Minister of Mines

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

For the Year ended 31st December

1948

VICTORIA, B.C.:
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1949.

BRITISH COLUMBIA DEPARTMENT OF MINES

VICTORIA, B.C.

Hon. R. C. MACDONALD, *Minister.*

JOHN F. WALKER, *Deputy Minister.*

JAMES STRANG, *Chief Inspector of Mines.*

G. CAVE-BROWNE-CAVE, *Chief Analyst and Assayer.*

HARTLEY SARGENT, *Chief Mining Engineer.*

P. J. MULCAHY, *Chief Gold Commissioner*

To His Honour CHARLES ARTHUR BANKS, C.M.G.,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Mining Industry of the Province for the year 1948 is herewith respectfully submitted.

R. C. MACDONALD,
Minister of Mines.

Minister of Mines' Office,
May, 1949.

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By Hartley Sargent.

The value of British Columbia mineral production in 1948 was $152,524,752. This record value may be compared with $113,221,254, the 1947 value, and with $60,525,000, the average value for the preceding twenty-five years. There were moderate increases in the quantities of all the principal metals and of structural materials in 1948, but the great increase in value can be traced in a great measure to substantially increased unit prices for copper, lead, zinc, and coal and to a moderate increase in the price of silver. Quantities and values of the principal products for 1948 and 1947 are given in Table I (p. 13). Metal prices for each year beginning with 1901 are given in Table II (p. 14). The valuation of coal is the subject of a paragraph on page 12.

The quantities of the principal products mined in 1948 are considerably greater than in several recent years when the output was reduced because of war conditions and strikes. In quantity, placer gold, silver, and copper were considerably less than the average for the last twenty-five years, while lode gold, lead, and zinc were not very far from the twenty-five-year average; however, the high prices for silver, copper, lead, and zinc in 1948 gave the output of these five metals a combined value of approximately $126,500,000, compared with $55,500,000 in 1938, and an average of about $47,200,000 for the last twenty-five years.

Antimony, bismuth, cadmium, tin, tungsten, and sulphur had a combined value of $5,190,660 in 1948. The price for tungsten concentrates fell from $30 to $24.50 per unit of tungstic oxide during 1948. The Emerald mill has been converted to treat lead-zinc ore, and the production of tungsten concentrates has been suspended.

Coal production in 1948 was 1,809,018 short tons, compared with 1,923,573 short tons in 1947. The 1948 output was somewhat less in quantity than the average for the nineteen-forties but was considerably greater than in the nineteen-thirties. Because of the increased price, the value was the highest for any year since 1929. Production on Vancouver Island has been reduced in recent years because of the declining output of the Nanaimo field. The Tsable River mine near Comox has been under development, and when it reaches full production, an increase in the Vancouver Island output is expected. Since 1940 well over half the output for the Province has come from the Crowsnest Pass field, and in the past two years production from strip mines in that field has amounted to an important part of the total output. Strip mining has also been started in the Princeton field.

Exploratory work has demonstrated that the gypsum deposit, discovered in 1947, near Windermere is very large. It is proposed to ship crude gypsum from this deposit to a processing plant to be built near Spokane. Exploratory work was done on a deposit of asbestos (variety anthophyllite) near Okanagan Falls.

The output of cement, clay products, sand, gravel, and other structural materials was high in 1948. The loss of the Kilgard plant of the Clayburn Company by fire, early in 1949, will seriously reduce the output of clay products until a new plant is built.

Drag-line dredges accounted for most of the placer gold recovered in 1948. After construction of 68 miles of road from the Alaska Highway a dredge was built on McDame Creek and was operated from May until the end of the season. A new dredging operation was begun on Pine Creek. These two new dredges and the dredge of the Swift River Dredging Company recovered most of the placer gold mined and were responsible for the considerable increase over the 1947 output. The Atlin placer-mining area had another very quiet season, and there was less than usual activity in hydraulic mining in the Cariboo. The Lowhee hydraulic mine, which has been operated each year since about the beginning of the century, was operated successfully by four men on a lay; company operation of the mine ended in 1947.

In 1948 lode-gold mining may have passed the most difficult part of a very unfavourable period, marked first by war-time difficulties in obtaining men, supplies, and equipment, and subsequently by greatly increased prices for materials, greatly increased wages, shortage of labour, and the loss of the exchange premium. Unit costs are still high, but more labour is obtainable and some benefit is being received under the "Emergency Gold Mining Assistance Act."

The Silbak Premier mine was shut down in July and the Privateer was shut down in November. Production began at the Premier mine in 1918, and continued under the name of Silbak Premier when the adjoining Premier, B.C. Silver, and Sebakwe properties were consolidated in 1935. The combined production amounted to about 1,750,000 oz. of gold and 37,000,000 oz. of silver, as well as some copper, lead, and zinc. Dividends paid amounted to more than $21,000,000. The mine was not eligible for assistance under the "Emergency Gold Mining Assistance Act" because silver, lead, and zinc were contributing more than 30 per cent. of the value of the output. The Polaris-Taku, Cariboo Gold Quartz, Island Mountain, Bralorne, Pioneer, Nickel Plate, and Hedley Mascot mines were operated throughout the year. Milling was resumed late in the year at the Sheep Creek mine.

Prevailing high prices stimulated interest in silver and base-metal properties, and substantial progress was made in development programmes and in provision of plants. The major copper producers operated continuously. A mill was built at the gold-copper property of Vananda Mining Company at Vananda, and exploratory work was done on properties near Nicola and Phoenix.

Silver and silver-lead-zinc properties in widely separated parts of the Province received much attention. At the Sullivan mine the new main haulage-level was nearly completed and changes were being made in the mill. Exploratory work and development were done by the Consolidated Mining and Smelting Company on properties at Riondel, near Nakusp, and at Tulsequah. Other companies did work on properties in the East Kootenay, Slocan-Ainsworth, and Nelson areas, and at Hazelton and Alice Arm. The Sullivan, Base Metals, Lucky Jim, Whitewater, Western Exploration, and Highland Bell mines were the principal producers of silver-lead-zinc and silver ore. The Britannia mine, in addition to copper, produced a substantial quantity of zinc concentrates. Ore from several properties was milled on a customs basis at the Western Exploration and Whitewater concentrators. A new mill at the Silver Standard mine at Hazelton came into production in September, a mill for the Torbrit silver mine was essentially complete by the end of 1948, and preparations for production of lead-zinc ore were well advanced at the Emerald and the Reeves MacDonald properties.

The high prices for silver, lead, and zinc made it possible to ship ores and concentrates long distances. In 1948 shipments were made to the Trail smelter from Australia, Hong Kong, Peru, and Quebec, as well as from northern Washington.

Late in 1948, production of iron ore for export to a ferro-alloy plant at Wenatchee, Wash., was begun near Quinsam Lake, Vancouver Island.

Production was recorded in 1948 from 99 lode-mining operations, including gold mines, copper mines, silver and silver-lead-zinc mines, one tungsten mine, and one producer of siliceous flux. These numbers include properties from which shipments of a few tons were made as well as the large producers. The total quantity* of ore mined in 1948 was 5,766,970 tons. The net value of the output of lode mines was $101,519,910. The quantity of coal mined was 1,809,018 tons. The average number employed in all branches of the mining industry was 16,397, salaries and wages totalled $38,813,486, expenditures for fuel and electricity amounted to $6,139,174, and for process supplies amounted to $11,532,181; Dominion taxes amounted to $16,974,914, Provincial taxes to $5,141,148, and municipal and other taxes to $475,516; Workmen's Compensation, silicosis, unemployment insurance, and other levies amounted to $1,530,238; dividends paid in 1948 amounted to $37,672,319.

* Including tungsten ore and siliceous flux from lode mines.

Statistics.

Mining statistics are collected and compiled and the statistical tables for this Report are prepared by the Bureau of Economics and Statistics, Department of Trade and Industry.

METHOD OF COMPUTING PRODUCTION.

The tables of statistics recording the mineral production of the Province for each year are compiled from certified returns made by the operators of mines, augmented by some data obtained from the Dominion of Canada assay office and from the operators of customs smelters. The value of each mineral product, in Canadian funds, is calculated at the average price for the year (*see* below). The quantities of metals are net after making deductions for losses in smelting and refining.

In preparing the statistics for the 1925 Annual Report, changes were made in the procedures for computing the quantities and values of metals produced, but the general style of the tables was not changed. The procedures adopted for the 1925 Report are still used essentially unchanged, and the same arrangement of tables has been retained, but new tables have been added from time to time.

Production figures, given in notes dealing with individual lode-mining operations on later pages of this Annual Report, are the assay contents of the products shipped (ore, concentrates, or bullion), no deductions being made for losses in smelting and refining. In previous Annual Reports the production figures given for individual properties are net, deductions for smelting and refining losses having been made from the assay contents, in accordance with the procedures adopted by the Dominion Bureau of Statistics and the co-operating Provincial Departments of Mines.

METALS.

Placer Gold.

The data on placer-gold production were very largely obtained from the Gold Commissioners until 1925. The value of placer gold in dollars is now obtained from returns received annually from the operators. At the old standard price, $20.67 per ounce of fine gold, $17 was regarded as a close approximation of the average value per ounce of crude placer gold produced in British Columbia. Dividing the production reported in dollars by 17 gave the equivalent in crude ounces. Beginning with 1932 the average value per crude ounce has been based on the same fineness but has recognized the varying price of gold. For the years 1940 to 1945, inclusive, the price per fine ounce was $38.50 in Canadian funds, and the equivalent average value per crude ounce was $31.66. The official price for gold in Canada was reduced to $35 per fine ounce, effective July 5th, 1946; the average price for the year was approximately $36.75; the equivalent average price per crude ounce was $30.22. The price per fine ounce in 1947 and 1948 was $35 and the equivalent price per crude ounce was $28.78.

Lode Metals, Net Contents.

From the total assay contents of silver, copper, lead, and zinc, the net contents are calculated by making deductions for smelting and refining losses at rates agreed upon with the Dominion Bureau of Statistics and co-operating Provincial Departments of Mines. For the procedure prior to the year 1925, *see* foot-note under Table II, page 14.

Average Prices.

In the interests of uniformity the Statistical Bureaus of the Provinces and the Dominion Bureau of Statistics use the same average metal prices in valuing mineral production. Up to and including the year 1939 the prices used in evaluating metal and mineral production were:—

Gold and Silver.—The average United States prices for the year, as quoted in the Engineering and Mining Journal, converted into Canadian funds at the average exchange rate.

Copper, Lead, and Zinc.—The average London Metal Market prices for the year converted into Canadian funds at the average exchange rate. Until 1932 the New York price for copper was used.

Suspension of trading on the London Metal Exchange in September, 1939, and the controls of metals during the war years necessitated changes from the procedures which had been followed.

The method of arriving at the price for gold continued unchanged, but the prices for the metals controlled were those set by the Canadian Metals Controller. In 1945 the controls were largely removed from sales but not from prices. Control of metal prices ended on June 6th, 1947. For 1945 and subsequent years the prices are those computed by the Dominion Bureau of Statistics, using information supplied by the principal Canadian refiners of silver and the base metals.

In the period 1945–47 the prices received for silver, lead, and zinc sold for use in Canada were substantially less than the prices received for these metals exported to the United States. The prices for silver in 1945 and 1946 and for copper, lead, and zinc in 1946 and 1947 are weighted averages, taking into consideration sales in Canada at the ceiling prices and sales abroad at New York prices converted into Canadian funds.

For the years 1940–45 the price for gold in Canada was $38.50 per ounce. Since July 5th, 1946, the price has been $35 per ounce. The average price used for 1946 was $36.75 per ounce.

In computing the average metal prices for 1948, the Dominion Bureau of Statistics used generally the monthly quotations in the Engineering and Mining Journal and, where possible, evaluated at the world market. For some metals such as silver, antimony, and tin, Montreal quotations have been used.

In addition to metal sold in Canada, British Columbia silver, lead, and zinc are exported to the United States, Great Britain, and other markets abroad, and for some years all British Columbia copper has been sold in the United States. If the United States prices had been used instead of the Dominion Bureau of Statistics average price, additional amounts could be credited to the copper production values, as follows: 1943, $473,845; 1944, $315,815; 1945, $82,728; 1946, $458,513; 1947, $515,614; a total for the five years of $1,846,515. It is to be noted that 1948 copper production is valued at the United States average for export f.o.b. refinery.

Fuel.

In 1926 a change was made in computing coal and coke statistics. The practice in former years had been to list as coke production only the coke made in bee-hive ovens, the coal used in making it not being listed; coke made in by-product ovens was not listed as coke, but the coal used in making this coke was credited as coal production. The result was that both the coal and the coke production figures were incomplete. Starting with the 1926 Annual Report, the standard practice of the Bureau of Statistics, Ottawa, has been adopted. This consists of crediting all coal produced, including that used in making coke, as primary mine production. Coke-making is considered a manufacturing industry. As it is, however, of interest to the mining industry, a table included in the Report shows the total coke produced in the Province, together with by-products, and the values given by the producers. This valuation of coke is not, of course, included in the total gross mine production of the Province.

Coal production is given in Table XIV. Up to and including the year 1947, production was recorded in long tons (2,240 lb.). Beginning with 1948, production is given in short tons (2,000 lb.). The quantity of coal produced in the preceding years has been recalculated in short tons.

From 1918 to 1930, coal production was valued at $5 per long ton. In 1931 the price used was $4.50, and from 1932 to 1946 the price used was $4.25 per long ton. For 1947 the price used was $5 per long ton. For 1948 the price used was $6 per short ton.

TABLE I.—BRITISH COLUMBIA MINE PRODUCTION,* 1947 AND 1948.

	Quantity, 1947.	Quantity, 1948.	Value, 1947.	Value, 1948.	Per Cent. Increase (+) or Decrease (—). Quantity.	Value.
METALLICS.			$	$		
Antimony			384,255	113,173		—70.6
Bismuth			560,183	444,000		—20.7
Cadmium			941,266	1,126,437		+19.7
Copper lb.	41,783,921	43,025,388	8,519,741	9,616,174	+3.0	+12.9
Gold, lode fine, oz.	243,282	286,230	8,514,870	10,018,050	+17.6	+17.6
Gold, placer crude, oz.	6,969	20,332	200,585	585,200	+191.7	+191.7
Iron ore				3,735		
Lead lb.	306,400,709	332,996,351	41,884,977	60,072,542	+8.7	+43.4
Platinum			59	21,175		
Silver oz.	5,707,691	6,718,122	4,109,538	5,038,592	+17.7	+22.6
Tin lb.			517,794	688,567		+33.0
Tungsten concentrates			680,792	1,409,297		+107.0
Zinc lb.	268,450,926	296,012,941	30,147,039	41,234,603	+10.3	+36.8
Totals			96,461,099	130,371,545		+35.2
FUEL.						
Coal (2,000 lb.) tons	1,923,573	1,809,018	8,587,380	10,854,108	—6.0	+26.4
NON-METALLICS.						
Barites, diatomite, and mica			52,362	25,734		—49.0
Fluxes—limestone, quartz tons	102,918	83,389	174,655	248,977	—19.0	+42.6
Granules—slate and rock, talc tons	1,156	4,958	19,686	68,937	+329.0	+250.2
Gypsum and gypsum products			523,298	546,707		+4.5
Iron oxides			464	30,472		
Sodium carbonate tons	163		1,793			—100.0
Sulphur† tons	157,161	144,448	1,503,714	1,409,156	—8.1	—6.3
Totals			2,275,972	2,330,877		+2.4
CLAY PRODUCTS AND OTHER STRUCTURAL MATERIALS.						
Clay Products.						
Brick—						
Common No.	4,318,000	3,810,000	122,660	111,300	—11.7	—9.3
Face, paving, and sewer brick No.	1,232,812	2,584,752	64,849	129,268	+109.6	+99.4
Fire-bricks, blocks			389,899	392,458		+0.7
Fire-clay tons			9,675	32,922		+240.3
Structural tile—hollow blocks			158,276	116,513		—26.4
Drain-tile, sewer-pipe No.	1,962,583	2,385,470	361,975	597,541	+21.5	+65.1
Pottery—glazed or unglazed			3,476	5,138		+47.8
Other clay products: bentonite			9,332	9,611		+3.0
Totals			1,120,142	1,394,751		+24.5
Other Structural Materials.						
Cement			1,896,772	2,441,304		+28.7
Lime tons	151,671	209,453	714,126	1,177,632	+38.1	+65.0
Sand and gravel			1,828,919	3,060,535		+67.3
Stone tons	19,835	3,579	119,971	54,220	—82.0	—54.8
Rubble, riprap, crushed rock tons	222,044	896,780	216,873	839,780	+303.9	+287.2
Totals			4,776,661	7,573,471		+58.3
Total value			113,221,254	152,524,752		+34.7

* For information on computing and evaluating mine production, *see* pages 11 and 12.

† Sulphur content of pyrites shipped and estimated sulphur contained in sulphuric acid made from waste smelter-gases.

TABLE II.—Average Metal Prices* used in compiling Value of Provincial Production of Gold, Silver, Copper, Lead, and Zinc.

Year.	Gold, Fine Ounce.	Silver, Fine Ounce.	Copper, Lb.	Lead, Lb.	Zinc, Lb.
	$	Cents.	Cents.	Cents.	Cents.
1901	20.67	56.002 N.Y.	16.11 N.Y.	2.577 N.Y.	.....
1902	.....	49.55 ,,	11.70 ,,	3.66 ,,	.....
1903	.....	50.78 ,,	13.24 ,,	3.81 ,,	.....
1904	.....	53.36 ,,	12.82 ,,	3.88 ,,	.....
1905	.....	51.33 ,,	15.59 ,,	4.24 ,,	.....
1906	.....	63.45 ,,	19.28 ,,	4.81 ,,	.....
1907	.....	62.06 ,,	20.00 ,,	4.80 ,,	.....
1908	.....	50.22 ,,	13.20 ,,	3.78 ,,	.....
1909	.....	48.93 ,,	12.98 ,,	3.85 ,,	.....
1910	.....	50.812 ,,	12.738 ,,	4.00 ,,	4.60 E. St. L
1911	.....	50.64 ,,	12.38 ,,	3.98 ,,	4.90 ,,
1912	.....	57.79 ,,	16.341 ,,	4.024 ,,	5.90 ,,
1913	.....	56.80 ,,	15 27 ,,	3.93 ,,	4.80 ,,
1914	.....	52.10 ,,	13.60 ,,	3.50 ,,	4.40 ,,
1915	.....	47.20 ,,	17.28 ,,	4.17 ,,	11.25 ,,
1916	.....	62.38 ,,	27.202 ,,	6.172 ,,	10.88 ,,
1917	.....	77.35 ,,	27.18 ,,	7.91 ,,	7.566 ,,
1918	.....	91.93 ,,	24.63 ,,	6.67 ,,	6.94 ,,
1919	.....	105.57 ,,	18.70 ,,	5.19 ,,	6.24 ,,
1920	.....	95.80 ,,	17.45 ,,	7.16 ,,	6.52 ,,
1921	.....	59.52 ,,	12.50 ,,	4.09 ,,	3.95 ,,
1922	.....	64.14 ,,	13.38 ,,	5.16 ,,	4.86 ,,
1923	.....	61.63 ,,	14.42 ,,	6.54 ,,	5.62 ,,
1924	.....	63.442 ,,	13.02 ,,	7.287 ,,	5.39 ,,
1925	.....	69.065 ,,	14.042 ,,	7.848 Lond.	7.892 Lond.
1926	.....	62.107 ,,	13.795 ,,	6.751 ,,	7.409 ,,
1927	.....	56.37 ,,	12.92 ,,	5.256 ,,	6.194 ,,
1928	.....	58.176 ,,	14.570 ,,	4.575 ,,	5.493 ,,
1929	.....	52.993 ,,	18.107 ,,	5.050 ,,	5.385 ,,
1930	.....	38.154 ,,	12.982 ,,	3.927 ,,	3.599 ,,
1931	.....	28.700 ,,	8.116 ,,	2.710 ,,	2.554 ,,
1932	23.47	31.671 ,,	6.380 Lond.	2.113 ,,	2.405 ,,
1933	28.60	37.832 ,,	7.454 ,,	2.391 ,,	3.210 ,,
1934	34.50	47.461 ,,	7.419 ,,	2.436 ,,	3.044 ,,
1935	35.19	64.790 ,,	7.795 ,,	3.133 ,,	3.099 ,,
1936	35.03	45.127 ,,	9.477 ,,	3.913 ,,	3.315 ,,
1937	34.99	44.881 ,,	13 078 ,,	5.110 ,,	4 902 ,,
1938	35.18	43.477 ,,	9.972 ,,	3.344 ,,	3.073 ,,
1939	36.14	40.488 ,,	10.092 ,,	3.169 ,,	3.069 ,,
1940	38.50	38.249 ,,	10 086 ,,	3.362 ,,	3.411 ,,
1941	38.50	38.261 ,,	10.086 ,,	3.362 ,,	3.411 ,,
1942	38.50	41.166 ,,	10 086 ,,	3 362 ,,	3.411 ,,
1943	38.50	45.254 ,,	11.75 ,,	3.754 ,,	4.00 ,,
1944	38.50	43.000 ,,	12.000 ,,	4.500 ,,	4.300 ,,
1945	38.50	47.000 ,,	12.550 ,,	5.00 ,,	6.440 ,,
1946	36 75	83.650 ,,	12.80 ,,	6.75 ,,	7.81 ,,
1947	35.00	72.000 ,,	20.39 ,,	13.67 ,,	11.23 ,,
1948	**35.00**	**75.000** Mont.	**22.35** U.S.	**18.04** ,,	**13.93** ,,
Average, 1944–48 (inc.)	36.75	64.130	16.018	9.59	8.75

* Prices are in Canadian funds. The bases for the prices listed are discussed under "Methods of computing Production," *see* pages 11 and 12.

Prior to 1925 the average prices for gold and copper are true average prices, but, as a means of correcting for losses in smelting and refining, the prices of other metals were taken at the following percentages of the year's average price for the metal: Silver, 95 per cent.; lead, 90 per cent.; and zinc, 85 per cent. For 1925 and subsequent years the value has been calculated using the true average price and the net metal contents, *see* pages 11 and 12.

TABLE III.—TOTAL PRODUCTION FOR ALL YEARS UP TO AND INCLUDING 1948.

Gold, placer	$93,559,097
Gold, lode	355,763,299
Silver	174,820,797
Copper*	358,621,346
Lead	483,484,511
Zinc	333,788,103
Coal and coke	455,420,853
Structural materials	116,827,466
Miscellaneous metals, minerals, and materials	62,733,129
Total	$2,435,018,601

* *See* last paragraph under "Average Prices," page 12.

TABLE IV.—PRODUCTION FOR EACH YEAR FROM 1852 TO 1948, INCLUSIVE.

