, at Atlin, may also be expected to become a big gold-producer, possibly within the next year.

With the war over and the return of many of the men who enlisted from this north country, together with others who will be well fitted for the life and alive to the many opportunities of this particular portion of the Province, I look for an extensive revival of prospecting and mining activities.

The following is a short review of the mining situation, under the headings of the separate Mining Divisions:—

#### Bella Coola Mining Division.

I had the opportunity of visiting only one property in this Division this year, on Evans arm. I am informed that there has been very little active mining during the year, but that options have been taken by one of the large mining companies on several claims, and it is expected that development-work will be started as soon as possible.

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**Queen Charlotte Mining Division.**

Since becoming the centre of the spruce industry and the consequent employment of so many men, the islands have had considerable prospecting, resulting in some little mining activity. The beach placers on the north and east coasts of Graham island have been exploited to some extent, but no gold production is reported from either place. A centrifugal-action gold-amalgamating machine was installed by the inventor at the mouth of the Oeanda river, on the east coast, but I believe was never operated on account of the inventor being called in the United States Army draft. It will no doubt have a trial right away.

The Ikeda Mines, Limited, on Ikeda bay, has been a very light shipper this year owing to the shortage of labour. The output was 358 tons of ore, producing 77 oz. gold, 986 oz. silver, and 83,384 lb. copper. There is sufficient low-grade ore on the dumps and exposed in the mine to justify a small concentrating-plant, which would also probably make development-work profitable.

The South Easter Mining Company, under the management of A. S. Holmes, has been steadily developing its property, situated about a mile from Skidegate. An equipment of compressor and hoist was installed last fall; since then a shaft has been sunk 100 feet, from which two levels have been run, aggregating about 600 feet of drifting. A good shoot of ore was opened above the 50-foot level, and it is the company's aim to expose sufficient milling-ore to warrant the erection of a plant; to this end a diamond-drill is contemplated for deep exploration.

The *Producer* group of mineral claims, formerly the *Lucky Seven*, situated just outside of Jedway harbour and owned by Thompson & McKinnon, has been optioned to Seattle people and work commenced by them. Former work consists of a shaft down 50 feet and a drift to the left of 60 feet, besides some surface open-cuts and stripping. The drift at the bottom of the shaft shows an average of 18 inches of good copper ore carrying fair values in gold and silver, averaging about \$30 a ton in all values. A compressor and water-power is about installed; a tunnel will be driven from a suitable point at the beach to tap the vein under the shaft, a distance of about 300 feet.

Some little local excitement was caused at a logging camp on Shuttle island, about six miles south of Lockeport, when the cook discovered gold in the gravel on the beach, and later in small quartz stringers running through the slaty country-rock. No work to amount to anything had been done on the quartz stringers at the time of my visit, but I am informed that the owner is now sinking a shaft on the most likely looking portion. The placer claims on the beach have been purchased from the original stakers and will be worked this winter. The beach gold is, without doubt, the result of the disintegration of the quartz gold-bearing stringers whose gold has been concentrated in the gravel.

The *Thunder* group, at Collision bay, owned by Ike Thompson, Jedway, was under option to Seattle interests early in the summer and considerable work done underground in trying to locate the ore cropping on the surface. The values are in chalcopyrite, which is disseminated and in bunches throughout a vein gangue of magnetite. Obliquely crossing the vein are numerous dykes which give all the trouble underground. In justice to the property, I think that the operator's idea of the ore occurrence was in error, and consequently the work done underground is not conclusive.

The *Iron Duke* group of nine iron claims, on Louise island, is owned by Benson, Rogers & Pearson. A tunnel 75 feet long and several open-cuts across the vein or ore-body show it to be an immense body of pure magnetite 75 feet wide. The showing is about two miles from the beach and mining and transportation would be economical.

The *Swede* group, at Lockeport, has had no work other than assessment done this year. Property was diamond-drilled a year ago, but work was very unsatisfactory to owners, who were unable to procure information as to results obtained.

On Copper island are three claims, owned by A. Heino, from which each year a few tons have been mined, sorted, and shipped by the owner. A tunnel has been driven on the vein for 33 feet, which appears to be a basic igneous rock carrying disseminated chalcopyrite for a width of between 20 and 30 feet wherever exposed on the surface. This property would bear investigation as a low-grade copper-deposit.

Some little interest is again being shown in the oilfields on the west coast of Graham island. From my own observations and information obtained from other sources, I am of the opinion



that indications are sufficient to warrant a thorough investigation of the area, but not promiscuous drilling. My suggestion would be that the surface be thoroughly examined by a competent oil geologist, further development depending on the results of his findings.

#### Skeena River Mining Division.

The Belmont-Surf Inlet Mines, Limited, operating at Surf inlet, on Princess Royal island, has been under continuous operation and had a very successful year. The output was 8,209 tons of concentrates, shipped to Tacoma, and yielding 43,328 oz. gold, 27,990 oz. silver, and 451,820 lb. copper, a very satisfactory showing for the first year's operation. Extensive development-work is being carried on continuously, with such successful results that the ore reserves have been largely increased. An ice-breaker has been put on the lake for the winter months, so that there will be no interruption of shipments.

The Drum Lummon Copper Mines, Limited, has been operating its property on Douglas channel all summer. The main work underground has been the continuation of the drive on the ore-zone, which has now been opened up for a distance of over 200 feet. Considerable ore was broken down on to the drift-level before closing down the underground work for the season. This will give ample material for the mill to experiment with from now until spring. A new compressor, run by a 25-horse-power gas-engine, was installed early in the year and proved ample for all requirements. A small milling plant was erected and had been in operation only one day at the time of my examination. It is equipped with a small jaw-crusher at the head which takes the mine-run of ore, crushing to about 1 inch size and discharging into storage-bin. Two Gibson type mills, each of 18 tons per 24 hours capacity, are fed from this bin and grind to discharge through a 40-mesh screen, feeding directly to a concentrating-table designed by the manufacturers of the Gibson mill. The whole is run by a 10-horse-power gas-engine. This plant has demonstrated that it will make a concentrate of 62.5 per cent. copper, 1.12 oz. gold, 30 oz. silver, running on a feed of 5.9 per cent. copper ore. The loss, however, will be very heavy unless some scheme, such as a flotation-cell, is used to treat the slimes and middling product. It is a very creditable little plant and will no doubt be gradually improved and enlarged.

The claims up the Ecstall river, mentioned in last year's report, have been further explored by diamond-drilling by the Granby Consolidated, who have the property under option. No information is available from the company as to the results obtained. The work was closed for the winter, but will be resumed in the spring. The importance of the success of this property to this part of the Coast cannot be overestimated.

There has been little mining activity along the line of the Grand Trunk Pacific Railway west of Terrace.

The *Molybdenum* group of three claims is situated about six miles from Zimacord Station up the Zimacord river. Some little work has been done by way of stripping and open-cuts. The ore occurs in small, flat quartz veins lying in a diorite-belt in the granite. They lie more or less parallel with each other, but the lenses are short and too far apart to be worked together and too small to be worked separately; therefore I consider them unimportant.

The *Copperas* group is located about two miles from Kitsumgallum lake, up Maroon creek, which flows into the lake, about its centre on the east side. The ore consists of a mineralized series of hornblende and mica schists about 30 feet in width, through which chalcopyrite is disseminated and in small veinlets lying in the bedding-planes of the schists. So far as exposed it is low grade, but further work might disclose richer portions, and would require thorough prospecting to ascertain whether of commercial value or not.

The *Treadwell No. 2* group, situated on the east side of the lake, about a mile from the upper end, lies in the sedimentaries. Considerable work has been done in open-cutting and drifting on separate bands which have become mineralized by the deposition of quartz along the bedding-planes and cross-fractures, carrying mainly bornite in thin seams. A little free gold has also been found, mostly in the seams, but also in the quartz.

On Douglas creek, which flows into the lake at its head, a tunnel was being driven across a sharp bend in the creek in order to drain the water from above and allow a portion of the creek-bed to be worked for placer gold.

The *Blue Grouse* group, about seven miles north of Cedar River crossing, or twenty miles north of Kitsumgallum lake, on the east bank of Cedar river, consists of two claims, owned by O. Wickstrom. Vein opened up by three open-cuts showing a brecciated country-rock cemented

together with quartz mineralized with galena and chalcopyrite, lying in a sedimentary formation. The quartz is well mineralized and with favourable transportation would be of concentrating grade.

The *Hunter* group, adjoining the *Blue Grouse* on the east, has six claims, owned by O. Olander *et al.*, and contains the continuation of the *Blue Grouse* vein which has been opened up by a couple of open-cuts on this group.

There are several prospects up the Beaver and Little Beaver rivers, but these were not visited on account of the snow.

This is a very favourable country to prospect, from the head of Kitsumgallum lake following the inside contact of the granite range through to the head of Observatory inlet at Alice arm.

The *Ptarmigan* group, five claims owned by Michaud Bros. on Thornhill mountain, just across the Skeena river from Terrace, contains a schist-belt about 50 feet wide lying in the granodiorite. In this belt is a smaller one about 8 feet in width in which are quartz seams up to 6 inches thick carrying grey-copper, chalcopyrite, and galena. An 8-foot shaft does not get below the intensely oxidized surface.

On the *St. Paul* claim of this group a quartz vein 13 feet wide has been partially opened up in several places by open-cuts. The quartz is mineralized with iron pyrites and sparingly with chalcopyrite, galena, and zinc sulphide. Samples of the straight iron sulphides assayed as high as \$80 a ton in gold, while the best ore of the mixed minerals carried up to \$60 a ton in all values. This is a good strong vein and warrants development.

The *Society Girl* group of three claims, owned by Mason & Bell, adjoins the *Ptarmigan* group. The big quartz vein from the *St. Paul* claim has been traced for 1,000 feet by open-cuts on this ground and shows up well. Several smaller quartz veins have also been open-cut, in which the values are low.

The *Lucky Seven* group, owned by Oleson & Dohl, adjoins the *Society Girl* on the west. The owners have done a great deal of work on this group by way of surface-stripping, open-cutting, and tunnelling. About \$5,000 was taken out of a small pocket of gold in a small, flat quartz vein on the *Diamond* claim during the past summer. There appear to be a number of these small quartz veins, striking in all directions, all over the property, some of them carrying high values in silver, in grey-copper, and none of which have been opened up to any extent.

On the *Beaver* claim a strong vein of quartz from 2 to 4 feet wide has been exposed along a creek for 500 feet by seven open-cuts. The upper end of the vein, where the creek bends away from it, is covered with a heavy overburden and has been traced no farther. The owners give the average values in the vein from the seven open-cuts at \$10 a ton—\$7 in free gold, \$2 in silver, and the balance in lead and copper. This vein would make a good concentrating proposition and is well worth investigating for a small company.

The *Iron Hat* claim is just above the Lakelse wagon-road on Thornhill mountain, and owned by Oleson. A tunnel has been driven 60 feet to get under surface showings exposed by open-cuts above. The vein, of quartz, varies in width from a few inches to 4 feet, and in the open-cuts shows 6 inches of solid pyrites assaying from \$40 to \$50 a ton in gold. A very promising little property.

The *Dardanelles* group, owned by Geo. Kerr and associates, of Prince Rupert, is situated fourteen miles up the Zymoetz river from Copper City. There are three quartz veins on the property, each averaging about 4 feet in width and traceable on the surface for the length of three claims. The No. 1 or North vein has a short tunnel driven on it at the bottom of the hill, showing it to average about 18 inches in width and well mineralized with pyrites, chalcopyrites, and galena. At the top of the hill, at an elevation of 1,100 feet, this same vein has a shaft sunk on it 12 feet deep, exposing a 6-foot vein of banded quartz, about half of which is well mineralized. At 800 feet elevation the three veins are exposed by open-cuts and stripping. The middle vein at this point has an open-cut for 30 feet, from which some good ore is piled on the dump. At the face of the open-cut the vein is very well defined between two good walls and well mineralized for its width of 4 feet. A shaft has been sunk, giving an additional depth of 8 feet, or a total of 20 feet, which gives a good idea of the vein. A sample across the bottom of the shaft gave assay returns of \$5.60 gold, 1.78 oz. silver, and 1.8 per cent. copper, or about \$16 a ton. This will probably concentrate 6 or 7 into 1. The other veins give every promise of being as good or better than this. I consider this a very promising property.

The North Pacific Iron Mines, Limited, claims are situated thirty-eight miles up the Zymoetz river from Copper City, on an old survey-line of the Grand Trunk Pacific. They comprise an area of approximately 375 acres, and the iron tonnage has been variously estimated up to 7,500,000 tons of limonite ore. The average assay of the essential minerals would be: Iron, 50 to 51 per cent.; phosphorus, none; sulphur, 1.5 to 1.75 per cent.; silica, 1.3 to 1.5 per cent. I understand that 25 per cent. of this class of ore with 75 per cent. of magnetite, so plentiful on the Coast, gives a perfect smelting mixture.

#### Nass River Mining Division.

The Granby Consolidated Mining, Smelting, and Power Company, Limited, has exceeded its last year's output of copper, smelted from its own British Columbia ores, by nearly 3,000,000 lb. The amount of ore smelted from its *Hidden Creek* mines was 828,488 tons, exclusive of limestone and quartz used for fluxing purposes, producing 30,394,109 lb. copper and approximately \$107,000 in gold and \$282,000 in silver.

The 100-ton "pilot mill" has been operating steadily all year in experimental work on the concentration of the *Hidden Creek* ores, as well as ores from the company's Alaska properties. The milling process is confined to flotation alone, and some very satisfactory results have been obtained on the siliceous ores. Good progress has also been made in experiments on the selective flotation of the heavy sulphide ores.

The company has under way an immense project in the installation of coke-ovens, with all the attendant modern equipment for saving and utilizing the by-products. The plant will cost approximately \$2,000,000, and it is expected it will be in operation early in the spring. The coal-supply for this plant will be obtained from the company's coal property on Vancouver island. The most important prospecting-work the company has undertaken during the year is the exploration of the Ecstall River pyrite-showings. I understand that results from work to date have been sufficiently encouraging to justify further investigation in the spring.

#### ALICE ARM SECTION.

The United Metals Mining Company has a number of claims up the Illiance river, fourteen miles from tide-water. Considerable surface work has been done, exposing several small high-grade silver-lead veins, from which probably 50 tons of ore has been sorted ready for shipment. The selected ore should run 120 oz., or better, in silver.

The *Silver Bell* group adjoins the United Metals farther up the river, and also shows a number of small high-grade veins on which a little surface work has been done. The country is rather flat and a suitable tunnel-site hard to obtain. It is hard to size up the possibilities from an ore-producing standpoint because of the detached croppings and the fact that no sinking has been done on any of them; however, the number of the showings and the grade of the ore would lead one to think that sufficient tonnage could be obtained to make operating profitable.

Farther up—in fact, over the summit on the Nass River slope—the *Bromley* claims have a little work done on a small vein showing from 8 to 12 inches of the characteristic high-grade silver ore of this section. The extension of this vein is located across the creek on the *Ingraham-Bone* claims, which, unfortunately, I did not know of while in that neighbourhood.

The *Monarch* group of four claims lies just on the summit, on the south bank of the Illiance. Extensive surface work has been done, exposing the vein for several hundred feet along the surface, in which there is some fine ore. A tunnel was driven to tap this showing a distance of 162 feet, but failed to get it. Further work is fully warranted.

The *Silver Star* group, just across the creek from and adjoining the United Metals property, has a tunnel driven in from the bottom of a deep gulch to crosscut the vein, which was then drifted on for 14 feet. The vein in the tunnel is 8 inches wide, but pinches in the face of the drift, where the country-rock is intensely twisted and displaced. The vein crops about 40 feet farther down the gulch from the tunnel, and better judgment would have been shown had the vein been drifted on for 42 feet instead of crosscutting that distance to get it. The surface shows 6 inches of ore assaying 170 oz. silver and 25 per cent. lead.

Farther up the hill from the *Silver Star* the *Silver Cliff* group shows some croppings of ore, but no work has been done.

The *Silver Bell* claim, on the south slope of McGrath mountain, has a 15-foot vein of a dark, dioritic appearing rock, throughout which are bands, bunches, and stringers of quartz carrying



pyrites, arsenical pyrites, and some zinc and galena. It has been opened up with a 6-foot open crosscut and a 12-foot tunnel. A sample from the dump gave small values in silver and zinc.

The *Lone Star* group, adjoining the *Silver Bell* claim, consists of five claims. A 25-foot tunnel has been driven across a greyish quartz vein with bands of pure white quartz through it. The whole is fairly well mineralized with pyrites and arsenical pyrites, from which fair assays in gold have been obtained. A grab sample from the dump was low grade.

The *Silver Band* group consists of four claims on the east side of McGrath mountain, about seven miles from the beach. Three open-cuts, at an elevation of 3,600 feet, expose as many veins of interbanded slate and quartz, varying in width from 2 to 10 feet, lying in a hard, fine-grained, silicified slate formation. Farther south are other exposures up to 30 feet in width of the same kind of vein-filling. The quartz portions of the veins, which would be about half the total, are mineralized with sphalerite (zinc-blende) and a small percentage of galena. There are also small kidneys of solid zinc-blende. Altogether it is a very promising zinc-showing, requiring a lot of work to develop the tonnage for concentration, which would be necessary.

The *Standard* group of four claims is situated on the south side of McGrath mountain. It is owned by W. McLean and others, of Alice Arm. The showing on the property is an immense vein of quartz, 60 feet wide where exposed by an open-cut along the side-hill, mineralized with zinc-blende disseminated through the quartz in bunches and in bands up to 2 feet in thickness; in fact, it would be hard to break off a piece of quartz that did not show zinc in the whole 60 feet. Further strippings and open-cuts down the hill expose the same class of ore, but whether it is the same vein or a parallel one is hard to decide from the amount of work done. It is a remarkable showing of zinc sulphide, about four miles from the beach, and ideally located for economical tunnel-mining. The ore, being a straight zinc sulphide and quartz, is a perfect one for concentration.

The *Kent* and *Maple Leaf* claims each had a little work done, showing the characteristic banded quartz and slate veins of the McGrath mountain area.

#### KITSULT RIVER SECTION.

This section was in a fair way to become an important factor in the mining industry of the Province this winter or early next year. The railroad from the beach to the *Dolly Varden*, partially constructed last year, was practically rebuilt and nearing completion when the contracting company went into liquidation, with the result that the camp of Alice arm and the section tributary to it are tied up for the winter. It is to be hoped that an early adjustment of railroad affairs will be arranged, so that this may have the opportunity of becoming one of the most important mining sections of the Province.

The *Dolly Varden* Mines Company owns the *Dolly Varden* property, about eighteen miles from tide-water on the west bank of the Kitsault river, and the *Wolf* property, two miles farther up on the east bank of the Kitsault. The *Dolly Varden* has been extensively opened up by underground development, as described in the Minister of Mines' Report of 1916, and is therefore in condition to start shipping at any time. The ore-bodies have been proven by thousands of feet of diamond-drilling. On the *Wolf* a tunnel 35 feet long has been driven in on the ore-body, from the face of which a crosscut to the north 50 feet and to the south 10 feet proves the ore-body for a width of 60 feet, with neither wall in sight. Several thousand feet of diamond-drilling has been done, proving the extent of the ore-body and showing it to be of a good milling grade.

The *Black Bear* group, the old *Roundy* property, owned by Salinas and others, shipped 13 tons of ore of gross value of \$2,712 in silver.

The *Independent* group, just above Alice arm, has a 50-foot tunnel driven on a 3-foot brecciated vein of slate, quartz, and calcite, lying in a slate formation and mineralized with galena, chalcopyrite, with a little zinc and pyrites. A shaft above the tunnel about 14 feet deep discloses a clean-cut vein 6 feet wide, which is about half quartz and the balance slate and quartz. The property is under option at present, and the tunnel is being driven ahead to get under the surface showing in the shaft.

The Molybdenum Mining and Reduction Company's property, near the head of Alice arm, is still inactive. There appears to be considerable ore available for the amount of development-work done. More work and less litigation might put the property on a paying basis.

The *La Rose* group, mentioned in last year's report, has been further exploited during the year, and some tonnage of high-grade ore shipped to the Granby smelter (tonnage not available).

A good trail was built by the owners from the railroad to the mine, with the assistance of the Mines Department, and continuous small shipments may be expected from this property.

The *North Star* claim, owned by Pearson, Evindsen & Carlson, is situated north of and adjoining the *Dolly Varden* group. The vein has been opened up, at an elevation of 700 feet above the railroad, by an open-cut 30 feet long on the foot-wall, from which a crosscut has been driven 20 feet to the hanging-wall. The vein-filling between the two basic dykes which appear to form the walls is a siliceous rock, with about 8 feet of it on the hanging-wall of quartz, which carries the values in argentite, ruby-silver, and a little galena. There is about a foot of high-grade ore lying right on the hanging-wall which will assay over \$100 a ton, the balance of the 8 feet averaging around \$25 a ton, with still less values in the remaining portion of the vein toward the foot-wall. It is a very promising showing so far as opened up, and with a tunnel driven at a further obtainable depth of 100 feet will probably develop into a very valuable property.

The *Tiger* group, consisting of two claims owned by Ed. Pickett, is situated on the east side of the Kitsault, about two miles above the end of steel at the *Dolly Varden*. A very strong, well-defined quartz vein 8 feet wide has been traced for several hundred feet by open-cuts and surface strippings, lying in the andesite formation of this silver-belt. The quartz is heavily pyritized, and in general, so far as exposed on the surface, is low grade; however, recent work on the upper portion of the vein has disclosed some very high-grade silver ore of argentite, ruby-silver, and native silver, and further exploration may prove the existence of high-grade shoots in the vein.