1852 to 1895 (inclusive)	$94,547,370	1923	$41,304,320
1896	7,507,956	1924	48,704,604
1897	10,455,268	1925	61,492,242
1898	10,906,861	1926	67,188,842
1899	12,393,131	1927	60,729,358
1900	16,344,751	1928	65,372,583
1901	19,671,572	1929	68,245,443
1902	17,486,550	1930	55,391,993
1903	17,495,954	1931	34,883,181
1904	18,977,359	1932	28,798,406
1905	22,461,325	1933	32,602,672
1906	24,980,546	1934	42,305,297
1907	25,882,560	1935	48,821,239
1908	23,851,277	1936	54,081,967
1909	24,443,025	1937	74,475,902
1910	26,377,066	1938	64,485,551
1911	23,499,072	1939	65,681,547
1912	32,440,800	1940	75,701,155
1913	30,296,398	1941	78,479,719
1914	26,388,825	1942	75,551,093
1915	29,447,508	1943	65,892,395
1916	42,290,462	1944	54,923,803
1917	37,010,392	1945	63,343,949
1918	41,782,474	1946	71,807,951
1919	33,296,313	1947	113,221,254
1920	35,543,084	1948	152,524,752
1921	28,066,641	Total	$2,435,018,601
1922	35,162,843		

TABLE V.—Quantities and Value of Mine Products for 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, and 1948.

Description.	1939.		1940.		1941.		1942.		1943.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer ..... oz.	49,746	$1,478,492	39,067	$1,236,928	43,775	$1,385,962	32,904	$1,041,772	14,600	$462,270
Gold, lode ..... oz.	587,180	21,221,272	583,416	22,461,516	571,026	21,984,501	444,518	17,113,943	224,403	8,639,516
Silver ..... oz.	10,771,585	4,361,199	12,327,944	4,715,315	12,175,700	4,658,545	9,677,881	4,080,775	8,526,310	3,858,496
Copper* ..... lb.	73,254,679	7,392,862	77,980,223	7,865,085	66,435,583	6,700,693	50,097,716	5,052,856	42,307,510	4,971,132
Lead ..... lb.	378,743,763	12,002,390	485,364,420	16,317,952	490,185,657	16,480,042	463,269,005	15,575,104	405,285,476	15,214,417
Zinc ..... lb.	278,409,102	8,544,375	310,767,251	10,600,271	363,302,195	12,392,238	396,857,260	13,536,801	335,137,014	13,405,481
Coal ..... tons, 2,240 lb.	1,477,872	6,280,956	1,667,827	7,088,265	1,802,353	7,660,000	1,938,158	8,237,172	1,821,654	7,742,030
Structural materials	.....	1,832,434	.....	2,534,840	.....	2,845,262	.....	3,143,382	.....	3,039,148
Miscellaneous metals, minerals, and materials	.....	2,567,567	.....	2,880,983	.....	4,372,476	.....	7,769,288	.....	8,559,905
Totals	.....	$65,681,547	.....	$75,701,155	.....	$78,479,719	.....	$75,551,093	.....	$65,892,395

Description.	1944.		1945.		1946.		1947.		1948.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer ..... oz.	11,433	$361,977	12,589	$398,591	15,729	$475,361	6,969	$200,585	20,332	$585,200
Gold, lode ..... oz.	186,632	7,185,332	175,373	6,751,860	117,612	4,322,241	243,282	8,514,870	286,230	10,018,050
Silver ..... oz.	5,705,334	2,453,293	6,157,307	2,893,934	6,365,761	5,324,959	5,707,691	4,109,538	6,718,122	5,038,592
Copper* ..... lb.	36,300,589	4,356,070	25,852,366	3,244,472	17,500,538	2,240,070	41,783,921	8,519,741	43,025,388	9,616,174
Lead ..... lb.	294,797,469	13,265,886	353,497,689	17,674,884	347,990,146	23,489,335	306,400,709	41,884,977	332,996,351	60,072,542
Zinc ..... lb.	280,356,477	12,055,328	301,737,902	19,431,921	270,718,128	21,143,086	268,450,926	30,147,039	296,012,941	41,234,603
Coal ..... tons, 2,240 lb.	1,933,639	8,217,966	1,518,673	6,454,360	1,463,640	6,220,470	1,717,476	8,587,380	1,809,018	10,854,108
Structural materials	.....	3,025,445	.....	3,401,229	.....	5,199,563	.....	5,896,803	.....	8,968,222
Miscellaneous metals, minerals, and materials	.....	4,002,506	.....	3,092,698	.....	3,392,866	.....	5,360,321	.....	6,137,261
Totals	.....	$54,923,803	.....	$63,343,949	.....	$71,807,951	.....	$113,221,254	.....	$152,524,752

* *See* last paragraph under "Average Prices," page 12.

TABLE VI.—PRODUCTION OF LODE GOLD, SILVER, COPPER, LEAD, AND ZINC.

Year.	GOLD.		SILVER.		COPPER.		LEAD.		ZINC.		Total Value.
	Ounces.	Value.	Ounces.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
		$		$		$		$		$	$
1887	.....	.....	17,690	17,331	.....	.....	204,800	9,216	.....	.....	26,547
1888	.....	.....	79,780	75,000	.....	.....	674,500	29,813	.....	.....	104,813
1889	.....	.....	53,192	47,873	.....	.....	165,100	6,498	.....	.....	54,371
1890	.....	.....	70,427	73,948	.....	.....	.....	.....	.....	.....	73,948
1891	.....	.....	4,500	4,000	.....	.....	.....	.....	.....	.....	4,000
1892	.....	.....	77,160	66,935	.....	.....	808,420	33,064	.....	.....	99,999
1893	1,170	23,404	227,000	195,000	.....	.....	2,135,023	78,996	.....	.....	297,400
1894	6,252	125,014	746,379	470,219	324,680	16,234	5,662,523	169,875	.....	.....	781,342
1895	39,270	785,400	1,496,522	977,229	952,840	47,642	16,475,464	532,255	.....	.....	2,342,526
1896	62,259	1,244,180	3,135,343	2,100,689	3,818,556	190,926	24,199,977	721,384	.....	.....	4,257,179
1897	106,141	2,122,820	5,472,971	3,272,836	5,325,180	266,258	38,841,135	1,390,517	.....	.....	7,052,431
1898	110,061	2,201,217	4,292,401	2,375,841	7,271,678	874,781	31,693,559	1,077,581	.....	.....	6,529,420
1899	138,315	2,857,573	2,939,413	1,663,708	7,722,591	1,351,453	21,862,436	878,870	.....	.....	6,751,604
1900	167,153	3,453,381	3,958,175	2,309,200	9,997,080	1,615,289	63,358,621	2,691,887	.....	.....	10,069,757
1901	210,384	4,348,605	4,396,447	2,462,008	27,603,746	4,446,963	51,582,906	2,010,260	.....	.....	13,267,836
1902	236,491	4,888,269	3,917,917	1,941,328	29,636,057	3,446,673	22,536,381	824,832	.....	.....	11,101,102
1903	232,831	4,812,616	2,996,204	1,521,472	34,359,921	4,547,535	18,089,283	689,744	.....	.....	11,571,367
1904	222,042	4,589,608	3,222,481	1,719,516	35,710,128	4,578,037	36,646,244	1,421,874	.....	.....	12,309,035
1905	238,660	4,933,102	3,439,417	1,971,818	37,692,251	5,876,222	56,580,703	2,399,022	.....	.....	15,180,164
1906	224,027	4,630,639	2,990,262	1,897,320	42,990,488	8,288,565	52,408,217	2,667,578	.....	.....	17,484,102
1907	196,179	4,055,020	2,745,448	1,703,825	40,832,720	8,166,544	47,738,703	2,291,458	.....	.....	16,216,847
1908	255,582	5,282,880	2,631,389	1,321,483	47,274,614	6,240,249	43,195,733	1,632,799	.....	.....	14,477,411
1909	238,224	4,924,090	2,532,742	1,239,270	45,597,245	5,918,522	44,396,346	1,709,259	8,500,000	400,000	14,191,141
1910	267,701	5,533,380	2,450,241	1,245,016	38,243,934	4,871,512	34,658,746	1,386,350	4,184,192	192,473	13,228,731
1911	228,617	4,725,513	1,892,364	958,293	36,927,656	4,571,644	26,872,397	1,069,521	2,634,544	129,092	11,454,063
1912	257,496	5,322,442	3,132,108	1,810,045	51,456,537	8,408,513	44,871,454	1,805,627	5,358,280	316,139	17,662,766
1913	272,254	5,627,490	3,465,856	1,968,606	46,460,305	7,094,489	55,364,677	2,175,832	6,758,768	324,421	17,190,838
1914	247,170	5,109,004	3,602,180	1,876,736	45,009,699	6,121,819	50,625,048	1,771,877	7,866,467	346,125	15,225,061
1915	250,021	5,167,934	3,366,506	1,588,991	56,918,405	9,835,500	46,503,590	1,939,200	12,982,440	1,460,524	19,992,149
1916	221,932	4,587,334	3,301,923	2,059,739	65,379,364	17,784,494	48,727,516	3,007,462	37,168,980	4,043,985	31,483,014
1917	114,523	2,367,190	2,929,216	2,265,749	59,007,565	16,038,256	37,307,465	2,951,020	41,848,513	3,166,259	26,788,474
1918	164,674	3,403,812	3,498,172	3,215,870	61,483,754	15,143,449	43,899,661	2,928,107	41,772,916	2,899,040	27,590,278
1919	152,426	3,150,645	3,403,119	3,592,673	42,459,339	7,939,896	29,475,968	1,526,855	56,737,651	3,540,429	19,750,498
1920	120,048	2,481,392	3,377,849	3,235,980	44,887,676	7,832,899	39,331,218	2,816,115	47,208,268	3,077,979	19,444,365
1921	135,663	2,804,154	2,673,389	1,591,201	39,036,993	4,879,624	41,402,288	1,693,354	49,419,372	1,952,065	12,920,398
1922	197,856	4,089,684	7,101,311	4,554,781	32,359,896	4,329,754	67,447,985	3,480,316	57,146,548	2,777,322	19,231,857
1923	179,245	3,704,994	6,032,986	3,718,129	57,720,290	8,323,266	96,663,152	6,321,770	58,343,462	3,278,903	25,347,062

TABLE VI.—PRODUCTION OF LODE GOLD, SILVER, COPPER, LEAD, AND ZINC—*Continued.*

Year.	Gold.		Silver.		Copper.		Lead.		Zinc.		Total Value.
	Ounces.	Value.	Ounces.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
		$		$		$		$		$	$
1924	247,716	5,120,535	8,341,768	5,292,184	64,845,393	8,442,870	170,384,481	12,415,917	79,130,970	4,266,741	35,538,247
1925	209,719	4,335,269	7,654,844	5,286,818	72,306,432	10,153,269	237,899,199	18,670,329	98,257,099	7,754,450	46,200,135
1926	201,427	4,163,819	10,748,556	6,675,606	89,339,768	12,324,421	263,023,937	17,757,535	142,876,947	10,586,610	51,508,031
1927	178,001	3,679,601	10,470,185	5,902,043	89,202,871	11,525,011	282,996,423	14,874,292	145,225,443	8,996,135	44,977,082
1928	188,087	3,888,097	10,627,167	6,182,461	97,908,316	14,265,242	305,140,792	13,961,412	181,763,147	9,984,613	48,281,825
1929	145,339	3,004,419	9,918,800	5,256,270	101,483,857	18,375,682	302,346,268	15,269,696	172,096,841	9,268,792	51,174,859
1930	160,778	3,323,576	11,289,171	4,307,270	90,421,545	11,738,525	319,199,752	12,535,931	250,287,306	9,010,093	40,915,395
1931	146,039	3,018,894	7,524,320	2,247,514	63,194,299	5,289,363	248,783,508	6,742,282	205,071,247	5,237,520	22,535,573
1932	181,564	4,261,307	7,130,838	2,258,453	49,841,009	3,179,956	254,488,952	5,378,878	192,120,091	4,621,641	19,700,235
1933	223,529	6,392,929	7,006,406	2,650,720	42,608,002	3,176,341	271,606,071	6,495,731	195,963,751	6,291,416	25,007,137
1934	297,130	10,250,985	8,572,916	4,068,792	48,084,658	3,567,401	347,366,967	8,461,859	247,926,844	7,546,893	33,895,930
1935	365,244	12,852,936	9,251,544	5,994,075	38,791,127	3,023,768	344,268,444	10,785,930	256,239,446	7,940,860	40,597,569
1936	404,472	14,168,654	9,521,015	4,296,548	20,806,672	1,971,848	377,971,618	14,790,029	254,581,393	8,439,373	43,666,452
1937	460,781	16,122,727	11,308,685	5,075,451	46,057,584	6,023,411	419,118,371	21,416,949	291,192,278	14,274,245	62,912,783
1938	557,522	19,613,624	10,861,578	4,722,288	65,769,906	6,558,575	412,979,182	13,810,024	298,497,295	9,172,822	53,877,333
1939	587,180	21,221,272	10,771,585	4,361,199	73,254,679	7,392,862	378,743,763	12,002,390	278,409,102	8,544,375	53,522,098
1940	583,416	22,461,516	12,327,944	4,715,315	77,980,223	7,865,085	485,364,420	16,317,952	310,767,251	10,600,271	61,960,139
1941	571,026	21,984,501	12,175,700	4,658,545	66,435,583	6,700,693	490,185,657	16,480,042	363,302,195	12,392,238	62,216,019
1942	444,518	17,113,943	9,677,881	4,030,775	50,097,716	5,052,856	463,269,005	15,575,104	396,857,260	13,536,801	55,359,479
1943	224,403	8,639,516	8,526,310	3,858,496	42,307,510	*4,971,132	405,285,476	15,214,417	335,137,014	13,405,481	46,089,042
1944	186,632	7,185,332	5,705,334	2,453,293	36,300,589	*4,356,070	294,797,469	13,265,886	280,356,477	12,055,328	39,315,909
1945	175,373	6,751,860	6,157,307	2,893,934	25,852,366	*3,244,472	353,497,689	17,674,884	301,737,902	19,431,921	49,997,071
1946	117,612	4,322,241	6,365,761	5,324,959	17,500,538	*2,240,070	347,990,146	23,489,335	270,718,128	21,143,086	56,519,691
1947	243,282	8,514,870	5,707,691	4,109,538	41,783,921	*8,519,741	306,400,709	41,884,977	268,450,926	30,147,039	93,176,165
1948	286,230	10,018,050	6,718,122	5,038,592	43,025,388	9,616,174	332,996,351	60,072,542	296,012,941	41,234,603	125,979,961
Totals	12,881,687	355,763,299	326,031,908	174,820,797	2,509,661,140	358,621,346	9,658,511,889	483,484,511	6,550,909,695	333,788,103	1,706,478,056

* *See* last paragraph under "Average Prices," page 12.

TABLE VII.—VALUE OF GOLD PRODUCTION TO DATE.

Year.	PLACER GOLD.		LODE GOLD.		Total.
	Crude (Ounces).	Value.	Fine (Ounces).	Value.	
1858–1862	580,680	$9,871,634	.....	.....	$9,871,634
1863–1867	957,860	16,283,592	.....	.....	16,283,592
1868–1872	582,080	9,895,318	.....	.....	9,895,318
1873–1877	530,540	9,019,201	.....	.....	9,019,201
1878–1882	328,230	5,579,911	.....	.....	5,579,911
1883–1887	225,970	3,841,515	.....	.....	3,841,515
1888–1892	148,550	2,525,426	.....	.....	2,525,426
1893	20,950	356,131	1,170	$23,404	379,535
1894	23,850	405,516	6,252	125,014	530,530
1895	28,330	481,683	39,270	785,400	1,267,083
1896	32,000	544,026	62,259	1,244,180	1,788,206
1897	30,210	513,520	106,141	2,122,820	2,636,340
1898	37,840	643,346	110,061	2,201,217	2,844,563
1899	79,110	1,344,900	138,315	2,857,573	4,202,473
1900	75,220	1,278,724	167,153	3,453,381	4,732,105
1901	57,060	970,100	210,384	4,348,605	5,318,705
1902	63,130	1,073,140	236,491	4,888,269	5,961,409
1903	62,380	1,060,420	232,831	4,812,616	5,873,036
1904	65,610	1,115,300	222,042	4,589,608	5,704,908
1905	57,020	969,300	238,660	4,933,102	5,902,402
1906	55,790	948,400	224,027	4,630,639	5,579,039
1907	48,710	828,000	196,179	4,055,020	4,883,020
1908	38,060	647,000	255,582	5,282,880	5,929,880
1909	28,060	477,000	238,224	4,924,090	5,401,090
1910	31,760	540,000	267,701	5,533,380	6,073,380
1911	25,060	426,000	228,617	4,725,513	5,151,513
1912	32,680	555,500	257,496	5,322,442	5,877,942
1913	30,000	510,000	272,254	5,627,490	6,137,490
1914	33,240	565,000	247,170	5,109,004	5,674,004
1915	45,290	770,000	250,021	5,167,934	5,937,934
1916	34,150	580,500	221,932	4,587,334	5,167,834
1917	29,180	496,000	114,523	2,367,190	2,863,190
1918	18,820	320,000	164,674	3,403,812	3,723,812
1919	16,850	286,500	152,426	3,150,645	3,437,145
1920	13,040	221,600	120,048	2,481,392	2,702,992
1921	13,720	233,200	135,663	2,804,154	3,037,354
1922	21,690	368,800	197,856	4,089,684	4,458,484
1923	24,710	420,000	179,245	3,704,994	4,124,994
1924	24,750	420,750	247,716	5,120,535	5,541,285
1925	16,476	280,092	209,719	4,335,269	4,615,361
1926	20,912	355,503	201,427	4,163,859	4,519,362
1927	9,191	156,247	178,001	3,679,601	3,835,848
1928	8,424	143,208	188,087	3,888,097	4,031,305
1929	6,983	118,711	145,339	3,004,419	3,123,130
1930	8,955	152,235	160,778	3,323,576	3,475,811
1931	17,176	291,992	146,039	3,018,894	3,310,886
1932	20,400	395,542	181,564	4,261,307	4,656,849
1933	23,928	562,787	223,529	6,392,929	6,955,716
1934	25,181	714,431	297,130	10,250,985	10,965,416
1935	30,929	895,058	365,244	12,852,936	13,747,994
1936	43,389	1,249,940	404,472	14,168,654	15,418,594
1937	54,153	1,558,245	460,781	16,122,727	17,680,972
1938	57,759	1,671,015	557,522	19,613,624	21,284,639
1939	49,746	1,478,492	587,180	21,221,272	22,699,764
1940	39,067	1,236,928	583,416	22,461,516	23,698,444
1941	43,775	1,385,962	571,026	21,984,501	23,370,463
1942	32,904	1,041,772	444,518	17,113,943	18,155,715
1943	14,600	462,270	224,403	8,639,516	9,101,786
1944	11,433	361,977	186,632	7,185,332	7,547,309
1945	12,589	398,591	175,373	6,751,860	7,150,451
1946	15,729	475,361	117,612	4,322,241	4,797,602
1947	6,969	200,585	243,282	8,514,870	8,715,455
1948	20,332	585,200	286,230	10,018,050	10,603,250
Totals	5,143,180	$93,559,097	12,881,687	$355,763,299	$449,322,396

TABLE VIII.—VALUE OF MINE PRODUCTION BY DIVISIONS, 1943, 1944, 1945, 1946, 1947, AND 1948.

Mining Division.	1943.	1944.	1945.	1946.	1947.	1948.
	$	$	$	$	$	$
Ainsworth	49,405	277,435	254,429	77,057	242,020	565,648
Alberni	527,401	9,726	6,194	112,613	503,699	412,872
Ashcroft	9,964	14,809	1,393	10,119	11,371	89,566
Atlin	314,005	255,539	321,227	459,965	868,658	1,096,922
Cariboo	1,161,053	979,399	1,033,181	988,815	1,486,961	1,693,656
Clinton	5,679	1,803	3,368	2,310	7,124	2,596
Fort Steele	36,305,963	31,668,064	42,910,466	54,256,000	80,933,067	110,156,469
Golden	438,726	324,525	825,803	290,143	279,206	1,155,232
Greenwood	361,396	275,571	191,767	484,670	593,539	789,523
Kamloops	161,820	124,130	135,791	300,758	566,001	666,392
Lardeau	95	1,288	.....	.....	1,731	600
Lillooet	3,312,574	3,072,599	2,412,843	1,394,343	2,962,585	3,531,186
Nanaimo	3,435,235	3,353,930	2,981,253	3,038,045	3,368,234	4,105,205
Nelson	892,159	544,663	516,283	372,005	1,137,752	2,391,739
New Westminster	607,133	597,569	677,220	1,028,101	1,229,047	2,007,835
Nicola	155,606	83,032	27,099	6,967	15,094	13,718
Omineca	5,357,775	1,409,984	142,315	70,216	99,622	204,939
Osoyoos	1,490,888	1,837,959	2,069,351	1,057,802	1,767,818	2,287,295
Peace River	59,354	58,251	32,342	14,586	32,934	52,124
Portland Canal	1,100,439	732,087	736,125	410,892	786,837	514,565
Quesnel	20,360	13,804	14,533	43,731	16,078	18,632
Revelstoke	29,031	19,664	35,904	39,658	40,420	42,364
Similkameen	3,497,570	3,242,076	2,205,091	1,634,831	4,898,314	7,353,503
Skeena	58,309	32,211	37,443	58,841	47,032	129,149
Slocan	1,089,433	1,193,092	954,479	628,445	1,300,194	2,475,242
Stikine	2,311	1,520	348	5,954	2,650	250,404
Trail Creek	1,374,132	1,111,591	1,247,960	1,274,603	2,139,817	1,525,519
Vancouver	2,607,391	2,233,911	2,124,478	1,668,492	5,343,934	5,916,470
Vernon	2,177	3,225	1,338	3,049	46,795	104,867
Victoria	1,465,011	1,450,347	1,443,925	2,074,940	2,492,720	2,970,520
Totals	65,892,395	54,923,803	63,343,949	71,807,951	113,221,254	152,524,752

TABLE XVI.—Coke and By-products Production of British Columbia, 1947 and 1948.

Description.	1947.		1948.	
	Quantity.	Value.	Quantity.	Value.
Coal used in making coke, short tons	284,049	$1,682,602	235,297	$1,440,415
Coke made in bee-hive ovens, short tons	44,517	$427,330	47,461	$559,735
Coke made in by-product ovens, short tons	55,233	527,810	52,478	616,488
Coke made in gas plants, short tons	75,656	557,754	56,490	454,697
Total coke made, short tons	*175,406*	$1,512,894	*156,429*	$1,630,920
Gas sold and used	.....	3,390,713	.....	4,520,886
Tar produced	.....	124,885	.....	153,130
Other by-products	.....	50,965	.....	33,790
Total production value of coke industry	.....	$5,079,457	.....	$6,338,726

TABLE IXB.—PRODUCTION VALUE OF PLACER GOLD, LODE GOLD, SILVER, COPPER,* LEAD, AND ZINC IN 1943, 1944, 1945, 1946, 1947, AND 1948.

Division.	1943	1944.	1945.	1946.	1947.	1948.
	$	$	$	$	$	$
Ainsworth	45,455	272,678	248,479	69,107	242,020	565,648
Alberni	521,595	5,631	63	99,492	467,214	392,583
Ashcroft	855	1,203	1,172	544	1,007	403
Atlin	310,734	253,242	318,147	457,602	868,383	1,095,393
Cariboo	1,104,703	947,593	950,292	908,622	1,401,214	1,578,154
Clinton	982	1,330	222	.....	288	86
Fort Steele	30,328,407	25,549,264	37,656,140	48,381,626	72,618,140	100,001,198
Golden	402,738	267,048	763,883	260,248	236,979	1,120,425
Greenwood	224,385	183,763	142,489	402,764	521,871	698,564
Kamloops	1,551	1,007	190	121	864	58
Lardeau	95	1,288	.....	.....	832	.....
Lillooet	3,286,891	3,068,573	2,407,569	1,381,993	2,957,103	3,490,465
Nanaimo	.....	190	.....	.....	.....	30,878
Nelson	837,919	276,616	425,304	317,912	379,880	848,998
New Westminster	380	728	317	574	849	.....
Nicola	.....	760	.....	42	4,791	.....
Omineca	31,789	30,141	19,250	20,642	22,094	102,983
Osoyoos	1,414,337	1,793,878	2,001,678	1,023,909	1,666,351	2,002,341
Peace River	.....	.....	538	272	950	29
Portland Canal	1,089,525	732,087	736,125	410,892	785,612	506,780
Quesnel	20,232	13,614	13,171	42,704	14,228	17,615
Revelstoke	253	1,361	823	302	29	57
Similkameen	3,010,155	2,949,189	1,967,074	1,457,031	4,635,551	6,412,504
Skeena	982	601	380	332	144	.....
Slocan	1,089,433	1,193,092	954,479	628,445	1,291,675	2,469,242
Stikine	2,311	1,520	348	5,954	1,900	249,749
Trail Creek	348,821	13,772	5,715	10,215	861,249	200,665
Vancouver	2,387,899	1,959,227	1,781,529	1,112,478	4,268,554	4,778,613
Vernon	831	398	285	1,229	576	1,500
Victoria	73,364	158,092	.....	.....	126,402	230
Totals	46,536,612	39,677,886	50,395,662	56,995,052	93,376,750	126,565,161

* *See* last paragraph under "Average Prices," page 12.

TABLE IXc.—Production and Value of Placer Gold, Lode Gold, Silver, Copper, Lead, and Zinc, 1900–48.

Division.	Gold—Placer.		Gold—Lode.		Silver.		Copper.*		Lead.		Zinc.		Division Total.
	Ounces.	Value.	Ounces.	Value.	Ounces.	Value.	Pounds.	Value	Pounds.	Value	Pounds.	Value	
		$		$		$		$		$		$	$
Ainsworth	212	5,690	4,006	117,795	6,683,735	4,040,802	10,175	1,201	126,679,386	6,484,164	45,096,198	1,812,473	12,462,125
Alberni	1,581	32,157	298,654	11,182,354	160,330	76,843	2,233,880	335,145	112,439	4,408			11,630,907
Ashcroft	11,084	255,949	8,476	289,680	16,804	9,513	633,775	155,721	99	4			710,867
Atlin†	666,077	15,346,038	162,509	5,671,733	59,907	36,255	83,161	11,949	109,945	7,036			21,073,011
Cariboo‡	1,923,463	39,348,423	638,270	23,369,259	70,355	34,360			656	30	492	16	62,752,088
Clinton	9,997	238,118	23,388	827,260	31,564	14,214	57,548	5,905	193	7			1,085,504
Fort Steele	17,193	398,430	2,532	56,964	162,065,856	81,344,700	28,592	6,193	8,839,221,854	446,298,517	5,865,625,516	297,636,661	825,741,465
Golden	467	11,213	74	1,587	1,438,438	859,317	57,378	10,590	100,894,338	4,076,451	124,796,287	5,365,271	10,324,429
Greenwood	4,044	94,807	1,086,429	23,425,663	24,505,507	12,694,425	441,171,575	70,493,191	10,283,649	501,410	10,420,121	438,694	107,648,190
Kamloops	3,342	83,686	39,376	1,318,141	281,229	167,209	5,767,133	1,021,694	368,662	20,737	409,170	26,063	2,637,530
Lardeau	1,769	38,136	24,889	652,366	2,805,427	1,120,084	5,594	785	9,572,318	382,893	449,032	20,606	2,214,870
Lillooet§	90,755	1,861,201	2,018,907	70,465,960	533,947	256,070	400	41	62,463	2,542			72,585,814
Nanaimo	600	13,826	68,385	1,443,600	519,497	299,162	20,280,670	3,214,502					4,971,090
Nelson	3,187	80,017	1,276,449	40,007,834	4,201,612	2,270,058	5,685,261	889,008	54,123,193	2,433,236	25,368,183	1,548,894	47,229,047
New Westminster	11,354	236,424	4,311	110,307	13,529	6,072	26,489	6,379	28,425	1,119	12,755	481	360,782
Nicola	230	4,652	8,525	234,914	267,098	126,317	549,975	106,230	2,235,137	90,469	320,486	10,566	573,148
Omineca	49,016	1,297,451	8,833	204,370	2,396,149	1,488,457	6,126,209	1,345,688	6,300,047	356,678	4,177,337	278,922	4,971,566
Osoyoos	190	4,142	1,281,856	37,308,211	528,144	336,498	2,305,241	274,262	252,623	7,512	5,472	200	37,930,825
Peace River	4,117	95,006											95,006
Portland Canal	201	4,260	1,939,656	48,841,974	49,238,370	27,401,805	649,677,707	96,796,399	36,690,745	1,912,595	1,990,976	126,726	175,083,759
Quesnel‖	623,926	12,994,143	206	7,436	311	139	82	17					13,001,735
Revelstoke	4,079	88,731	12	335	50,097	31,309	683	124	939,741	55,882	8,093	469	176,850
Similkameen	8,215	193,109	115,481	3,905,095	2,816,292	1,407,017	394,294,006	51,416,305	238,577	9,006	64,377	2,616	56,933,148
Skeena	3,919	86,924	414,794	9,979,046	265,198	182,759	7,671,642	1,215,720	39,539	1,287	15,277	490	11,466,226
Slocan	150	3,596	6,492	160,440	40,976,959	24,801,550	219,318	42,287	301,372,732	14,740,550	284,019,330	18,306,524	58,054,947
Stikine	41,615	1,021,523	114	4,120	204	146			5,810	1,048			1,026,837
Trail Creek¶	848	24,176	2,605,850	55,626,371	3,404,486	1,914,999	120,997,021	18,232,974	17,605,277	778,681	157,932,812	5,294,354	81,871,555
Vancouver	182	5,306	331,741	10,198,622	3,809,092	2,075,761	773,647,671	107,181,559	8,804,390	389,299	27,229,035	1,754,201	121,604,748
Vernon	2,166	57,150	5,212	175,639	7,948	4,000	614	89	8,317	617	6,898	708	238,203
Victoria	620	15,453	37,081	795,590	780,932	424,088	21,208,627	3,148,167	139,900	6,932	2,961,848	163,158	4,553,388
Provincial totals	3,484,599	73,939,737	12,412,508	346,382,666	307,929,017	163,423,929	2,452,740,427	355,912,125	9,516,090,455	478,563,110	6,550,909,695	332,788,093	1,751,009,660

* *See* last paragraph under "Average Prices," page 12.

† Atlin totals include estimated placer-gold production from and including 1898.

‡ Cariboo totals include estimated placer-gold production from and including 1858.

§ Lillooet totals include estimated placer-gold production from and including 1874.

‖ Quesnel totals include estimated placer-gold production from and including 1858.

¶ Includes zinc and lead recovered at the Trail smelter, from current and reclaimed slags, derived from mines in several mining divisions.

TABLE X.—Production in Detail of Structural Materials, 1947 and 1948.

Division.	Year.	Cement.	Lime and Limestone.	Building-stone.	Rubble, Riprap, and Crushed Rock.	Sand and Gravel.	Brick (Common).	Face, Paving, and Sewer Brick.	Firebrick, Blocks.	Fireclay.	Structural Tile (Hollow Blocks), Roof-tile, Floor-tile.	Drain-tile and Sewer-pipe.	Pottery, Glazed or Unglazed.	Other Clay Products.	Division Totals.
		$	$	$	$	$	$	$	$	$	$	$	$	$	$
Atlin and Stikine	1947	.....	.....	.....	.....	1,025	.....	.....	.....	.....	.....	.....	.....	.....	1,025
	1948	.....	.....	.....	320	1,864	.....	.....	.....	.....	.....	.....	.....	.....	2,184
Portland Canal and Skeena	1947	.....	26,000	.....	657	13,132	.....	.....	.....	.....	.....	.....	.....	8,324	48,113
	1948	.....	31,151	.....	54,107	51,676	.....	.....	.....	.....	.....	.....	.....	.....	136,934
Cariboo and Quesnel	1947	.....	.....	.....	2,454	59,431	.....	.....	.....	.....	.....	.....	.....	.....	61,885
	1948	.....	.....	.....	629	105,579	.....	.....	.....	.....	.....	.....	.....	.....	106,208
Omineca and Peace River	1947	.....	.....	.....	3,083	31,454	.....	.....	.....	.....	.....	.....	.....	.....	34,537
	1948	.....	.....	.....	20,494	14,871	.....	.....	.....	.....	.....	.....	.....	.....	35,365
Nicola, Vernon, and Kamloops	1947	.....	.....	450	5,655	82,166	.....	.....	.....	.....	.....	.....	.....	.....	88,271
	1948	.....	400	500	57,567	167,577	.....	.....	.....	.....	.....	.....	.....	.....	226,044
Greenwood, Osoyoos, and Similkameen	1947	.....	625	.....	3,509	60,175	16,140	.....	.....	.....	.....	.....	.....	.....	80,449
	1948	.....	.....	.....	255,850	505,364	6,000	.....	.....	.....	.....	.....	.....	.....	767,214
Fort Steele and Golden	1947	.....	.....	.....	3,472	114,173	.....	.....	.....	.....	.....	.....	.....	.....	117,645
	1948	.....	.....	.....	7,922	58,552	.....	.....	.....	.....	.....	.....	.....	.....	66,474
Ainsworth, Slocan, and Nelson	1947	.....	.....	10,717	1,861	70,252	.....	.....	.....	.....	.....	.....	.....	.....	82,830
	1948	.....	.....	16,070	893	101,781	.....	.....	.....	.....	.....	.....	.....	.....	118,744
Trail Creek, Revelstoke, and Lardeau	1947	.....	.....	.....	22,290	65,438	.....	.....	.....	.....	.....	.....	.....	.....	87,728
	1948	.....	.....	200	33,055	66,646	.....	.....	.....	.....	.....	.....	.....	.....	99,901
Alberni, Nanaimo, and Victoria	1947	1,896,772	685,881	17,500	1,753	451,433	106,520	1,014	.....	.....	36,274	41,278	3,476	.....	3,241,901
	1948	2,441,304	1,119,888	.....	877	566,612	104,400	19,090	.....	.....	44,397	39,797	5,138	.....	4,341,503
Ashcroft, Lillooet, and Clinton	1947	.....	.....	.....	205	20,684	.....	.....	.....	.....	.....	.....	.....	.....	20,889
	1948	.....	.....	.....	60,200	72,194	.....	.....	.....	.....	.....	.....	.....	.....	132,394
Vancouver and New Westminster	1947	.....	1,620	91,304	171,934	859,556	.....	63,835	389,899	9,675	122,002	320,697	.....	1,008	2,031,530
	1948	.....	26,193	37,450	347,866	1,347,819	900	110,178	392,458	32,922	72,116	557,744	.....	9,611	2,935,257
Totals	1947	1,896,772	714,126	119,971	216,873	1,828,919	122,660	64,849	389,899	9,675	158,276	361,975	3,476	9,332	5,896,803
	1948	2,441,304	1,177,632	54,220	839,780	3,060,535	111,300	129,268	392,458	32,922	116,513	597,541	5,138	9,611	8,968,222

TABLE XI.—PRODUCTION IN DETAIL OF MISCELLANEOUS METALS, MINERALS, AND MATERIALS, 1947 AND 1948.

Division.	Year.	Antimony.	Barite.	Bismuth.	Cadmium.	Diatomite, Mica.	Flux (Limestone and Quartz).	Gypsum Products.	Iron and Oxides.	Platinum.	Slate and Rock Granules.	Sodium Carbonate.	Sulphur.	Tin.	Tungsten Concentrates.	Division Total.
		$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Cariboo and Omineca	1947					24,240										24,240
	1948					9,494										9,494
Peace River and Quesnel	1947					1,472										1,472
	1948					817										817
Kamloops and Greenwood	1947						33,843	523,298								557,141
	1948						39,860	546,707								586,567
Osoyoos and Similkameen	1947						101,352			59						101,411
	1948						189,509			21,175						210,684
Fort Steele, Golden, and Lardeau	1947	384,255*	26,650	560,183*	938,497*									517,794†		2,427,379
	1948	113,173*	16,317	444,000*	1,126,437*									688,567†		2,388,494
Ainsworth, Nelson, and Revelstoke	1947														680,792	680,792
	1948								20,700						1,409,297	1,429,997
Trail Creek and Slocan	1947				2,769								1,232,130			1,234,899
	1948												1,267,860			1,267,860
Ashcroft and Clinton	1947											1,793				1,793
	1948															
Lillooet and Nanaimo	1947						39,400									39,400
	1948						19,608		3,735							23,343
Vancouver, New Westminster, and Victoria	1947						60		464		19,686		271,584			291,794
	1948								9,772		68,937		141,296			220,005
Totals	1947	384,255	26,650	560,183	941,266	25,712	174,655	523,298	464	59	19,686	1,793	1,503,714	517,794	680,792	5,360,321
	1948	113,173	16,317	444,000	1,126,437	10,311	248,977	546,707	34,207	21,175	68,937		1,409,156	688,567	1,409,297	6,137,261

* Recovered at smelter, principally from concentrates originating in Fort Steele Mining Division, may be in part from other mining divisions.

† Recovered from Sullivan mine, Fort Steele Mining Division.

TABLE XII.—British Columbia Mine Production, 1895–1948.

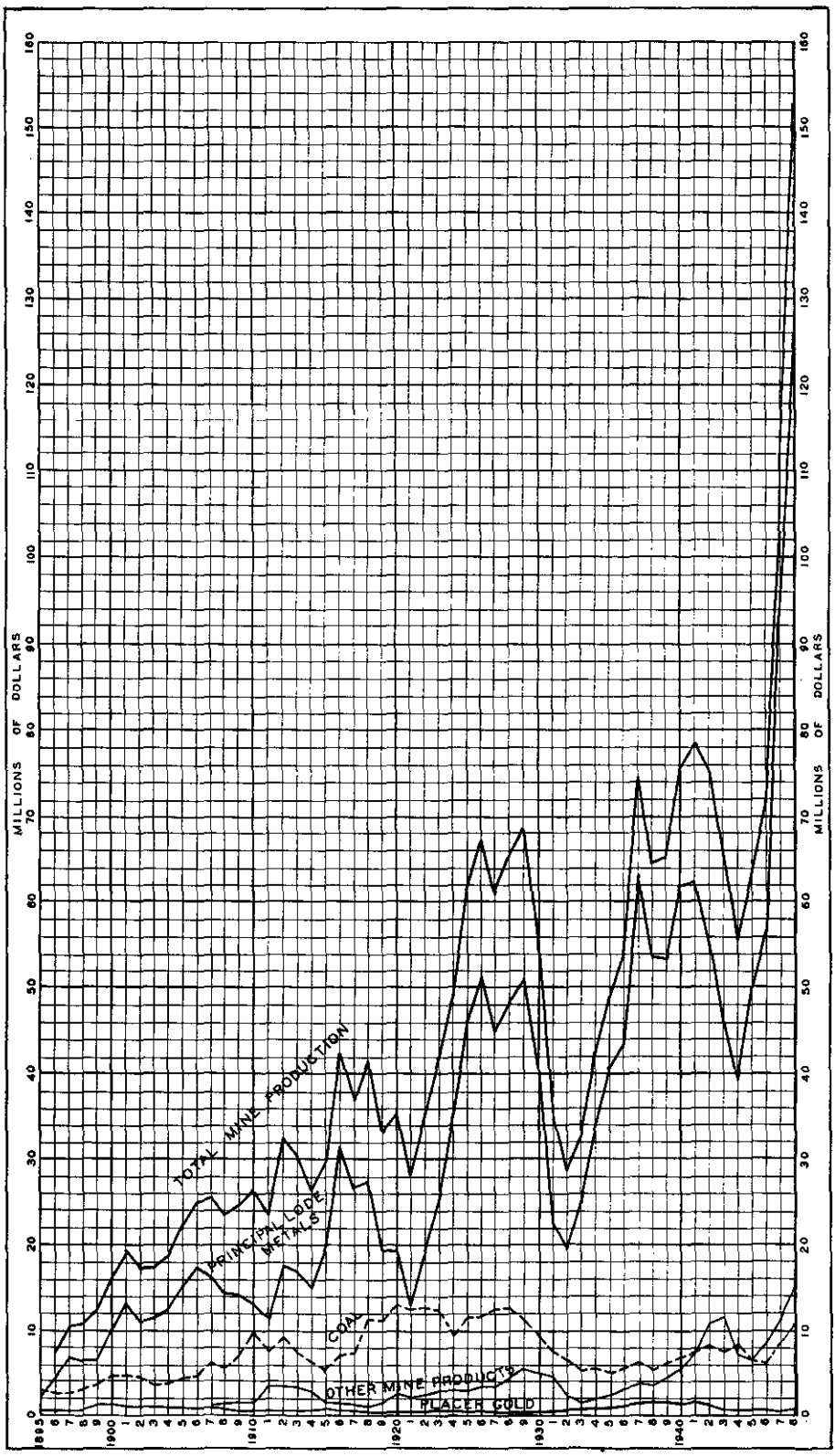


TABLE XIII.—British Columbia Lode Mines Production, 1913–1948.

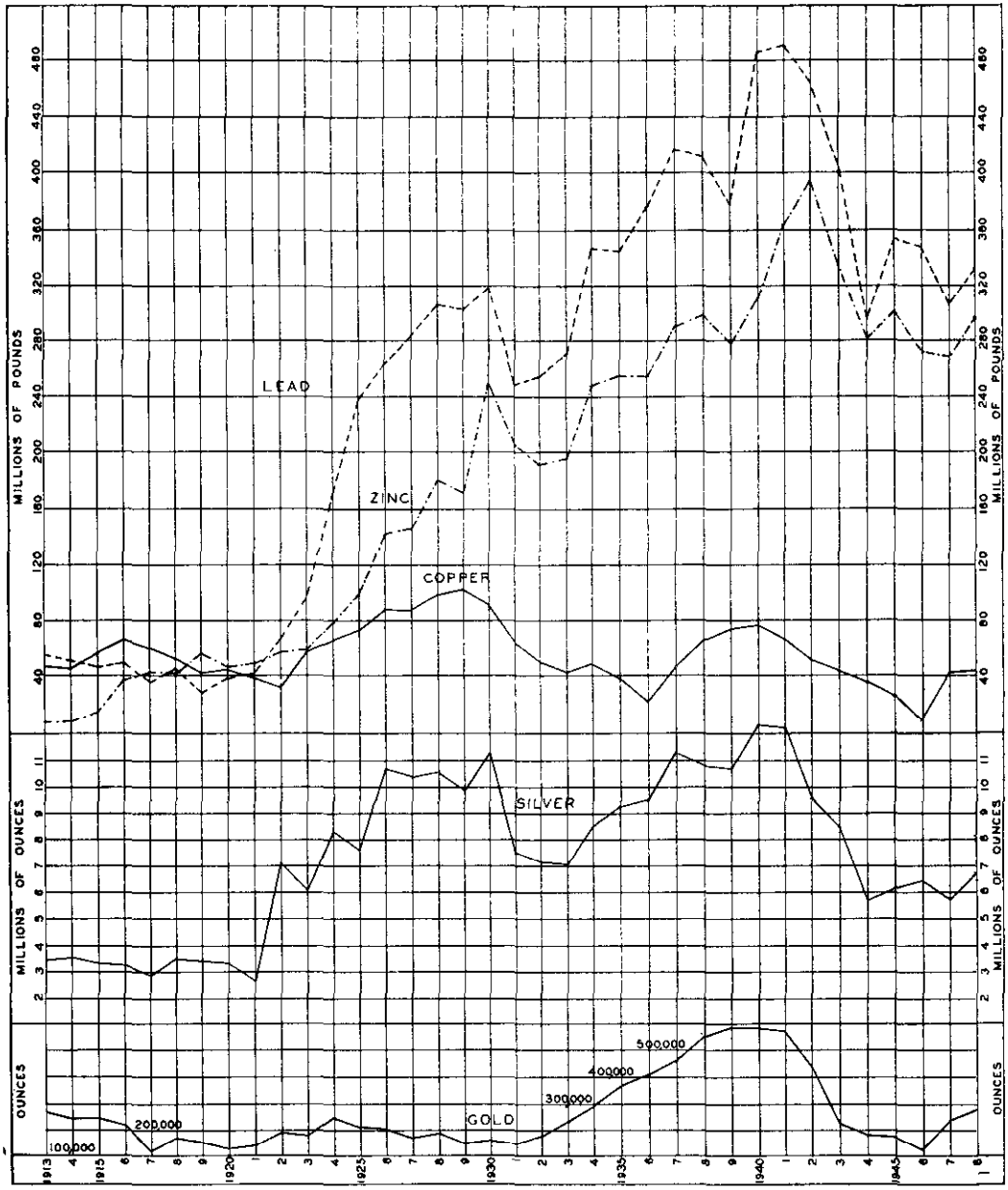


TABLE XIV.—Coal Production per Year to Date.*

	Tons (2,000 lb.)	Value.		Tons (2,000 lb.)	Value.
1836–85	3,392,492	$9,468,557	1918	2,578,514	$11,511,225
1886	365,832	979,908	1919	2,539,646	11,337,705
1887	462,963	1,240,080	1920	2,906,540	12,975,625
1888	548,017	1,467,903	1921	2,782,074	12,419,975
1889	649,410	1,739,490	1922	2,813,264	12,559,215
1890	759,517	2,034,420	1923	2,747,610	12,266,115
1891	1,152,589	3,087,291	1924	2,172,269	9,697,630
1892	925,495	2,479,005	1925	2,607,945	11,642,610
1893	1,095,689	2,934,882	1926	2,609,640	11,650,180
1894	1,134,507	3,038,859	1927	2,748,286	12,269,135
1895	1,052,413	2,818,962	1928	2,829,906	12,633,510
1896	1,003,769	2,688,666	1929	2,521,402	11,256,260
1897	988,797	2,648,562	1930	2,113,586	9,435,650
1898	1,272,169	3,407,595	1931	1,912,501	7,684,155
1899	1,463,083	3,918,972	1932	1,719,172	6,523,644
1900	1,612,346	4,318,785	1933	1,416,516	5,375,171
1901	1,635,571	4,380,993	1934	1,508,741	5,725,133
1902	1,565,081	4,192,182	1935	1,330,524	5,048,864
1903	1,308,377	3,504,582	1936	1,508,048	5,722,502
1904	1,404,063	3,760,884	1937	1,618,049	6,139,920
1905	1,550,429	4,152,936	1938	1,466,559	5,565,069
1906	1,699,379	4,551,909	1939	1,655,217	6,280,956
1907	2,016,075	6,300,235	1940	1,867,966	7,088,265
1908	1,879,191	5,872,472	1941	2,018,635	7,660,000
1909	2,247,253	7,022,666	1942	2,170,737	8,237,172
1910	3,136,052	9,800,161	1943	2,040,253	7,742,030
1911	2,456,229	7,675,717	1944	2,165,676	8,217,966
1912	2,944,261	9,200,814	1945	1,700,914	6,454,360
1913	2,393,981	7,481,190	1946	1,639,277	6,220,470
1914	2,028,283	6,338,385	1947	1,923,573	8,587,380
1915	1,804,465	5,638,952	1948	1,809,018	10,854,108
1916	2,334,184	7,294,325			
1917	2,407,972	7,524,913	Totals	$118,131,972	$429,747,253

* For all years to 1925 (inclusive) figures are net coal production and do not include coal made into coke; subsequent figures are entire coal production, including coal made into coke. **Commencing with 1948 production the short ton (2,000 lb.) has been used in all statistical tables, and to facilitate comparison with previous years, the tonnages as noted in Table XIV above, from 1836 to 1947, have all been converted from long tons to short tons. It must, however, be kept in mind that the original valuation has been retained.**

TABLE XV.—Coke Production from Bee-hive Ovens in British Columbia from 1895 to 1925.