The *Toric* group of four claims is owned by Strombeck Bros. The claims lie on the east bank of the Kitsault, just south of the *Tiger* claims. At an elevation of 150 feet above the railroad-grade an open-cut exposes a 3-foot 6-inch vein of barite, with quartz-bands running through it, in an andesite country-rock. Vertical bands of galena and pyrite lie in this gangue of barite and quartz. A sample taken from the dump, as it was thrown from the cut, gave an average of 17 oz. silver to the ton. The size of the showing and its proximity to transportation warrant further work.

The *Musketeer* group is owned by Miles Donald and Al Miner. There are five claims, lying just north of the *Tiger* group. Two veins have been opened up on the property, one striking about parallel with the vein on the *Tiger* claims and the other at right angles to it, their point of junction being up the hill at an elevation of 2,000 feet. Both are big, strong veins of pyritized quartz carrying small values in gold and silver, but worth exploration for high-grade ore-shoots, which seem to be characteristic in this class of vein.

The *Climax* group is situated on the north bank of Trout creek and will be about half a mile from the railroad when it is completed through to the *Wolf*. The vein differs somewhat from the general type found in this andesite or greenstone formation, in that it is composed of country-rock through which small veinlets of quartz interlace. About a foot of the vein on the hanging-wall is more siliceous and carries a little galena, the best looking of which assayed 14 per cent. lead and 14.5 oz. silver. It is a well-defined vein averaging about 4 feet in width.

The *Moose* group, owned by Don Cameron, comprises six claims adjoining the *Climax*, up the hill. The vein is of pyritized quartz lying in the andesite-belt, locally termed the "silver-belt," and has been opened up in several places on the surface by open-cuts. These expose some very high-grade ore which can be shipped as soon as the railroad is in operation.

The *Last Chance* group, owned by Archie McPhail, Pat Morley, and Geo. Kolbeck, consisting of five claims, is situated above the *Moose* group, on the north side of Trout creek, and probably a mile from the railroad when it is finished through to the *Wolf*. An open-cut about 20 feet long along the side-hill exposes a rather peculiar vein-filling, consisting of pebbles and small, round boulders of greenstone, which is the country-rock, cemented with barite and a little quartz. In places in the vein is a foot or more of fine-grained galena carrying argentite which is high-grade ore, while the barite and quartz are mineralized with galena, chalcopyrite, and pyrites, with argentite. Shots have been put in here and there all along the side-hill for a length of 300 feet, from which an average sample taken by the owners gave returns of 48 oz. silver a ton. The vein crops through the overburden on a bench about 100 feet above. A tunnel has been faced up at the foot of the hill and will be driven in to crosscut the vein. This is a very likely looking prospect and well worth exploring.

The *Casey* group of four claims and a fraction lies on the east side of the Kitsault, about two miles and a half above the *Wolf*. It is owned by Geo. Casey, Prince Rupert, and Jack Graham and others, of Alice Arm. The work done on the property consists of an open-cut along the vein on the side-hill and a tunnel 30 feet long driven across the vein about 50 feet vertically under the open-cut. The open-cut extends about 6 feet into the vein and about 30 feet along the surface. It shows a vein of quartz, with small enclosures of slate, with a few inches of high-grade ore along the foot-wall, which lies on the slate country-rock. The rest of the vein on the surface is low grade. The cross-section in the tunnel of the mineralized zone shows a vein of 4 feet in width, consisting of parallel bands of quartz and slate, fairly well mineralized, and showing argentite and ruby-silver, with, occasionally, native silver and gold. On the hanging-wall side of this vein for 12 feet is a belt of slates impregnated with quartz in small veinlets, evidently of low value, conforming with the strike and dip of the vein. On the foot-wall side of the vein for several feet, not yet penetrated by the tunnel, the formation is a banded quartz and slate, not conforming with the dip of the vein, but standing perpendicularly, slightly mineralized with pyrites and in which an occasional speck of native gold is found. An average sample from the dump, eliminating the slate, gave assay of 8 oz. silver, which is very encouraging. I consider it a showing with excellent possibilities. There is another quartz vein on the property on which nothing has been done.

The *Homestake* group of four claims is owned by Davidson *et al.*, of Alice Arm. They are situated on the west side of the Kitsault, at its head, about twenty-six miles from tide-water and about eight miles from the railroad at the *Dolly Varden*. The vein is an altered greenstone, up to 30 feet wide, exposed at intervals by open-cuts for a length of 500 to 600 feet, carrying galena, pyrites, and copper sulphide on the northern portion of it. It is a showing whose possibilities as a concentrating proposition will, I think, appeal to any one, and with the improvement in transportation facilities which this section deserves will doubtless receive merited attention.

There are several good-looking prospects situated above the *Homestake* ground. The more important of these are the *Matilda* claim, owned by Arthur Smith; the *Tip Top* claim, belonging to H. Mann; and the *Fox* claim and fraction, owned by O. Flint.

The *Vanguard* group of eight claims is owned by Maurice Petersen and the Stombeck Bros. It lies on the west bank of the Kitsault, about six miles above the *Dolly Varden*. Two open-cuts and some stripping expose a length of about 100 feet of practically solid chalcopyrite of from 4 to 8 feet in width. A tunnel has been run under this showing, exposing about 40 feet of the vein, which does not, as yet, show the solid chalcopyrite opened up on the surface. The vein should be drifted on farther, for it is very possible for the ore-shoot to rake into the hill, in which event the present drift is not in far enough to pick up the ore. This is a very fine surface showing. Another parallel vein shows 4 feet of solid chalcopyrite in one place, and about 6 feet of mixed copper and iron where opened up a little farther along. These veins lie in the contact-zone between the slates and the andesite-belt.

The *Copper Cliff* group of four claims, on the west side of the Kitsault, just opposite Trout creek, lies in the andesite-belt just above the contact with the slates. For a width of 100 feet along the contact the oxidation of the pyrites in the rock has given the belt a yellow-red colour, suggesting an immense ore-body. In the contact-belt are croppings of low-grade copper ore that will bear investigating.

The Carpenter & Eagan claim and fraction adjoin the end-claim of the *Wolf* group, across on the west side of the Kitsault. A quartz vein up to 10 feet in width, carrying pyrite, chalcopyrite, and some galena, can be traced in the andesite formation for a length of several hundred feet on the surface. Good copper ore is exposed in one or two of the open-cuts.

The *Silver Horde* group, situated west of and adjoining the *Wolf* group, has been diamond-drilled by the Granby Company; no information as to results. The vein is pyritized quartz, from 15 to 20 feet wide, lying in the andesites. Two open-cuts give averages of 4 oz. and 7 oz. of silver a ton across the vein.

The *Wildcat* group, owned by Davidson & Macey, is situated on the west side of the Kitsault above Homestake creek. On these four claims are several good showings of copper ore, any one of which is well worth developing. One cropping of 16 inches gave 7 per cent. copper and 3 oz. silver a ton. A tunnel 125 feet long has been driven toward getting under some of the surface showings. The property is well situated for transportation, being about 700 feet above the railroad. Shipments can be made as soon as the railroad is in commission.



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**Portland Canal Mining Division.**

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The general outlook for the mining industry in this Division continues to improve, and the shipment of a thousand tons or more of high-grade ore from the "Bush" property this winter will go far in proving the predictions of the last year or two for this district. Development-work in all parts of the Division during the past summer has been very encouraging, and in one case has resulted in a very significant mining deal. The tendency of a few "prospectors" to blanket certain sections of this Division, to the exclusion of others, is an unfavourable feature of the mining situation.

**PORTLAND CANAL SECTION.**

The *Outsider* group is composed of seventeen claims, situated at Maple bay and owned by Martin Woldson and associates, of Spokane, Wash. It is the property of the old Brown-Alaska Company, who opened it in 1906 and in two years' operations shipped several thousand tons of 2.8-per-cent. copper ore to the Hadley smelter. The present owners have been operating over a year, driving a main working-tunnel on the vein at an elevation of 912 feet above sea-level. The old tunnel, from which the ore was extracted, is at an elevation of 1,085 feet.

This year's work underground consists of driving on the vein for 351 feet and five crosscuts aggregating 114 feet. This work has opened up an ore-shoot over 200 feet long that will average 16 feet in width, of, I should judge, about 2-per-cent. copper ore. With backs of 200 feet on the vein between this level and the stoped level above, this ore-shoot will produce a big tonnage of milling-ore.

The West tunnel, at an elevation of 1,190 feet, crosscuts to the vein from the surface; then drifts both ways on an ore-shoot for 250 feet, averaging in width between 5 and 6 feet. This is apparently another ore-shoot farther north than the one being opened up in the working-tunnel, and does not appear in the main tunnel drifted under it at an elevation of 1,085 feet. A raise will no doubt be put up from the main tunnel to tap this ore-shoot, which will also produce a big tonnage of milling-ore. There is also an immense cropping of the same class of ore at an elevation of 2,100 feet, apparently a parallel vein to the one developed.

Unless favourable smelting rates can be obtained, it will be necessary to concentrate the ore to a shipping grade. The ore, consisting of a glassy quartz mineralized with pyrites and chalcopryrite, should lend itself admirably to the flotation process.

At Swamp point the Granby Consolidated Company employs an average of about thirty men the year round, mining limestone for fluxing purposes at their smelter. The production is about 250 tons a day.

The Georgia River Mining Company had a few men on development-work all summer on its property, about eight miles up the Georgia river, which empties into Portland canal. The work for the year consists of sinking the winze a further distance of 7 feet, making a total depth of 42 feet, the extension of the Bullion tunnel for 20 feet, and a crosscut west for 35 feet from the end of the tunnel toward the big vein outcropping on the surface. The work in the winze succeeded in getting back into the vein and showing up 2 feet of fine-looking ore. The trail up Georgia river was improved and extended under assistance from the Mines Department. There remains about three miles yet of fairly easy trail to be built.

No work of any account was done on the Marmot river.

**BEAR RIVER SECTION.**

The *Molybdenum* group is situated just across Bear river from Stewart, practically on tide-water, and is owned by J. W. Stewart and associates. The only work done on the property is an open-cut on the vein at the edge of the river and stripping of the vein for 15 or 20 feet above the cut. This discloses a vein 10 feet wide, consisting of quartz, garnetiferous silicates, epidote, and enclosures of a dark-green rock, probably hornblende. The chief mineralization is in pyrites, with a little chalcopryrite and molybdenite scattered through the whole vein, and especially in the dark-green basic rock. The molybdenum content will average about 2 per cent., and about 5 tons has been sorted and piled on the dump, a sample of which assayed 9 per cent.  $\text{MoS}_2$ . The property is ideally situated and worth investigating for molybdenum.

The *Prince John* group, owned by Nesbitt & Archie, is situated about four miles above Stewart, on the west side of Bear river. Development consists of surface cuts and a tunnel 185 feet long driven across the sedimentary formation. The cross-section in the tunnel shows

30 feet of greenstone-schists to the ore; then 45 feet of schistose slates and argillites through which the chalcopryite is disseminated, and in veinlets and bands interbedded with the slates, averaging approximately 2 per cent. copper and \$1 in gold and silver a ton; then 45 feet of acidic dyke; and 65 feet beyond the dyke of sparingly mineralized slates. I understand that the Granby Consolidated Company put in two or three diamond-drill holes, but owing to the "slippy" nature of the ground the drilling was unsatisfactory, and that they afterwards extended the tunnel through and beyond the dyke. From the showing in the tunnel, I think the property well worth further extensive development. It has the advantages of timber, water, and transportation.

The *Mayflower* group of four claims, belonging to H. Gibson, is located on the east side of Bear river, between Glacier and Bitter creeks. A crosscut tunnel has been driven 20 feet and a drift 6 feet on what appears to be the wall of the vein exposed on the surface. The vein is about 4 feet wide, of quartz and argillite mineralized with pyrite, a little chalcopryite, sphalerite, and a trace of galena, enclosed in the argillite country-rock. The tunnel should be extended about 40 feet to get some depth under the surface showing. Some high-grade ore was extracted from a vein farther down the hill.

The *Lakeview* group, consisting of four claims, belonging to McKay & Bibeau, is situated on the North fork of Glacier creek, about two miles and a half from Bear river. An open crosscut 80 feet long gives a depth of 12 feet on the vein, which has then been drifted on for 28 feet. Several tons of high-grade ore, assaying over 300 oz. silver a ton, has been shipped from this drift. A tunnel 230 feet long was driven to intersect the vein 100 feet vertically under the surface cut, but no vein being found the work was discontinued. The vein on the surface is 9 feet wide; 4 feet on the foot-wall is quartz carrying iron pyrites with some gold values; the remainder is a heavily pyritized quartz and slate. The whole would concentrate probably 7 or 8 into 1. Notwithstanding the fact that the vein was not found in the tunnel, I would recommend this property for further exploration.

The *Ruth & Francis* group, owned by Nesbitt & Archie, is situated on the North fork of Glacier creek, four miles from the railroad. Work consists of a 60-foot tunnel driven on the vein, which was 6 inches wide at the collar of the tunnel. At 31 feet in, the vein widens to about 10 feet, of which 6 feet 6 inches on the foot-wall is solid antimonial lead, assaying 40 cents in gold, 31.6 oz. silver, 15 per cent. lead, 18 per cent. zinc, and 8.3 per cent. antimony; the remaining portion of the vein, on which the tunnel is continued, consists of mixed quartz and slate carrying pyrites and a little galena. On the *Copper King* claim of the group a vein has been uncovered of quartz carrying chalcopryite. It was unfortunately covered with snow at the time of my examination of the property. A tunnel has been driven 40 feet toward it, and will take a further 30 feet to reach it. Altogether a good-looking property.

The *George* copper-mines, reported on in 1917, has had considerable work done on it this year by the owners, W. B. and R. George. This work was mainly confined to surface work on the high-grade veins. The White vein was crosscut about 30 feet west of the big gulch, showing a width of 9 feet 6 inches of ore, of which 4 feet is magnetite and chalcopryite, and the balance is quartz and chalcopryite, with 3 feet of solid chalcopryite. The whole will average between 8 and 10 per cent. copper. On the same vein, about 200 feet from the Blue vein, another crosscut exposes 15 feet of mixed ore, country-rock with stringers of chalcopryite all through it. The tunnel was extended 10 feet farther under the big low-grade zone with a little improvement. Development-work on this property is proving highly encouraging.

#### SALMON RIVER SECTION.

This section continues to improve with development. There has been considerable prospecting and assessment work done throughout the Salmon River valley during the year, the results in nearly every case being encouraging. A couple of new finds of high-grade ore have been reported.

A sleigh-road has been constructed by the owners of the "Bush" property, with some assistance from the Mines Department, from tide-water at Hyder to the mine, a distance of about fifteen miles. This road should be, and very possibly will be, extended for a further five or six miles to the upper Salmon river, thus opening up the whole valley, when connected with a necessary new wharf, which doubtless the Dominion Government will see fit to construct early in the coming spring.

The *Mineral Hill* group, nineteen miles from tide-water, has been steadily developed by the bondholders under the superintendence of Al. Harris. Good camps were erected and a first-class equipment provided for the contemplated development-work. Exploration-work for the year consists of numerous surface open-cuts and strippings, with a tunnel that had been driven 219 feet at the time of my visit to the property. I am informed that a crosscut has been run since that time of about 150 feet cutting high-grade ore, the extent of which I have at present no definite information. If surface showings are any criterion, this property should develop into a very valuable one.

The *Big Missouri* group, a well-known property belonging to Lindeborg Bros., of Stewart, has undergone during the past season a complete change. Heretofore it has been considered from the standpoint of a big, low-grade-complex-ore proposition, with many difficulties in sight and requiring large capital. Work done during the past season, however, on the two claims adjoining the *Mineral Hill* group has proven that the same high-grade ore-shoots extend on to the *Missouri* ground. Fifteen open-cuts were dug all over these claims, with results which were highly satisfactory. Since then the bond has been transferred to D. D. Mann and associates, who, I understand, are planning extensive exploration-work for the coming spring.

On the *Yellowstone* group the yearly assessment was done, uncovering some very fine ore.

The 49 group had considerable work done on it this summer by the owners, the Lindeborg Bros. Several open-cuts were made higher up the hill from the old one and two new veins exposed, one with 2 feet of ore assaying 72.6 oz. silver, the other a 10-foot vein with values of \$1.20 in gold and 6 oz. silver a ton. The old cut on the main vein was extended and another put in farther south, both showing fine values.

The *Hercules* has had no work done this year.

The *Pay Roll* group, south of the *Big Missouri*, had the yearly assessment done on it. This property is opening up well and looks as if it might produce a good tonnage of milling-ore.

The *Boundary* group, west of the *Pay Roll*, and the *Indian* mines, south of the *Pay Roll*, have both been idle this year.

The *International* group is situated at Eleven-mile, just above the boundary-line on the British Columbia side, and is now under option to Pat Daly and associates. A 10-foot vein of pyritized, silicified greenstone, with small veins of pure quartz running through it, is exposed on both banks of a creek which cuts across the vein. The walls are greenstone-schist. The vein, where exposed, is evidently low grade, but is strong, well defined, and well mineralized, and only development will prove whether it contains high-grade shoots of ore or not.

The Salmon-Bear River Mining Co., better known as the "Bush" property, has done very little by way of mine-development during the past year, the summer being fully taken up in the construction of the sleigh-road from the mine to the beach. The upper or No. 1 tunnel was in 430 feet at the time of my visit to the property, the last 83 feet being beyond the "dyke," and exposing some phenomenal ore the full width of the drift. The main crosscut had been extended to 90 feet without encountering the wall, maintaining its values all the way.

The owners expended about \$45,000 on their sleigh-road this summer, and took in fourteen head of horses, sleighs, etc., early this winter to haul their ore to the beach. They expect to ship at least 1,000 tons of ore that will average \$200 a ton in gold and silver values to either Trail or Tacoma, and possibly a considerable tonnage of lower-grade ore to Granby, at Anyox. The smelter loss on high-grade silver ores is too heavy for the Granby Consolidated to accept the first-class ore. Should these plans be successfully carried out it will be no small accomplishment for a property, fifteen miles from tide-water, operating two years and, as yet, without machinery.

#### Stikine Mining Division.

I am informed by H. W. Dodd, Gold Commissioner at Telegraph Creek, that the year has been exceptionally quiet so far as mining is concerned. Assessment has been kept up on several claims and the acreage-tax paid on about twenty claims. In placer gold the production will be about \$1,000, the greater portion of which will come from Dease creek.

The Thibert Creek Mining Company did not operate this year, and the Princess Hydraulic Company, operating on McDame creek, had only a few men working for a short time.



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**Atlin Mining Division.**

This portion of the Province has been comparatively quiet for the past two years on account of the scarcity of labour and the extreme high cost of everything pertaining to mining. There has been little or no prospecting for mineral and, with the exception of two properties, no development-work. In the placer areas there is no new ground being opened up, and where working on "pay" the lack of labour is a serious handicap.

I expect to see many of the returned soldiers take to this north country, for the life is suitable and the chances for a "stake" are good. I have no returns yet of the placer yield for the year, but I judge it will be less than last year.

**RAINY HOLLOW SECTION.**

This section of the Atlin Mining Division is reached by way of Haines, Alaska, a port of call for American boats. Rainy Hollow camp is two miles beyond the end of the wagon-road, or fifty-nine miles from Haines. From Haines to Wells camp is twenty-four miles and is made in an auto; the balance of the distance is good walking, with accommodations at Porcupine, fourteen miles from Wells, and Pleasant camp, on the boundary-line, seven miles from Porcupine, and the *Maid of Erin* camp, about fourteen miles from Pleasant camp.

The *Maid of Erin* group of thirteen claims on Mineral mountain, fifty-nine miles from Haines, is owned by Conway, Kennedy & Burnham, of Skagway, Alaska, Mr. Kennedy being in charge of operations at the mine. Mineral mountain is composed of bands of limestone, slates, sandstone in places altered into quartzite, the whole apparently lying on the granite. Directly in contact with the granite is a broad belt of crystalline limestone 300 or 400 feet wide, through which intrude granite tongues from the main mass. In this belt of limestone, about 250 feet from the granite, is a vein or belt of altered limestone, mainly calcite, averaging about 12 feet wide, impregnated with bornite in specks, bunches, and kidneys up to 4 feet in width. The whole deposit would make an ideal flotation feed.

Development-work consists of a tunnel 40 feet long driven under a surface showing, obtaining a depth of 20 feet, showing the vein rock well streaked and spotted with bornite across the full width of 12 feet. Below this about 100 feet another crosscut tunnel has been driven 40 feet toward the vein, which dips away from it. A shaft has been sunk to the ore on the top of the bench a depth of 12 feet. An open-cut was made on the ore just east of the ore-tunnel, from which 30 tons was shipped several years ago, assaying 32 per cent. copper and 56 oz. silver. There are croppings of bornite all along the side-hill on the general strike of the altered belt.

Present work consists of mining the best-looking ore from the surface, hand-sorting it, sacking it, and hauling to the end of the Government wagon-road, about two miles and a half, from which it is wagon-hauled to Haines for shipment to the smelter. I understand that about 80 tons has been shipped this summer. The total cost of mining, sorting, and transportation to Haines is about \$75 a ton, necessitating plenty of high-grade ore to be profitable.

The *Hibernian* group is situated east of the *Maid of Erin* and consists of six claims owned by Dan Sullivan. The showing is a belt of limestone, mineralized for a width of 40 feet, with magnetite carrying chalcopyrite. There are streaks of fairly good ore, but the general tenor is low grade. A grab sample from the dump assayed 2.5 per cent. copper, with a trace of gold and silver.

The *Victoria* claim, also owned by Conway, Burnham & Kennedy, has a perpendicular vein about 12 feet wide lying in the limestone, mineralized with galena, sphalerite, and a little pyrite. A sample was taken across the vein from an open-cut about 4 feet deep, assaying 4 oz. silver, 21 per cent. lead, and 21 per cent. zinc. With good transportation this property would bear investigation.

**ATLIN SECTION.**

This has been a big producer of placer gold for a number of years, and, judging from the extent of unworked ground on the larger creeks, will continue to produce for several years to come.

The *Engineer* mine has been developed to the point where it justifies being exploited on an extensive scale and put in the big producer class. This will naturally stimulate lode-mining in all parts of the section.

The *Engineer* mine property consists of eleven Crown-granted claims situated on the southern end of Taku arm. It was owned by the late Captain James Alexander, who, with Mrs. Alexander,

were victims of the S.S. "Sophia" in Lynn canal. The Captain "stayed with it" until he made what will probably be one of the greatest gold-producers on the continent.

During the past ten years there has been a great deal of work done by way of surface-stripping, open-cutting, shaft-sinking, mining from the surface, and underground development. This work has exposed on the surface two series of veins, each radiating from a central quartz-mass or "hub," the majority of the veins in each series showing visible gold, and the hubs reported to be of milling grade ore. A 2-stamp mill was operated for several years with ore mined from high-grade surface showings and packed to it on men's backs. The record run for this mill was two hours and a half, producing 24 lb. of gold.

All the underground work, with the exception of the new crosscut tunnels now under way, has been done on the "E" vein, from which a considerable tonnage was mined from the surface. A shaft has been sunk 250 feet, from which four levels have been run on the vein. The first level is from the surface, cutting the shaft at 50 feet below the collar, and extending a further distance of 345 feet on the vein. No. 2 level, 45 feet below No. 1, has been driven 100 feet north and 190 feet south of the shaft; No. 3 level, 50 feet below No. 2, has a drift 210 feet south of the shaft; and No. 4 level, 90 feet below No. 3, has been run 145 feet north and 90 feet south. The shaft is 40 feet below the No. 4 level and shows the vein to be 2 feet wide, with visible gold on each wall. There is a bonanza shoot of ore of from 1 to 6 inches thick, widening in one place to 18 inches, showing on the second, third, and fourth levels for a length of 40 feet. The remainder of the vein, on all the levels, would be considered high-grade ore. In development-work the waste is broken ahead of the ore about 10 feet; the ore is afterwards broken down and taken to the sorting-tables on the surface, where it is broken up and sorted into three grades of ore—that showing visible gold, a second grade which is sacked for shipment, and a third grade sent to the dump for future treatment. The grade showing gold is accumulated until sufficient to run through the ball-mill, 600 to 1,000 lb. being the usual charge, in which it is pulverized in about two hours; mercury is then added and amalgamation completed in from twenty to thirty minutes. The tailings are sacked and shipped with the crude second-grade ore, which averages from \$150 to \$200 a ton. The record run of the ball-mill was 24 lb. 8 oz. of gold from 160 lb. of ore.

A very comprehensive scheme of development has been started. Two crosscut tunnels are being driven—the Mill tunnel from the mill-site on the beach to a point under the shaft on "E" vein, a distance of 1,200 feet, crosscutting in that distance at least five veins from which high-grade ore has been taken on the surface. This tunnel will deliver all ore from "E" vein and intermediate veins to the mill and give a depth of 500 feet at the shaft. It has been driven 309 feet. The other tunnel, called the Boulder Vein tunnel, is being driven from the level of No. 1 level in the shaft to crosscut the upper series of veins radiating from Hub B. Two of these in particular, the Boulder vein and the Shaft vein, show bonanza ore on the surface. It will require between 300 and 400 feet of a tunnel to cut them; the whole series will take about 900 feet, giving a depth of 600 feet on the farthest vein. This tunnel has been driven 55 feet, and will deliver all ore from Hub B series to No. 1 shaft level, to shaft to Mill tunnel to mill. The three-compartment shaft at the head of the mill will be sunk to intercept a very rich vein cropping at the edge of the water, which can then be drifted on to Hub A, thus delivering all that ore to the shaft to be hoisted to the mill storage-bins.

The *Gleaner* group of three claims lies beside the *Engineer* group, up the mountain. It has the same formation and similar quartz veins. Work consists of a tunnel driven 35 feet in from the bank of Galena creek, on an 8-inch quartz vein; no values. Also several open-cuts and strippings from which it is said free gold specimens were obtained. Farther south, on a lower vein, which should intersect the Mickey vein of the *Engineer* group, a 200-foot open-cut drift has been run north from a shaft which was full of water, but apparently about 45 feet deep, also a short open drift south of the shaft, all low-grade ore. A crosscut tunnel was started under this vein to cut it, but never encountered it.

The *White Moose* group, owned by Partridge *et al.*, is situated on the west side of Taku arm, opposite the *Engineer* group. The showing consists of an 8-foot quartz vein lying in granite country-rock, sparingly mineralized with chalcopyrite, pyrite, and a trace of galena. A tunnel 245 feet long was driven on the vein for 40 feet, where the vein split; the left-hand split was then followed for 40 feet farther, where it pinched out entirely; the remaining 165 feet of the tunnel was driven in the granite country-rock. A crosscut was driven from the 80-foot point,

where the left branch of the vein pinched, to pick up the right-hand branch of the vein, but as this had 3 feet of water in it I was unable to examine it.

The *Sweepstake* group, owned by Ben Nichol and others, lies to the north of the *Engineer* group. The showing is a 15-foot brecciated vein of quartz and slate, crosscut on the surface at intervals of about 500 feet, the upper one showing a width of 30 feet. This looks as if it might be the continuation of the Mickey vein of the *Engineer* group. No distributed values to amount to anything have been disclosed yet.

The *Happy Sullivan* group of three claims, owned by Clarence Sands and associates, of Atlin, is situated about a mile and a half from the beach, on the north bank of Sheep creek. There is a surface showing of quartz 22 feet wide lying on the east side of a big diorite dyke, the other wall being a soft clayey rock. The quartz is lightly mineralized with pyrites, and a sample across the 22 feet on the surface gave only a trace in gold.

The *Brown* group is owned by Jack Dunham and partners, of Atlin. It consists of four claims situated about half a mile from Taku arm, on the west bank of the Wann river, which flows from Edgar lake into the arm. A fine water-power could be developed on the Wann river. About 40 feet above the river an open-cut exposes a 4-foot vein of quartz carrying some galena, zinc, and grey-copper, evidently a fine grade of ore. A tunnel has been started at the edge of the river, which will give about 40 feet depth when under the showing above. It is worth doing some work on because of the grade of ore exposed.

The *Munroe Mountain* group is owned by Jas. Stokes and others, of Atlin. Considerable work has been done on this property, and I am informed that a 2-stamp mill was in operation at one time. A crosscut tunnel 20 feet long reaches the vein from the side-hill; it is then drifted on for 180 feet, of which 55 feet has been stoped out to the surface, and about 20 feet in depth underhand-stopied below the level of the tunnel. Several samples were taken, but the average value of the ore is low grade, and further development would be necessary to find out if other shoots of ore of paying value exist in the vein. The vein lies in a diorite dyke.

The *Lakeview* group is owned by Clarence Sands, of Discovery. A 2-foot vein of quartz has been well opened up by a tunnel, a shaft 50 feet deep above the tunnel, and an open-cut along the vein for 60 feet above the shaft. It is a well-defined vein lying in a diorite-belt, in which are found specimens of free gold, but the general tenor of the ore is low grade.

The *Laverdiere* group is situated on Hoboe creek, flowing into the south end of West channel. The main ore-body lies along a band of crystalline limestone, with a greatly altered intrusive rock on the other wall. The main granite-mass must be very close; in fact, the presence of so many complex silicates with magnetite, which make up the bulk of the vein, would suggest contact metamorphism. A tunnel has been driven across the ore-body giving a cross-section of 30 feet from collar to ore, then about 135 feet of mineralized vein-matter to within 20 feet of the face. Of the mineralized portion, probably 40 feet of it would be considered worth investigating. There are bands of magnetite up to 15 feet in width carrying fair values in chalcopyrite which should be drifted on or diamond-drilled to ascertain whether there is sufficient tonnage to justify the construction of a milling plant. I believe this is the opinion, also, of Mr. Zortman, who has the property under bond, and his winter's work will be planned with that object in view.

#### NORTH-EASTERN MINERAL SURVEY DISTRICT, No. 2.

PRELIMINARY REPORT BY JOHN D. GALLOWAY, RESIDENT ENGINEER.

(Headquarters, Hazelton.)

##### GENERAL REMARKS.

The mineral production of the North-eastern District in 1918 is expected to have been somewhat less than in 1917. The district has as yet few productive mines, although undeveloped prospects and partially developed properties are numerous. Undoubtedly many of these will repay exploitation, but during the last two years conditions have not been conducive to extensive mining development. While it is true that metal prices have been high, this has mainly stimulated actual producing mines and has not induced the development of new properties, except where quick returns were in sight. On the other hand, the scarcity, inefficiency, and high cost of labour, high cost of mining supplies, especially powder and machinery, and scarcity of capital for speculation has had a retarding effect on the development of new mining properties. It may be expected, however, that the return to normal conditions will cause greater activity in this district during 1919.



The copper-output of the district during the past three years has been largely from the *Rocher Déboulé* mine, and this year the output from this mine has been less than in former years.

The zinc and most of the silver and lead output comes from the *Silver Standard* mine; this property is now in good shape to make an increased production in the future.

Considerable interest was shown in the coalfields of the Hazelton-Telkwa Sub-district during the year. The high cost of fuel-oil and the steadily increasing price of coal on the Pacific coast are conditions which have aroused interest in undeveloped coalfields. The Grand Trunk Pacific Railway during the year changed from oil-burners to coal-burning locomotives on the division from Prince George east, and it is quite possible that if a suitable local supply was available the division from Prince Rupert to Prince George would also be equipped with coal-burners.

Production of coal was started late in the fall from the Telkwa Collieries, situated four miles from Telkwa.

The production of placer gold in the district has this year been considerably less than in 1917, due to a shortage of water-supply during the season in the Cariboo Division, the main placer-producing section of the district; thus seriously handicapping hydraulicking operations.

The North-eastern Mineral Survey District contains a large virgin field for prospecting; many areas contiguous to the Grand Trunk Pacific have been partially prospected and claims staked there, but careful examination, such as has been carried out in some of the older camps in British Columbia, has not yet been done. In addition, there is a great deal of country, both north and south of the railway, which is as yet quite unprospected, but in which the general geological conditions are favourable for the occurrence of economic minerals. It is to be expected that the return of many men to the country now that the war is ended will result in a general revival of prospecting. Undoubtedly many of the prospectors who enlisted will return to their old occupation, while the free, adventurous life of the prospector, with its promise of possible spectacular returns, will make a strong appeal to many returned soldiers who before the war had led indoor lives. The North-eastern Mineral District should secure a considerable number of these returned men who are desirous of following such a life.

During the first five months of the year 1918 the Resident Engineer was in the Victoria office engaged in preparing the report of the previous year's work and assisting in the compilation of the Annual Report of the Minister of Mines, as field-work in the district could only be commenced at the beginning of June and be continued until the end of November.

More attention was given to the Cariboo and Quesnel Divisions than in 1917, with the result—as the district is a large one—that less field-work was carried out in Omineca Division than in the previous year. A reconnaissance in the Peace River Division was contemplated for the season, but lack of time prevented this work being effected.

The annual returns for the year 1918 are not yet available, but the following estimate, it is believed, will approximate the actual production:—

Gold, placer .....	4,000 oz.
Gold, lode .....	900 "
Silver .....	100,000 "
Lead .....	155,000 lb.
Zinc .....	327,000 "
Copper .....	560,000 "
Miscellaneous minerals .....	\$4,000
Coal .....	500 tons.
Total value, approximately .....	\$375,000

The North-eastern District has suffered a serious loss in the death from Spanish influenza of Jas. G. Powell, the assayer located at New Hazelton. By his reliable work and pleasant manner he had gained the respect and confidence of all those engaged in mining, and particularly of the prospectors, which caused his advice to be sought and enabled him to be of great assistance to the prospectors. It is to be hoped, for the sake of the district, that the business he so successfully started may find a worthy successor.

#### Omineca Division.

##### SKEENA RIVER SUB-DISTRICT.

*Cordillera*.—Development of this group of claims, situated at Usk and owned by the Kitsalas Mountain Copper Company, was carried on during the year. The crosscut tunnel commenced last year was driven in to intersect the vein and continued on for 50 feet or more. Where cut

the vein was not as well mineralized as on the surface, but it is expected that drifting on the vein will show up other ore-shoots.

Work was discontinued in the fall, but it is expected that operations will be resumed before long. It is probable that the first work done will be to prospect a vein which was cut in the crosscut tunnel at a point 121 feet from the portal. A short drift and winze on this vein have shown some nice ore, and the indications are sufficiently encouraging to warrant more extensive development.

*Lucky Luke.*—This claim adjoins the *Cordillera* and is owned by L. E. Moody and R. Lowrie, of Usk. There is a small vein on this property from 1 to 2 feet wide, lying in schist, and in places well mineralized with bornite. Assays of the clean ore show it to run over 2 oz. in gold to the ton, besides the copper content. Three men have a lease on the property at present; they erected a cabin and intend working on it all winter.

*Legate Creek.*—About a dozen prospectors were at work during the summer, developing their claims at the head of Legate creek. Orr & Lenhart have built a cabin and will continue work all winter on the *M. & K.* group. The more important properties in this locality were described in the 1917 Annual Report.

Development of the *M. & K.* group by Orr & Lenhart is reported to have been successful in finding a vein carrying ore similar in character to the 130 tons of high-grade float-ore shipped from the property early in 1917. It is believed that the vein found is the one from which the float-ore came. A car-load or more of ore was taken out, but will not be hauled to the railway until the spring of 1919.

Other prospectors on the creek who worked their claims are Brown, Halliday, Jones, Bell, and Burns. The season's work on the creek has been reported to have generally given encouraging results, and it is hoped that more extensive development will be carried on next year.

#### HAZELTON SUB-DISTRICT.

*Rocher Déboulé Mine.*—During the last three years this mine has been the most important one in the district, but the exhaustion of ore-bodies in the upper levels caused a decreased production in 1918. The mine was closed down in October, the reason given being: "It was thought best to suspend operations until such time as conditions become normal again."

Development on the lower levels has shown a considerable tonnage of milling-ore in the No. 2 vein, but has not as yet found ore in the main vein. An incline raise from the 1,200-foot level up to the 500-foot workings was commenced, but, as it was difficult to get miners, this work was stopped before it had gone far. It is probable that work will be resumed at the mine next summer and further development carried out. The installation of a concentrating plant to mill the low-grade ore will also be considered.

Production for the year amounted to about 3,000 tons, averaging about 9 per cent. copper.

*Delta Copper Co.*—The holdings of this company comprise the *Delta* and other groups of claims and a control of the stock in the company owning the *Highland Boy*; all these claims are on Rocher Déboulé mountain, lying to the east of the *Rocher Déboulé* mine. The financial obligations involved in acquiring this property were such as to impose some difficulties on the company, with the result that funds were not available to carry on active development and mining. Not much work has been done, therefore, on the property during the last two years.

At the present time, however, the company is reported to be in good shape, with the property practically paid for and funds in hand for settling outstanding liabilities and providing for further work. Late in the fall a few men were put to work, but it is not expected that much will be done before the spring of 1919. The property has been described in detail in the Annual Reports of the Minister of Mines for 1916 and 1917.

*New Hazelton Gold-Cobalt Co.*—This company has operated its property on the western slope of Rocher Déboulé mountain steadily throughout the year with a force of from six to ten men under the superintendency of Dalby Morkill. Two car-loads of ore was shipped, one to the ore-dressing plant of the Ottawa Mines Branch, containing values in gold, cobalt, molybdenite, and arsenic, and the other, consisting of gold ore, to the Anyox smelter.

Late in the year work was commenced on a copper-bearing vein which is believed to be the extension of the *Rocher Déboulé* main vein. A tunnel is being driven to develop this vein. At this place the vein is somewhat broken up, also oxidized and leached, so that some distance may have to be driven before the vein is found in a normal condition. Work will be continued on the property throughout the winter.

*Golden Wonder.*—Intermittent work in a small way was carried on at this property during the first half of the year with satisfactory results. Owing to the difficulty of obtaining miners and the general unsatisfactory conditions for development mining, the work was stopped. It is expected development will be resumed next spring.

*Cap Group.*—The driving of a development tunnel on this property was started in 1917 and continued during the first two months of 1918. Work was then stopped and nothing further has been done since.

*Silver Standard.*—This property was worked more or less continuously throughout the year. Near the end of 1917 the erection of a 50-ton concentrator was commenced, and this was completed by May. After the delays incidental to getting a new plant in operation the mill worked well and has proved satisfactory. While the mill was being built very little mining was done; while a part of the time a small force was being kept on development. After the mill started a considerable accumulation of ore in bins and on the dumps was put through, so that very little mining of ore was necessary to keep the mill supplied.

The mill has so far only been run one shift, but in eight hours treats from 17 to 20 tons. It was built by the Faust Concentration Company, of Vancouver. In principle the mill is an ordinary water-concentrator for the treatment of silver-lead-zinc ores, but most of the machinery is of special design. The jigs and tables are made by the Faust Company and differ somewhat from ordinary types, and a higher extraction is claimed for them. The milling machinery consists of a jaw-crusher, three sets of rolls, elevators, two sets of Faust jigs, three Faust tables, classifiers, screens, settling-tanks, etc.

The mill-site is on Two-mile creek, two miles from the mine. Mill-water is secured from the creek, and also sufficient power to run the tables and the dynamo for the electric plant. Boilers with cordwood for fuel supply the other requisite power. The ore is hauled from the mine-bins to the mill-bins in a 5-ton Packard truck, and from these bins it is trammed into the mill.

The superintendent, W. G. Norrie-Lowenthal, reports that the percentage recoveries in the mill are satisfactory and that the mill is now running nicely. During the year shortage of efficient labour handicapped operations, and in the fall the epidemic of Spanish influenza stopped operations for a time. Development at the mine has been satisfactory during the year, and there are now considerable reserves of milling-ore and also some high-grade shipping-ore. Both the main vein and the No. 4 vein are looking well. While the mill was being built the power plant at the mine was changed and improved. The old steam plant at the shaft was dismantled and a new plant put in at the tunnel, which is now the shipping-point for the mine. A 60-horse-power distillate engine supplies the power to run the 5-drill compressor. The old compressor and boiler from the shaft are set up at the tunnel plant and can be utilized when necessary.

Numerous improvements and additions were made in the way of shops, etc., and comfortable camp buildings have been erected at the mill. The tonnage milled during the year amounted to about 3,000 tons.

*American Boy.*—This property was not worked during the year. In January and February 250 tons of ore was hauled from the dumps to the *Silver Standard* mill and later was treated at that plant. It is expected that development of the property will be proceeded with in the summer of 1919.

*Nine-mile Mountain.*—During the summer options on a number of the more important claims on this mountain, including the *Sunrise*, *Silver Cup*, *Lead King*, Miller property, and others, were secured by Byron R. Jones, acting for an Eastern syndicate. Work was commenced on the *Sunrise* property and carried on for a couple of months with a small force of men under H. Sparks. This work consisted of surface-stripping and shallow cuts exposing the veins. One vein in the *Sunrise* was exposed 500 feet, maintaining good values and size throughout. Work was stopped in October for the winter, but will be resumed in the spring, when it is expected diamond-drilling will be carried out.

There are a number of veins on these claims, varying from a few inches up to several feet in width and mineralized with galena, zinc-blende, grey-copper, stibnite, and jamesonite. The galena is, as a rule, high in silver content, while the stibnite and zinc-blende also carry some silver. The grey-copper occurs sparingly, but carries a high silver content.

#### TELEKWA SUB-DISTRICT.

There was not a great deal of activity in metal-mining in this district during 1918. The chief disappointment was the failure of the *Santa Maria* to continue to operate on a productive



basis. The lease and bond held on this property by the Jefferson-Dockrill Syndicate may expire before long and the property revert to the original owners. Further prospecting of some of the surface showings would seem to be warranted, and it is to be hoped that next year the owners will do this.

The most important development in the district during the year was the opening-up of a small coal-mine by the Telkwa Collieries, Limited. This is the beginning of productive coal-mining in the district, and although the output as yet is small, it is a hopeful sign for the future.

*Cronin's Mine.*—This property was worked for a short time during the summer, but in the fall operations were stopped for the winter. The property was examined by several engineers during the season, and it is reported that before next spring arrangements will have been made to develop and equip the property so as to put it on a productive basis. A low-level crosscut tunnel has been projected for some time by Mr. Cronin, and this policy of development may be carried out.

During the year some further work was done on the sleigh-road to the property from Telkwa by the Public Works Department. No ore was shipped during the year.

*Hudson Bay Mountain.*—During the year small-scale prospecting and mining was carried out on a number of claims on this mountain, including the *Victory*, *Mamie*, *Last Chance*, and *Silver Creek* groups. From this last group, owned by Schufer and partners, 30 tons of ore was taken out and shipped to the *Silver Standard* mill for treatment. This ore will run from 100 to 150 oz. in silver, 15 to 20 per cent. zinc, and 25 to 40 per cent. lead.

The *Last Chance* claim was developed by a 50-foot tunnel, and it is reported that this working disclosed a body of low-grade copper ore.

*Cassiar Crown Copper Co.*—Development of this company's property on Grouse mountain has been carried on more or less continuously throughout the year. Work on the long crosscut tunnel was discontinued for the time being and surface work on the *Ruby* and *Eureka* claims started. This development is turning out very satisfactorily, and work with a small crew will be carried on all winter. The surface showings of copper ore on this property are quite promising, and before long the property should become a producer.