	Tons (2,240 lb.)	Value.		Tons (2,240 lb.)	Value.
1895–97	19,396	$96,980	1913	286,045	$1,716,270
1898 (estimated)	35,000	175,000	1914	234,577	1,407,462
1899	34,251	171,255	1915	245,871	1,475,226
1900	85,149	425,745	1916	267,725	1,606,350
1901	127,081	635,405	1917	159,905	959,430
1902	128,015	640,075	1918	188,967	1,322,769
1903	165,543	827,715	1919	91,138	637,966
1904	238,428	1,192,140	1920	67,792	474,544
1905	271,785	1,358,925	1921	59,434	416,038
1906	199,227	996,135	1922	45,835	320,845
1907	222,913	1,337,478	1923	58,919	412,433
1908	247,399	1,484,394	1924	30,615	214,305
1909	258,703	1,552,218	1925	75,185	526,295
1910	218,029	1,308,174			
1911	66,005	396,030	Totals	4,393,265	$25,673,600
1912	264,333	1,585,998			

TABLE XVI.—Coke and By-products Production of British Columbia, 1947 and 1948.

Description.	1947.		1948.	
	Quantity.	Value.	Quantity.	Value.
Coal used in making coke, short tons	284,049	$1,682,602	235,297	$1,440,415
Coke made in bee-hive ovens, short tons	44,517	$427,330	47,461	$559,735
Coke made in by-product ovens, short tons	55,233	527,810	52,478	616,488
Coke made in gas plants, short tons	75,656	557,754	56,490	454,697
Total coke made, short tons	*175,406*	$1,512,894	*156,429*	$1,630,920
Gas sold and used	.....	3,390,713	.....	4,520,886
Tar produced	.....	124,885	.....	153,130
Other by-products	.....	50,965	.....	33,790
Total production value of coke industry	.....	$5,079,457	.....	$6,338,726

TABLE XVII.—Dividends paid by Mining Companies, 1897–1948.

*Lode-gold Mines.**

Company or Mine.	Locality.	Class.	Amount paid.
Arlington	Erie	Gold	$94,872
Athabasca	Nelson	Gold	25,000
Bayonne	Tye Siding	Gold	25,000
Bralorne Mines, Ltd.	Bridge River	Gold	14,829,050
Belmont-Surf Inlet	Princess Royal Island	Gold	1,437,500
Cariboo Gold Quartz Mining Co., Ltd.	Wells	Gold	1,679,976
Cariboo-McKinney Con. M. & M. Co.	Camp McKinney	Gold	565,588
Canadian Pacific Exploration (Porto Rico)	Nelson	Gold	37,500
Centre Star	Rossland	Gold-copper	472,255
Fairview Amalgamated	Oliver	Gold	5,254
Fern Gold Mining & Milling Co., Ltd.	Nelson	Gold	9,375
Gold Belt Mining Co., Ltd.	Sheep Creek	Gold	†668,595
Goodenough (leasers)	Ymir	Gold	13,731
Hedley Mascot Gold Mines, Ltd.	Hedley	Gold	1,290,553
Island Mountain Mines, Ltd.	Wells	Gold	1,339,652
I.X.L.	Rossland	Gold	134,025
Jewel-Denero	Greenwood	Gold	11,751
Kelowna Exploration, Ltd. (Nickel Plate)	Hedley	Gold	1,740,000
Kootenay Belle Gold Mines, Ltd.	Sheep Creek	Gold	357,856
Le Roi Mining Co.	Rossland	Gold-copper	1,475,000
Le Roi No. 2, Ltd.	Rossland	Gold-copper	1,574,640
Lorne (later Bralorne)	Bridge River	Gold	20,450
Motherlode	Sheep Creek	Gold	163,500
Mount Zeballos Gold Mines, Ltd.	Zeballos	Gold	165,000
Nickel Plate (Hedley Gold Mining Co., Ltd.)	Hedley	Gold	3,423,191
Pioneer Gold Mines of B.C., Ltd.	Bridge River	Gold	9,299,393
Poorman	Nelson	Gold	25,000
Premier Gold Mining Co., Ltd.	Premier	Gold	‡18,858,075
Privateer Mine, Ltd.	Zeballos	Gold	1,914,183
Queen	Sheep Creek	Gold	85,000
Relief Arlington Mines, Ltd. (Second Relief)	Erie	Gold	†308,000
Reno Gold Mines, Ltd.	Sheep Creek	Gold	†1,433,640
Sheep Creek Gold Mines, Ltd.	Sheep Creek	Gold	2,915,625
Silbak Premier Mines, Ltd.	Premier	Gold	‡2,375,000
Spud Valley Gold Mines, Ltd.	Zeballos	Gold	168,000
Sunset No. 2	Rossland	Gold-copper	115,007
Surf Inlet Consolidated Gold Mines, Ltd.	Surf Inlet	Gold	120,279
War Eagle	Rossland	Gold-copper	1,245,250
Ymir Gold	Ymir	Gold	300,000
Ymir Yankee Girl	Ymir	Gold	†415,002
Miscellaneous mines		Gold	108,623
Total, lode-gold mines			$71,245,391

* The gold-copper properties of Rossland are included in this table.

† Includes "Return of Capital" distributions.

‡ Up to and including 1936, dividends paid by Premier Gold Mining Company, Limited, were derived from operations of the company in British Columbia. Subsequent dividends paid by Premier Gold Mining Company, Limited, have been derived from the operations of subsidiary companies in British Columbia and elsewhere and are not included in the figure given. In 1936, Silbak Premier, a subsidiary of Premier Gold Mining Company, took over the former gold operations of that company in British Columbia. Dividends paid by Silbak Premier are given above.

TABLE XVII.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1948—*Continued.*

Silver-Lead-Zinc Mines.

Company or Mine.	Locality.	Class.	Amount paid.
Antoine	Rambler	Silver-lead-zinc	$10,000
Base Metals Mining Corp., Ltd. (Monarch and Kicking Horse)	Field	Silver-lead-zinc	*466,143
Beaverdell-Wellington	Beaverdell	Silver-lead-zinc	97,200
Beaver Silver Mines, Ltd.	Greenwood	Silver-lead-zinc	48,000
Bell	Beaverdell	Silver-lead-zinc	388,297
Bosun (Rosebery-Surprise)	New Denver	Silver-lead-zinc	25,000
Capella	New Denver	Silver-lead-zinc	5,500
Consolidated Mining and Smelting Co. of Canada, Ltd.	Trail	Silver-lead-zinc	†210,810,019
Couverapee	Field	Silver-lead-zinc	5,203
Duthie Mines, Ltd.	Smithers	Silver-lead-zinc	50,000
Florence Silver	Ainsworth	Silver-lead-zinc	35,393
Goodenough	Cody	Silver-lead-zinc	45,668
H.B. Mining Co.	Hall Creek	Silver-lead-zinc	8,904
Highland Lass, Ltd.	Beaverdell	Silver-lead-zinc	132,464
Highland Bell, Ltd.	Beaverdell	Silver-lead-zinc	849,975
Horn Silver	Similkameen	Silver-lead-zinc	6,000
Idaho-Alamo	Sandon	Silver-lead-zinc	400,000
Iron Mountain (Emerald)	Salmo	Silver-lead-zinc	20,000
Jackson	Retallack	Silver-lead-zinc	20,000
Last Chance	Three Forks	Silver-lead-zinc	213,000
Lone Bachelor	Sandon	Silver-lead-zinc	50,000
Lucky Jim	Three Forks	Silver-lead-zinc	80,000
Mercury	Sandon	Silver-lead-zinc	6,000
Meteor	Slocan City	Silver-lead-zinc	10,257
Monitor and Ajax	Three Forks	Silver-lead-zinc	70,500
Mountain Con	Cody	Silver-lead-zinc	71,387
McAllister	Three Forks	Silver-lead-zinc	45,088
Noble Five	Cody	Silver-lead-zinc	72,859
North Star	Kimberley	Silver-lead-zinc	497,901
No. One	Sandon	Silver-lead-zinc	6,754
Ottawa	Slocan City	Silver-lead-zinc	110,429
Payne	Sandon	Silver-lead-zinc	1,438,000
Providence	Greenwood	Silver-lead-zinc	‡142,328
Queen Bess	Alamo	Silver-lead-zinc	25,000
Rambler-Cariboo	Rambler	Silver-lead-zinc	467,250
Reco	Cody	Silver-lead-zinc	334,992
Ruth Mines, Ltd.	Sandon	Silver-lead-zinc	125,490
St. Eugene	Moyie	Silver-lead-zinc	566,000
Silversmith and Slocan Star§	Sandon	Silver-lead-zinc	1,267,600
Spokane-Trinket	Ainsworth	Silver-lead-zinc	10,365
Standard Silver Lead	Silverton	Silver-lead-zinc	2,734,688
Sunset and Trade Dollar	Retallack	Silver-lead-zinc	88,000
Utica	Kaslo	Silver-lead-zinc	64,000
Wallace Mines, Ltd. (Sally)	Beaverdell	Silver-lead-zinc	135,000
Washington	Rambler Station	Silver-lead-zinc	20,000
Whitewater	Retallack	Silver-lead-zinc	592,515
Miscellaneous mines		Silver-lead-zinc	70,239
Total, silver-lead-zinc mines			$222,739,408

* "Return of Capital" distribution.

† Earnings of several company mines, and customs smelter at Trail.

‡ Includes $10,504 paid in 1944 but not included in the yearly figure.

§ These two properties were amalgamated as Silversmith Mines, Limited, in August, 1939.

TABLE XVII.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1948—*Continued.*

Copper Mines.

Company or Mine.	Locality.	Class.	Amount paid.
Britannia M. & S. Co.*	Britannia Beach	Copper	$12,502,887
Canada Copper Corporation	Greenwood	Copper	615,399
Cornell	Texada Island	Copper	8,500
Granby Cons. M.S. & P. Co.†	Copper Mountain	Copper	27,363,597
Marble Bay	Texada Island	Copper	175,000
Hall Mines	Nelson	Copper	233,280
Miscellaneous mines		Copper	261,470
Total, copper mines			$41,160,133

* Britannia Mining and Smelting Company, Limited, is a subsidiary of the Howe Sound Company, which is the holding company for Britannia and for other mines in Mexico and the State of Washington. Dividends paid by the Howe Sound Company, therefore, can not be credited to British Columbia. Dividends in the above table for Britannia have been paid by that company, none being paid subsequent to 1930, until 1939. In making comparison with yearly totals the amounts shown as paid by the Howe Sound Company have been deducted for the years shown, so the total in the annual report concerned will show the higher figure.

† The Granby Consolidated Mining, Smelting and Power Company dividends commenced in 1904 and cover all company activities in British Columbia to date, the present operations being conducted at Allenby and Copper Mountain. The dividends as set out in the table in the Minister of Mines Annual Report for 1942 were incorrect; the correct total is as above. The figure now includes all dividends, capital distributions, and interim liquidating payments, the latter being $4,500,000, paid, in 1936, prior to reorganization.

The term "Miscellaneous" noted in each class of dividend covers all payments of $5,000 and under, together with payments made by companies or individuals requesting that the item be not disclosed.

In compiling the foregoing table of dividends paid, the Department wishes to acknowledge the kind assistance given by companies, individuals, and trade journals in giving information on the subject.

Coal.

Wellington Collieries, Ltd., Nanaimo	$16,000,000
Crow's Nest Pass Coal Co., Ltd., Fernie	13,986,142
Total	$29,986,142

Miscellaneous, Structural, and Placer Gold.

Various	$3,582,655

Aggregate of all Classes.

Lode-gold mining	$71,245,391
Silver-lead-zinc mining and smelting	222,739,408
Copper mining	41,160,133
Coal-mining	29,986,142
Miscellaneous, structural, and placer gold	3,582,655
Total	$368,713,729

TABLE XVII.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1948—*Continued.*

Dividends paid Yearly, 1917–48, inclusive.

Year.	Amount paid.	Year.	Amount paid.
1917	$3,269,494	1934	$4,745,905
1918	2,704,469	1935	7,386,070
1919	2,494,283	1936	10,513,705
1920	1,870,296	1937	15,085,293
1921	736,629	1938	12,068,875
1922	3,174,756	1939	11,865,698
1923	2,983,570	1940	14,595,530
1924	2,977,276	1941	16,598,110
1925	5,853,419	1942	13,627,104
1926	8,011,137	1943	11,860,159
1927	8,816,681	1944	11,367,732
1928	9,572,536	1945	10,487,395
1929	11,263,118	1946	15,566,047
1930	10,543,500	1947	27,940,213
1931	4,650,857	1948	37,672,319
1932	2,786,958		
1933	2,471,735	Total	$305,560,869

Dividends paid during 1947 and 1948.

	1947.	1948.
Bralorne Mines, Ltd.		$124,700
Britannia Mining and Smelting Co., Ltd.	$720,438	271,000
The Consolidated Mining and Smelting Co. of Canada, Ltd.	26,207,219	36,035,160
The Crow's Nest Pass Coal Co., Ltd.	186,354	186,354
Granby Consolidated Mining, Smelting, and Power Co., Ltd.	270,139	450,231
Highland Bell, Ltd.	78,293	125,268
Island Mountain Mines, Ltd.	84,057	73,550
Kelowna Exploration, Ltd. (Nickel Plate)	180,000	
Sheep Creek Gold Mines, Ltd.		150,000
Others	213,713	256,056
Totals	$27,940,213	$37,672,319

TABLE XVIII.—Salaries and Wages, Fuel and Electricity, and Process Supplies, 1948.

Class.	Salaries and Wages.	Fuel and Electricity.	Process Supplies.
Lode-mining	$28,427,739	$4,314,570	$7,652,800
Placer-mining	297,496	20,484	126,462
Coal-mining	5,596,731	403,424	648,512
Miscellaneous metals, minerals, and materials	1,980,754	277,207	2,592,962
Structural materials industry	2,510,786	1,123,489	511,385
Totals, 1948	**$38,813,506**	**$6,138,174**	**$11,532,121**
Grand totals, 1947	$32,160,338	$5,319,470	$13,068,948
Grand totals, 1946	26,190,200	5,427,458	8,367,705
Grand totals, 1945	22,620,975	7,239,726	5,756,628
Grand totals, 1944	23,131,874	5,788,671	6,138,084
Grand totals, 1943	26,051,467	7,432,585	6,572,317
Grand totals, 1942	26,913,160	7,066,109	6,863,398
Grand totals, 1941	26,050,491	3,776,747	7,260,441
Grand totals, 1940	23,391,330	3,474,721	6,962,162
Grand totals, 1939	22,357,035	*3,266,000	6,714,347
Grand totals, 1938	22,765,711	3,396,106	6,544,500
Grand totals, 1937	21,349,690	3,066,311	6,845,330
Grand totals, 1936	17,887,619	2,724,144	4,434,501
Grand totals, 1935	16,753,367	2,619,639	4,552,730
Grand totals, 1935–48	346,436,743	*66,646,861	101,613,272

* Estimated.

Note.—The above figures, compiled from returns on the subject made by companies and individuals, illustrate the amount of money distributed in salaries and wages, fuel and electricity, and process supplies (explosives, chemicals, drill-steel, lubricants, etc.).

TABLE XIX.—Lode Metal Mines—Tonnage, Number of Mines, Net and Gross Value of Minerals, 1901–48.

Year.	Tonnage.*	No. of Shipping-mines.	No. of Mines shipping over 100 Tons.	Gross value of Lode Minerals as reported by Shipper.†	Freight and Treatment.	Net Value to Shipper of Lode Minerals produced.‡	Gross Value of Lode Minerals produced.§
1901	920,416	119	78	.....	.....	.....	$14,100,282
1902	998,999	124	75	.....	.....	.....	11,581,153
1903	1,286,176	125	74	.....	.....	.....	12,103,237
1904	1,461,609	142	76	.....	.....	.....	12,909,035
1905	1,706,679	146	79	.....	.....	.....	15,980,164
1906	1,963,872	154	77	.....	.....	.....	18,484,102
1907	1,804,114	147	72	.....	.....	.....	17,316,847
1908	2,083,606	108	59	.....	.....	.....	15,847,411
1909	2,057,713	89	52	.....	.....	.....	15,451,141
1910	2,216,428	83	50	.....	.....	.....	14,728,731
1911	1,770,755	80	45	.....	.....	.....	11,454,063
1912	2,688,532	86	51	.....	.....	.....	17,662,766
1913	2,663,809	110	58	.....	.....	.....	17,190,838
1914	2,175,971	98	56	.....	.....	.....	15,225,061
1915	2,690,110	132	59	.....	.....	.....	19,992,149
1916	3,188,865	169	81	.....	.....	.....	31,483,014
1917	2,761,579	193	87	.....	.....	.....	26,788,474
1918	2,892,849	175	80	.....	.....	.....	27,590,278
1919	2,112,975	144	74	.....	.....	.....	19,750,498
1920	2,178,187	121	60	.....	.....	.....	19,444,365
1921	1,562,645	80	35	.....	.....	.....	12,920,398
1922	1,573,186	98	33	.....	.....	.....	19,227,857
1923	2,421,839	77	28	.....	.....	.....	25,347,092
1924	3,397,105	86	37	.....	.....	.....	35,538,247
1925	3,849,269	102	40	.....	.....	.....	46,200,135
1926	4,775,073	138	55	.....	.....	$38,558,613	51,508,031
1927	5,416,021	132	52	.....	.....	27,750,364	44,977,082
1928	6,241,310	110	49	.....	.....	29,070,075	48,281,825
1929	6,977,681	106	48	.....	.....	34,713,887	51,174,859
1930	6,803,846	68	32	.....	.....	21,977,688	40,915,395
1931	5,549,103	44	22	.....	.....	10,513,931	22,535,573
1932	4,340,158	75	29	.....	.....	7,075,393	19,700,235
1933	4,030,978	109	47	.....	.....	13,976,358	25,007,137
1934	5,116,897	145	69	.....	.....	20,243,278	33,895,930
1935	4,916,148	177	72	.....	.....	25,407,914	40,597,569
1936	4,381,027	168	70	.....	.....	30,051,207	43,666,452
1937	6,145,144	185	113	$48,617,920	4,663,843	43,954,077	62,912,783
1938	7,377,021	211	92	40,222,237	4,943,754	35,278,483	53,877,333
1939	7,211,323	217	99	45,133,788	4,416,919	40,716,869	53,522,098
1940	7,937,358	216	92	50,004,909	6,334,611	43,670,298	62,848,642
1941	7,938,803	200	96	52,354,870	5,673,048	46,681,822	62,216,019
1942	6,708,277	126	76	50,494,041	5,294,637	45,199,404	55,359,479
1943	5,429,557	48	32	37,234,070	3,940,367	33,293,703	46,089,042
1944	4,763,332	51	31	29,327,114	2,877,706	26,449,408	39,315,910
1945	4,377,722	36	27	34,154,017	2,771,292	31,383,625	49,997,071
1946	3,705,375	50	32	48,920,971	2,904,130	46,016,841	56,519,691
1947	4,953,030	75	33	81,033,093	4,722,010	76,311,087	93,176,165
1948	**5,655,266**	**97**	**51**	**118,713,859**	**18,585,183**	**100,128,727**	**125,979,961**

* Does not include mercury nor tungsten ores.

† Data not collected before 1937.

‡ Previous to 1937 the shipper reported "Net Value at Shipping Point," no indication being given as to how the net value was arrived at. From 1937 on the shipper has reported "Gross Value" from which deduction of freight and treatment gives "Net Value."

§ Gross value as represented by valuing lode metals at yearly average prices.

TABLE XX.—Average Number employed in the Mining Industry of British Columbia, 1901–48.

Year.	Placer-mining.	Lode-mining.			In Concentrators.	In Smelters.	Coal-mining.			Structural Materials.		Miscellaneous.	Total.*
		Under.	Above.	Total.			Under.	Above.	Total.	Quarries and Pitts.	Plants.		
1901	.....	2,736	1,212	3,948	.....	.....	3,041	931	3,974	.....	.....	.....	7,922
1902	.....	2,219	1,126	3,345	.....	.....	3,101	910	4,011	.....	.....	.....	7,356
1903	.....	1,662	1,088	2,750	.....	.....	3,137	1,127	4,264	.....	.....	.....	7,014
1904	.....	2,143	1,163	3,306	.....	.....	3,278	1,175	4,453	.....	.....	.....	7,759
1905	.....	2,470	1,240	3,710	.....	.....	3,127	1,280	4,407	.....	.....	.....	8,117
1906	.....	2,680	1,303	3,983	.....	.....	3,415	1,390	4,805	.....	.....	.....	8,788
1907	.....	2,704	1,239	3,943	.....	.....	2,862	907	3,769	.....	.....	.....	7,712
1908	.....	2,567	1,127	3,694	.....	.....	4,432	1,641	6,073	.....	.....	.....	9,767
1909	.....	2,184	1,070	3,254	.....	.....	4,713	1,705	6,418	.....	.....	.....	9,672
1910	.....	2,472	1,237	3,709	.....	.....	5,903	1,855	7,758	.....	.....	.....	11,467
1911	.....	2,435	1,159	3,594	.....	.....	5,212	1,661	6,873	.....	.....	.....	10,467
1912	.....	2,472	1,364	3,837	.....	.....	5,275	1,855	7,130	.....	.....	.....	10,967
1913	.....	2,773	1,505	4,278	.....	.....	4,950	1,721	6,671	.....	.....	.....	10,949
1914	.....	2,741	1,433	4,174	.....	.....	4,267	1,465	5,732	.....	.....	.....	9,906
1915	.....	2,709	1,435	4,144	.....	.....	3,708	1,283	4,991	.....	.....	.....	9,135
1916	.....	3,357	2,036	5,393	.....	.....	3,694	1,366	5,060	.....	.....	.....	10,453
1917	.....	3,290	2,198	5,488	.....	.....	3,760	1,410	5,170	.....	.....	.....	10,658
1918	.....	2,626	1,764	4,390	.....	.....	3,658	1,769	5,247	.....	.....	.....	9,637
1919	.....	2,513	1,746	4,259	.....	.....	4,145	1,821	5,966	.....	.....	.....	10,225
1920	.....	2,074	1,605	3,679	.....	.....	4,191	2,158	6,349	.....	.....	.....	10,028
1921	.....	1,355	975	2,330	.....	.....	4,722	2,163	6,885	.....	.....	.....	9,215
1922	.....	1,510	1,239	2,749	.....	.....	4,712	1,932	6,644	.....	.....	.....	9,393
1923	.....	2,102	1,516	3,618	.....	.....	4,342	1,807	6,149	.....	.....	.....	9,767
1924	.....	2,353	1,680	4,033	.....	.....	3,894	1,524	5,418	.....	.....	.....	9,451
1925	.....	2,298	2,840	5,138	.....	.....	3,828	1,615	5,443	.....	.....	.....	10,581
1926	299	2,606	1,735	4,341	808	2,461	3,757	1,565	5,322	493	324	124	14,172
1927	415	2,671	1,916	4,587	854	2,842	3,646	1,579	5,225	647	138	122	14,830
1928	355	2,707	2,469	5,176	911	2,748	3,814	1,520	5,334	412	368	120	15,424
1929	341	2,926	2,052	4,978	966	2,948	3,675	1,353	5,028	492	544	268	15,565
1930	425	2,316	1,260	3,576	832	3,197	3,389	1,256	4,645	843	344	170	14,032
1931	688	1,463	834	2,297	581	3,157	2,957	1,125	4,082	460	526	380	12,171
1932	874	1,355	900	2,255	542	2,036	2,628	980	3,608	536	329	344	10,524
1933	1,134	1,786	1,335	3,121	531	2,436	2,241	853	3,094	376	269	408	11,369
1934	1,122	2,796	1,729	4,525	631	2,890	2,050	843	2,893	377	187	360	12,985
1935	1,291	2,740	1,497	4,237	907	2,771	2,145	826	2,971	536	270	754	13,737
1936	1,124	2,959	1,840	4,799	720	2,678	2,015	799	2,814	931	288	825	14,179
1937	1,371	3,603	1,818	5,421	1,168	3,027	2,286	867	3,153	724	327	938	16,129
1938	1,303	3,849	2,266	6,115	919	3,158	2,088	874	2,962	900	295	369	16,021
1939	1,252	3,905	2,050	5,955	996	3,187	2,167	809	2,976	652	311	561	15,890
1940	1,004	3,923	2,104	6,027	1,048	2,944	2,175	699	2,874	827	334	647	15,705
1941	939	3,901	1,823	5,724	1,025	3,072	2,229	494	2,723	766	413	422	15,084
1942	489	2,920	1,504	4,424	960	3,535	1,892	468	2,360	842	378	262	13,270
1943	212	2,394	1,699	4,093	891	2,835	2,240	611	2,851	673	326	567	12,448
1944	255	1,896	1,825	3,721	849	2,981	2,150	689	2,839	690	351	628	12,314
1945	209	1,933	1,750	3,683	822	2,834	1,927	503	2,430	921	335	586	11,820
1946	347	1,918	1,817	3,735	672	2,813	1,773	532	2,305	827	555	679	11,933
1947	360	3,024	2,238	5,262	960	3,461	1,694	731	2,425	977	585	869	14,899
1948	**348**	**3,143**	**2,429**	**5,572**	**1,126**	**3,884**	**1,594**	**872**	**2,466**	**1,591**	**656**	**754**	**16,397**

*** The average number employed in the industry is the sum of the averages for individual companies. The average for each company is obtained by taking the sum of the numbers employed each month and dividing by 12, regardless of the number of months worked.**

TABLE XXI.—Lode Metal Producers in 1948.*

Mine or Group.	Location of Mine.	Mining Division.	Owner or Agent.	Process.	Character of Ore.
Ainsmore (Kootenay Florence)	Ainsworth	Ainsworth	Ainsmore Mines, Ltd., Ainsworth	Flotation	Silver, lead, zinc.
August	Ainsworth	Ainsworth	L. D. Besecker, Kaslo		Silver, lead, zinc.
Besecker	Kaslo	Ainsworth	L. D. Besecker, Kaslo		Silver, lead, zinc.
Cork Province	Kaslo Creek	Ainsworth	Chas. Lind, Kaslo		Silver, lead, zinc.
Crow Fledgling	Ainsworth	Ainsworth	E. Emilson, Balfour		Silver, lead, zinc.
Daisy Bell	Ainsworth	Ainsworth	W. J. Turner, Ainsworth		Silver, lead, zinc.
Doherty	Retallack	Ainsworth	E. H. Lovitt, Ltd., Vancouver		Silver, lead, zinc.
Flint	Kaslo	Ainsworth	L. H. McPherson, Kaslo		Silver, lead, zinc.
Highland	Ainsworth	Ainsworth	Stanley McLellan, Ainsworth		Silver, lead, zinc.
Highland Leasers	Ainsworth	Ainsworth	Geo. L. Green, Ainsworth	Concentration	Silver, lead, zinc.
Humboldt	Crawford Bay	Ainsworth	A. Shrieves and R. Golac, Nelson		Silver, lead, zinc.
Jackson	Retallack	Ainsworth	B. I. Nesbitt, Silverton		Silver, lead, zinc.
Lucky Boy	Retallack	Ainsworth	E. H. Lovitt, Ltd., Vancouver		Silver, lead, zinc.
Scranton	Woodbury Creek	Ainsworth	Scranton Cons. Mining Co., Kaslo		Silver, lead, zinc.
Shutty Bench	Kaslo	Ainsworth	John Kuz, Kaslo		Silver, lead, zinc.
Silver Hoard	Ainsworth	Ainsworth	W. E. Lane, Ainsworth		Silver, lead, zinc.
Spokane	Ainsworth	Ainsworth	T. and G. E. Hawes, Ainsworth		Silver, lead, zinc.
Sun Mine	Fortynine Creek	Nelson	Wm. Rozan, Nelson		Gold, silver.
Towser	Retallack	Ainsworth	C. J. Garrett, Retallack		Silver, lead, zinc.
Utica	Kaslo Creek	Ainsworth	Utica Mines (1937), Ltd., Kaslo		Silver, lead, zinc.
Whitewater	Retallack	Ainsworth	Retallack Mines, Ltd., Vancouver	Flotation	Silver, lead, zinc.
Winona	Retallack	Ainsworth	J. R. Tinkess, Kaslo		Silver, lead, zinc.
Cox & Cunningham	Alberni	Alberni	Cox & Cunningham, Port Alberni		Gold, silver, copper.
Davies, Victor	Zeballos	Alberni	Victor Davies, Zeballos		Gold, silver.
Kroening	Port Alberni	Alberni	Kroening Prospectors, Port Alberni		Gold, silver, lead, zinc.
Nitinat	Port Alberni	Alberni	M. H. Cunningham, Port Alberni		Gold, silver, copper, lead.
Privateer	Zeballos	Alberni	Privateer Mine, Ltd., Vancouver	Cyanidation	Gold, silver.
Polaris-Taku	Tulsequah Creek	Atlin	Polaris-Taku Mining Co., Ltd., Vancouver	Flotation	Gold, silver.
Cariboo Gold Quartz	Wells	Cariboo	Cariboo Gold Quartz Mining Co., Ltd., Vancouver	Cyanidation	Gold, silver.
Island Mountain	Wells	Cariboo	Island Mountain Mine, Ltd., Wells	Cyanidation	Gold, silver.
Blackmore	Kingsgate	Fort Steele	H. W. Blackmore, Camp Lister		Silver, lead.
Sullivan	Kimberley	Fort Steele	Cons. Mining & Smelting Co. of Canada, Ltd., Trail	Flotation	Silver, lead, zinc.
Society Girl	Moyie	Fort Steele	Mark Nicholson, Moyie		Silver, lead, zinc.
Monarch and Kicking Horse	Field	Golden	Base Metals Mining Corp., Ltd., Field	Flotation	Silver, lead, zinc.
Silver Giant	Spillimacheen	Golden	Silver Giant Mines, Ltd., Vancouver		Silver, lead, zinc.
Halifax	Greenwood	Greenwood	Walter W. Schwartzenhauer, Rossland		Silver, lead.
Highland Bell	Beaverdell	Greenwood	Highland Bell, Ltd., Vancouver		Silver, gold, lead, zinc.
Dentonia	Greenwood	Greenwood	Dentonia Mines, Ltd., Vancouver	Flotation	Gold, silver.
Dynamo	Greenwood	Greenwood	Dynamo Mine Syndicate, c/o M. M. Butorac, Trail		Silver, lead, zinc.

* Includes lode producers of gold, silver, copper, lead, zinc, tungsten, iron, and siliceous flux.

TABLE XXI.—LODE METAL PRODUCERS IN 1948*—*Continued.*

Mine or Group.	Location of Mine.	Mining Division.	Owner or Agent.	Process.	Character of Ore.
Enterprise	Greenwood	Greenwood	Olav Johnson, Greenwood		Gold, silver, lead, zinc.
Silver Bounty	Beaverdell	Greenwood	Silver Bounty Mines, Ltd., Vancouver		Silver, lead, zinc.
Zamora	Rock Creek	Greenwood	Geo. E. White, Box 30, Oliver		Silver, lead, zinc.
Surprise	Lardeau	Lardeau	Joe Gallo, Howser		Silver, lead, zinc.
Bralorne	Bridge River	Lillooet	Bralorne Mines, Ltd., Vancouver	Amalgamation, flotation	Gold, silver.
Pioneer	Bridge River	Lillooet	Pioneer Gold Mines of B.C., Ltd., Vancouver	Cyanidation	Gold, silver.
Iron Group	Quinsam Lake	Nanaimo	*Coast Iron Co., Ltd., Vancouver*		*Iron.*
Vananda	Vananda	Nanaimo	Vananda Mines (1948), Ltd., Vancouver	Flotation	Gold, silver, copper.
Alpine	Sitkum Creek	Nelson	Alpine Gold, Ltd., Nelson	Flotation	Gold, silver, lead, zinc.
Arlington	Erie Creek	Nelson	Messrs. Golac and Kenville Gold Mines, Ltd., Nelson		Gold, silver, lead, zinc.
Bayonne	Tye	Nelson	H. Moore and D. Macdonald, Ymir		Gold, silver, lead, zinc.
Centre Star (Wesko)	Ymir	Nelson	Messrs. Barclay, Anderson, Rankin, and Wilkinson, Ymir		Gold, silver, lead, zinc.
Emerald	Salmo	Nelson	Canadian Exploration, Ltd., Vancouver	Flotation, gravity	Tungsten.
Kenville (Granite Poorman)	Taghum	Nelson	Kenville Gold Mines, Ltd., Toronto	Cyanidation	Gold, silver.
Kootenay Belle	Sheep Creek	Nelson	J. R. Thompson, Sheep Creek		*Gold, silver.*
Lakeview	Sanca	Nelson	E. G. Timmons, Sanca		Silver, lead, zinc.
Lomond	Nelway	Nelson	Messrs. Burgess, Burgess, and Lundgren		Silver, lead, zinc; iron.
Michaely (Red Rock)	Pend d'Oreille	Nelson	Wm. C. Holland, Salmo		Silver, lead, zinc.
Nugget	*Sheep Creek*	Nelson	A. Endersby, Sr. and Jr., Fruitvale		Gold, silver.
Pilot Bay	Pilot Bay	Nelson	H. T. Stearns, c/o 312 Silica St., Nelson		Silver, lead, zinc.
Protection (Goodenough)	Ymir	Nelson	Messrs. Turk, Sterna, and Myers, Ymir		Silver, lead, zinc.
Queen (Sheep Creek)	Sheep Creek	Nelson	Sheep Creek Gold Mines, Ltd., Vancouver	Cyanidation	Gold, silver.
Second Relief	Erie Creek	Nelson	Williams & Anderson, Ymir		Gold, silver.
Shamrock	Nelson	Nelson	A. G. Harvey, 907 Third St., Nelson		*Silver, lead, zinc.*
Silver King	Nelson	Nelson	Messrs. Gowing, Edwardson, and McDonald, Ymir		Silver, lead, zinc.
Spokane	Tye	Nelson	K. K. Laib, Bayonne		Gold, silver, lead, zinc.
Silver Standard	Hazelton	Omineca	Silver Standard Mines, Ltd., New Hazelton	Flotation	Silver, lead, zinc.
Fairview and Morning Star	Oliver	Osoyoos	*Cons. Mining & Smelting Co. of Canada, Ltd., Trail*		Silica-flux, gold.
Hedley Mascot	Hedley	Osoyoos	Hedley Mascot Mines, Ltd., Vancouver	Flotation, cyanidation	Gold, silver.
Hedley Monarch	Olalla	Osoyoos	Hedley Monarch Gold Mines, Ltd., Vancouver		Gold, silver.
Nickel Plate	Hedley	Osoyoos	Kelowna Exploration Co., Hedley	Cyanidation, flotation	Gold, silver.
Okanagan	Penticton	Osoyoos	W. J. Armstrong, Penticton		Gold, silver, lead, zinc.
Esperanza	Alice Arm	Portland Canal	Esperanza Mines, Ltd., New Westminster		Gold, silver, copper.
Hansa	Glacier Creek	Portland Canal	Art Cameron and L. Robichaud, Stewart		Gold, silver, lead, zinc.
Silbak Premier	Premier	Portland Canal	*Silbak Premier Mines, Ltd., Premier*	*Flotation*	*Gold, silver, lead.*
Copper Mountain	Allenby	Similkameen	Granby Cons. M.S. & P. Co., Ltd., Copper Mountain	Flotation	Copper, gold, silver.
Arlington No. 2	*Springer Creek*	*Slocan*	*John J. McDonell, Slocan City*		*Silver, lead, zinc.*
Black Colt (dump)	Sandon	Slocan	A. E. Avison, New Denver		Silver, lead, zinc.
Bosun	New Denver	Slocan	Santiago Mines, Ltd., Vancouver		Silver, lead, zinc.
Dumac	Enterprise Creek	Slocan	Dumac Mines, Ltd., Silverton		Silver, lead, zinc.
Galena Farm	Silverton	Slocan	F. Mills and W. Postlethwaite, Silverton		Silver, lead, zinc.

Metallic	Silverton	Slocan	W. Crowe and A. K. Lotze, Waneta, and F. L. Kersey, Opportunity, Wash.		Silver, lead, zinc.
Noble Five	Sandon	Slocan	L. P. Gormley, Nelson; E. Bakos, Nelson		Silver, lead, zinc.
Ottawa	Springer Creek	Slocan	J. S. Klemans and J. J. McDonell, Slocan City		Silver.
Piedmont (Hope)	Slocan City	Slocan	Kabatoff & Paley, Nelson		Silver, lead, zinc.
Ruth Hope	Sandon	Slocan	Black & Higgins, Sandon		Silver, lead, zinc.
Silver Leaf	Slocan City	Slocan	D. Webster, Jr., Nelson		Silver, lead, zinc.
Silver Ridge	Sandon	Slocan	Ansaldo, Smith & Olson, Sandon		Silver, lead, zinc.
Silversmith	Sandon	Slocan	E. H. Petersen, Sandon		Silver, lead, zinc.
Slocan Rambler	McGuigan Creek	Slocan	B.C. Slocan Rambler Mines (1947), Ltd., New Denver		Silver, lead, zinc.
Standard, Mammoth, and Enterprise	Silverton	Slocan	Western Exploration Co., Ltd., Silverton	Flotation	Silver, lead, zinc.
Van Roi	Silverton	Slocan	Van Roi Mines, Ltd., Silverton		Silver, lead, zinc.
Violamac	Sandon	Slocan	Violamac Mines (B.C.), Ltd., New Denver		Silver, lead, zinc.
Zincton (Lucky Jim)	Zincton	Slocan	Zincton Mines, Ltd., Vancouver	Flotation	Silver, lead, zinc.
Holliday-Ranson	Alaska Highway	Stikine	Yukon Ranges Prospecting Syndicate, Toronto		Silver, lead, zinc.
I.X.L.	Rossland	Trail Creek	Doran & Nordholm, Rossland		Gold, silver.
Midnight	Rossland	Trail Creek	Kootenay Central Mines, Ltd., Rossland		Gold, silver.
Mayflower	Rossland	Trail Creek	E. H. Lovitt, Ltd., Vancouver		Gold, silver, lead, zinc.
Velvet	Rossland	Trail Creek	Grenfell and Coryell, Seattle, Wash.		Gold, silver, copper.
Britannia	Britannia Beach	Vancouver	Britannia Mining & Smelting Co., Ltd., Britannia Beach	Flotation	Copper, gold, silver.
Director No. 5	Edgewood	Vernon	H. A. McKen, Edgewood		Silver, lead, zinc.
Silver Star	Vernon	Vernon	Mylow O. Lewis, Vernon		Silver, lead, zinc.

* Includes lode producers of gold, silver, copper, lead, zinc, tungsten, iron, and siliceous flux.

TABLE XXII.—Mining Companies employing an Average of Ten or More Men during 1948.*

Shipping Mines.

Name of Mine or Company.	Days operating.		Tons.		Average Number employed.	
	Mine.	Mill.	Mined.	Milled.	Mine.	Mill.
Ainsmore Consolidated Mines, Ltd.	280	280	.....	13,661	20	5
Whitewater (Retallack Mines, Ltd.)	210	210	38,282	29,893	13	10
Privateer Mine, Ltd.	317	331	23,648	14,402	59	12
Polaris-Taku Mining Co., Ltd.	366	366	.....	102,624	167	11
Cariboo Gold Quartz Mining Co., Ltd.	365	365	.....	73,726	245	15
Island Mountain Mines Co., Ltd.	282	366	.....	40,752	89	10
Sullivan (Cons. M. & S. Co., Ltd.)	280	291	.....	2,283,625	1,776	357
Base Metals Mining Corp., Ltd.	366	366	.....	34,394	66	8
Highland Bell, Ltd.	279	.....	7,542	5,467	35	.....
Bralorne Mines, Ltd.	366	366	150,240	148,119	416	25
Pioneer Gold Mines of B.C., Ltd.	366	366	55,821	52,211	237	14
Vananda Mines (1948), Ltd.	311	36	.....	4,994	50	1
Alpine Gold, Ltd.	180	180	.....	735	13	5
Kenville Gold Mines, Ltd.	366	366	46,228	35,939	80	11
Sheep Creek Gold Mines, Ltd. (Queen Mine)	309	174	.....	25,432	69	6
Canadian Exploration, Ltd. (Emerald)	281	281	.....	81,476	137	48
Silver Standard Mines, Ltd.	290	67	4,378	3,543	32	2
Hedley Mascot Gold Mines, Ltd.	306	306	.....	42,788	91	23
Kelowna Exploration Co., Ltd.	286	355	.....	115,556	123	69
Fairview and Morning Star (Cons. M. & S. Co., Ltd.)	366	.....	30,228	.....	26	.....
Silbak Premier Mines, Ltd.	166	166	.....	41,360	121	9
Copper Mountain (Granby Cons. M.S. & P. Co., Ltd.)	362	362	1,705,624	1,653,029	563	250
Bosun (Santiago Mines, Ltd.)	290	.....	.....	1,194	14	.....
Silver Ridge Mining Co., Ltd.	295	.....	36	.....	10	.....
Western Exploration Co., Ltd.	280	211	22,749	20,815	82	15
Zincton Mine (Sheep Creek Gold Mines, Ltd.)	311	282	.....	97,329	71	8
Britannia Mining and Smelting Co., Ltd.	278	278	.....	799,502	553	186

Non-shipping Mines.

Bluebell (Cons. M. & S. Co., Ltd.)	.....	.....	.....	.....	21	.....
Tulsequah Chief (Cons. M. & S. Co., Ltd.)	.....	.....	.....	.....	53	.....
Reeves MacDonald Mines, Ltd.	.....	.....	.....	.....	56	.....
Torbrit Silver Mines, Ltd.	.....	.....	.....	.....	40	.....
Carnation (Kelowna Exploration Co., Ltd.)	.....	.....	.....	.....	11	.....

* The average number employed includes wage-earners and salaried employees. The average is obtained by adding the monthly figures and dividing by 12, irrespective of the number of months worked.

Departmental Work.

ADMINISTRATIVE BRANCH.

The administrative branch is responsible for the administration of the Provincial mining laws regarding the acquisition of mineral rights, and deals with other departments of the Provincial service for the Department or for any branch.

Gold Commissioners, Mining Recorders, and Sub-mining Recorders, whose duties are laid down in the "Mineral Act" and the "Placer-mining Act," administer these Acts and other Acts relating to mining. Mining Recorders, in addition to their own functions, may also exercise the powers conferred upon Gold Commissioners with regard to mineral claims within the mining division for which they have been appointed. Similar duties may be performed by Mining Recorders with regard to placer claims but not in respect of placer-mining leases. Recording of location and of work upon mineral claims, placer claims, and placer-mining leases as required by the various Acts must be made at the office of the Mining Recorder for the proper mining division. Information concerning claims and leases and concerning the ownership and standing of claims and leases in any division may be obtained from the Mining Recorder for the mining division in which the property is situated and from the Central Records Offices. Sub-mining Recorders, who act as forwarding agents, are appointed at various places throughout the Province. They are authorized to accept documents and fees, and forward them to the office of the Mining Recorder for the correct mining division. Officials and their offices in various parts of the Province are listed in the table on pages 43 and 44.

Copies of the various Acts, upon payment of the prices listed on page 270, can be obtained from the office of the Chief Gold Commissioner; the King's Printer, Victoria; the Central Records Office in Vancouver; or from the offices of the Gold Commissioners throughout the Province.

Central Records Offices (Victoria and Vancouver).

Complete records of the recorded owners of mineral claims held by record, of placer-mining leases, and of leases of reverted Crown-granted mineral claims, together with the numbers of certificates of work and the names of principals and their interests in bills of sale recorded, are available at the general office, Department of Mines, Victoria, B.C. The approximate positions of mineral claims held by record and of placer-mining leases are shown on maps from details supplied by the locators. The maps conform in geographical detail, size, and number to the reference and mineral reference maps issued by the Department of Lands. The information outlined, so far as possible, is brought up to date on receipt of semi-monthly returns from Gold Commissioners and Mining Recorders. Semi-monthly returns are forwarded to the Central Records Office, 305 Federal Building, Vancouver, B.C., from Victoria, together with copies of the cards provided by the Gold Commissioners and Mining Recorders. The maps and records may be inspected at either office by anyone who calls in business hours. Provision has been made to supply the general public, on request to the Department at Victoria, with copies of the maps.

Amalgamation of Mining Divisions.

(Particulars of Mining Divisions amalgamated since 1939.)

Date.	Mining Divisions amalgamated.	New Name.	Mining Recorder's Office.
July 2, 1939	Yale and New Westminster	New Westminster	New Westminster.
Sept. 18, 1939	Bella Coola and Skeena	Skeena	Prince Rupert.
Nov. 20, 1939	Slocan City and Slocan	Slocan	New Denver.
Aug. 1, 1940	Queen Charlotte and Skeena	Skeena	Prince Rupert.
Aug. 5, 1940	Grand Forks and Greenwood	Greenwood	Greenwood.
Oct. 15, 1942	Arrow Lake and Slocan	Slocan	New Denver.
Oct. 15, 1942	Golden and Windermere	Golden	Golden.
Nov. 30, 1942	Nanaimo and Quatsino	Nanaimo	Nanaimo.
Dec. 1, 1942	Alberni and Clayoquot	Alberni	Alberni.