*Emerald Group.*—This property, situated on Sweeney mountain, in the Sibola section, was examined during the year by several engineers. The option held on it by James Cronin was renewed for a year by making a cash payment. The showing of silver-lead ore is a very fine one, but the location of the property makes the transportation problem somewhat difficult.

*Telkwa Collieries.*—This company is composed of Prince Rupert and Telkwa men, and was formed to develop a small area of coal land near the mouth of Goat creek, which joins the Telkwa river four miles from Telkwa. J. Ashman, who was instrumental in arranging the promotion of the company, is in charge of the work.

The colliery is connected to Telkwa by an auto-road, the distance being about four miles and a half. During the year the property was equipped with bunkers, camp buildings, etc. Two seams of coal are being opened up, each of which contains from 8 to 10 feet in width of clean coal. Analyses show the coal to be of good-grade bituminous quality and not unduly high in ash.

Late in the fall shipments were commenced, about three car-loads a week being put out. The coal is hauled to Telkwa and shipped to Prince Rupert, where it is marketed. It is expected that when sleighing becomes good from 30 to 40 tons of coal a day will be shipped.

The area of coal formation at this point is not great, but further development may show it to be larger than is apparent from surface conditions.

#### Cariboo Division.

##### FRASER RIVER SUB-DISTRICT.

*Tertiary Gravel Co.*—In 1917 the old Killam gravel-mine at Cottonwood canyon was acquired by the Tertiary Gravel Company, and the property was equipped with a mill to treat the cemented gravel. The mill was tested in the fall of 1917, and shortly after work was stopped for the winter. Operations were resumed in the spring of this year and some changes were made in the milling equipment. During the fall the mill worked satisfactorily, treating 50 to 60 tons a day. It is believed that work will be continued all winter. Further development of the gravel-deposit is also to be carried on.

This gold-bearing deposit is a cemented gravel lying on a bed-rock and carrying values throughout a thickness of 10 to 12 feet. Development has been by a tunnel with lateral drifts

from it, and the workings total several hundred feet; the gravel-deposit is of considerable size, but the gold values may be variable throughout it.

This deposit of cemented gravel is so hard that it cannot be successfully worked by ordinary placer-mining methods. The system used is to mine the ground as in a lode mine, using compressed-air-driven drills, and then the product is treated in a mill in much the same manner as gold-bearing quartz.

#### BARKERVILLE SUB-DISTRICT.

The hydraulic placer mines near Barkerville made a smaller production than in 1917. The water-supply during the year was not very satisfactory, so that a smaller yardage of ground was handled than in the previous year. In the early part of the season the winter's snow melted with great rapidity, causing a flood of water which went to waste, and after that a long dry period occurred, during which there was an insufficiency of water for steady hydraulicking. Not much help was obtained from fall rains, so the season as a whole was unsatisfactory as regards water conditions.

The grade of ground handled is believed to have been about the same as in 1917, and no important new developments were made.

In August Dr. B. R. MacKay, of the Dominion Geological Survey, arrived in the district and spent a few weeks examining the country. Dr. MacKay intends to make a complete study of the placer deposits, and his visit this year was to size up the country and plan out his work for the season of 1919. This work is intended to assist the development of the known deposits and indicate the probable courses of the old drainage systems of the country, with the possibility of indicating likely places where new deposits may be found.

*Hopp Mines.*—These mines, consisting of *Lowhee*, *Stouts Gulch*, and *Mosquito Creek*, which are operated under the management of John Hopp, were worked as continuously throughout the season as the supply of water permitted. The major portion of the placer-gold production of the Cariboo District comes from these three properties. *Stouts Gulch* mine was worked up to its head in 1917, but this year the work was carried on laterally, side channels and benches being worked. There is still a considerable yardage of gravel to work out, but it may prove to be lower grade than the main channel. *Lowhee* mine was worked continuously throughout the season, and it is reported the average grade of gravel handled was well up to that of former years. *Mosquito Creek* mine was handicapped by shortage of water, and only a small yield of gold was obtained.

*Point Mine.*—This property, owned by Loo Gee Wing, of Vancouver, was worked during the season under the supervision of Jos. Wendle. Owing to shortage of water the season's output was not large.

*Chisholm Creek.*—The drifting-work of the Cariboo-Chisholm Creek Mining Company was discontinued early in the year and not started again. The future plans of the company are not known.

*Lightning Creek Gold Gravels and Drainage Co.*—This company carried on work at its property at Wingdam during the season with a force of about a dozen men under the superintendency of Elmer S. Will. The work done consisted of putting the surface plant of the property in shape for actual mining, which is planned for the season of 1919.

The property is an old one and equipped with a plant for deep-drifting placer-mining on a large scale. During the year the flume was rebuilt, giving more water-power, the pumping machinery was overhauled and added to, and generally the whole plant was put in good condition.

Drilling of the ground, which has been progressing for two or three years back, was continued. The Keystone drill was operated nearly continuously throughout the season, Mr. Brown being in charge of this work.

*Proserpine Mountain.*—The gold-quartz claims on Proserpine mountain, which are owned by Armstrong, Tregillus, Carey, and Blair, still continue to attract considerable attention. Further development by the owners was carried on during the summer. This work was confined to surface prospecting by cuts and shallow pits. Late in the fall, however, Tregillus and partners commenced sinking a shaft, and it is expected they will continue work all winter.

There are a number of well-defined quartz veins on these claims varying in width from 1 to 30 feet. These veins are mineralized in places with pyrite, arsenopyrite, and a little galena. The main valuable metal content is gold, the distribution of which is somewhat irregular. It

would seem probable that the gold primarily was associated with the sulphides, but surface oxidation and leaching have in places scattered free gold through the quartz.

From the results of many samples taken, it is evident that at least portions of the veins would pay to work, and it is quite possible that further development would show considerable tonnages of ore which would pay to mill. The ore will have to be milled on the ground, and much further development is required before a large mill would be warranted. The possibilities for these claims are that when the veins are properly opened up they will furnish sufficient tonnage to mine and mill on quite a large scale, although average values may prove to be comparatively low grade. These properties warrant a thorough investigation by any company looking for gold properties.

#### Quesnel Division.

The only productive mining carried on in this Division is placer-mining, and in recent years but little placer gold has been taken out. The gold production was about the same as last year. A certain amount of prospecting of lode mineral claims has been carried on each year, but there is little to record for 1918.

*Quesnel Hydraulic Mining Co.*—The big hydraulic-mining plant of this company at Twenty-mile creek, Quesnel river, was in operation during most of the season and a considerable yardage was handled. The gravel, however, is very low grade in gold content, and it is not probable that much gold was recovered in the sluice-boxes. It is believed, however, that the black sand occurring in small and varying quantities throughout the gravel carries appreciable values in platinum and flour gold, so at the beginning of the season arrangements were made to save this black sand. An undercurrent was put in the sluice-box by means of which the fine material passing through was caught and lifted by an hydraulic elevator to a mill where it is treated.

This mill consists of two Neal jigs which make a partial concentration of the fine material. The spigot product or concentrate from these jigs then goes to a Deister table, which produces a fine black-sand concentrate. The tailings from both jigs and table go to waste.

It was found that the amount of black sand in the gravel is quite variable, and also assays of this black sand show wide divergence of results. Tests are now being carried out to find the average value of this concentrate, of which a considerable quantity was secured during the season, and also as to how these values can be extracted. If the black sand carries appreciable values which can be economically extracted, then a new future for the property is apparent.

*Harrison Mine.*—This property is situated on Keithley creek, one of the old placer-gold producing creeks of the Cariboo. For the last four years R. W. Harrison has operated the property as a drift-digging, employing from four to twelve men. The season's operations were only partially successful, but there would seem to be plenty of pay-ground yet to work.

The Keithley Creek section, which is reached from Quesnel Forks, has been virtually deserted for some years back. It would seem, though, that there are still many deposits of gravel there which would pay to work. It is to be hoped that more attention will be paid to this portion of the Cariboo in the future.

### CENTRAL MINERAL SURVEY DISTRICT, No. 3.

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

(Headquarters, Kamloops.)

In the "Mineral Survey and Development Act, 1917," it is stated: "The Central Mineral Survey District shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Clinton, Lillooet, Kamloops, Ashcroft, Nicola, Vernon, and Yale; and shall have its permanent survey station and office at the City of Kamloops."

The area covering the above-mentioned seven Mining Divisions in shape roughly approximates a triangle, with the north-eastern angle touching the Alberta boundary about twenty-five miles south of the Yellowhead pass, the north-western angle being formed by the boundaries of the watershed of the headwaters of the Chilcotin river, and the southerly point of the triangle touching the State of Washington at the Skagit river. The superficial area is approximately 45,000 square miles.

#### PHYSIOGRAPHY.

Taking the nomenclature adopted by the Geographic Board of Canada, practically the whole of this district would be included in the Fraser plateau of the Interior system, merging into the



Nechako plateau on the north, the Coast mountains and Cascade mountains of the Pacific system on the west, and the Monashee mountains of the Columbia system on the east. Dr. Dawson, in describing the physical features of this portion of British Columbia, writes: "It is only when regarded in a broad general way and by contrast to the lofty and rugged mountains by which it is bordered that this interior region can be designated a plateau. . . . But even as it exists at the present time, it is not unnatural to designate this region generally as a plateau, for, standing upon any point of sufficient elevation, the great lower valleys are entirely lost to view, while the higher tracts run together everywhere in the distance to form a nearly level horizon line, above which the rugged forms of some of the adjacent mountains may stand out. . . . Within the area of the Kamloops sheet near its middle line the normal level of the plateau may perhaps be described as declining northward from about 4,500 feet to about 3,500 feet, and it is very possible that the early Miocene drainage of the country took place in that direction."

It is not within the scope of this brief review to discuss the geology of the district. Information on this subject can best be obtained by studying the reports by Dawson, Daly, Drysdale, Camsell, and others, published by the Geological Survey of Canada.

#### Clinton Mining Division.

*Scottie Creek Chrome-iron Mine.*—This is situated about four miles and a half up Scottie creek from the Eighteen-mile on the Cariboo Road. It is being operated by Stewart & Calvert, of Oroville, Wash. A road connecting the mine with the Cariboo Road has recently been completed. Ore to the amount of 500 tons which is said to be of shipping value has been extracted. No shipments have yet been made.

*Magnesium Sulphate (Epsom Salts) Lake.*—About a mile and a half south of town of Clinton. Covered by two claims, being operated by Stewart & Calvert, of Oroville, Wash. The magnesium-sulphate crust is removed by shovels and barrows ready for shipment. One hundred and fifty tons was shipped over the Pacific Great Eastern during the latter part of the year, leaving about 2,000 tons in storage at the lake.

*Soda Lake or Red Rock Lake.*—Situated three miles west of 70-Mile House, Cariboo Road. Area of main lake about 100 acres. Water carries in solution 6 per cent. sodium carbonate. The crystallized sodium carbonate is produced by artificial evaporation, a plant having been installed during the summer, having a capacity of 3 tons of crystal soda per day of ten hours. Owners, Pacific Coast Contractors, Limited, Vancouver; manager, Mr. Falls, 70-Mile House. I understand 20 tons of crystal soda was shipped late in the year.

*Magnesite.*—The following occurrences are mentioned because of the growing demand for magnesite, not only on account of its use as a refractory in smelting-works, but as a constituent in the manufacture of cements and allied products, these being preferable to Portland cement for a great many purposes. The opening-up of the Pacific Great Eastern Railway puts these deposits in the category of commercial possibilities.

Near 105-Mile House on the Cariboo Road is a hydromagnesite deposit referred to by Dr. Dawson in the 1898 Report of the Geological Survey. This is situated less than a mile from the line of the Pacific Great Eastern Railway. The owner is E. A. Carew-Gibson, London Building, Vancouver.

About fourteen miles west of the 59-Mile on the Cariboo Road is a large deposit which has been favourably reported on by Dr. Hodge, of the University of British Columbia.

Near the town of Clinton C. E. Cartwright, of 445 Granville Street, Vancouver, has been developing a magnesite occurrence, of which he writes under date of October 25th as follows:—

"Our progress has been much slower than expected, due to the depth of drift-covering and the fact that for the greater portion of the time we have only employed one man. The indications are good and have improved greatly during the last two weeks. We are now getting plenty of small angular pieces of white and grey crystalline magnesite in a tunnel being driven on the *Anzac* claim, half a mile south-east of Clinton village. I hope to be able to prove that there is a bed of solid magnesite several hundred feet wide in the mountain-side, above the snow-white deposit in the valley-bottom."

Speaking generally, the area in the Clinton Mining Division appears to be more productive of minerals which are the result of alterations of the basic volcanic rocks which predominate in the area than of the metallic ores.

L. Reinecke, of the Geological Survey of Canada, has been working in this Division during the summer. His report may be looked forward to with interest.

#### Lillooet Mining Division.

The only output of any importance in this Division is that from the gold-mining district of Cadwallader creek.

*Pioneer Mine.*—This property has been working steadily during the greater portion of the year. For three months milling was discontinued to allow of shaft-sinking and development-work being carried out. At the middle of November the shaft was down to a depth of 280 feet from the collar, with 120 feet of drifting on the vein at this level. The lead at this depth showed strong and of good value. Milling was about to be resumed.

*Lorne Mine.*—On account of the scarcity of labour and the low comparative value of gold, this property has not been worked to capacity limit during the year. However, a considerable amount of effective development-work has been carried out. The only rock milled was that from development-work, amounting to about 280 tons.

*Ida May.*—A reduction plant consisting of a small jaw-crusher, a Huntington mill of 10 tons in 24 hours capacity, and amalgamating-table was installed during the summer. The power is supplied by a 10-horse-power gasoline-motor. A trial run was made before closing down for the winter. Operations will be resumed in the spring.

*Coronation Mine.*—No work has been done on this property during the year.

*Wayside Mine.*—Development-work has been carried on steadily with a small force of men.

It is estimated that approximately 2,600 oz. of gold bullion will have been produced from the Cadwallader Creek district during 1918, the principal contributor being the *Pioneer* mine.

*Tenquille Creek.*—A considerable number of claims have been staked in the vicinity of the headwaters of Tenquille creek. These show chalcopyrite principally, but occurrences of pyrrhotite and arsenical iron carrying gold and silver values are also reported. Practically no development-work has been done, but to assist the prospectors the Government is constructing a trail of approximately eight miles in length, a continuation of the trail up the Birkenhead river from the 71-Mile on the Pacific Great Eastern Railway. This when completed will bring the claims to within about thirteen miles of the railway over an easy grade, as compared with a distance of twenty-eight miles over the old route via Lillooet river to Pemberton Station.

*Copper Mountain, Gun Creek.*—Development-work consisting of open-cuts principally has been carried out on this property. Trail-work up Gun creek is proceeding. Charles Camsell, British Columbia representative of the Geological Survey of Canada, made an examination of this property during the summer.

A considerable amount of prospecting has been going on in the vicinity of Lillooet lake, Birkenhead river, and Owl creek.

#### Kamloops Mining Division.

*Iron Mask Mine.*—Situated seven miles south-west of the city of Kamloops. This is practically the only producer in this Division. During the year 1917 the old water-concentrating plant was discarded and a 150-ton in 24 hours flotation plant was installed under the superintendence of A. E. Wallinder. This was so satisfactory that another unit of like capacity was added early in the present year, making the present capacity 300 tons in 24 hours. On account of the scarcity of labour this has not been working to its full capacity. The shipments for the year are estimated to total 2,800 tons of copper concentrates carrying considerable gold values. All the power used is supplied by the city of Kamloops light and power plant.

*Lydia Group.*—A block of fourteen claims on Canyon creek, situated seven miles south of Birch Island Station, Canadian Northern Railway; being operated under the management of R. H. Stewart, Vancouver Block, Vancouver. (See report by W. M. Brewer in Report of Minister of Mines, 1915, page 221.) During the past year a good trail over which a narrow-gauge wagon can be operated has been constructed from the Canadian Northern depot to the mine. A 2-drill air-compressor operated by gasoline-motor has been installed and a camp with accommodations for twenty men has been erected. Development-work is being carried on with satisfactory results.

*Queen Bess Mines Co., Inc.*—Head office, Hoge Building, Seattle; president and manager, O. A. Thomas. Property situated near Black Pool Station, Canadian Northern Railway. Ore, silver-lead and zinc. A concentrator having a capacity of 50 tons in 24 hours is nearing com-

pletion on the property. This consists of rolls, jigs, and Faust tables. Steam-power with wood fuel is to be used at the start.

*Zinc Zone Claim.*—Situated on west shore of Adams lake, about fourteen miles from Adams Lake Post-office; owner, Geo. L. Breeden, Kamloops. This is an occurrence of sphalerite in limestone, outcropping for some distance along the shore just above the water-level. The mineralized bed appears to be about 5 feet in thickness where it is exposed in an open-cut. A sample taken across 18 inches next the foot-wall, and which was more lightly mineralized than the overlying portion, gave on assay at the Provincial Mineralogist's office 22 per cent. zinc.

*Homestake Mine.*—Situated about three miles west of Adams lake, on north side of Pass creek. (See Report of Minister of Mines, 1917, page 221.) This property has recently been bonded to Eastern capitalists and is being managed locally by H. D. Cameron; post-office address, Blucher Hall. A dozen men are employed completing the construction of a camp and preparing for development on a broad scale.

*Copper King and Camp McLeod Groups.*—(See report by W. M. Brewer in Report of Minister of Mines, 1913, page 203.) During the year a trail has been practically completed from the head of Seymour arm to the claims. The Granby Company has done a considerable amount of development-work and diamond-drilling. Work has been closed down for the winter, but it is intended to resume operations in the spring.

*Maxime Group.*—On north shore of Kamloops lake. (See report by W. M. Brewer in Report of Minister of Mines, 1915, page 216.) During the year about 20 tons of ore was shipped.

*Fortuna Group, Louis Creek.*—In last year's Preliminary Review this property was mentioned in connection with the statement that the ore carried values in platinum. Early during the present year two car-loads of ore was shipped to Republic, Wash., the returns from which are not available. No further work has been done since the shipment was made.

#### Ashcroft Mining Division.

There has been practically nothing doing in this Division during the past year in the way of mining ores of a metallic nature; the O.K. mine, in the Highland valley, the only producer during the previous year, having closed down in the autumn of 1917 and remaining so to date. Neither has any development-work been carried out on the north-eastern side of the valley on the *Transvaal, Highland, Consolidated, Keystone, or Glossie* groups.

*Snowstorm Group, Highland Valley.*—(See Report of Minister of Mines, 1917, page 223.) The Department of Mines has let a contract for diamond-drilling this property. At the time of writing the drillers were on the property and the machinery on the way. Operations were expected to start about the New Year.

*Magnesium-sulphate Deposits near Basque.*—Three miles and a half from Hammond's Spur, on the Canadian Northern Railway. Owners, the Basque Chemical Production Company, Limited, 509 Richards Street, Vancouver; president, G. H. Hammond. Property consists of five lakes which during the summer evaporate to dryness, so that the crystallized magnesium sulphate (Epsom salts) can be removed with suitable implements. A good road has been constructed from the bunkers on the Canadian Pacific Railway to the No. 1 lake, where the refining-works are to be erected. The president, Mr. Hammond, writing under date of December 19th, 1918, says:—

"You asked me to write a letter to your Department stating the tonnage shipped from the *Basque* mine during 1918. About two weeks ago we had a snow-storm which will prevent our making any shipments before the first of the year. Therefore I regret to report a blank so far as shipments are concerned for this year. Am glad to say, however, that prospects for large shipments are splendid, and we are proceeding with the erection of buildings and preparations for putting in a refinery. We might add that we have approximately 200 tons of salts mined and stored in warehouse at No. 1 mine awaiting shipment."

#### Nicola Mining Division.

This might be termed the Coal Division of the Central District, as up to the present time this product is the only one worked on any extensive scale in this Division.

The Middlesboro Collieries and the Fleming Coal Company have been working steadily during the year, making an aggregate output of approximately 130,000 tons.



The Diamond Vale Coal Company has made no shipments during the year, but is now putting in a new tippie on a spur from the railway and expect to start shipping at an early date from a seam that has recently been opened up.

*Aspen Grove.*—Approximately 50 tons of copper ore was shipped from this district during the year from various sources. Recently options were taken on a large number of claims in the vicinity by responsible parties, who intend to prospect the ground by diamond-drilling. Operations are expected to start in the spring.

*Donohoe Mines, Stump Lake.*—The *Joshua* shaft was unwatered to a depth of 300 feet for examination purposes. No further developments have been reported.

*Mary Reynolds Claim, Stump Lake.*—R. R. Hedley, of Nicola, is now working this property with the idea of shipping the higher-grade ore and at the same time proceeding with development-work.

#### Vernon Mining Division.

There is nothing of interest to report from this Division.

#### Yale Mining Division.

The work carried out in this Division during the year can best be described by quoting verbatim from the report sent to me by H. Beech, Mining Recorder, Yale, as follows:—

"Owing to snowslides on the Kettle Valley Railway, which have tied up railway traffic, have been unable to hear from the owners of claims on the Coquihalla river, but the following particulars can be taken as approximately correct:—

*"Aufes Mining Co., Hope.*—This company has had a gang of men working during the summer putting in a cable tramway from the tunnel to the road.

*"23-Mile Copper Camp.*—Active exploratory and prospecting work has been carried on at the various groups of claims owned by Frank Fritz, Wm. Robinson, Fred Bears, and others.

"DeFries, Marshall, Howlett & Towne have opened up a new mineral showing carrying good values in the vicinity of Steamboat mountain.