Peace River Mining Division.

Effective May 1st, 1949, the office of the Gold Commissioner for the Peace River Mining Division will be established at Victoria. A Sub-mining Recorder will be appointed at Pouce Coupe, and other sub-mining recording offices for the Peace River Mining Division are at Finlay Forks, Fort St. John, and Prince George.

Gold Purchasing.

Late in 1935 the Department of Finance, co-operating with the Department of Mines, undertook to purchase placer gold, in quantities of not less than 3 pennyweight and not more than 2 oz. in weight, from individual placer-miners. The Gold Commissioners throughout the Province are paying a cash price of $28 per ounce for clean placer gold and are purchasing dirty placer gold and amalgam on a deferred-payment basis. Purchases made under this arrangement are as follows:—

Year.	No. of Lots.	Paid.	Paid per Oz.
1937	1,657	$52,250	$28.00
1938	2,397	72,000	28.00
1939	2,322	60,000	29.00
1940	1,336	31,600	29.00
1941	631	16,825	29.00
1942	229	8,068	29.00
1943	93	2,705	29.00
1944	59	1,196	29.00
1945	63	1,604	29.00
1946	115	3,911	28.00*
1947	107	3,502	28.00
1948	100	3,224	28.00
Totals	9,109	$256,882	.....

* Following the reduction of the official Canadian price for fine gold, the price paid by Gold Commissioners was set at $28 per ounce of clean placer gold. This price is now in effect; for the earlier purchases made in 1946 the price paid was $29 per ounce.

This purchasing scheme was established during the depression years to give the individual miner the best possible price for his gold, and this was realized in that the total price paid has been almost exactly the same as the receipts from the Royal Canadian Mint.

List of Gold Commissioners, Mining Recorders, and Sub-mining Recorders in the Province.

Mining Division.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-recorder.
Ainsworth	Kaslo	C. Macdonald	B. F. Palmer	
Sub-office	Poplar			A. Robb.
Alberni	Alberni	T. H. Harding	T. H. Harding	R. MacGregor.
Sub-office	Nanaimo			W. H. Cochrane.
Sub-office	Quatsino			Axel Hansen.
Sub-office	Tofino			R. R. Barr.
Sub-office	Zeballos			H. M. B. Sutton.
Ashcroft	Ashcroft	D. Dalgleish (Kamloops)	D. H. Bruce	
Sub-office	Lytton			J. Blakiston-Gray.
Atlin	Atlin	A. E. Roddis	A. E. Roddis	
Sub-office	Lower Post			J. W. Stewart.
Sub-office	Pouce Coupe			H. O. Callahan.
Sub-office	Squaw Creek			Mrs. F. Muncaster.
Sub-office	Telegraph Creek			Mary C. Allen.
Sub-office	Tulsequah			T. G. Emery.
Cariboo	Barkerville	W. L. Draper	W. L. Draper	Mrs. T. B. McLean.
Sub-office	Fort McLeod			J. E. McIntyre.
Sub-office	McBride			T. R. Maxwell.
Sub-office	Prince George			G. H. Hallett.
Sub-office	Quesnel			S. Allen.
Clinton	Clinton	C. G. Sutherland	C. G. Sutherland	
Sub-office	Haylmore			W. Haylmore.
Sub-office	Williams Lake			Miss J. Foster.
Fort Steele	Cranbrook	E. L. Hedley	E. L. Hedley	
Sub-office	Fernie			F. E. P. Hughes.
Golden	Golden	S. M. Carling	S. M. Carling	
Sub-office	Invermere			T. N. Weir.
Greenwood	Greenwood	G. L. Hamilton	G. L. Hamilton	
Sub-office	Beaverdell			L. F. Crump.
Sub-office	Grand Forks			W. E. McLean.
Sub-office	Oliver			L. M. McKinnon.
Kamloops	Kamloops	D. Dalgleish	D. Dalgleish	
Sub-office	Chu Chua			G. M. Fennell.
Sub-office	Salmon Arm			T. G. O'Neill.
Lardeau	Beaton	W. G. Fleming (Revelstoke)	C. A. McElroy	
Lillooet	Lillooet	G. H. Beley	G. H. Beley	Miss D. M. Eggie.
Sub-office	Haylmore			W. Haylmore.
Nanaimo	Nanaimo	W. H. Cochrane	W. H. Cochrane	
Sub-office	Alberni			T. Harding and R. MacGregor.
Sub-office	Alert Bay			A. J. Dillabough.
Sub-office	Cumberland			A. G. Freeze.
Sub-office	Quatsino			Axel Hansen.
Sub-office	Stuart Island			J. B. Willcock.
Sub-office	Vananda			Henry Carter.
Nelson	Nelson	S. Hamilton	S. Hamilton	Miss W. M. Palethorpe.
Sub-office	Creston			B. J. H. Ryley.
Sub-office	Salmo			M. C. Donaldson.
New Westminster	New Westminster	A. B. Gray	J. F. McDonald	
Sub-office	Chilliwack			E. L. Anderson.
Sub-office	Hope			J. H. Richmond.
Sub-office	Lytton			J. Blakiston-Gray.
Nicola	Merritt	D. Dalgleish (Kamloops)	R. G. Couper	
Omineca	Smithers	K. D. McRae	K. D. McRae	
Sub-office	Bella Coola			E. Bradley.
Sub-office	Burns Lake			A. Fisher.
Sub-office	Copper River			L. G. Skinner.
Sub-office	Dorreen			W. E. Horwill.
Sub-office	Fort St. James			Norman Henry.
Sub-office	Finlay Forks			Mrs. M. McDougall.

LIST OF GOLD COMMISSIONERS, MINING RECORDERS, AND SUB-MINING RECORDERS IN THE PROVINCE—*Continued.*

Mining Division.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-recorder.
Omineca (*Continued*)				
Sub-office	Fort St. John			R. H. Rashleigh.
Sub-office	Hazelton			W. A. A. West.
Sub-office	Manson Creek			A. D. Mackintosh.
Sub-office	Prince George			G. H. Hallett.
Sub-office	Takla Landing			Mrs. G. M. Henry.
Sub-office	Telkwa			T. J. Thorp.
Sub-office	Vanderhoof			George Ogsdon.
Osoyoos	Penticton	T. S. Dalby	T. S. Dalby	
Sub-office	Hedley			W. E. Benton.
Sub-office	Keremeos			L. S. Coleman.
Sub-office	Oliver			L. M. McKinnon.
Peace River	Victoria	K. B. Blakey		H. O. Callahan.
Sub-office	Finlay Forks			Mrs. M. McDougall.
Sub-office	Fort St. John			R. H. Rashleigh.
Sub-office	Prince George			G. H. Hallett.
Portland Canal	Stewart	G. Forbes (Prince Rupert)	C. G. Tran	
Sub-office	Alice Arm			Mrs. J. F. Butler.
Quesnel	Williams Lake	Miss J. Foster	Miss J. Foster	
Sub-office	Barkerville			W. L. Draper.
Sub-office	Horsefly			Mrs. H. Gibbons.
Sub-office	Keithley Creek			W. Rae.
Sub-office	Likely			L. R. Speed.
Sub-office	Quesnel			S. Allen.
Revelstoke	Revelstoke	W. G. Fleming	W. G. Fleming	
Similkameen	Princeton	Chas. Nichols	Chas. Nichols	E. C. Hepburn.
Sub-office	Hedley			W. E. Benton.
Skeena	Prince Rupert	G. Forbes	G. Forbes	
Sub-office	Bella Coola			E. Bradley.
Sub-office	Burns Lake			A. Fisher.
Sub-office	Copper River			L. G. Skinner.
Sub-office	Queen Charlotte			H. R. Beaven.
Sub-office	Stewart			C. G. Tran.
Slocan	New Denver	C. MacDonald (Kaslo)	F. Broughton	Miss M. Butlin.
Sub-office	Slocan			W. E. Graham.
Stikine	Victoria	K. B. Blakey		
Sub-office	Telegraph Creek			Mary C. Allen.
Sub-office	Burns Lake			A. Fisher.
Sub-office	Dease Lake			R. A. Farrell.
Sub-office	Fort St. James			N. Henry.
Sub-office	Fort St. John			R. H. Rashleigh.
Sub-office	Lower Post			J. W. Stewart.
Sub-office	Pouce Coupe			H. O. Callahan.
Trail Creek	Rossland	E. B. Offin	E. B. Offin	
Vancouver	Vancouver	J. Egdell	Mrs. D. White (Deputy)	Miss F. Schachter.
Sub-office	Alert Bay			A. J. Dillabough.
Sub-office	Powell River			J. P. Scarlett.
Sub office	Stuart Island			J. B. Willcock.
Vernon	Vernon	A. E. Wilson	A. E. Wilson	
Sub-office	Kelowna			E. R. Oatman.
Victoria	Victoria	K. B. Blakey	R. H. McCrimmon (Deputy)	Miss D. T. Arnott.

Gold Commissioners' and Mining Recorders' Office Statistics, 1948.

Mining Division.	Free Miners' Certificates.				Lode-mining.					Placer-mining.				Revenue.		
	Individual.	Company.	Special.	Provisional (Placer).	Mineral Claims recorded.	Certificates of Work.	Bills of Sale, etc.	Certificates of Improvements.	Leases of Reverted Crown-granted Mineral Claims.	Placer Claims recorded.	Placer Leases granted.	Certificates of Work, Placer Leases.	Bills of Sale, etc.	Free Miners' Certificates.	Mining Receipts.	Total.
Ainsworth	121	4	4	.....	165	186	12	.....	92	3	2	.....	.....	$825.25	$4,352.75	$5,178.00
Alberni	117	6	3	.....	110	267	33	5	32	.....	.....	3	2	1,154.40	5,160.10	6,314.50
Ashcroft	64	1	.....	2	99	27	7	.....	.....	1	2	7	19	327.25	3,253.10	3,580.35
Atlin	156	7	5	.....	95	153	23	.....	2	9	7	163	17	1,317.25	12,537.25	13,854.50
Cariboo	410	16	4	14	197	333	29	1	.....	11	171	394	209	3,544.25	33,782.25	37,326.50
Clinton	63	1	.....	5	116	80	4	.....	.....	2	16	5	8	354.50	1,850.25	2,204.75
Fort Steele	179	.....	.....	3	81	170	7	2	7	1	10	33	12	819.25	3,470.65	4,289.90
Golden	67	3	1	.....	183	165	99	.....	11	.....	.....	.....	.....	574.00	2,973.01	3,547.01
Greenwood	95	1	2	.....	73	155	23	.....	22	1	5	1	.....	535.00	2,198.25	2,733.25
Kamloops	171	.....	1	21	286	152	15	1	16	4	2	.....	.....	800.50	2,739.00	3,539.50
Lardeau	38	1	.....	.....	53	100	14	.....	.....	.....	.....	.....	.....	238.25	523.75	762.00
Lillooet	322	8	2	4	381	701	70	46	5	1	5	40	23	2,254.00	6,349.40	8,603.40
Nanaimo	98	.....	.....	.....	67	191	30	1	18	.....	.....	3	.....	445.25	1,893.50	2,338.75
Nelson	336	13	6	.....	217	307	62	17	15	14	1	14	1	2,746.00	5,157.75	7,903.75
New Westminster	190	4	.....	20	120	208	25	1	8	.....	12	16	27	1,131.75	2,717.25	3,849.00
Nicola	62	.....	3	.....	247	257	44	8	.....	.....	.....	.....	.....	257.00	1,947.45	2,204.45
Omineca	307	4	.....	.....	326	674	86	.....	11	6	29	89	23	1,718.00	14,069.50	15,782.50
Osoyoos	93	.....	2	3	67	114	27	.....	.....	.....	.....	.....	.....	716.25	696.75	1,413.00
Peace River	59	1	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	5	305.50	35.00	340.50
Portland Canal	79	2	4	.....	69	308	37	2	.....	.....	.....	.....	.....	635.50	2,691.25	3,326.75
Quesnel	394	12	14	6	181	145	26	.....	.....	9	41	149	65	3,068.75	14,306.25	16,029.00
Revelstoke	42	1	2	.....	37	39	25	.....	20	.....	6	3	4	316.25	6,413.50	6,729.75
Similkameen	211	6	2	7	56	95	17	3	3	1	14	37	18	1,586.25	3,534.25	5,120.50
Skeena	125	.....	4	.....	62	104	28	6	23	.....	1	.....	.....	581.75	2,108.75	2,690.50
Slocan	110	1	1	.....	92	332	42	1	.....	.....	.....	.....	.....	609.50	1,327.50	1,937.00
Stikine	124	.....	2	.....	89	90	14	.....	5	1	27	72	50	633.00	11,722.50	12,355.50
Trail Creek	93	2	.....	.....	32	68	13	.....	2	.....	1	.....	.....	568.50	536.02	1,104.52
Vancouver	1,154	91	28	50	134	245	38	3	17	.....	.....	.....	2	13,832.00	4,909.97	18,741.97
Vernon	123	2	1	15	101	66	5	3	5	1	.....	30	7	620.25	1,617.25	2,237.50
Victoria	241	10	2	2	57	30	7	.....	10	1	9	9	1	2,213.50	1,713.00	3,926.50
Totals, 1948	5,658	194	90	152	3,803	5,762	862	100	324	66	361	1,068	493	$43,347.90	$156,587.20	$199,935.10
Totals, 1947	6,253	203	81	165	4,083	7,314	1,177	96	257	76	492	1,483	524	46,630.25	156,137.92	202,768.17

CHEMICAL LABORATORIES.

During 1948 the chemical laboratory in Victoria issued reports on 2,100 rock samples and specimens from prospectors and Departmental engineers. A laboratory examination of a prospector's sample generally consists of the following: (1) A mineralogical determination of visible minerals and a classification of the type of rock; (2) a spectrographic analysis to determine if any base metals are present in interesting percentages; (3) assays for precious metals, and for base metals shown by the spectrographic analysis to be present in interesting percentages; (4) test for radioactivity. The laboratory reports were distributed in the following manner amongst bona-fide prospectors, bona-fide prospectors who were grantees under the "Prospectors' Grub-stake Act," and Departmental engineers:—

	Samples and Specimens.	Mineralogical Determinations.	Spectrographic Analysis.	Assays.	Radioassays reported.
Bona-fide prospectors	893	835	788	1,433	180
Bona-fide prospectors (grantees)	443	440	430	970	61
Departmental engineers	764	32	321	2,084	150
Totals	2,100	1,307	1,539	4,487	391

Proximate analyses and heat-value determinations were made on twenty-six coal samples. Of these, eight were for the Department of Mines, fifteen were for the Department of Lands, and three were for the Department of Public Works.

Twenty-two samples of agricultural materials were analysed for the Department of Agriculture, and twenty-five analyses of a miscellaneous nature were undertaken for various other departments, including the Department of Trade and Industry, Liquor Control Board, Provincial Museum, and the British Columbia Research Council.

For the Attorney-General's Department, sixty-six cases of a chemico-legal nature were undertaken, involving a study of 274 widely varied exhibits. These included sixteen toxicological analyses, five analyses of liquors, three analyses of blood for alcohol, and seven analyses of samples of gasoline seized under the "Coloured Gasoline Tax Act." A great number of the remaining cases involved the identification of exhibits, frequently by spectrographic or microscopic means.

Work of the previous year was continued for the Live Stock Branch of the Department of Agriculture in an investigation involving dietary deficiencies in cows. In this connection, nine samples of blood serum were analysed for phosphorus and calcium. This investigation will continue into 1949.

Spectrochemical analyses of twenty samples of coal-ash and concentrates derived therefrom were undertaken for the Department of Mining and Metallurgy of the University of British Columbia. This work was in connection with an investigation being carried out by the University as to possible sources of the metals gallium and germanium.

An investigation commenced in 1947 in co-operation with the Mineralogical Branch, to study possible methods of correlating coal-seams, was continued. This involved the spectrochemical analysis for certain "trace" metals of a great number of coal-ashes.

Another phase of the same problem was undertaken in co-operation with the Coal, Petroleum, and Natural Gas Commission. In this case, the relative degree of radioactivity of numerous samples of coal was determined in an attempt to correlate seams by this means. Work in both phases of this investigation will be continued during 1949.

With the installation of a Geiger-Mueller counter, it was decided to undertake the radioassay of all samples submitted either for assay or mineralogical determination

since the beginning of 1947. Of these samples, 3,396 have so far been tested, and the remainder will be completed early in 1949.

A total of 100 lots of placer gold, amounting to 114.6737 oz. and representing purchases from individual placer-miners, was received from Gold Commissioners.

Provincial Government examinations for certificates of competency and licence to practise assaying in British Columbia were held in Victoria and Trail in May. Of the two candidates who sat for the entire examination, one passed and the other failed. One candidate sat for a supplemental examination previously granted him and passed.

INSPECTION BRANCH.

Organization and Staff.

Inspectors and Resident Engineers.

James Strang, Chief Inspector	Victoria.
Hamilton C. Hughes, Senior Inspector of Metalliferous Mines	Victoria.
L. Wardman, Electrical Inspector	Victoria.
J. A. Mitchell, Inspector of Mines	Victoria.
J. H. Bennett	Victoria.
Robert B. King	Vancouver.
John MacDonald	Nanaimo.
J. E. Merrett	Lillooet.
E. R. Hughes	Princeton.
J. W. Peck	Nelson.
Robert B. Bonar	Fernie.
F. J. Hemsworth	Prince Rupert.

The Inspectors are stationed at the places listed, and inspect coal mines, metalliferous mines, and quarries in their respective districts. They also examine prospects and mining properties.

Board of Examiners for Coal-mine Officials.

James Strang	Chairman, Victoria.
Robert B. Bonar	Member, Fernie.
John MacDonald	Member, Nanaimo.

R. B. Bonar and John MacDonald and the Inspector of Mines of the district in which an examination is being held form the Board for granting certificates of competency to coal-miners.

An Inspector of Mines is empowered to grant provisional certificates to miners for a period not exceeding sixty days between regular examinations.

Instructors, Mine-rescue Stations.

Richard Nichol	Nanaimo Station.
Arthur Williams	Cumberland Station.
Thomas H. Cunliffe	Princeton Station.
Joseph J. Haile	Fernie Station.

Staff Changes.

J. A. Mitchell was transferred from Nelson to Victoria to take charge of work relative to mining roads and trails and prospectors' grub-stakes, replacing B. T. O'Grady, who retired. J. H. Bennett is associated with him in this work.

J. W. Peck was transferred to Nelson and J. E. Merrett to Lillooet.

Robert B. King and J. H. Bennett were appointed to the staff. Mr. King was transferred from Victoria to Vancouver in April, 1949.

MINERALOGICAL BRANCH.

Field-work by officers of the Mineralogical Branch consists principally of geological mapping and the examination of mineral deposits. The results are published partly in the Annual Report of the Minister of Mines and partly in a series of bulletins. The activities of the Branch include identification of rock and mineral specimens submitted by prospectors and others, and the examination of all samples submitted by prospectors to the Analytical Branch. The Mineralogical Branch also supplies information regarding mineral deposits and the mineral industry in response to inquiries received in great number.

Seven officers of the Mineralogical Branch were engaged in field-work during the 1948 field season, and two field parties were led by geologists employed for the season.

J. M. Black did geological mapping in the placer area on the east side of Atlin Lake and made detailed or preliminary studies of lode properties at Tulsequah, Salmon River, Alice Arm, Hazelton, and Smithers.

J. M. Cummings continued studies of clay deposits and examined barite deposits, gypsum deposits, and deposits which had been considered as possible sources of feldspar. At the end of 1948 Mr. Cummings left the service of the Department to enter private engineering practice.

M. S. Hedley continued detailed geological mapping of an area extending westerly and south-westerly from Sandon.

Stuart S. Holland mapped the geology of the Bowron River coal-occurrence and began detailed mapping of an area on Yanks Peak.

W. H. Mathews began detailed mapping of the Sheep Creek gold area.

C. B. Newmarch completed detailed geological mapping of selected areas in the Crowsnest Pass coalfield.

B. T. O'Grady, whose automatic retirement became effective on April 30th (*see* biographical note, Minister of Mines, B.C., Annual Report, 1947, p. 49), continued to supervise the road and trail and grub-stake programmes, and to assist the Securities Commission in administering the "Securities Act" until the end of September.

John S. Stevenson, who has been on leave as Guggenheim Research Fellow, returned to the service of the Department in June. In 1948 he continued detailed mapping of properties in the Bridge River area.

James T. Fyles, who was engaged as party chief for the field season, mapped copper-showings on Sooke Peninsula and began the geological mapping of an area north of Cowichan Lake.

G. B. Leech, who was engaged as party chief for the field season, completed geological mapping of an area on Upper Yalakom River.

GRUB-STAKING PROSPECTORS.

The "Prospectors' Grub-stake Act," as amended in March, 1944, provides for grub-stakes of up to $300 to prospectors, plus an additional $200 if travelling expenses are deemed necessary. For the 1943 season, $25,000 was appropriated by the Legislature; for each of the 1944, 1945, and 1946 seasons, $50,000 was appropriated; and for each of the 1947 and 1948 seasons, $40,000 was appropriated.

STATISTICS.

Field Season.	Approximate Expenditure.	Men Grub-staked.	Samples and Specimens received at Department Laboratory.	Mineral Claims recorded.
1943	$18,500	90	773	87
1944	27,215	105	606	135
1945	27,310	84	448	181
1946	35,200	95	419	162
1947	36,230	91	469	142
1948	35,975	92	443	138

Samples and specimens submitted by grub-staked prospectors are examined by an engineer, following which examination further study is made by one or more of the following methods: Mineralogical determination, spectrographic analysis, assay.

Several properties discovered by grub-staked prospectors have been explored by mining companies. In 1948 no outstanding discoveries were made by grantees, but in several areas discoveries were made which merit further exploration.

The grub-stake programme was supervised by B. T. O'Grady, assisted by D. H. Rae and J. H. Bennett, until September 30th. After that date the programme was carried on by J. A. Mitchell and J. H. Bennett.

MUSEUMS.

The Department has a large exhibit of ores and minerals in the museum on Superior Street, Victoria; smaller collections are displayed in the joint office, 305 Federal Building, Vancouver, and in the offices of the Inspectors of Mines in Nelson and Prince Rupert.

Information regarding collections of specimens of rocks and minerals available to prospectors and schools in British Columbia will be found on page 258.

PUBLICATIONS.

Annual Reports of the Minister of Mines, bulletins, and other publications of the Department, with prices charged for them, are listed on pages 256 to 258.

Publications may be obtained from the offices of the Department in Victoria and elsewhere in the Province. They are also available for reference use in the Department's library (Mineralogical Branch) at Victoria; in the joint office, 305 Federal Building, Vancouver; and in the offices of the Inspectors of Mines in Nelson and Prince Rupert, as well as in public libraries listed on pages 259 and 260.

JOINT OFFICES OF THE BRITISH COLUMBIA DEPARTMENT OF MINES AND OF THE DEPARTMENT OF MINES AND RESOURCES, CANADA.

The Provincial Department's engineer, the Gold Commissioner and Mining Recorder for the Vancouver Mining Division, and the officers of the Dominion Geological Survey now occupy one suite of offices. All official information relating to mining is now available to the public in the one suite of offices at 305 Federal Building, Vancouver.

The services offered to the public include technical information on mining, the identification of mineral specimens, distribution of Dominion and Provincial mining publications, a reference library, a display of rocks and minerals, and a central records office.

GEOLOGICAL SURVEY OF CANADA.

By an arrangement made at the time the Province of British Columbia entered Confederation, geological investigations and mapping in the Province are carried on by the Geological Survey of Canada. Several geological parties are in the field each year. Many excellent reports and maps covering large areas of British Columbia have been issued by the Geological Survey of Canada, and they have made available a great amount of information that has been of much benefit to the mining and prospecting activities in British Columbia.

A branch office of the Geological Survey of Canada is maintained at 305 Federal Building, Vancouver. Maps and reports on British Columbia can be obtained there. W. E. Cockfield is in charge of this office.

One of the main branches of the Dominion Government Department of Mines and Resources is the Mines, Forests, and Scientific Services Branch. It has sub-branches known as the Bureau of Mines, Geological Survey, and Surveys and Mapping Bureau. The Topographical Survey is under the Surveys and Mapping Bureau. A list of geological and topographical parties working in British Columbia in 1948 follows.

GEOLOGICAL PARTIES.

E. F. Roots completed geological mapping of the Aiken Lake area; latitude 56°–57° and longitude 125°–126°.

S. Duffell continued geological mapping of the Whitesail Lake area; latitude 53°–54° and longitude 126°–128°.

A. G. Jones commenced geological mapping of the Revelstoke area; latitude 50°–51° and longitude 118°–119°.

H. W. Little continued geological mapping of the Nelson area; latitude 49°–50° and longitude 117°–118°.

A. L. McAllister completed geological mapping of the Ymir area; latitude 49°15′–49°30′ and longitude 117°–117°15′.

J. W. Hoadley continued geological mapping in the Zeballos area; latitude 49°45′–50° and longitude 126°30′–127°.

J. E. Armstrong commenced systematic geological mapping of a series of 1-mile map-sheets in the Vancouver area between latitudes 49°–49°30′ and longitudes 122°30′–123°30′.

A. F. Buckham, assisted by A. B. Latour, commenced a field investigation of the Groundhog coal area.

J. L. Usher continued a study of the palæontology of the Upper Cretaceous of the east coast of Vancouver Island and the islands of the Strait of Georgia.

V. J. Okulitch carried out an investigation of the late Precambrian geological section along the Canadian Pacific Railway on both sides of Glacier.

W. E. Cockfield assisted the Dominion Water and Power Bureau in its investigations of the Columbia River drainage system and visited a number of mining properties.

E. Hall carried out field studies at the Fairmont, Torrent, Wardner, Plumbob, and Bromley dam-sites in connection with the Dominion Water and Power Bureau's investigation of the Columbia drainage system.

TOPOGRAPHICAL PARTIES.

Seven field parties were engaged in topographical mapping in British Columbia during the 1948 season, using photo-topographical methods for control of vertical photographs.

Field-work was completed in an area at the head of the Skeena River, latitude 56° 30′–57° and longitude 128°–128° 15′.

Field-work was completed in the Dease River area; latitude 59°–60° and longitude 128°–130°.

Field-work was completed in the central Liard River area; latitude 59°–60° and longitude 126°–128°.

Field-work, started in 1947, was completed in the Whitesail Lake area; latitude 53°–54° and longitude 126°–128°.

Field-work was about half completed in the Upper Nechako River area; latitude 53°–54° and longitude 124°–126°.

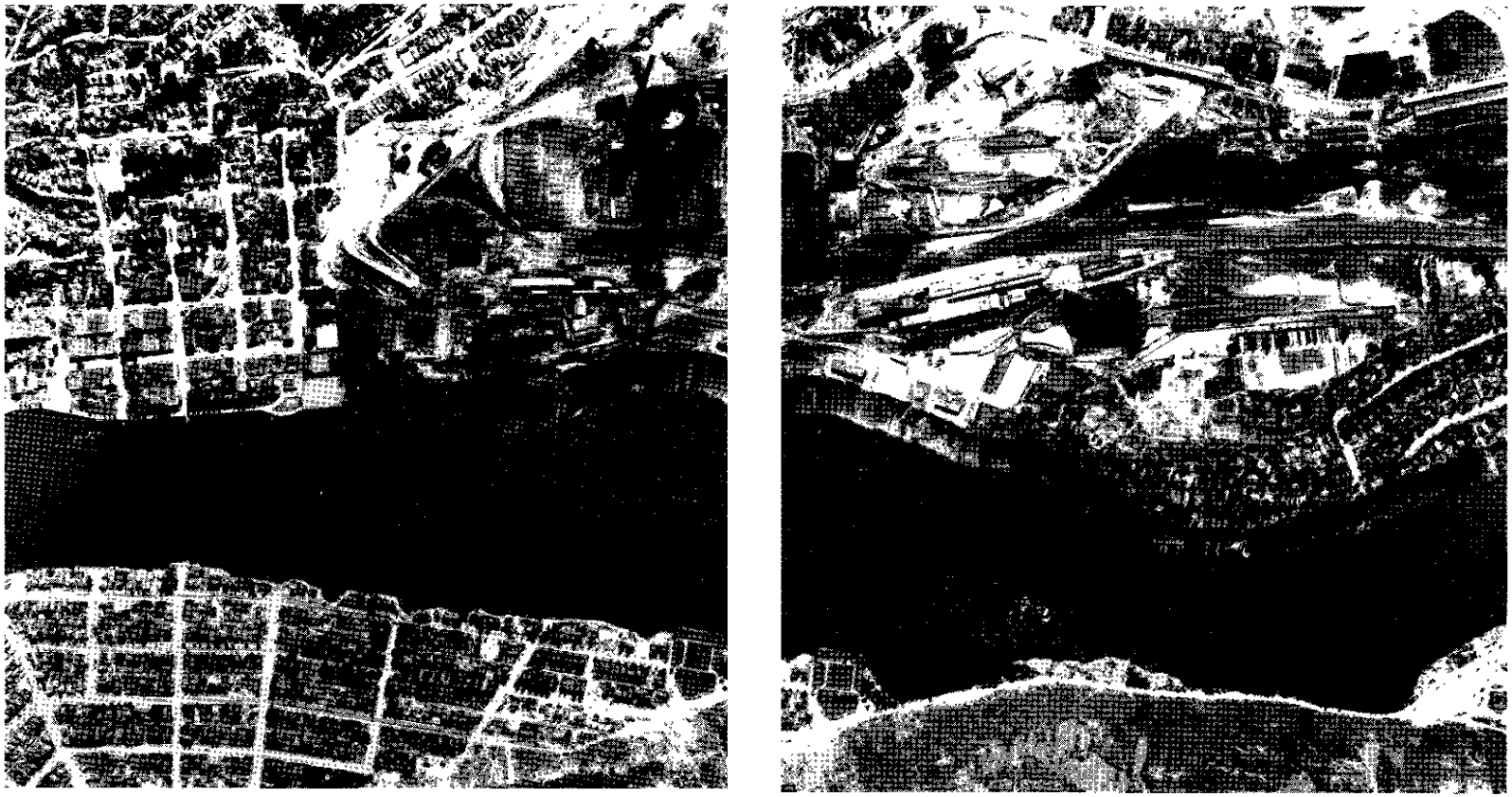
PLATE I.

A. Copper Mountain mine, surface workings and plant.

B. Town of Hedley; Nickel Plate mill, lower right.

(British Columbia Government air photographs.)

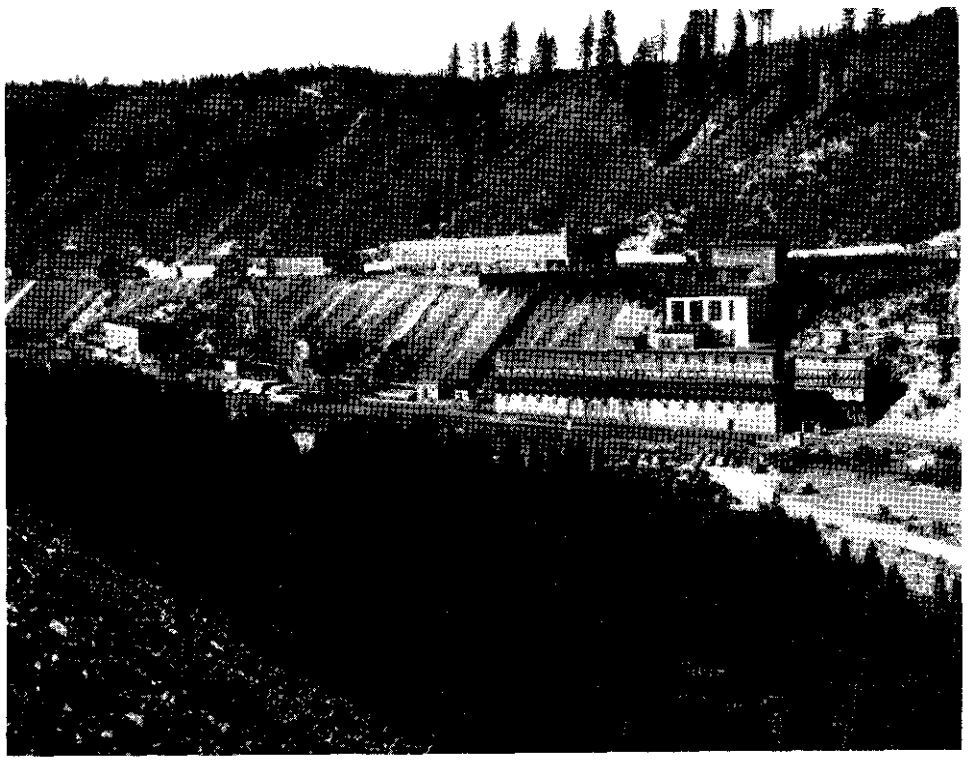
PLATE II.



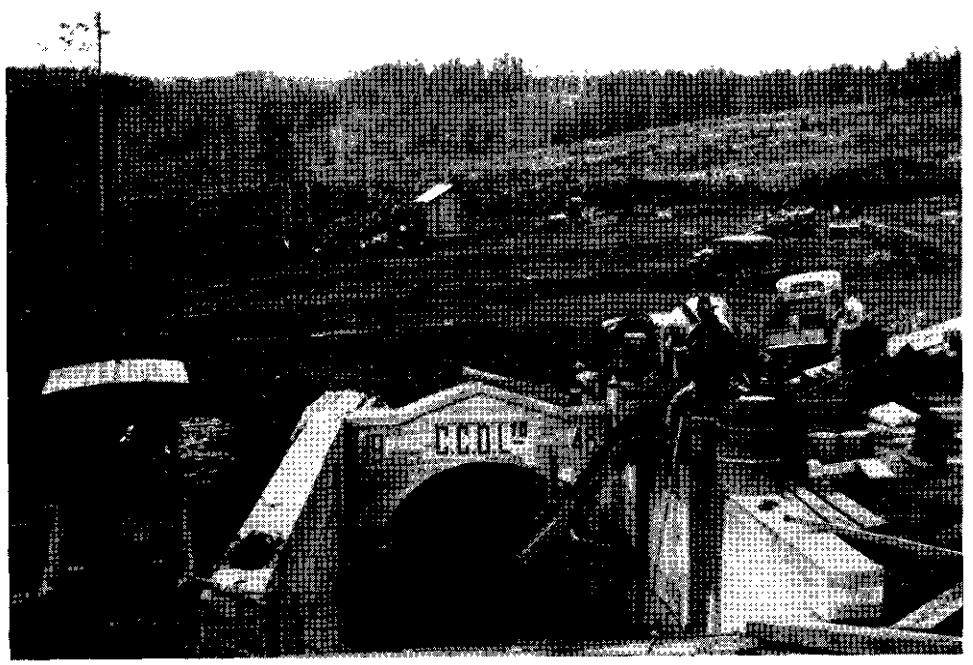
Plates II and III. Adjoining air photographs showing smelter at Trail and adjoining fertilizer plant.

(British Columbia Government air photographs.)

PLATE IV.



A. Sullivan mine surface plant, Mark Creek.



B. New slope portal, Tsable River colliery.

(Photograph courtesy of Canadian Collieries, Ltd.)

Metal-mining (Lode).

CONTENTS.

NOTES ON METAL MINES—*Continued.* PAGE.

NOTES ON METAL MINES—*Continued.* PAGE.

NOTES ON METAL MINES—*Continued.* PAGE.

DRAWINGS.

GENERAL REVIEW.

In 1948 lode-metal mining was at a high level of activity. The rise in prices of copper, lead, and zinc was responsible for great interest in base-metal mining and exploration. In general, lode-gold mines operated more successfully than in 1947. In all mines the supply of labour, and particularly of experienced miners, improved considerably over the previous few years. The average number of men employed in the lode-metal mining industry, including underground and surface workers at mines, mills, and smelters, was 10,582 in 1948 as compared with 9,683 in 1947.

The quantities of silver, copper, lead, and zinc produced in 1948 increased moderately over the quantities produced in 1947, but higher prices increased the value of production of these four metals from $84,659,295 in 1947 to about $116,000,000 in 1948. The quantity of lode gold produced in 1948 was about 18 per cent. greater than the amount produced in 1947.

During 1948 twenty-five mines equipped with mills were in production. Of these mills, seventeen were operated continuously, three were operated intermittently, three were closed, and two new ones were started. Silbak Premier was the only large operation to close in 1948. Privateer also shut down, to await better conditions for gold-mining. The two new mills started were those at the Vananda and Silver Standard mines. Ore was shipped to smelters by seventy-two other properties, a large increase over the number of shipping properties in 1947. The shipments of ore ranged from amounts of 1 ton or less to more than 5,000 tons. A large proportion of these shipping properties are in the Kootenay and Boundary areas.

In the larger mines, diamond-drill blast-hole mining was used widely. For example, all ore produced at the Copper Mountain mine, over half that produced at Britannia, and a large part of the Sullivan ore was broken by this method. Mechanization was further advanced in most mines, particularly by the increased use of slusher-hoists in moving broken ore. At the Sullivan the main haulage-level was completed, and work started on the sink-and-float plant. At several mines extensive testing of tungsten-carbide bits was done with some encouraging results, particularly in drilling chert at the Sullivan mine.

The Torbrit mill was practically completed, and scheduled to start production early in 1949. The Reeves MacDonald mine was under active development and is expected to start milling in 1949. The Silver Giant property at Spillimacheen was under development by Siscoe Gold Mines, Limited; installation of a mill is contemplated. Sheep Creek Gold Mines, Limited, was preparing to put a mill on the Paradise property. The Tulsequah Chief and Big Bull properties continued to be developed by Consolidated Mining and Smelting Company; this company was also actively developing the Blue Bell. The Jersey claim, part of the Emerald tungsten property, was explored by diamond-drill; a body of lead-zinc ore was found, and plans were made to treat this ore in the present mill. Production of iron ore was started at Quinsam Lake on Vancouver Island, where magnetite was mined by open-pit quarrying and shipped to a smelter in the State of Washington.

Development of the Salmon Gold property was continued. Underground exploration was done at several properties in the Cariboo and Bridge River areas. Surface exploration was done in the Unuk River area, and some interest was taken in the Adams Plateau region north-east of Kamloops. Exploration was active in many other sections, and promises to continue even more intensively in 1949.

NOTES ON METAL MINES.

The following section includes short notes on mines and prospects, and detailed reports. In general, material for the short notes was supplied by Inspectors of Mines. The more detailed reports are written by Engineers of the Mineralogical Branch, but may include information supplied by an Inspector. Authorship is shown by foot-notes. Information about companies was obtained from the office of the Registrar of Companies. Statistics of development and production were obtained from the Bureau of Economics and Statistics. Production figures shown are the gross metal content except where noted otherwise. Net contents were shown in previous years.

The notes are arranged in geographical order under headings which are place-names that suggest the area in which the properties lie. Also, the approximate position of properties is shown by numbers and letters, in parentheses, that follow the place-name or the name of the property. The numbers give the latitude and longitude of the south-east corner of the 1-degree quadrilateral, and the letters show the quarter of the quadrilateral in which the property is situated.

ATLIN.*

Copper.

Hoboe Creek.—(59° 134° S.E.) Nine mineral claims were staked on Hoboe Creek by Harper Reed, W. J. Husselbee, and C. Baker. The claims cover a copper showing at the south end of Atlin Lake.

Gold.

Engineer.—(59° 134° S.E.) This property on Tagish Lake is owned by Neil Forbes and Walter Sweet. During the summer of 1948 the owners cleaned up an old dump and recovered about 64 oz. of gold. No work was done in the mine.

ALASKA HIGHWAY.

Silver-Lead.

Holliday Ranson. (59° 130° N.W.) This group of thirteen claims, 6.5 miles south of Mile 707, Alaska Highway, was located by A. F. Holliday, of Swift River, Yukon, and Roy R. Ranson, of Sault Ste. Marie, Mich. It was later optioned to Yukon Ranges Prospecting Syndicate. Work to date

* By F. J. Hemsworth.

has been confined to surface-stripping. A shipment of 5 tons to the smelter at Trail yielded 187 oz. of silver and 5,657 lb. of lead.

McDAME CREEK (59° 129° S.W.).*

Gold.

Turmoil.—The Turmoil group of five claims is recorded in the name of P. Hamlin. He reported that work done on the group consisted of deepening the shaft a few feet and surface exploration.

Hurricane.—This group comprises the Hurricane No. 1, No. 2, No. 3, and No. 4 and was formerly known as the Vollaug group. It is reported that R. Wilms did some work on these claims.

TAKU RIVER (58° 133° N.W.).

Gold.

Polaris-Taku (Taku River Gold Mines, Ltd.).†

Company office, 1500 Royal Bank Building, Vancouver. W. B. Milner, president; W. F. James, managing director; G. W. Robinson, manager. Capital: 3,000,000 shares, no par value. Taku River Gold Mines, Limited, owns all the issued shares of Polaris-Taku Mining Company, Limited, which owns a block of claims that extend across the bottom and part way up the west slope of Tulsequah Valley. In 1948 development was continued, and production was 270 to 300 tons per day. All ore mined came from below the Polaris level, mostly from the 300 and 450 levels. Most of the ore was mined in shrinkage stopes; 10 per cent. of the ore was mined by cut and fill from a stope on the 300 level.

Production: Ore milled, 102,624 tons; concentrates produced, 8,458 tons. Gross contents: Gold, 29,156 oz.; silver, 1,311 oz.

Development-work consisted of 3,942 feet of drifting and crosscutting, 1,250 feet of raising, and 17,975 feet of diamond-drilling.

A 150,000-gallon sump and a pumping-station were completed on the 750 level. To check the excess flows of water, diamond-drill holes are directed toward wet areas and are grouted. This temporarily seals the area and permits better working conditions in stopes and raises.

A 25,000-cubic-feet-per-minute (at 3½-inch water gauge) exhausting-fan with a 32-inch axial flow, driven by a 25-horsepower motor, has been installed on the 300 level to increase the circulation of the air in the eastern workings.

If it is practical to roast the ore and cyanide the roasted product, to recover the gold at the mine, a considerable reduction in costs might result. The chief problem is the disposal of the arsenious trioxide produced by the roaster; research to solve this problem continued, and plans were formulated for the installation of a roasting plant.

A new wet-assay laboratory and a new community hall with two bowling-alleys were built, and increased accommodation was provided for families. The number of men employed averaged about 190.

This property was described in the British Columbia Minister of Mines Annual Report, 1947, pages 62–68. The following notes refer only to developments in 1948.

A road, built on the slope south of Polaris portal, partly exposes some greenstone apparently interbedded with blue, grey, and white limestone, and presumably in the southern limb of what is believed to be the syncline in which the ore-zones occur. Some of the limestone-beds strike north-westerly and dip steeply north-eastward, and one bed is drag-folded in such a way that it appears to be on the south limb of an anticline and slightly overturned, rather than in the south limb of a syncline. The folding, there-

* By J. H. Bennett.

† By J. M. Black, incorporates data from note by F. J. Hemsworth.

fore, is more complex than that described previously. A few observations underground suggest that down to the 600 level the tuffaceous beds, where recognizable, are in a nearly closed syncline.

The ore-shoots occur in "A" shear, and in North and intermediate vein-zones. The "A" shear strikes south 50 degrees east and dips steeply south-westward. The North veins strike northerly and have steep dips, and the intermediate veins are between the other two vein types.

"B" zone, first recognized on the 450 level as a separate major zone within the "A" shear, has been developed between that level and Polaris level, south of the shaft and also toward the south-east on the 300 and 450 levels.

On the 300 level, several shoots were found in the "B" zone, and a drift was driven on the "B" zone to where a mineralized zone striking north-easterly was encountered. This latter zone, one of the intermediate ones, has been explored by drifting, and the drift is being extended north-westward into the area where the southern extension of some North veins are expected to occur. Development-work on the North veins of the 300 level was continued.

On the 450 level, the "B" zone has been explored to where it is cut by a north-easterly striking vein. This is the vein that is being explored on the 300 level, and a raise has been driven up in it between the two levels. A drift on this north-easterly striking vein, on the 450 level, has been extended through No. 1 fault; it cut North veins 370 and 470 feet from "B" zone, and they are being explored. It appears that the pattern seen on the upper levels, of two major sets of vein-zones nearly connected by a third intermediate set of veins, is repeated at these lower levels.

Development on the 600 level consists of one crosscut eastward from the shaft and some drifting along three North veins exposed by the crosscut, 630, 680, and 1,180 feet east of the shaft. The "A" shear has not been developed on this level.

All these workings are in greenstones, either tuffaceous beds or chloritized intrusives. The few attitudes observed indicate that the North veins are in the north limb of the south-easterly striking syncline and that the "A" shear is in the south limb. In each limb the vein-zones transect the tuffaceous beds.

No. 1 fault on the 300, 450, and 600 levels has about the same attitude as on the upper levels and also comes between the veins of the "A" shear and the North veins and is near the synclinal axis.

The felsite dyke appears to continue through No. 1 fault without being displaced, so probably is younger than the fault and the mineralization.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1947, pp. 62–68. *Geol. Surv., Canada*, Sum. Rept., 1932, Pt. A II, pp. 15–28; Mem. 248, pp. 65–69.]

Gold-Silver-Copper-Lead-Zinc.

Big Bull.* Consolidated Mining and Smelting Company. J. McLean, manager. The Big Bull mine is on the east side of the Tulsequah River, about 6 miles south of Polaris-Taku. During 1948 a road was constructed to the property and a sawmill erected. At Tulsequah Landing a warehouse and two 50,000-gallon oil-storage tanks were erected, and at the mine a camp consisting of cook-house, five bunk-houses, warehouse, power-house, dry, and three residences was built. It is proposed to build a steel-shop, hoist-house, and head-frame early in 1949 and then to begin sinking a shaft. Thirty men were employed for the last six months of 1948.