*"Emancipation Mining Co., Ltd.*—This company has taken out three shipments during the year and is the only shipper in the district at present. Although exact figures are not to hand, the following particulars are approximately correct: Early in the year 6 tons was treated at the Tacoma smelter and returned \$6,000; later a shipment of 12 tons was treated at the Tacoma smelter which returned \$1,920. The last parcel of ore sent out was a small one of about 1 ton of hand-sorted high-grade ore which was expected to net about \$2,000 a ton. The tunnel, which has been driven to about 200 feet, still carries milling values in the face, but a winze has been sunk to follow the high-grade seam, which without losing its values narrowed at this point. Prospecting-work has been carried out on the *Packard* group, owned by this company, with very promising results. On the same lead as the *Emancipation* group there has been considerable excitement this year owing to the discovery of very rich free gold in the surface quartz of many of the claims. This has caused the staking of the whole lead for nearly eight miles. High-grade ore has been found on the claims owned by Toni Angelis, J. Bailey, W. Palmer, and W. McLean. Claims extend now all the way from the *Emancipation* group to the *Emigrant Mines* properties, a distance of eight miles. The past year has been the most promising since the district was first prospected.

*"River Gold Recovery Co.*—This company, which is operating placer-ground near Hope, has kept a full crew busy all summer and is planning for further extensions.

*"Emigrant Mines, Ltd.*—This company is under the management of Mr. Wilson and has been actively developing its property during the year. Preparations are being made to install machinery as soon as the developments in the mine warrant it. The machinery has been forwarded to the mine and will no doubt be erected in the coming year.

*"Gold Creek Mining and Development Co.*—This company, which owns claims on Gold creek, near Spuzzum, is continuing development-work under the management of A. A. McDonald, who recently reported the opening-up of good milling-ore.

"Altogether the year has been one of great promise and many of the properties have reached a stage which justifies a large expenditure of capital. This will no doubt be forthcoming at an early date now that the war is over and mining once more resumes its normal activity."

## SOUTHERN MINERAL SURVEY DISTRICT, No. 4.

PRELIMINARY REPORT BY PHILIP B. FREELAND, RESIDENT ENGINEER.

(Headquarters, Grand Forks.)

The above district includes four Mining Divisions—Grand Forks, Greenwood, Osoyoos, and Similkameen. The following report is a résumé of work done for the year 1918, together with an approximate tonnage shipped. The district has produced about 705,000 tons of mixed ore. Considerable activity was shown during the early part of the year in prospecting for minerals necessary for producing war materials. Some success was achieved in this respect, which will be detailed in the Annual Report.

## Grand Forks Mining Division.

*Union Mine.*—On hundred and fifty-three tons of gold ore was shipped to the Granby smelter at Grand Forks. The bonding of this property was considered by Eastern American capital, and also by a local mining engineer representing American capital. Neither of these organizations was able to satisfy the demands of all the owners of the mine.

*Maple Leaf.*—The lower tunnel was driven about 60 feet and some copper sulphides have been encountered, disseminated through the rock. A good deal of interest was centred in this property early in the summer owing to the fact that the presence of platinum was detected in the old upper workings. The Imperial Munitions Board, of Ottawa, sent a representative into this locality during the summer. The results of this investigation are not forthcoming at the present time, but will no doubt appear in reports made by the Munitions Board at a later date.

*Rock Candy Group.*—This claim, situated on Kennedy creek, a tributary to Granby river (North fork of Kettle), has been bonded by the Consolidated Mining and Smelting Company, of Trail. Considerable development-work has been done by this company by diamond-drilling and tunnelling to prove the extent of the deposit of fluorite. A road has been built into the property and the construction of an aerial tram is under way. The high price of fluorite (fluorspar) has made the exploitation of this deposit possible. The company has shipped 100 tons.

*Molly Gibson.*—This mine has been worked by the Molly Gibson Mining Company, of Rossland, for some months. A tunnel was driven approximately 200 feet, with the intention of tapping an ore-shoot evident in a shaft above.

*Berlin.*—This mine, situated at Paulson, was operated for a greater part of the year by the Inland Mining Company, of Walla Walla, Wash. A shaft was sunk 100 feet and a prospect-tunnel driven on the lead about 200 feet. One hundred tons of gold and silver ore was shipped. In October the property was leased to the Griswold-Billingsley Company, contractors. Two car-loads have been shipped to Trail smelter by the lessees.

*Waterloo Claim.*—Situated on Lightning peak. Considerable work was done upon a sleigh-road up to this property during the summer; 9,381 lb. of high-grade silver ore was transported by pack-horses to the end of the wagon-road, and from thence by wagon and railway to the Trail smelter. Development is continuing this winter.

*B.C.*—This property was leased to J. St. Claire, of Eholt, and about 2,250 tons of copper ore has been shipped.

*Mastodon Group, Cascade.*—This group produced approximately 800 tons of chromite ore carrying from 30 to 45 per cent. chromide oxide. The ore-bodies lying in small lenses made development-work difficult and expensive.

*Emma.*—Approximately 20,000 tons of low-grade copper ore has been shipped from this mine during the past year. Development-work consisted of 171 feet of shaft-sinking, 50 feet of pockets and stations, 1,220 feet of drifting and crosscutting, and 363 feet of raising. This property is owned by the Consolidated Mining and Smelting Company, Trail.

## Greenwood Mining Division.

*Granby, Consolidated Mining, Smelting, and Power Co., Phoenix.*—About 444,500 tons of copper ore was shipped from these mines to the Grand Forks smelter during the year. This tonnage is below that of 1917, chiefly owing to smaller ore-bodies and their increasing distance from the centre of operations. Sickness caused by the Spanish influenza created a shortage of labour and a reduction in tonnage.

*Canada Copper Corporation.*—The *Mother Lode* mine operated steadily until about the end of November, when the Canada Copper Corporation ceased operations at their smelter at Greenwood. About 163,382 tons of ore was shipped during this period. The *Sunset* mine has also closed. About 2,697 tons of ore was shipped.

*Big Copper.*—This mine, under lease to J. Poggi, shipped 330 tons of copper ore to the Grand Forks smelter.

*Surprise No. 3* (Skylark camp) is under lease and bond to J. E. Thompson *et al.*, of Phoenix. Intermittent development-work has been carried on during the year, with the result that the shaft has been sunk about 25 feet farther and tunnel driven 30 feet on the lead to the east. About 90 tons of ore carrying copper and silver has been shipped to the Grand Forks smelter. This is a good prospect.

*Sally.*—This mine has been under lease and 71 tons of silver ore shipped to the Trail smelter.

*Bell.*—This mine is under lease to Oliver & McIntosh. Considerable development-work has been done and ore blocked out. Approximately 320 tons of high-grade silver ore has been shipped to Trail and Grand Forks smelters.

*Kokomo* claim shipped 21 tons of silver ore.

*Bounty Fraction* claim shipped 39 tons of silver-lead ore to Trail.

*Rambler B.* claim shipped 5 tons of silver-lead ore to Trail.

*Standard Fraction.*—This claim is still under lease to Nordman & Sons, of Coltern. About 58 tons of silver-lead ore has been shipped to Trail.

*Black Diamond.*—Considerable development-work has been done on this mine during former years. P. Kennedy & Steves operated this property early in the year, shipping 2 tons to the Trail smelter.

*Sunnyside.*—This claim, on James creek, a tributary of the main Kettle river, was worked by E. Williamson. Several hundred feet of tunnels have been driven in this property and some fairly high-grade silver-lead ore shipped.

*Stemwinder.*—This mine, situated at Phoenix, shipped 41 tons of ore to the Greenwood smelter, containing 0.09 oz. in gold, 0.35 oz. in silver, and 1.81 per cent. in copper.

*Sudbury* claim (Deadwood), owned by J. Graham, shipped 3¼ tons of copper ore to Greenwood.

*Aftermath* claim, formerly called *Great Hopes*, in the Deadwood district, shipped 85 tons of ore, carrying gold and copper, to the Greenwood smelter.

*Sappho* claim, under lease to O. Loftstod, Greenwood, shipped 20 tons of copper and silver ore.

*Providence.*—This mine is under lease to J. A. Morrison, of Greenwood. Considerable shaft-work and drifting on the lead has been done and some high-grade ore-bodies encountered. Approximate tonnage shipped for the year amounts to 100 tons.

*Lakevale* claims, under sublease to M. Shannier, shipped 5 tons of silver-lead ore to the Trail smelter.

#### CAMP MCKINNEY.

The Consolidated Mining and Smelting Company of Canada did a considerable amount of work upon its holdings in this camp during the summer. A continuance of some of the quartz leads were uncovered, showing a fair amount of mineralization.

In the fall the West Kootenay Power Company established two camps near the old *Cariboo* mine and commenced cutting a right-of-way for the high-power electric line, which, it is understood, will pass through the McKinney camp on its way from Greenwood to Copper mountain.

*Cariboo Mine.*—A. Savage and Leo. Mader, of Grand Forks, obtained a sublease on the tailings from the old mill. Under great difficulties they erected two concentrators below the dump, also a small Pelton wheel. The early drought so diminished the supply of water that they were obliged to install a gasoline-engine to run the concentrators in place of the Pelton wheel. Notwithstanding these difficulties, about 9 tons of concentrates was shipped to the Grand Forks smelter.

#### Osoyoos Mining Division.

*Hedley Gold Mining Co., Ltd.*—This company has operated the *Nickel Plate* mine steadily throughout the year in spite of the increased costs in labour, supplies, etc. About 70,100 tons of ore has been crushed and treated in the company's mill.



*Copper King Group.*—This group is again leased and bonded to A. Hagelberg, of Keremeos, who is endeavouring to develop the ore-body, apparent upon the surface, at depth.

*Golconda Claim.*—In 1917 3,390 lb. of molybdenite was shipped to Ottawa. On driving the main tunnel ahead on the lead, the molybdenite to a great extent disappeared and a good grade of chalcopryite was encountered. Transportation difficulties prohibit shipping any low-grade ore from this property. About 10 tons, carrying 18.1 per cent. copper, was sent to Trail.

*Torpedo.*—This mine is situated on Okanagan lake, approximately one mile from Penticton. The property has been leased by a Penticton syndicate. The old shaft and lower tunnel have been unwatered and the mine generally put in shape for working. About 170 tons of ore has been stoped from the lake-shore level and after sorting shipped to the Trail and Greenwood smelters. The ore is a mixture of copper, gold, silver, and lead.

*Horn Silver-mine.*—Work has been carried on continuously throughout the year in this property despite the handicaps due to shortage of skilled labour. Development consisted of a crosscut tunnel driven with the intention of tapping the lead at a lower elevation. This tunnel was not driven far enough to encounter the ore-body. About 800 tons of silver ore was shipped to the Grand Forks smelter during the year.

#### Similkameen Mining Division.

*Canada Copper Corporation, Ltd.*—The chief energies of this company during the year have been confined to building a 2,000-ton concentration plant at their mill-site, situated about four miles from Princeton. In connection with this plant, the erection of houses for their employees, a school-house, and every facility necessary for the welfare of families has been thought of. A branch of the Kettle Valley Railroad from Princeton to Copper mountain is under construction at the present time.

At the mine, on Copper mountain, work practically ceased during the summer; all the development-work having been done that was necessary until the concentration plant has been installed. A more detailed account of this mine and its mill will appear in the 1918 Annual Report of the Minister of Mines.

*Princeton Coal & Land Co.*—The operations of this company have continued steadily during the year.

*Regal Group.*—This group consists of 10 claims—*Regal, Rose, Lark, Hit or Miss, Rose Frac., Regal No. 1, Regal No. 2, Regal No. 3, and Regal No. A*—and is situated two miles and a half north-east of Princeton. The owners, a general mining syndicate, are developing this group under the superintendency of W. C. McDougall, of Princeton. Development-work done consists of an open-cut 150 feet in length by 25 feet in depth, this cut being continued as a tunnel for 50 feet; also extensive stripping. The surface in the region of this work shows a strong stain of copper carbonates. Assays from samples taken on the surface give from 1.50 to 5 per cent. copper. The sulphides in the tunnel assay from 1.87 to 2.8 per cent. copper and \$1.50 in gold and silver. Future development of this property is looked forward to with interest.

*Copper Farm.*—This group consists of three claims—*Copper Farm, Copper Farm No. 2, and Copper Farm No. 4*. These claims are being developed by the Princeton Mining and Development Company, Limited, Princeton, and are situated about four miles and a half east of the town on the Great Northern Railway. A considerable amount of development-work was done in former years on this property by Robert Stevenson.

The present company is building a spur and putting in bunkers. The lead, which strikes north and south, is small but persistent as far as development-work has shown. The ore is a chalcopryite and carries 2 oz. in silver and 12 per cent. copper.

#### TULAMEEN RIVER.

The strong demand for platinum caused a great deal of activity in the vicinity of the Tulameen river. Besides numerous small placer-workers, the Munitions Board, of Ottawa, under the direction of G. S. MacKenzie, did a considerable amount of drilling, with the intention of ascertaining the possibilities of working the gravels profitably for platinum.

It is improbable that the price of platinum will keep up to its present price for any length of time, but the drilling of these gravels and the ascertaining of the quantities, if any, of platinum is seemingly necessary, to provide against any such contingency as that which arose during the period of the war.

## OLIVINE MOUNTAIN.

A Vancouver syndicate obtained some holdings on this mountain early in the year, and prospected it, with a view of mining certain localities for platinum and chromite. Some segregations of the chromite have been found to contain platinum in small quantities, but these segregations are so scattered that profitable mining is at present out of the question.

On the north side of Olivine mountain some good showings of copper sulphides and carbonates have been uncovered by Andy Jensen, of Tulameen. Assays from these showings run up to 4 per cent. copper. This locality is worthy of some investigation.

## EASTERN MINERAL SURVEY DISTRICT, No. 5.

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

(Headquarters at Revelstoke.)

## Golden Mining Division.

*Couverapee*.—This property is situated above the *Monarch* mine, near Field, and formerly belonged to Mr. Adkins, but is now being operated by the Couverapee Mines, Limited, of Calgary. S. Chapin is general manager; W. Orville Young, mine superintendent; and W. Whittaker, mine foreman. The ore occurs as a bedded vein replacing the limestone in large shoots. A considerable quantity of ore is said to be available for extraction, while the average values are reported to be: Lead, 15 per cent.; silver, 3 oz.; and a small percentage of zinc. The ore is concentrated in the *Monarch* mill. During the year 979 tons of ore has been shipped to Trail, which is a considerable increase over last year's shipments.

*I.X.L. and Condor*.—These claims are owned by R. McKeeman and A. W. Logan, of Castledale. A trail from the Columbia river to the property was slashed out this year and a little surface work has been done on the showing. Although not enough development-work has been done to determine the extent of the mineralization, indications are favourable for there being a large body of low-grade ore. The ore, principally consisting of an intimate mixture of galena and sphalerite, occur replacing and impregnating the limestone near a contact between limestone and argillites.

*Tarheel Group*.—It is reported that C. J. Lincke has been doing a little work on the *Rainbow* claim. A small cabin was built near the tunnel-site, and another at Spruce Tree camp, on the Middle fork of the Spillimacheen river. The trail from Carbonates Landing to Spruce Tree camp is reported to be in good condition. This trail also gives access to the *Bobbie Burns* and *International* groups, which are situated near the headwaters of the Middle fork of the Spillimacheen. No work has been done on these properties for a number of years, but they are now evidently attracting attention, as several parties have made examinations during the season.

Among other properties in which some interest has been taken during the season are the *Atlanta*, *Constance*, and *Horseshoe* claims, on Jubilee mountain, near Spillimacheen. H. Moody, of Golden, had the old trail slashed out and the claims surveyed. The ore is said to run high in copper values.

## Windermere Mining Division.

*Paradise*.—This property, which is owned by Robert Randolph Bruce, of Invermere, has been operated steadily during the year and has shipped 2,500 tons to Trail, which is an increase over last year's shipment of 400 tons. Thirty-five to forty men are employed at the mine.

*Silver Belt*.—Situated in Spring Creek basin, below the *Paradise*; owned by C. M. Keep, of Kendrick, Idaho. During the year a shipment of 50 tons was made to Trail. The ore is somewhat similar to that at the *Paradise*.

*Sitting Bull*.—Very little work has been done on the property during the year by the owners, pending the installation of a compressor plant, which they propose to make as soon as the new road up Boulder creek is built. The future development-work will consist of driving an adit-tunnel at a location easily accessible and free from snowslides to tap the vein at a depth. Ore is exposed in the upper workings along the apex of the vein, but on account of the rugged and steep nature of the country these workings cannot be mined with safety during the winter months. Some 300 sacks of high-grade silver-lead ore are ready for shipment.

*Trojan Group*.—This group comprises six claims and is situated on Boulder creek at a distance of eighteen miles from Athalmer, the nearest point on the railway. Access is gained

by a good wagon-road to within three miles of the property, and for this distance there is a good 4-foot trail. The property formerly known as the *Delos* group was bought by the Trojan Mining Corporation, a company promoted in Seattle by F. Wonn, who is also largely interested in the *Sitting Bull* mine. E. D. Smith is in charge of the development-work. The ore occurring in the quartz-filled vein is principally chalcopyrite, with occasional values in gold and silver. A sample of ore from an open-cut on the surface ran as follows: Gold, a trace; silver, a trace; copper, 15.5 per cent. There were between two and three car-loads of ore ready for shipment, and the manager now reports that he has nearly 300 tons available, and which he hopes to haul out during this winter. During the year development has been confined to surface work along the outcrop and to the continuation of the old tunnel. Surface improvements consist of commodious camp buildings suitable for a crew of about twenty-five men. The new road up Boulder creek, which has been completed for a distance of five miles, leaves the main road up Horse Thief creek at a point 7.4 miles from Wilmer.

*Burman Group*.—Situated at a short distance in a north-westerly direction from the *Paradise* mine, on the Boulder Creek slope of the divide between Boulder and Spring creeks. Work was commenced on the property, which is owned by John Burman, in the fall of 1917. A small cabin has been built and about 100 feet of drifting done on the vein. An ore-shoot about 12 feet long and having an average width of 12 inches is exposed in the tunnel. A 7-foot winze sunk on the ore is said to show an improvement in the width, but this could not be examined on account of water; the indications, however, seemed favourable for an increase in width with depth. A crosscut has been started with a view of developing this ore at a depth. The ore principally consists of galena, zinc-blende, and carbonates. Some samples are said to have run very high in silver values. The property is easily accessible from Boulder creek or from the *Paradise* mine.

*Black Prince*.—Situated near the *Trojan* group, on the south side of Boulder creek. The old workings, consisting of several crosscuts, are now caved. The property is reported to have been taken under bond this year by M. E. Olson, who has started some men to work.

Previously to this year ore from the Boulder Creek properties had to be packed out over a very poor trail to the Horse Thief Creek road, and then hauled for about thirteen miles to Athalmer. The new road, which has been completed to within three miles of the *Trojan* group, has been built to a suitable grade and shortens the distance considerably. With the improved transportation facilities, it is to be hoped that the increase in production will fully justify the expenditure that has been made on the road.

*Lead Queen*.—Situated on Frances creek. Tom Brown, of Athalmer, is the principal owner. The property is reported to have been bonded this year to Paul Denhart, of Seattle, who has a small crew working at the property. Shipments will probably be made this winter. Between 70 and 80 tons of ore was sacked last winter, but unfortunately a bridge was carried away, which prevented shipments being made. The ore carries about 30 or 40 oz. in silver and about 65 per cent. lead.

*Tatler Group*.—R. S. Gallop has been doing some development-work on this property. The group, consisting of twelve claims, is situated at the head of the South fork of Horse Thief creek. The metallic contents of the ore are principally copper.

#### Fort Steele Mining Division.

*Sullivan*.—This mine, which is by far the largest producer of lead and zinc in British Columbia, has been steadily operated by the Consolidated Mining and Smelting Company, who report that there is an immense tonnage available for extraction and treatment. The output of this mine, which could be worked to much greater capacity, just about equals the total output of lead and zinc of all the other mines in the Province. Latterly about 300 men have been employed at the property. Shipments for the year are as follows: Lead ore, 30,554 tons; zinc ore, 96,950 tons; and iron pyrites, 4,582 tons. The long adit-tunnel which is being driven from Mark creek is now in about 7,600 feet.

*Stemwinder*.—This mine, situated on Mark creek, was bonded by the Federal Mining and Smelting Company, who did two or three months' diamond-drill work, but the results were evidently not satisfactory, as the project was abandoned.

*North Star*.—This property has been worked under lease by O. Brander and O. C. Thompson during the latter part of the year; about 2,500 tons of ore has been shipped to Trail. Indications are reported to be favourable for the continuance of shipments.



*St. Eugene.*—Situated at Moyie. This property has been worked by the Consolidated Mining and Smelting Company and by leasers. Shipments to Trail total 1,200 tons.

*Victor.*—Very little work has been done on this property during the year. It is reported that the company is being reorganized, with a view of obtaining more capital to carry on progressive development-work.

Renewed activity has been in evidence at the placer-gold workings on Wild Horse and Perry creeks. On Perry creek a company has taken over the property owned and formerly operated by the Perry Creek Hydraulic Company. A considerable amount of work has been done in preparation for next season's operations.

Successful results were obtained from work done on a small scale on Wild Horse creek, where \$600 is said to have been taken out of three sluice-boxes.

*Yellow Metal Group.*—Further prospecting-work has been carried on at this property by W. van Arsladen, of Cranbrook, who is one of the principal owners. It is a gold-quartz property.

#### Arrow Lake Mining Division.

There has been quite a little activity in the district surrounding Lightning peak, where rich discoveries of high-grade silver ore have been reported. Unfortunately the writer was unable to visit this part of the country on account of other work on hand. However, P. B. Freeland, Resident Engineer for the Southern Mineral Survey District, examined some of the properties in 1917, whose report may be seen in the Annual Report of the Minister of Mines for that year. The properties are situated at a distance of between thirty-six and forty miles from Edgewood, from which place horses may be obtained.

*Millic Mack.*—The trail has been extended from Blue Grouse creek for a distance of two miles to connect with the terminal of a light tramway recently constructed by H. E. Forster, the owner of the property. A small crew of men is employed at the property. Some 35 tons of sacked high-grade silver-lead ore is now ready for shipment at the mine.

#### Trout Lake and Lardeau Mining Divisions.

Mining activities have been on a smaller scale than last year in these Divisions, and it is to be hoped that before long the district will attract the attention that it deserves.

*Triune.*—R. H. Batty resumed work this year, and employed fourteen men during the summer.

*Towser.*—This property was worked under lease and bond. Eight to ten men were employed.

*Nettie L.*—Peter Cameron and others had a lease on the property. Five men were working during the season.

*Ethel.*—A few men were working on this property, and a small shipment was made to Trail.

*True Fissure.*—Development-work was done under the management of A. C. Houston. Ten men were employed.

*Foggy Day.*—Situated near the head of Eight-mile creek. The property belongs to Mrs. A. C. Jowett, and has been worked for the latter under lease and bond by J. S. Lamphere. The ore is gold quartz. A small shipment of high-grade ore was made.

*Fidelity.*—This property, which is situated near Gerrard, was worked during the season by J. C. Rady.

*Crescent.*—This property, situated near the head of Eight-mile creek, has been developed by M. R. Leahy. Two or three men were employed.

The following is a list of shipments made to Trail: *Towser*, 81 tons; *Triune*, 46 tons; *True Fissure*, 41 tons; *Ethel*, 13 tons; *Nettie L.*, 31 tons; *Foggy Day*, 9 tons; *Fidelity*, 6 tons.

#### LARDEAU.

*Kitsap.*—C. A. Stuart, the owner, had a new trail built from Lexington creek to the property, which is situated at a distance of about twelve miles from Cambourne. A good cabin has been erected on the claims, upon which the owner expects to do some work next year.

*Multiplex Group.*—Development-work was continued during the early part of the year, but the property is now temporarily closed down, pending the securing of more capital.

There have been a number of inquiries about the *Mammoth*, *Scout*, and other properties, which seem to have attracted outside attention; but so far no new developments have taken place, and the Lardeau has suffered from an unusually quiet season.

## Ainsworth Mining Division.

## NEAR AINSWORTH.

*Bluebell.*—This mine has been operated steadily during the year under the management of S. S. Fowler. On account of a large flow of water, work has been discontinued in the lower workings of the mine, pending the installation of a new pump. The concentrator has not been run during the year, the output of the mine being derived from a large body of oxidized silver-lead ore on the surface. This was extracted by "glory-hole" method and taken out through an adit-tunnel. During the year over 5,000 tons of crude ore was shipped to the Trail smelter.

*Florence.*—This property, consisting of eight Crown-granted claims, is owned by the Florence Silver Mining Company, of which F. R. Wolfe is manager and F. Hewer mine superintendent. The mine is developed by means of over 10,000 feet of underground workings. The concentrator, which is situated on the shore of Kootenay lake, is said to have a capacity of 150 tons. Water-power to run the plant is developed on Woodberry creek under a 350-foot head. A large gang of men was employed by the company during the year, and over 2,000 tons of silver-lead-zinc concentrates was shipped to the Trail smelter.

*No. 1.*—Mining and development work have been actively carried on during the year by the Consolidated Mining and Smelting Company. John Cannon is mine foreman. The ore shipped this year, amounting to over 6,000 tons, shows a considerable increase in production over that of last year.

*Highland.*—This property is also operated by the Consolidated Mining and Smelting Company. L. W. Oughtred has been in charge of the work. During the year about 800 tons of silver-lead-zinc ore and concentrates have been shipped to the smelter.

*Spokane-Trinket.*—This property, which is owned by Frank. T. McCullough and others, of Spokane, has been operated during the summer under the management of J. McGougall. Shipments for the year total 226 tons.

Other properties which have shipped during the year are as follows: *Little Phil*, 110 tons; *Tariff*, 26 tons; *Tam O'Shanter*, 26 tons; *Silver Hoard*, 21 tons; *Maestro*, 69 tons; *Gallagher*, 32 tons.

Development-work has been done during the year on the *Crescent*, at Coffee creek, and the *Buckeye*, where considerable work has been done under the supervision of Mr. Dagleish.

Molybdenite was reported to have been discovered near Crawford bay. Two men have put in a season's work on the property. No information is to hand regarding results obtained.

## NEAR KASLO.

*Cork-Province.*—Mining and development work have been actively carried on during the year under the management of W. E. Zwicky. The production shows a substantial increase over that of last year. A Minerals Separation flotation plant consisting of fourteen 12 x 12 cells, three Wilfley tables, a Dorr classifier, and other equipment was added to the mill during the year. About 800 tons of silver-lead concentrates has been shipped to Trail during the year. Latterly the property has been temporarily closed down.

*Curle Manganese Group.*—This property, which is situated on the Kaslo & Nakusp Railway at a short distance from Kaslo, was partly developed by Col. Millard, of Spokane. The first shipments contained such a high percentage of moisture that it was found necessary to install a dryer. The results evidently did not meet with much success, and after shipping fifteen cars of ore the property was closed down in October. The ore runs from 34.5 to 49.5 manganese, is low in silica and iron, and may be classified as a good grade of wad. It is possible that the failure to make a success of the venture may be attributed to unfamiliarity with mining and treatment methods for this class of ore.

*Index Group.*—This property has been bonded by J. C. Roberts, of Portland, and others. A crosscut is being driven to intersect the vein at a point 500 feet below the old workings.

*Utica.*—This property has been operated by a crew of twelve men since July, during which time six cars of ore has been loaded for shipment.

*Moctezuma.*—One hundred and six tons of zinc concentrates from the old dump was shipped, which had been neglected for fifteen years.

*Silver Bell.*—This property, situated on the South fork of Kaslo creek, is being operated by Green Bros. under the management of Mr. Newton. There is said to be a good showing of high-grade ore.

*Whitewater.*—This property has been worked under lease, and satisfactory results are reported to have been obtained. The property is controlled by J. L. Retallack & Co., of which W. H. Burgess, of Kaslo, is manager. Shipments to Trail total 150 tons.

*Helen.*—W. English, of Kaslo, has been doing some development-work on this property.

*Bell.*—Operated by the Jackson Basin Zinc Company. Shipments to Trail total 255 tons.

*Lucky Jim.*—The bulk of the shipments from this mine were made during the first six months in the year; for the balance of the year only small shipments were made. Total shipments to Trail, 1,843 tons.

#### DUNCAN RIVER DISTRICT.

*Lavina Butte.*—Situated on Hamill creek. A few men have been working. Thirty-five tons of ore has been shipped as yet.

*St. Patrick Group.*—Situated at a distance of six miles from Argenta. The property belongs to the British Alberta Mining Company, of which W. R. Allen, of Nelson, is secretary. A few men have been employed at the mine, and two car-loads of ore has been extracted for shipment.

*International Group.*—Situated at a distance of nine miles up the Duncan river from Howser lake. The mine is situated at an elevation of 3,100 feet above the river, at a distance of three miles by trail and 7,400 feet by air-line. A small camp consisting of two cabins has been established on the bank of the river, and a cabin built at the mine with accommodation for four men. The property is being operated by the Blue Lake Consolidated Mining Company, of which W. J. Milne is managing director. The ore is silver-lead. The property is in the prospective stage of development.

*Bannockburn Group.*—Situated on Hall creek at a distance of approximately six miles from the Duncan river. Development-work has been continued under the direction of Alex. Smith, of Kaslo, who is one of the principal owners. H. McKay and another man have been employed during the summer. The ore, which is principally galena carrying high silver values, shows up strongly on the surface. The present work is being confined to driving a crosscut to prove the continuance of the ore with depth.

*Superior Group.*—This property adjoins the *Bannockburn* group to the south-east. The property, which was originally staked by Brown Bros., of Ferguson, has been bonded to Connaway & Birch, of California, who are also interested in the *Old Gold* mine, near Ferguson. Work was started last fall, and since that time a great deal has been accomplished by a small crew of men. Encouraging results were obtained, but further development-work is necessary to prove the existence of ore-bodies of economical importance.

*Wagner and Jewel.*—These properties, which have been lying dormant for a number of years, are situated at the head of Hall creek, and close to the summit of the divide which forms the boundary-line between the Trout Lake and Ainsworth Mining Divisions. C. T. Porter, of Spokane, who is one of the principal owners, improved the trail up Healey creek and built a new trail to the *Jewel* camp. No work was done on either of the properties. The natural outlet for the Hall Creek properties is via the Duncan river, but they can either be reached by Healey creek from Gerrard or from Howser by way of the Duncan river.

*Old Gold.*—Situated at a distance of about thirteen miles from Ferguson. This property, which has been intermittently operated for a number of years, is greatly handicapped by lack of transportation facilities. The ore has to be packed out over the Ainsworth-Trout Lake divide down to Trout lake. A few men were working at the property during the summer.

#### Slocan Mining Division.

##### SANDON CAMP.

Conditions in the Sandon camp have been better than for many years past, and the prospects for a large increase in production from the surrounding district is most encouraging, providing market conditions remain favourable.

Clarence Cunningham, who has been carrying on progressive mining and development work at his various properties, has done a lot to stimulate the industry in the Slocan and elsewhere.

Besides the *Queen Bess*, which is proving to be one of the richest mines in the Division, he is operating the following properties, in which, all told, about 250 men are employed: *Idaho-Alamo*, *Sovereign*, *Wonderful*, *Van-Roi*, *Hewitt*, and *Wakefield*.



At *Alamo* a 150-ton concentrator is nearing completion. The plant will be operated by water-power developed from the North fork of Carpenter creek.

The Surprise Mining Company has also been very active this year, and recently acquired the *Ivanhoe* group and adjoining claims of the *Adams* group. The company is also operating the *Bosun* mine, where sixty men are being employed. The ore from this mine is concentrated at the Rosebery mill. The entire output from the properties operated by this company is shipped to the United States for reduction, under arrangements of a long-term contract.

*Slocan Star*.—This mine is now being operated by the Silversmith Mines, Limited, under the management of R. H. Stewart. A large shoot of ore was recently developed on the tenth level, which is the lowest point in elevation in the Sandon camp at which ore has been developed. After nearly a year's idleness the mill was again started in October, and it is to be now hoped that the mine will once more rank among the leading producers of the district.

*Noble Five*.—Work is progressing satisfactorily on the four-compartment vertical raise, being driven to connect the lower workings and the main adit-tunnel with the upper workings.

*Ruth*.—Work has been continued on the driving of the long crosscut.

*Carnation Group*.—A considerable amount of prospecting-work has been done under the direction of George Clarke. Four or five men have been steadily employed.

*Payne*.—Leasers have been on this property, and small shipments have been made to Trail.

*Mountain Con*.—Development-work has been continued. Unfortunately the principal owner, W. Bennett, and another man lost their lives in a snowslide this fall. Mr. Bennett was an old-timer in the Slocan and his loss will be greatly regretted by the mining community.

*Rambler-Cariboo*.—This property has been steadily operated under the management of W. A. Cameron, although during the early part of the year the company suffered material loss from a heavy snowslide.

*Noonday*.—Development-work has been carried on under the direction of Bruce White, who recently died at Nelson from pneumonia, following an attack of influenza. Mr. White was one of the first men to find his way into the Slocan country, and staked the *Slocan Star* in 1891. He was liked and respected by all who knew him, and has done a lot to attract attention to the mineral wealth of the Kootenays.

#### NORTH FORK OF CARPENTER CREEK.

*Jo-Jo*.—Situated at a distance of about six miles from Three Forks and belonging to T. Trenary. Two men were working during the summer. Ten tons of high-grade silver ore was shipped to Trail.

*Milton*.—Adjoining the *Jo-Jo*. R. McPherson, who has worked steadily at this property for a number of years, and has done a phenomenal amount of work single-handed, continued his mining operations during the summer.

*Black Grouse*.—Situated at a distance of two miles from Three Forks. Some work was done by G. Murhard, the owner, during the summer.

The ore from properties on this creek carry high silver values and are low in lead and zinc.

#### SILVERTON CAMP.

This camp has been a little quieter than usual on account of the temporary close-down of the *Standard* mine, which for many years has been the leading shipper of the Slocan. However, further development-work is being done, and it is to be hoped that before long it will again become one of the large shippers. In the meantime the mine is being partly worked under lease by L. McPhee and partner. Small shipments are now being made to Trail.

*Echo*.—This mine, situated above the *Standard* and on the same lead, promises to be an important shipper in the near future. Arrangements have been made to lease the *Standard* mill, and a tramway has been built from the mine to connect with the *Standard* tram. J. P. Bonner is mine superintendent.

*Galena Farm*.—This property was worked during the summer under the supervision of P. Clarke, of Spokane. After a short close-down the mine was leased to the foreman, J. Casey. A new shoot of ore was recently developed.

*Van-Roi and Hewitt*.—These properties are being systematically mined and developed under the management of C. Cuchin Moore. About 100 men are employed.

*Wakefield*.—This property was recently acquired by Clarence Cunningham and is now being developed under the supervision of Oscar White. About seven men are employed.

*L. & H.*—Owned by F. Finland and C. Brandt, of Silverton. The property has had a lot of work done on it and a considerable tonnage of low-grade gold ore has been developed. It should attract attention when economic conditions are more favourable for the mining of this class of ore. The average values run about \$6 a ton in gold. The owners confined their work this summer to the driving of the lower crosscut.

*Midnight*.—Situated near the *Galena Farm*. About a 10-inch width of ore has been uncovered along the bottom of a prospect-drift for a distance of about 70 feet. The ore is a mixture of galena and zinc-blende carrying high silver values. The development-work done by R. MacFarland, of Silverton, the owner, this year consisted of continuing this drift.

*Bosun*.—Besides the mining and development work being carried on in the upper levels of the mine, the lower or No. 6 tunnel is now being driven to tap the vein. This tunnel will gain a depth of nearly 800 feet on the vein at a point under the main workings. A 100-horse-power boiler and a 600-foot Ingersoll Rand compressor have been installed near the lake. S. R. Moore is mine superintendent. Sixty men are employed.

*Molly Hughes*.—Situated on Slocan lake, near New Denver. The property is being mined by the owner, H. Cleaver, of New Denver. A few men are working and a small shipment was made to Trail.

*Lucky Thought*.—This property has been operated by the Consolidated Mining and Smelting Company and a small shipment was made to Trail.

The following is a list of shippers of the Slocan Mining Division, giving the approximate tonnage shipped or milled by each property during the year:—

	Ore, Tons.
Anna group, Sandon .....	17
Best, Rambler .....	37
Canadian, Sandon .....	11
Echo, Silverton .....	90
Freddy Lee, Sandon .....	40
Gem, Sandon .....	70
Idaho-Alamo, Sandon .....	127
Ivanhoe, Sandon .....	53
Jo-Jo, Three Forks .....	10
Lucky Jim, Zincton .....	6,450
No. 1, Sandon .....	81
Noonday, Sandon .....	5
Payne, Sandon .....	72
Queen Bess, Sandon .....	2,710
Rambler-Cariboo, Rambler .....	10,000
Reco, Sandon .....	19
Richmond-Eureka, Sandon .....	66
Silversmith, Sandon .....	2,940
Sovereign, Sandon .....	84
Surprise, Sandon } .....	16,500
Bosun, Sandon { .....	
Wonderful, Sandon .....	32
Standard, Silverton .....	45,000
Galena Farm, Silverton .....	15,000
Van-Roi, Silverton } .....	8,000
Hewitt, Silverton { .....	
Lucky Thought, Silverton .....	129
Molly Hughes, New Denver .....	19

#### Slocan City Mining Division.

There has apparently been more activity in this district than last year. Generally speaking, the ores are "dry ores" containing high silver values, with small percentages of lead and zinc.

*Meteor*.—J. C. Buchanan, who is also interested in the *Lily B.* mine, recently acquired this

property and has started a small gang of men to work. There is said to be 400 tons of ore suitable for shipment on the dump.

*Lily B.*—This season's work was confined to driving a crosscut to tap the vein at a depth. Work was discontinued this fall.

*Arlington.*—M. Davys, of Kaslo, who has secured a lease of the mine and ore-dumps, has started to make shipments from the latter to the Trail smelter. It is estimated that there are approximately 10,000 tons in the dumps, and he proposes to erect a concentrator to treat the second-grade ore, which will not stand shipment.

*Enterprise.*—Situated on Ten-mile creek. Work has recently been started on this property by Earle Hyde, who is confining his attention to the development of a parallel vein on the one which was worked previously. About seven men are employed at the property.

*Ottawa.*—This property has been mined by the Consolidated Mining and Smelting Company and a small shipment made to Trail.

*Black Prince.*—F. Tipping put in a season's work on this property, which is a small but steady shipper.

*Republic.*—G. E. Laird was in charge of the mining operations at this property during the summer.

*Westmount.*—Situated on Ten-mile creek. Worked under lease by H. Lee.

The following shipments were made: *Arlington*, 302 tons; *Ottawa*, 48 tons; *Black Prince*, 30 tons; *Republic*, 14 tons; *Westmount*, 49 tons; *Lily B.*, 15 tons.

#### Nelson Mining Division.

The output from this Division compares favourably with that of last year, while prospecting-work has probably been more active.

#### SHEEP CREEK CAMP.

*Emerald.*—Mining and development work have been steadily carried on with satisfactory results. This property is the largest producer of lead-silver ore in the district. Between twenty and thirty men were employed. According to information received, the mine closed down temporarily on December 7th, upon receipt of advice from the smelter that further shipments would not be acceptable at the present time.

*Ore Hill.*—Mining operations have been carried on under the management of W. De Witt. Four or five men were employed.

*Aspen.*—A few men have been working at this property. A new trail was built between the *H.B.* camp and the mine.

*Reno.*—Situated on Fawn creek, above the *Nugget* mill. W. B. Poole put in a season's work on the property and reports the finding of two new veins. The ore is gold quartz.

*Southern Bell.*—Situated on Wilson creek. The Trail Mining Company was incorporated to develop this property and adjoining claims, which originally belonged to C. E. Wilson, of Salmo. The proposed development is to consist of driving a long crosscut to tap the vein at a depth. A good cabin has been built, but not much mining-work has been accomplished this year.

*Queen.*—This property, together with the *Vancouver*, *Kootenay Belle*, and *Alexandria* claims, has been bonded by A. W. McCune, of New York, who has for many years taken an active interest in the mines of the Kootenay district.

Due to economic conditions brought about by the high price of labour and supplies, the *Queen* closed down in 1916, having produced up to that date over a million dollars in gold. Work has been commenced on a crosscut tunnel running south-easterly across the various properties. The erection of a 200-ton mill is contemplated, should the development come up to expectations. The above may be considered the most important development-work now taking place in the Nelson Division, and will have a far-reaching effect on the Sheep Creek camp.

*Spokane Group.*—This property, which is situated on the easterly side of the Sheep Creek divide, has been developed by the Laib Bros., and twenty tons of high-grade ore has been packed out.

*Yankee Girl.*—Situated near Ymir. This mine has been steadily operated during the year under the management of W. T. McDowell. Shipments have been made to the Greenwood smelter, from which the mine received very favourable smelting rates. Mining operations were tem-



porarily ceased early in December, which may partly be attributed to the closing-down of this smelter.

#### OTHER PROPERTIES.

*Relief*.—Situated near Erie. The season's work has been principally confined to the building of a new flume. Plans are being prepared for reorganization, with a view to obtain more capital in order to continue operations on a larger scale. A. D. Westby is manager.

*California*.—Situated near Nelson. Development-work is being continued. About six men are employed.

*Monarch Group*.—Situated near Beasley. Development-work has been carried on during the year. Four or five men employed. The principal values are in copper.

*Silver King*.—The Consolidated Mining and Smelting Company has had a small crew of men employed during the season.

*Eureka*.—Now being operated by the Inland Mining Company, of Walla Walla, with head office at Nelson. W. M. Myers is mine manager. Work done by the previous owners during the early part of the year consisted of erecting a 1,100-foot 2-bucket tram, new bins, and extending the *Granite-Poorman* tramway for 3,000 feet across Kootenay river to the railway. The ore carries values in gold, silver, and copper. Twelve men are employed.

*Gold Hill*.—A little development-work was done during the year and the bridges on the road leading past the *May & Jennie* mill were repaired. The ore carries high values in gold, silver, and copper.

*Molly Gibson*.—This mine has been operated by the Consolidated Mining and Smelting Company. Motor-haulage from the mill to Kitto Landing was used for the first time this year, and is reported to be considerably more economical than the use of teams.

*Iva Fern*.—Situated on Cultus creek. This mine is owned by J. Mullholland and is being developed under a bond by the Consolidated Mining and Smelting Company, who are now driving a crosscut to intersect the vein at a point below the surface showings.

*Speculator Group*.—Situated on Lockhart creek at a distance of six miles and a half from Kootenay lake. The old trail to the claims was slashed out by R. Yuill and T. Wall, the owners, who have done further work on the showing.

The following is a list of shipments made from the district: *Emerald*, 3,176 tons; *Aspen*, 7 tons; *Eureka*, 766 tons; *Lost Cabin*, 13 tons; *Monarch*, 170 tons; *Ore Hill*, 37 tons; *Queen*, 14 tons; *Spokane*, 20 tons; *Yankee Girl*, 8,000 tons.

#### Trail Creek Mining Division.

The smeltery at Trail has been run continuously throughout the year, but the output will fall a little short of that of last year, which may be attributed partly to higher penalties enforced on the zinc content in lead ores as introduced by Schedule B, and partly to the non-payment for the silver or lead contained in zinc ores and concentrates.

The following is Schedule B as submitted by the company on January 20th, 1918:—

#### " SCHEDULE B—LEAD ORES.

##### " Payments.

" *Gold*.—Pay for 95 per cent. of the assay at \$20 per oz. No pay for gold unless 0.05 oz. per dry ton or over.

" *Silver and Lead*.—Payments for silver and lead will be based upon the zinc contents of the ore on the following schedule:—

" No ore containing more than 25 per cent. zinc will be accepted under this schedule.

##### " Zinc Contents—

		Silver Payment.		Lead Payment.	
4 per cent. or under .....		95	per cent.	90	per cent.
Over 4 per cent. and including	5 per cent. ..	94½	"	89	"
" 5 "	6 "	94	"	88	"
" 6 "	7 "	93½	"	87	"
" 7 "	8 "	93	"	86	"
" 8 "	9 "	92½	"	85	"
" 9 "	10 "	92	"	84	"
" 10 "	11 "	91½	"	83	"

Over 11 per cent. and including 12 per cent. ..				Silver Payment. 91 per cent.	Lead Payment. 82 per cent.
" 12	"	"	13	" .. 90½	" 81
" 13	"	"	14	" .. 90	" 80
" 14	"	"	15	" .. 89½	" 79
" 15	"	"	16	" .. 89	" 78
" 16	"	"	17	" .. 88½	" 77
" 17	"	"	18	" .. 88	" 76
" 18	"	"	19	" .. 87½	" 75
" 19	"	"	20	" .. 87	" 74
" 20	"	"	21	" .. 86½	" 73
" 21	"	"	22	" .. 86	" 72
" 22	"	"	23	" .. 85½	" 71
" 23	"	"	24	" .. 85	" 70
" 24	"	"	25	" .. 84½	" 69

"*Silver* will be paid for to the extent shown by the above schedule on the fire assay at the average of the *Engineering and Mining Journal*, New York, quotations for the second calendar month succeeding the date of sampling at Tadanac, B.C. In no case will the deduction from the silver assay be less than 0.5 oz. per dry ton.

"*Lead* will be determined by the wet method of analysis, from which 1½ units will be deducted to arrive at the dry-lead assay. Lead will be accounted for to the extent shown by the above schedule: Provided, however, that in no case will the deduction from the said dry-lead assay be less than 1 unit or 20 lb. per dry ton. Settlement for lead will be made on the basis of our circular of November 5th, 1917, as modified by our circular of January 18th, 1918.

#### Deductions.

"*Smelting*.—Per dry ton of material \$7.50 as a base rate, which will be modified in accordance with the following formula:—

"(1.) Add to the base rate per ton 9 times the units of zinc shown by analysis at 9 cents per unit.

"(2.) Deduct from this result the total units of silica, iron, manganese, lime, and magnesia at 9 cents per unit:

"Provided that in no case said base rate be reduced more than \$3.50 per ton as the net result of the additions and deductions:

"Provided also that in making the above computation iron, silica, and lime of 1 per cent. or under and manganese and magnesia if 3 per cent. or under will be disregarded.

"*Sulphur*.—A charge will be made in addition to the above for all sulphur contained at 50 cents per unit per dry ton of material, provided that such charge shall not exceed \$4 per ton in any case.

"*Moisture*.—A minimum moisture deduction of ¼ per cent. will be made. The following penalty for moisture will apply to fine concentrates and clayey ore only: If over 5 per cent. charge for contents at 10 cents per dry ton per unit.

"*Flotation Concentrates*.—Flotation concentrates will be charged \$1 extra per dry ton.

"*Size*.—Coarse and fine concentrates and ores must be shipped separately; if over 30 per cent. will pass through a ¼-inch screen; otherwise an extra charge of 50 cents per ton will be made.

"*Sampling*.—If the shipment is less than a car-load or contains more than one lot per car, a deduction will be made for extra sampling, assaying, etc., of \$10 per lot.

"*Weights and Samples* to be used in settlement shall be those made at the smelter.

"*Representation*.—Shippers are expected to notify us as to who will represent them while their shipments are being weighed and sampled. Failure to do so will be construed as meaning that the smelter will have authority to appoint one of the local mine representatives at the shipper's expense, unless the shipper notifies us that a representative is not required. All shipments will be released for smelting as soon as sampled.

"*Assays*.—Shippers will supply the smelter with their assays on smelter pulps shortly after sampling. In case of difference in assays requiring it, the umpire pulp will be referred to an

umpire mutually agreeable. The party whose result is farthest from the umpire's result will pay his fee.

"*Settlement.*—Advances on preliminary settlements will be made as set out in our circular of November 5th, 1917, as modified by our circular of January 18th, 1918. The final settlement for the silver will be adjusted between the parties shortly after the close of the second calendar month succeeding the date of sampling when quotations are available. The final settlement for the lead will be adjusted whenever the pooling arrangement will permit.

"If the present price of coke is changed the above rates will be increased or decreased 25 per cent. of whatever price per ton coke costs, more or less.

"If our present price of labour is changed the above rates will be increased or decreased 1½ cents per ton for each 1 cent change per shift for labour.

"The above rates are subject to change without notice."

#### ROSSLAND CAMP.

The output of the *Le Roi-Centre Star* group has exceeded that of last year, although the production of these mines was greatly curtailed during the latter six months of the year on account of economic conditions not being favourable for the mining and treatment of low-grade ores.

Of the other mines, the production of the *Le Roi No. 2* shows a substantial increase over that of last year, while that of the *White Bear* compares favourably with the previous year.

The *Velvet* mine has been taken over by the Granby Consolidated Mining and Smelting Company, who have had a crew of men steadily employed at development-work.

The following list shows the approximate amount shipped by each property during the year:—

	Tons.
Centre Star-Le Roi .....	89,374
Le Roi No. 2 .....	18,416
White Bear .....	1,408

*Mountain Chief.*—This property is situated within a distance of three miles from Renata, on Arrow lake. The claims are owned by a syndicate composed of M. McDaniels, T. Williams, O. Wheeler, E. McDaniels, F. E. Estey, and G. Thomas. M. McDaniels had charge of the work, which consisted of mining ore from a long open-cut, from which 570 tons has been shipped to Trail. The ore is a mixture of chalcopryite, bornite, and carbonates of copper. Previous shipments show the average value to be: Silver, 2.5 oz.; copper, 3.5 per cent. The ore occurs in the limestone near a contact with an intrusive granitic rock. The work done this summer has been most encouraging, and there appear to be good possibilities for the development of a large body of ore.

#### Revelstoke Mining Division.

*Lanark.*—A hydro-electric plant capable of developing 250 horse-power has been installed on the Illecillewaet. The power is used for running the concentrator and the compressor at the mine. Operations at the mine consisted of further development-work and the prospecting of a new lead which shows up strongly on the surface for a distance of approximately 200 feet. W. B. Dornberg is manager. Ten or twelve men are employed.

*Woolsey Group.*—Situated on Silver creek at a distance of seven miles from Albert canyon. A good trail from the Illecillewaet river to the claims was completed, as was also a bridge across the river. Quite a little excitement was created by reports of the property being bonded to the Mining Corporation of Canada. C. E. Watson, general manager of the company, was prepared to proceed with the development of the claims under an option and upon the recommendation of his engineer, R. O. Randolph. Both of these gentlemen lost their lives in the wreck of the "Princess Sophia," and it is reported that the deal has fallen through. Cabins have been erected on the claims and everything is in readiness for next season's work. The vein is strong and well defined, having a width in places of about 15 feet and containing some excellent exposures of silver-lead ore near the surface. The continuity of the ore has still to be proven by further development; very little prospecting has been done on the vein so far. The ore is principally galena, with a little zinc-blende. The silver values run as high as 80 oz. The zinc and lead are not intimately mixed, while the gangue is quartz, conditions which made it an ore admirably suited for concentration.



Claims were staked above the *Woolsey* group and on the same lead by Gus Hedstrom and O. Sandberg. It was while examining these properties that A. B. Clabon, president of Vancouver Chamber of Mines, lost his life.

*Mastodon*.—Development-work has been continued on this property during the year. The summer's work was confined to exploiting the vein on the surface. This winter work will be devoted to the sinking of the shaft, at the bottom of which there are now some small showings of galena.

Placer-mining on a small scale is carried on every year on the creeks entering the Columbia river in the Big Bend district, but no information has yet come to hand regarding the results obtained from this season's work.

#### WESTERN MINERAL SURVEY DISTRICT, No. 6.

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

(Headquarters, Nanaimo.)

#### INTRODUCTION.

During the past year, while there has been no phenomenal progress in coal and metalliferous mining in the district, there has been a steady advance, which would have undoubtedly been more marked except for the difficulty in obtaining capital, labour, and bottoms for the shipment of ore to Coast smelters. The epidemic which raged throughout Canada and the United States during the last quarter of 1918 had a very marked effect on the mining industry generally, as in many camps there was fully one-third of the normal force of workmen absent from work either by reason of their own sickness or because of sickness in their families. This was particularly noticeable with regard to the coal-mines and the *Britannia* copper-mine.

The high cost for labour and supplies, together with the difficulty in obtaining capital, deterred the prosecution of much development-work in metalliferous mines, but to a great extent this has been offset by new development-work that has been done by the colliery companies of Vancouver island, which will be referred to in detail later in this report.

At the beginning of 1918 it was anticipated that the lack of smelting facilities in this district, owing to the closing-down of the Ladysmith smelter during the later part of 1917, would be removed by that smelter being blown in early in 1918, but all hope from that source had to be abandoned, as the smelter has remained idle except during a few weeks last summer, when about 2,000 tons of copper-gold ore that had accumulated earlier in the year was smelted, after which the plant was again closed down and is still idle.

Wages paid to all classes of miners have advanced steadily during the year, and to such an extent that many coal-miners are receiving as much as \$10 a day and upwards, and the minimum wage since the last increase made on November 1st is about \$5 a day. Wages in the metalliferous mines have been advanced from time to time during the continuance of the war to keep pace with the advancing price of metals. This fact has had a deterrent effect on the progress of gold-mining, because the price of that metal is fixed and does not fluctuate, but, so far as this district is concerned, gold-bearing ores are rarely found, except such ores as carry gold values in association with other metals, and generally the gold content in such ores is very low.

Fortunately there have been no labour troubles that resulted in strikes in this district during the past year, although such were threatened, but the questions in dispute were settled by conferences in which the employers, employees, and Government officials participated.

Early in the year there was considerable agitation with regard to promoting the iron and steel industries in the Province, and as the great bulk of the known iron-ore deposits that occur in British Columbia are found on Vancouver and adjacent islands, this movement naturally created much interest in this district. It resulted in the engagement of Dr. Alfred Stansfield, of Montreal, by the Hon. the Minister of Mines to investigate and report on the possibilities and feasibility of smelting the magnetite ore in electric furnaces. The report has not yet been published, so it is impossible to discuss it in this preliminary statement.

The discovery of a good grade of manganese ore in deposits which promise to develop into ore-bodies of considerable extent was made in the mountains adjacent to Cowichan lake, Vancouver island, during the past summer. Owing to the demand for ferro-manganese on account of the war, this discovery created a good deal of interest, which, however, abated to a great extent when the armistice was signed. The future importance of the occurrence of this mineral

will now depend upon demand and supply, which govern the markets of the world, and whether the demand for ferro-manganese on the Pacific coast is sufficient to warrant the erection of furnaces in British Columbia to supply the demand. A large number of samples taken by different mining engineers from the *Hill 60* group of mineral claims, which contain the deposits most easy of access, assayed from 40 to 50 per cent. manganese, with the silica content of those samples between 13 and 18 per cent., with no iron or phosphorus.

Considerable prospecting was done during last summer for molybdenite ore, and occurrences of that ore were found on Buttie mountain, near Cowichan lake, Vancouver island, also on the mainland near Agassiz, and on the upper Stave river, as well as in the Cheam range, about twenty miles east of the town of Chilliwack. The development-work done on the various mineral claims that contained deposits of this ore was quite limited in extent and no production was reached.

The development-work done on metalliferous mines in the Western Mineral Survey District during 1918 was confined principally to the *Britannia*, *Marble Bay*, *Sunloch*, *Old Sport*, *Monitor*, *Indian Chief*, and *Blue Grouse* mines, which will be further referred to later in this report.

There was a discovery of seepages of oil in the vicinity of Burnaby lake in the spring of 1918, on Land Section 130 in the south-east corner of Burnaby Municipality. The seepages were examined by the writer during the early part of May, and a sample taken showed from analysis that the oil has a paraffin base. The pool sampled was at the root of an old tree, about 4 feet deep and full of oil and water. The seepages appear to occur along a zone where holes had been sunk with a post-auger by J. B. Woodworth, lessee of the land section, some to a depth of 15 feet, in peat marsh, and oil-scum was noticeable on the surface of the water in several of the holes in the marsh.

Later in the year the lessee and associates organized the Spartan Oil Company, Limited, and after securing the advice of W. R. Jewell, Kansas City, U.S.A., geologist and petroleum engineer, decided to bore a test-hole with a diamond-drill at the point selected by Mr. Jewell. This work is progressing at the time of this writing, the drill having reached a depth of 875 feet, with the core showing that the drill is boring in sandstone at that depth.

Copper ore carrying varying values in gold and silver was shipped during 1918 from the following named mines in the Western Mineral Survey District: *Britannia*, *Marble Bay*, *Blue Grouse*, *Ingersoll*, *Indian Chief*, *Monitor*, *Willow Grouse*, and *East Sooke*. The *Britannia* and *Marble Bay* were the only regular shippers, the other mines mentioned being irregular or spasmodic. During the coming year it is expected that the number of shipping mines in this district will be increased by the addition of the *Sunloch*, on Jordan river, and possibly the *Yreka* and *Old Sport*, on Quatsino sound, as well as the *Lucky Four*, in the Cheam range, near the Canadian Northern Pacific Railway.

Iron ore was shipped during 1918 from the bog-iron ore deposit near Mons, on the Pacific Great Eastern Railway, and from the *Good Hope* mineral claim, on the east coast of Texada island, all of which was treated at the Irondale furnace, in the State of Washington.

#### Nanaimo Mining Division.

*Coal-mining.*—As coal-mining is the most important mineral industry in the Western Mineral Survey District, its progress during the past year will be considered in the following report ahead of metalliferous mining. The detailed statistical tables of production are included in the reports made by the several Mine Inspectors, consequently are not reproduced in the following, which is merely a brief description of new mines that have been opened during the past year and of important new development-work performed in old mines.

There have been four new coal-mines opened during the past year, three of which are producing coal on a commercial scale, and the fourth one will be doing so about the middle of 1919. The three new mines to be added to the long list of producing coal-mines on Vancouver island are as follows: The Granby Colliery No. 1, at Cassidy, about eight miles southerly from Nanaimo, owned by the Granby Consolidated Mining, Smelting, and Power Company, Limited. The No. 5 mine, at South Wellington, owned by the Canadian Collieries (Dunsmuir), Limited. The extension to the Grant mine, at Nanoose, owned by the Nanoose Collieries, Limited. The fourth mine, which is not yet a producer, is the Wakesiah, in the Five Acres district, West Nanaimo, owned by the Canadian Western Fuel Company, Limited.

Prospecting for coal with diamond-drilling plants has been carried on at the following localities: Near Chase river by the Canadian Western Fuel Company, Limited; on the company's farm, Five Acres district, West Nanaimo, where the Wakesiah mine is opened; near Craig's Station, on the Alberni extension of the Esquimalt & Nanaimo Railway, by the Canadian Collieries (Dunsmuir), Limited; also at Wellington by the same company, as well as by Harry Shepherd and associates, of Nanaimo. The last-mentioned drilling was done in the expectation of locating the Old Wellington seam at a point where it had not been previously worked, and, as operations were suspended by both the outfits, it is presumed that the results were not satisfactory. Near the mouth of the Chemainus river some foreshore leases were acquired by H. W. Treat and associates, of Seattle, and drilling was commenced at this point in December, 1918.

A new discovery of coal-outcroppings was made last summer on the land of the Canadian Collieries (Dunsmuir), Limited, on the Tsaabl river (sometimes called Baynes Sound river), at a point about five miles up the river from its mouth. The company is opening up a road into the district in order to haul in and install a diamond-drilling plant to prospect the field next year.

The No. 1 East Wellington (Jingle Pot) mine, owned by the British Columbia Coal Mining Company, Limited, situated two miles west of the city of Nanaimo, which was closed down during 1917 because of gob-fire, was reopened during the summer of 1918 to draw the pillars left in the mine.

Following is a brief description of the new mines that have been opened and new work that has been done by the various colliery companies in the Nanaimo and Comox districts, Vancouver island, during 1918:—

The Canadian Western Fuel Company, Limited, Nanaimo, has opened the new mine, called the Wakesiah, on the Wellington seam by sinking two shafts. The air-shaft is down to coal, and connection has been made with the main shaft, which reached coal at a depth of about 325 feet. The development of the property is proceeding, and it is expected that an estimated output of 500 tons of coal a day will be reached by about the middle of 1919. The estimated cost of the plant, railway connecting the mine with the wharves and bunkers on the water-front at Nanaimo, and initial development is approximately \$200,000.

The Granby Consolidated Mining, Smelting, and Power Company, Limited, which started the preparatory work of opening a coal-mine at Cassidy, about eight miles southerly from Nanaimo, in 1917 by prospecting with a diamond-drill, was satisfied with the results and started sinking the main slope on March 7th, 1918. The mine is now opened by three slopes—the manway, hoist, and return airway—and a limited quantity of coal is being hoisted daily, but the proposed plant is not expected to be completed for about a year and a half. The estimated cost of the completed plant, including railway connection with the Esquimalt & Nanaimo Railway, coal-washer, houses for staff, miners, and workmen, is approximately \$1,000,000, when the capacity of the plant will reach about 250,000 tons of coal per annum. The maximum thickness of the coal-seam is 12 feet.

The Canadian Collieries (Dunsmuir), Limited, after having completed the preliminary work commenced in September, 1917, opened the No. 5 mine, at South Wellington, down to the Douglas seam and began producing coal during the summer of 1918. Coal was first exposed by a prospecting shaft 5 x 5 feet, 90 feet deep. A slope was later enlarged to 10 x 12 feet for a ventilating-shaft. A slope has been driven 2,200 feet, which intersects the coal-seam 60 feet south of the prospecting-shaft. Levels to the north and south have been driven at 300 centres. The coal, which is of very good quality, varies in thickness from 2 to 12 feet. The estimated capacity of the mine is about 90,000 tons of coal per annum.

In the old coal-mines the development-work has been carried on as extensively as circumstances permitted. The chief improvements made during the past year are as follows:—

The Canadian Western Fuel Company, Limited, installed a new power-engine (1,300-kw. direct-current generator) at the No. 1 Esplanade mine to replace the generator formerly in use. At the Harewood mine the same company installed the following additions to the former plant: 1,200-kw. generator, two 150-horse-power boilers, and new screening plant. The total estimated cost of the above improvements is about \$42,000.

The Canadian Collieries (Dunsmuir), Limited, carried on the following improvements at the No. 4 mine, Cumberland, in the Comox district: Drove a new tunnel, the mouth of which is 15 feet higher than the entrance to the old slopes. The new tunnel is being driven directly over the old slopes, and when completed will cut out the use of tail-ropes to haul empties back



from long flat from top of those slopes. A new tippie is being built at the same mine, with a Marcus screen installed in the tippie. The capacity of the plant is about 1,000 tons a day.

#### TEXADA ISLAND.

*Metalliferous Mining.*—The only metalliferous mine in the Nanaimo Mining Division that has maintained regular shipments during 1918 is the *Marble Bay* copper-mine, on the east coast of Texada island. During 1918 the following described development-work has been done: After locating an ore-body below the 1,500-foot level, which is 1,360 feet vertical depth below the collar of the main shaft, by diamond-drilling, an incline winze was sunk 125 feet deep on a 45-degree angle at the north-westerly end of the drift on the 1,500-foot level, and a drift driven from the bottom of the incline winze, about 110 feet in length, on the 1,600-foot level, along the strike of a well-defined ore-body showing in the roof of the drift. Stopping was started above the drift on the 1,600-foot level, and the first ore was drawn from the stope on August 8th, 1918.

The ore in this body shows about the same average grade as that mined from higher levels. It is chiefly bornite in a gangue made up of tremolite, garnetite, diopside, quartz, and calcite. On the 1,600-foot level there is also an occurrence of chalcopyrite in a gangue of magnetite, but this has not yet been prospected to determine the extent or grade of the body.

Diamond-drill borings below the 1,600-foot level indicate the occurrence of ore-bodies below that level, but there has not been sufficient prospecting done to determine the conditions. The fact that the ore in the *Marble Bay* mine has maintained continuity to the vertical depth exceeding 1,500 feet, and that there are good indications that ore occurs at still lower depth, is most gratifying, and should encourage further development of the *Copper Queen*, *Cornell*, and *Little Billy* mines, which are in the near vicinity of the *Marble Bay* and in the same geological formation.

The *Good Hope* mineral claim, on Raven bay, on the east coast of Texada island, owned by Harry Walbran, on which occurs a deposit of magnetite, was equipped with tramway and bunkers in 1918, and about 1,000 tons of high grade iron ore shipped to the Pacific Steel Company at Irondale, Washington. The ore was quarried from an open-cut about 20 feet square on the floor and 20 feet high in the face. The shipping facilities are ideal, as the quarry is connected with ore-bins on the shore by a gravity-tramway 140 feet long. Two trestles are built out from the bins, each being 150 feet long and 14 feet high, so that ore can be loaded into both ends of a scow at the same time, at the rate of about 40 tons an hour.

The *Loyal* mineral claim, near the north-east end of Texada island, has been operated during a portion of 1918 under lease by Thos. Davis, of Seattle, but only about 100 tons of copper ore was mined. This was due largely to the fact that serious difficulties were encountered in unwatering the old workings, which had been sunk to a depth of 300 feet. Work was suspended early in November and the camp closed for the winter.

The *Retriever* mineral claim, near the west coast of Texada island, on Surprise mountain, has been the scene of very considerable activity during the past season. The owners, W. H. Lea and Wm. McDonald, reorganized a company that had been promoted by a syndicate of Puyallup operators in 1917, and completed the development-work in the mine started by that company, as well as finishing the auto-road and the construction of an aerial tramway 1,850 feet in length from the mine-workings to a concentrating-mill at the shore. This mill is fully equipped with Faust jigs and concentrating-tables to treat 50 tons of ore a day. A good wharf has been built near the mill, as well as bins for shipping ore or concentrates.

The lime-quarries at both Sturt and Blubber bays have been in operation during 1918. The former furnishes limestone to the Powell River pulp-mills, and the latter to the Granby Consolidated Mining, Smelting, and Power Company, Limited, for flux in the smelters at Anyox.

The *Cornell* copper-mine was not operated during 1918, but an attempt was made to concentrate the tailings that had accumulated from past operations of the mine. Faust jigs were installed for the purpose of effecting a separation of the copper ore in the tailings from the garnetite gangue, but the attempt was a failure owing to the difference in specific gravity not being sufficient between the materials fed into the jigs to permit of concentration by a water process.

Assessment-work was generally performed on several other mineral claims on the island, and limited development-work was done on the *Stromberg* group of mineral claims, near Davis

bay, on the west coast, which was worked by York & Young, of Seattle, under a bond from the owners.

#### GABRIOLA ISLAND.

There was a reorganization of the old Dominion Shales Product Company, Limited, which has been engaged in brick-making on the southerly shore of Gabriola island, and whose plant had been idle for some time past. The Gabriola Island Shale Product Company, Limited, took over the property during the late fall of 1918 and started operations under the superintendence of D. W. Campbell, of Victoria. The plant has a capacity of moulding 20,000 brick a day, and at this writing is running up to its capacity. A good grade of red brick is made from shale, and owing to the excellent transportation facilities the brick is in good demand, because it is placed on the market at all seasons of the year, being hauled on scows from the plant to Vancouver.

The deposit of shale from which the brick is manufactured is mentioned by both Chas. H. Clapp and Heinrich Reis in their reports published by the Canada Geological Survey, but it is only comparatively recently that any attempt has been made to utilize the deposit.

The reorganization has assured the financial basis of the operations, and also a further pay-roll for the Nanaimo Mining Division. The works have recently been visited twice by the writer, and samples of the shale taken for testing, the results of which will appear in the Annual Report of the Minister of Mines.

#### QUADRA (VALDES) ISLAND.

*Ingersoll Group.*—This group of mineral claims at the head of Gowland harbour, on Quadra island, owned by the Valdes Island Copper Company, Limited, of Victoria, has been the only property on the Valdes group of islands that has been worked to any extent during 1918. Some shipments of copper ore have been made during the past season from the property by scows to both the Tacoma and Ladysmith smelters, which have yielded above 4 per cent. copper. The contract made in 1917 between the owners and Jones & Rant for mining and shipping ore having expired, a lease was made to T. H. Kerruish, of the Yukon, who started development-work in a systematic and miner-like manner. He opened up a new ore-body on the *Senator* claim, one of the group, and demonstrated that the mineralized zone was of more extent than had been shown by previous work; also that, while in the past it had been considered that the ore-bodies dipped towards the east at a flat angle, the ore-body he developed dipped towards the west at an angle of 38 degrees. The maximum width of ore exposed in the workings is 7 feet and length of the lens about 100 feet. The mineralization is chiefly chalcocite occurring as impregnations through the gangue material, composed of dark-green amygdaloidal igneous rock which has been very much crushed and rendered almost schistose. The ore-body occurs in a wide fissure in a shear-zone, and is enclosed by well-defined slickensided walls. At the time the property was examined the superintendent was preparing to sink on the mineralized zone and determine the possibilities of the ore-body maintaining continuity at depth. An average sample from the ore-body assayed: Gold, trace; silver, 0.4 oz.; copper, 5.6 per cent.

The *Santa Anna* group, on the east coast of Quadra island, was worked to some extent under a lease.

Assessment-work was done on several mineral claims adjacent to Granite bay, on the north-westerly portion of the island.

#### KNIGHT INLET.

During 1918 there was more attention paid by prospectors to the mountainous sections near the several inlets on the mainland coast than has been the case for several years past.

The Princess Copper Mines, Limited, of 533 Pender Street, Vancouver, of which J. Carmichael is manager, prospected a group of mineral claims near Glendale cove, about twenty miles easterly from Minstrel island, towards the head of Knight inlet, where some deposits of copper ore occur.

The Union Copper Mines, Limited, under the same management, also prospected a group of mineral claims in the same neighbourhood on which some deposits of copper ore occur.

#### FANNY BAY.

T. Golby and associates, of Victoria, operated quite extensively on a group of mineral claims on Fanny bay, on the mainland coast, near the entrance of Bute inlet, where they mined about

100 tons of ore, but were unable to ship to a smelter because of the difficulty in obtaining a scow to carry the ore.

#### Vancouver Mining Division.

*Britannia Mine.*—The operations of the Britannia Mining Company are, of course, far more important than those of any other company in the Western Mineral Survey District, and for that reason the following description of the development-work and improvements that have been carried on during 1918 are given in more detail in this preliminary report.

The following shows the development-work performed in the mine: Drifts, 9,837 feet; crosscuts, 4,427 feet; raises, 8,754 feet; chutes, 1,541 feet; winzes, 36 feet; total, 24,595 feet.

*Development-work.*—In the *Fairview* mine drifts have been extended on previously developed veins, also new ones have been opened up to the south, on which stoping operations have started. The outside glory-holes were worked during the open season (seven months), breaking ore on top of the mountain into large transfer rock-chutes delivering it to the underground crushers with but one handling.

The *Bluff* mine to the west and the *Empress* mine to the east of the *Fairview* have been extensively developed during the year and stoping has been started. Two drifts are being driven west under the *Jane* mine on the 1,200-foot level, developing this ore-body 200 feet below any previous working-level.

During the year another connection through Britannia mountain was made, this being on the 600-foot level, making the fourth level to have portals on both the north and south side of the mountain. Two other levels, the 1,200 and 1,600, are being driven through for connection, the former having approximately 1,600 feet to go and the latter 700 feet.

Work is progressing for the extension of No. 1 shaft from the 1,000-foot level to the 700-foot level, and also the extension of the *Grandview* shaft (No. 3 shaft) from the 500-foot to the 700-foot level. This construction will in time supplement the No. 2 shaft, now operating between the 1,000-foot and 500-foot levels.

A crosscut adit, 8 x 8 feet, known as the Victoria tunnel, to the east of the present *Empress* workings, at the elevation of the 1,800-foot level, has been advanced 400 feet to prospect the extension of the veins in that section of the property. Another crosscut, 8 x 8 feet, known as the Hillside tunnel, is being driven at a point west of the present *Jane* mine at an elevation of the 1,000-foot level. This has advanced approximately 200 feet.

Considerable diamond-drilling has been done during the year, prospecting new areas and also to prove the extension of known ore-bodies. The footages driven in the different mines are as follows: *Fairview*, 15,062 feet; *Empress*, 4,897 feet; *Bluff*, 2,404 feet; *Jane*, 2,071 feet; 3,100-foot tunnel, 690 feet; 2,700-foot tunnel, 1,558 feet; total, 26,682 feet.

The 4,100-foot level tunnel, the portal of which is about the level of the roof of the mill, was advanced 1,735 feet during the year, making the total length 4,220 feet. This tunnel will eventually be used as the main haulage adit. A raise has been started at this level and driven a distance of 100 feet. This raise will be continued to the 3,100-foot level, a distance of 1,130 feet, and from there to the 2,700-foot level, 370 feet. This raise is 7 x 12 feet and is being driven on a 65-degree slope.

The 3,100-foot level east drift was advanced 659 feet, and from this drift another drift 260 feet long has been driven to the location of the proposed raise from the 4,100-foot level, from which point it is proposed to raise to the Armour crosscut, 2,700-foot level, at the westerly end of the tunnel railway. The Armour crosscut has been driven a distance of 502 feet.

The raise from the 4,100-foot level to the 2,700-foot level will be used to transfer the mine ore to the 4,100-foot level, and thence a distance of about 5,000 feet by railway to the mill.

The 2,200 Daisy tunnel was advanced 910 feet, making the total length 1,309 feet, and a crosscut 106 feet long driven to the south.

The Harp tunnel was advanced 811 feet to completion during the year. This tunnel is 2,246 feet long and will be used to divert water for power purposes.

The following tunnels driven for development-work were advanced during the year: Lantz tunnel, advance for year, 60 feet; footage to date, 890 feet. Lloyd tunnel, advance for year, 71 feet; footage to date, 134 feet. Copper mountain tunnel, advance for year, 152 feet; footage to date, 324 feet.



*Equipment.*—Four Westinghouse 3½-ton storage-battery mine locomotives were added to the previous equipment of eight, in addition to which there are in the mine one 6-ton General Electric trolley locomotive and two 3½-ton Westinghouse trolley locomotives.

Fifty-four 2-ton automatic side-dump cars were added to the mine equipment, making a total of approximately 150 cars of this type. Besides these, twenty cars of the same type and size, but built for a 3-foot gauge, were added to the equipment for handling ore broken on the 2,200-foot level and for outside tunnels having a 3-foot gauge.

The present equipment of the tunnel railway consists of ten 20-ton bottom-dump cars; twelve 20-ton side-dump cars; two flat cars; four 15-ton electric locomotives; one 8-ton electric locomotive; and one 40-ton electric locomotive. The 40-ton locomotive was added during the year.

The present equipment of machine-drill sharpeners, including those located at outside tunnels, as well as at the mine proper, consists of nine Leyner machines, four Sullivan, and one Vaughn.

A 3,600-cubic-foot-per-minute compressor, driven by a 600-horse-power output motor, was installed in the Beach power-house.

No new buildings were erected at the mine, with the exception of a concrete storage or root house; outside dimensions 38 x 30 feet, with an inside height of 9 feet at the crown of the arched roof. This is located at the tunnel cook-house and affords an excellent place for the storage of winter vegetables.

#### LYNN CREEK DISTRICT.

The *Mountain Lion* group of mineral claims, on the east side of Lynn creek, near North Vancouver, was operated during a part of the past year by W. F. Dunphy under bond from the Lynn Valley Copper-Gold Mining Company, Limited. The old workings were reopened and some additional development-work was done. It was proposed to ship the ore on the old dumps via an automobile-road constructed up the creek from the intake by the Cotton Contracting Company, of Vancouver, for the Cedars Company, Limited, which built a sawmill about one mile and a quarter above the intake and about one mile below the *Mountain Lion* group. Mr. Dunphy also bonded the Crown-granted mineral claims owned by the Lynn Creek Gold-Copper Mining Company, Limited, which are situated on the west side of Lynn creek, and he proposed working this group in connection with the *Mountain Lion* group. Ore-bins and a camp were constructed at the last-named property, to which the auto-road is to be built. The ore on the dumps at the *Mountain Lion* group is chiefly chalcopyrite in a gangue made up of epidote, a garnet, and hornblende. Grab samples assayed from 3.8 per cent. up to 16.4 per cent. in copper, with traces in gold and about 2 oz. in silver.

#### PACIFIC GREAT EASTERN RAILWAY DISTRICT.

The *Cougar* group of mineral claims, near Mons, on the Pacific Great Eastern Railway, was bonded in 1918 by Dr. Davidson and associates, of Vancouver, who built a spur track from the mine-workings to the railway-track, installed a steam-shovel, and shipped several hundred tons of bog-iron ore to the Pacific Steel Company at Irondale, Washington.

The *Fitzsimmons* group of mineral claims, also near Mons, was bonded during 1918 by the Consolidated Mining, Smelting, and Power Company, of Trail, which started development-work in September last. This property shows all the ear-marks of developing into a big low-grade copper proposition which can apparently be operated on a large scale, providing the ore is amenable to concentration by oil-flotation. It is well situated so far as transportation is concerned, as the distance from the railway is only about three miles, and the elevation about 800 or 1,000 feet above the track.

Quite a little prospecting has been done during the past season in the mountains near this part of the Pacific Great Eastern system, and assessment-work has been done on several claims which were examined by the writer during the latter part of last September. The district appears to warrant thorough and systematic prospecting, especially since the operating of the railway provides excellent facilities for cheap transportation.

#### JERVIS INLET AND HOWE SOUND DISTRICTS.

On both Jervis inlet and Howe sound considerable prospecting-work has been carried on during the past season, also in the mountains in the neighbourhood of the heads of the Indian

river and Seymour creek, and a group of about twenty mineral claims was located on the Mamquam river, a tributary of the Squamish, with the confluence near the head of Howe sound.

#### New Westminster Mining Division.

*Lucky Four Group.*—The most important work done in metalliferous mining in the New Westminster Mining Division is that on the *Lucky Four* group, which occupies a part of the summit of the Cheam range of mountains at the head of Wahleach (Jones) creek, about fifteen miles southerly from Laidlaw Station, on the Canadian Northern Pacific Railway.

This group of claims has been an especially difficult one to prospect, for the reason that an immense glacier covers a large part of the surface, and in order to determine the existence of ore on the northerly slope of the mountain range it was necessary to install a diamond-drill on the glacier and bore through the ice. This prospecting was done in 1917 and the drill-core showed that ore occurred under the glacier.

During 1918 systematic prospecting has exposed an ore-body that occurs on the southerly slope of the mountain range, and is apparently an extension of the occurrence exposed under the glacier on the northerly slope. Development-work is to be carried on by driving an adit under the recently found ore-body, which has been partially crosscut by a deep open-cut. There is a width of 20 feet of chalcopryite ore exposed; an average sample across it assayed: Gold, trace; silver, 2 oz.; copper, 7.6 per cent.

The *Contact* group of mineral claims is about five miles easterly from Agassiz Station, on the Canadian Pacific Railway. This group was acquired during the past autumn by W. A. Tanner and associates, of Seattle, who arranged with John McConville, of Vancouver, to operate the property on a lease. There are occurrences of high-grade copper ore made up chiefly of chalcopryite, associated with which are copper carbonates with some chalcocite and bornite. These occurrences are apparently lenses occurring in limestone country-rock, the gangue being garnetite, epidote, and calcite. The surface is covered with gossan, which forms a capping to the ore. Selected samples assayed: Gold, trace; silver, 4 oz.; copper, 19 per cent.; and gold, trace; silver, 4 oz.; copper, 10.2 per cent. A sleigh-road was being built at the time the writer visited the property in October last for the purpose of hauling ore to the railway at Agassiz.

#### Victoria Mining Division.

The *Sunloch* and the *Blue Grouse* groups of mineral claims have been the only metalliferous-mining propositions that have been operated in the Victoria Mining Division continuously during 1918, and although there have been a few irregular shipments of copper ore from the *East Sooke* and the *Willow Grouse* properties, on Sooke peninsula, the bulk of the production from this Division has been shipped from the *Blue Grouse*, on Cowichan lake, as the *Sunloch*, on the Jordan river, has not yet been developed to the shipping class.

*Sunloch.*—The work on this property has been confined to development in a systematic manner. There has been about 800 feet of drifting and crosscutting and about 400 feet of diamond-drill boring done on this property, in addition to the construction of about 6,000 feet of automobile-road, the installation of a 4-drill compressor plant, and construction of new camp buildings.

*Blue Grouse.*—On this group of mineral claims the work done during the past season has been extending the old underground workings and doing very extensive prospecting by trenching and diamond-drill boring. The ore shipped has been such as was mined from the prospect openings and the underground extensions.

*Manganese Ore.*—The discovery of deposits of manganese ore in the mountains adjacent to Cowichan lake during the past summer attracted considerable attention. These deposits occur in a zone of jasperized cherty rock, and were discovered at three distinct points within a distance of about twenty-five miles; the most south-easterly occurrence, known as *Hill 60*, is about four miles from the foot of Cowichan lake, and the most north-westerly is about eight miles above the mouth of Shaw creek, which empties into the lake about five miles from its head. A limited amount of prospecting-work was done on the various claims by the locators, who propose to do further development in the coming season and place the properties on a shipping basis.

### Alberni Mining Division.

Owing to various causes, and especially the high cost of labour and supplies, the development-work carried on in connection with the mining industry in this district during 1918 failed to reach the proportions indicated early in the season as likely to be accomplished; there being no mineral claims in the Division that were developed up to the stage of regular shippers at the beginning of the year, and the owners of most of the prospects being poor men with a large proportion away on military service, it is no wonder that the high costs retarded development.

The *Monitor* mine is situated about seventeen miles down the Alberni canal from Port Alberni. The most serious attempt at fully developing a shipping mine was carried on at this property, where a compressor plant, ore-bins with a capacity to hold about 1,000 tons, and wharf were built near the portal of the main drift-adit on the ore-body known as the *Leonard* showing. The adit was extended about 100 feet, an upraise made partly in ore to a height of about 75 feet, and two other upraises were started. The mine was closed down temporarily about September, after a shipment of ore had been made to the Tacoma smelter of about 125 tons, because the results showed that the property belonged to the concentrating class rather than to the smelting direct, and that very considerably more development-work was necessary to block out available ore before the erection of a concentrating plant was considered.

The *Canadian* group of mineral claims, on Alberni canal, was further prospected by Wm. Hutton, one of the owners, and a dump containing about 100 tons of good-grade chalcopryite ore has been accumulated ready for shipment.

The *Big Interior* group of mineral claims, about twelve miles northerly from the head of Great Central lake, was examined during the summer of 1918 by Messrs. Archibald and Kilbourne, mining engineers for the Consolidated Mining, Smelting, and Power Company, of Trail. The report made by these gentlemen has, of course, not been made public, and so far as is known no deal has been made for the property.

### Clayoquot Mining Division.

The *Indian Chief* mine, on Sidney inlet, has been the only mining proposition in this Division that has been at all active during 1918. A reorganization of the old Tidewater Copper Company has been effected, the new corporation being registered in British Columbia. A new management has been appointed and is at present engaged in extending the development-work in the mine in order to determine the actual tonnage of ore available for concentrating. Water-power is to be developed to replace steam for power purposes, and if the development-work in the mine demonstrates that it is advisable, the capacity of the present concentrating-mill will be increased.

During 1918 the mine and mill were operated during a portion of the year, the mill being closed down in the summer, since when a force of miners has been engaged in development. Concentrates and such shipping-ore as was mined as the development-work progresses have been shipped to the Tacoma smelter.

### Quatsino Mining Division.

The *Old Sport* group of mineral claims, on Elk lake, near Quatsino sound, has been active during 1918; the development-work on the 400-foot level in the incline winze has been extended, and diamond-drill boring has been done on the southerly end of the main mineral-bearing zone. It is reported that the Consolidated Mining, Smelting, and Power Company has completed the payment for the property, and it is assumed that in the near future work will be commenced on construction of the railway that has been surveyed to connect the mine with deep water on Quatsino sound.

The *Yreka* group of mineral claims, on the South-east arm of Quatsino sound, has been idle during the past year, but late in the fall this property was examined for the newly organized Tidewater Copper Company, Limited, by Wesly Warren, the former mine manager, and a bond secured from James Breen and associates, the owners, of Butte, Montana, for the purchase. It is the purpose of the Tidewater Copper Company to extend the development-work on the *Yreka* property, and if the results are satisfactory, to mine ore and ship to the concentrating-mill on the *Indian Chief* group, Sidney inlet.

A geological survey has been carried on in the Quatsino Mining Division during 1918 by Victor Dolmage, of the Canada Geological Survey.



## PROFITS OF MINING COMPANIES.

The following statement shows the dividends declared by operating metalliferous-mining companies during the calendar years 1914, 1915, 1916, 1917, and 1918:—

Name of Company.	1914.	1915.	1916.	1917.	1918.
Consolidated Mining and Smelting Co., Trail .....	\$ 464,376	\$ 493,425	\$ 841,050	\$ 996,503	\$ 1,047,744
Granby Co. ....	449,955	449,955	1,049,896	1,499,848	1,499,848
Standard Silver-Lead Mining Co., Silverton.....	475,000	250,000	600,000	300,000	.....
Hedley Gold Mining Co. ....	300,000	300,000	240,000	240,000	144,000
Le Roi No. 2, Ltd., Rossland.....	.....	58,440	.....	29,199	.....
Rambler-Cariboo Mines, Ltd., Three Forks .....	.....	35,000	70,000	35,000	.....
Utica .....	.....	.....	137,500	64,000	.....
Mother Lode .....	.....	.....	.....	.....	.....
Totals.....	\$1,689,331	\$1,586,820	\$2,938,446	\$3,164,550	\$2,691,592

The amount of \$2,691,592 shown above as distributed profits for the year 1918 by no means represents the total of net profits earned during that year. A glance at the published accounts of several of the companies for their respective last fiscal years will make it clear that in these several instances there was as well a substantial sum placed to the credit of Profit and Loss Account.

It will be noticed that the Standard Silver-Lead Company suspended dividends in 1918, although the company operated and made a profit. None of the coal companies are listed as dividend-payers, but doubtless profits were made. Similarly, profits accruing to small companies and individual mining enterprises as a rule are not given publicity as dividends as is the case with the large companies, so that no record of these profits, which in the aggregate are considerable, is available.

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