* By F. J. Hemsworth. Data *re* Big Bull from information supplied by H. C. Giegerich, general superintendent of outside mines for Consolidated Mining and Smelting Company.

Tulsequah Chief.*

This property includes five Crown-granted claims—the River Fraction, Tulsequeh Bonanza, Tulsequeh Chief, Tulsequeh Elva Fraction, and Tulsequeh Bald Eagle—and nine recorded claims owned by residents of Juneau, Alaska. In 1946 the Consolidated Mining and Smelting Company optioned the claims mentioned, located two additional claims lying south of the others, and began exploratory work. The engineer in charge is R. M. Mattson.

The property is on a steep, wooded, rocky slope about half a mile east of Tulsequah River, about 8 miles from its mouth. A road was built on the east side of the river in 1947 from a landing near the confluence of the Taku and Tulsequah Rivers to within 2 miles of the property. Freight is brought by barge and passengers by aeroplane to the mouth of Tulsequah River. In the earlier part of the 1948 season, freight was taken by truck on the road west of Tulsequah River to the Polaris-Taku mine, and from there by tractor up the bars and across the river at a ford to the Tulsequah Chief. In July the tractor was lost in a hole in the bottom of the river, and after that some freight was taken to the end of the road east of the river and back-packed to the camp. During periods of low water, tractors can haul freight along the eastern bars of the river.

The prominent rusty zones exposed on the steep rock slopes were explored in 1923 by trenches and in the "A" adit (now called the 1600). In 1928 and 1929 the adit was extended and another one, the "B" (now called the 1400), was driven 200 feet lower, and seven holes were drilled to explore the extension of the mineralized zones along their dip and strike. In 1946 Consolidated Mining and Smelting Company drilled five additional holes to explore at greater depth the zones exposed by the two adits and in 1947 built the road east of the river.

In 1948 a camp for about thirty men was built and another adit-level, the 5900 drift north, was started about 500 feet lower down the slope than the 1400 adit and about 1,500 feet south-west of it. The new adit by the end of 1948 had been driven about 1,700 feet. Additional diamond-drilling, in four holes totalling 1,756 feet, was done to test other workings on the property. The four holes did not intersect any sulphide-bodies similar to those exposed in the upper levels. About thirty men were employed.

The mineralized zones that are being explored are in grey much-altered rocks which have a poorly developed schistosity with a north-easterly strike and steep dip. The width of the outcrop of these grey rocks decreases northward, and on the east, north, and west they are surrounded by more massive greenstones. Some of the less-altered members are fragmental, and some are amygdaloidal, and presumably all are derived from volcanic rocks of acid to medium composition. Numerous faults, nearly parallel to the schistosity of the altered rocks, are exposed in the underground workings.

Pyrite is a common mineral in the altered grey rocks and is particularly abundant in zones which trend north-easterly. Within these pyritized zones are irregular lenticular bodies consisting of the sulphides sphalerite, chalcopyrite, and galena, together with quartz, carbonate, barite, unreplaced country rock, and pyrite. The bodies containing these mixed sulphides strike north-easterly, and most of those exposed on the 1600 and 1400 levels occur along one or other of two continuous pyrite-zones. Since the mixed sulphide lenses occur only at intervals, as shown on Fig. 1, along pyrite-zones, it is likely that a similar relationship prevails down the dip. Therefore, although mixed sulphides occur in the drill cores as indicated on Fig. 1, it is unlikely that the mixed sulphide mineralization in any zone is continuous between the intersection of the zone at the drill-hole and at a level several hundred feet above. The mineralization intersected on the vertical projection of Fig. 1 is not necessarily continuous between Hole

* By J. M. Black.

No. 3 and the two levels, but is shown to illustrate diagrammatically the probable trend and extent of the mineralization, based on the information gained by exploration. The enveloping pyritized zones are more nearly continuous and appear to be converging north-easterly and downward.

The mixed sulphide bodies seem to be confined to the altered grey rocks, because they are not found in the more massive greenstones. The sulphide-bodies occur farther north on the 1600 level than on the 1400 level, so the plunge of the margin of the altered zone may be southwards. To the south the sulphide-bodies appear to extend to the surface. If, as seems likely, judging from the relative lengths on each of the upper two levels on which the mixed sulphide mineralization is found, the dip of the contact between the altered zone and the less-altered greenstone is steeper than the surface slope, longer lengths of favourable mineralization may be expected at depth. This possibility will be tested by the present exploration.

The positions of nine samples taken are shown on Fig. 1, and their assays, given below, indicate the approximate range of values of the mixed sulphide lenses. At present prices, zinc is the most valuable constituent, followed by copper, lead, gold, and silver in that order. Results of sampling, including considerable widths of sparse mineralization, are given in the British Columbia Minister of Mines Annual Reports, 1928 and 1929.

Sample.	Width.	Gold.	Silver.	Copper.	Lead.	Zinc.
1400 Level.	Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.
889A	12*	0.09	1.0	3.4	0.4	4.4
890A	72	0.18	8.9	9.0	†	†
891A	38	0.20	6.4	2.2	7.9	33.2
892A	90	0.13	9.0	2.3	†	24.9
893A	30	0.02	Trace	†	1.3	8.3
894A	48	0.08	1.7	3.6	2.2	29.3
895A	84	0.21	4.1	7.3	0.9	3.9
1600 Level.						
896A	42	0.06	Trace	†	†	1.1
897A	95	0.11	Trace	1.5	0.6	4.6

* Average of two samples.
† Less than 0.3 per cent.

Dipping between the two main zones, and striking slightly across their trend, is a light-coloured felsitic dyke from 5 to 15 feet wide. This dyke is fine-grained, has a smooth fracture, and contains some pyrite.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1928, pp. 123–125; 1929, p. 128 and pp. 136–139. *Geol. Surv., Canada,* Sum. Rept., 1930, Pt. A, pp. 20–31; Mem. 248, pp. 58–61.]

Martha and Sinclair.*

L. Sinclair and M. Bracken have two claims at the west edge of the Tulsequah Valley flats, about a mile south of the Polaris-Taku mine. In 1948 a hole was drilled westwards and downwards at 40 degrees for 400 feet to explore under the valley-slope. The core from this diamond-drill hole consists of schistose, chloritic greenstone traversed by innumerable white quartz and carbonate veinlets and of grey, pyritized, altered rock. This altered grey zone extends from footage 150 to footage 325. Some sections of the core, considered by the owners to contain mineralization of economic importance, were removed for assay and were not seen by the writer.

* By J. M. Black.

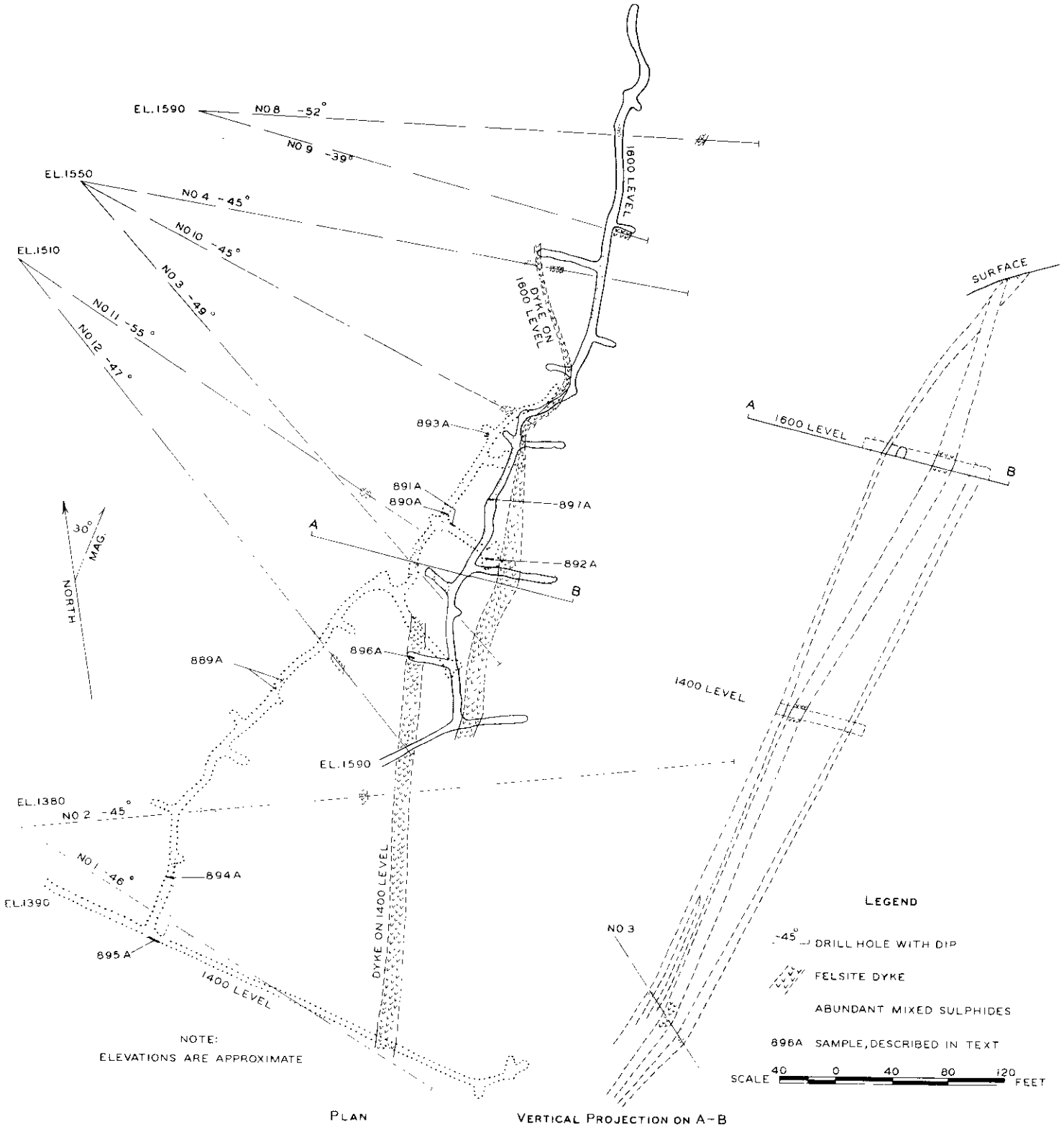


FIG.1. TULSEQUAH CHIEF PROPERTY.

Apex and Badger.*

The Apex and Badger groups, a total of eleven claims, were located in 1947 and 1948 by H. Bracken and J. Sve, of Juneau, Alaska. The claims are at the north end of the ridge extending northward from Ericksen Mountain and are 3 to 4 miles north-east of the confluence of the Tulsequah and Taku Rivers. A short trail leaves Taku River about 3 miles above the confluence and leads to a camp-site at about 2,500 feet elevation.

Rusty exposures on the west slope of Ericksen ridge are visible for several miles. Claims to cover some of these showings were located by Messrs. Ericksen and Ashby in 1929. Before these claims lapsed, an adit was started on what was probably considered to be the most attractive showing.

The rusty exposures are on the bare western slope of the ridge between timber-line, which is at about 2,500 feet elevation, and the crest of the ridge. The owners report that in the 1948 season similar showings were found on the eastern slope of the ridge. Because the western slope is precipitous and consists of bluffs and talus slopes, the exposures which strike up the slope cannot readily be followed. However, all the rusty showings are not in one zone.

Greenstones, which include flows, tuffs, and agglomerates, predominate in the exposures, and interbedded with these are quartzites, limestone, and marble. In general, the bedding strikes south-easterly and southerly and dips moderately to steeply westward.

The pyrite, which is oxidized to form the rusty surface showings, occurs in beds in the volcanic and sedimentary series, and in shear-zones that are nearly parallel to the beds. Most of the pyrite is in limy beds. In the pyritized zones, quartz is fairly abundant; sphalerite, galena, chalcopyrite, and other sulphides are present, and most of the surface showings are manganese stained.

The only place where sulphides other than pyrite are exposed in more than very small proportions is where an adit was started at about 3,750 feet elevation. These sulphides are in a bed of sheared grey limestone, between quartzites containing very small amounts of sulphides. The beds strike south 20 degrees east and dip 70 degrees westward. The mineralization, which includes abundant sphalerite, is intense in the central part of the zone and decreases in intensity toward the quartzites. A chip sample taken across the width of the zone (30 feet) near the adit assayed: Gold, 0.01 oz. per ton; silver, 8.6 oz. per ton; copper, less than 0.5 per cent.; lead, 5.9 per cent.; zinc, 21.6 per cent. This zone does not appear to extend far down the bluff on which it is exposed. It can be followed up the slope, along the limestone, for about 100 feet, and in this distance the silica increases and the sulphides decrease compared to the proportions present at the adit.

At the upper showing, at about 4,300 feet elevation, on the crest of the ridge, beds of white marble, which contain blocks of greenstone, are pyritized. The beds strike south-south-easterly and dip steeply westward. The western limit of the mineralized zone seems to be at some shearing that is parallel to the bedding. Toward the east the intensity of mineralization gradually decreases. A chip sample taken across a width of 18 feet assayed: Gold, *nil;* silver, 1.3 oz. per ton; copper, less than 0.5 per cent.; lead, 0.8 per cent.; and zinc, less than 0.5 per cent.

Several other pyritized zones occur lower down on the slope. They have not been trenched to expose fresh surfaces; however, as far as could be seen, excluding pyrite, none of them have as large a proportion of sulphide as the adit zone.

* By J. M. Black.

PORTLAND CANAL.*

UNUK RIVER (56° 130° S.E.).

Gold.

Halport Mines, Ltd.

Company office, 844 Hastings Street West, Vancouver. K. J. Springer, president; D. F. Kidd, manager. The property is on the south fork of the Unuk River, opposite Divelbliss (Cabin) Creek, at timber-line. The claims were located on discoveries by T. McQuillan in September, 1946, while prospecting for Leitch Gold Mines. In 1947 the ground was explored by Leitch Gold Mines by trenching. In 1948 nineteen diamond-drill holes, totalling 4,200 feet, were drilled and a cabin was built. It may be reached by trail from Burroughs Bay, Alaska, a distance of about 50 miles. Supplies and equipment required in 1947 and 1948 were flown from Stewart and dropped at the property. Supplies and equipment for the 1948 programme, amounting to 16 tons, including the diamond-drill, were dropped at the property in May.

Numerous quartz veins mineralized with hematite, pyrite, galena, and a little chalcopyrite occur in shear-zones on the property. Where sulphides appear in the veins, gold is often present, and less frequently silver. The host rocks are described as siliceous tuff, arkose, massive andesite, limestone, and sills of gneissic diorite.

The quartz veins or lodes are numbered and designated by the prefix "Q." Trenching has been done mostly on three lodes. Q 17 and Q 22 lodes have been traced 1,200 feet by forty-four trenches, and were tested below the surface by the drilling done in 1948. Q 25 has been traced 450 feet by eleven trenches. Q 19 lode has been traced 800 feet by twenty trenches.

TIDE LAKE (56° 130° S.E.).

Gold.

East Group.

The East group is 4 miles north by trail from Summit Lake. J. Bundy and W. Bodecker secured a lease and option from the owner, A. A. Phillips, of Hyder, Alaska. The lessees packed in a compressor and other mining equipment and intended to mine shipping-ore.

SUMMIT LAKE (56° 130° S.E.).

Gold.

Salmon Gold (Morris Summit Gold Mines, Ltd.).†

Company office, 510 Stock Exchange Building, Vancouver. E. M. Thomson, president; E. E. Harris, mine manager. Capital: 3,000,000 shares, $1 par value. The property is west of Summit Lake and about twenty miles north of Stewart and is reached from there by road to the Big Missouri and thence by trail to the south end of the lake, which has to be crossed to reach the camp. Freight is taken to the property in a period toward the end of winter and early spring (when some of the crevasses are filled with snow) over the Salmon Glacier and Summit Lake by tractor and snowmobile, and in the summer and early autumn by aircraft, which land on Summit Lake.

Claims covering the surface showings were located in 1930, and from 1931 to 1939 the mineral-zones were explored by trenches and drill-holes and by an adit, now known as 3600 level. In 1945 the present company acquired the property and began a diamond-drilling programme to explore some possibilities indicated by the earlier work. In 1946, 1947, and 1948 underground development and additional drilling have been done. In the first four months of 1948, 225 feet of drifting, 190 feet of raising, and 2,324 cubic feet of slashing were done. Thereafter work consisted of diamond-drilling. A total of 5,693 feet of drilling in twenty-one holes was done from the 3000 level in 1948.

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* By F. J. Hemsworth, except as noted.

† By J. M. Black.

Holes drilled previously from the surface and from the 3600 level indicated mineralized zones, with erratic values in gold, which strike westerly and north-westerly and have steep dips. The exact location of the mineralized intersection is not known because the drill-holes, most of which were over 500 feet in length, were not surveyed, and, therefore, the correlation of the mineralized intersections, which are fairly widely separated, cannot be made with certainty.

The recent development has exposed mineralized zones containing shoots of important gold mineralization below and south of those indicated by the earlier exploration. One of these shoots has been drilled below and above the 3000 level, on which it is exposed. A raise has been driven up in this shoot for a few feet, near its east end. The other shoots have not been developed.

The country rock is massive, grey and green. In part it looks like a fine- to medium-grained gabbroic intrusive and contains rounded inclusions up to several inches across, slightly different in colour from the matrix. Elsewhere the rock is fine-grained and in places has what appears to be coarse fragments. No flow boundary or other primary structure was seen. Pyrite is abundantly disseminated, and in the western part of the 3002 West drift some silicification and chloritization is seen.

All the mineralized zones explored are west of a major fault, and the results indicate that the zones split and weaken as they approach the fault.

The mineralized zones consist generally of a central zone, ranging in width from a few inches to several feet, surrounded by a zone in which iron sulphides replace the country rock for a distance up to several feet from the central zone. The central zone consists of a vein or veins of quartz and carbonate, some of which also contain a small proportion of the sulphides chalcopyrite, sphalerite, galena, and arsenopyrite, in massive pyrrhotite and pyrite. The quartz and most of the carbonate are white and grey, but a small proportion of the carbonate is pink In the outer replacement zone the proportions of the iron sulphides are reversed, and pyrite is much more abundant than pyrrhotite.

The fact that in 3004 East drift the pyrrhotite-pyrite zone is cut by a vein in which chalcopyrite, galena, and sphalerite predominate suggests that the latter sulphides occurring in small amounts near gangue minerals in the central part of the mineralized zone may also be somewhat younger than the pyrrhotite-pyrite mineralization.

The mineralized zones are cut by dark-green lamprophyre dykes, which strike north-easterly and dip steeply. These dykes range in width from a few inches to 5 feet and spall readily where exposed.

As shown on Fig. 2, three mineralized zones, which curve and branch, are exposed on the 3000 level. One drill intersection indicates another zone about 200 feet south of 3004 East drift. A fifth zone splits off the zone exposed in 3002 East drift, about 50 feet above the drift. The general trend of these mineralized zones is westerly to north-westerly, but some veins within the zones diverge slightly from the general trend. Widths up to 20 feet occur, although widths of 2 to 5 feet are most common.

The western part of the mineralized zone exposed in 3002 West drift is in the wall of a fault which contains a few inches of gouge. Some narrow dykes, not shown on the plan (Fig. 2), are displaced a few inches to the right by post-mineralization movement along the fault. Toward the west end of this drift the fault splits and the mineralization is not continuous along the splits; at the west face, quartz predominates and pyrrhotite is absent. This fault may have been the channel for the mineralizing solutions.

The zone exposed in 3004 East drift is also associated with a fault along which, probably, there has been slight post-ore and post-dyke movement; a dyke is sliced by the fault but not displaced.

The position of samples taken is shown on Fig. 2. Most of the samples are from three sections—in drifts 3002 West, 3002 East, and 3004 East—that have been found

by the management to be of better than average grade. These sections are about 220, 90, and 100 feet in length respectively. The samples are not numerous enough to serve as a dependable base for calculating average values of the indicated shoots, though they do show the range of values that occur. The assays are tabulated below.

Sample No.	Width.	Gold.	Silver.	Sample No.	Width.	Gold.	Silver.
3002 West Drift.	Inches.	Oz. per Ton.	Oz. per Ton.	*3002 East Drift*—Continued.	Inches.	Oz. per Ton.	Oz. per Ton.
873	34	0.01	0.3				
872	30	0.02	0.4	672	33	4.82	0.88
864	20	0.14	2.1	853	42	2.75	0.6
863	72	0.17	0.4	852	54	0.85	0.6
862	56	0.14	0.4	851*	30	1.12	0.8
861	46	0.02	0.4	850†	31	0.65	0.5
860	44	0.25	0.4	849*	33	0.26	0.7
859	48	0.13	0.5	848†	36	0.65	1.0
858	17	0.57	0.5	671	127	0.61	0.9
857	36	0.02	0.4	847	42	3.82	1.8
843	52	0.13	0.2	670	21‡	2.09	0.9
842	34	0.08	0.2	846	28	0.28	0.7
841	56	1.54	0.4	845	45	0.17	0.1
840	39	0.14	0.2	844	40	0.25	0.2
839	33	0.53	0.4	876	24	0.03	*Nil*
838	32	0.03	0.3	877	48	0.02	*Nil*
871	6	0.13	0.3	875	36	0.02	0.1
856	19	0.02	0.2	874	48	Trace	0.3
855	47	0.01	*Nil*				
816	40	*Nil*	*Nil*	*3004 East Drift.*			
817	41	Trace	*Nil*	870	48	0.07	0.3
818	Picked	0.05	0.1	865	40	0.14	0.6
854	15	0.61	0.4	866	28	0.02	0.2
819	50	0.42	0.8	867	20	0.20	1.9
820	51	0.01	1.2	868	18	0.19	0.4
821	44	0.05	0.1	873	40	0.78	0.6
822	60	0.01	0.1	869	30	0.86	0.6
823	72	0.01	1.1	669	18	1.38	0.8
881	60	0.01	*Nil*	668	36	1.00	0.6
				667	28	3.83	1.2
3002 East Drift.				666	13	1.35	0.5
880	15	0.01	0.7	665	16	1.18	0.6
878	15	0.07	0.1				

* Hanging-wall portion of vein-zone.
† Foot-wall portion of vein-zone.
‡ Average of two samples.

The gold is erratically distributed and appears to be related to the pyrrhotite, though the amount of gold is not directly proportional to the amount of pyrrhotite. Samples containing much pyrite and little pyrrhotite generally contain less gold than those with a preponderance of pyrrhotite, and those composed only of pyrite are low in gold. No free gold was seen.

On the longitudinal vertical projection EF (Fig. 2) is indicated part of the outline of a shoot containing important gold values exposed in 3002 East drift and part of two other shoots not exposed in the workings. These outlines are based on intersections of mineral-zones seen in the core of the holes shown on the plan. For clarity these intersections of the drill-holes with the mineralized zones are omitted from the plan in the vicinity of the vertical projections. The areas outlined on the vertical projection include those parts of three zones in which, judging from an examination of the core, the mineralization is of about the same grade as that exposed on the level; however, additional development is necessary before the areas outlined may be considered to be proven ore-shoots. The outlined areas are not extended upward to include intersections obtained in the holes drilled downward from the upper (3600) level. The area outlined below the drift is based on only one intersection (that for hole No. 334), about 135 feet

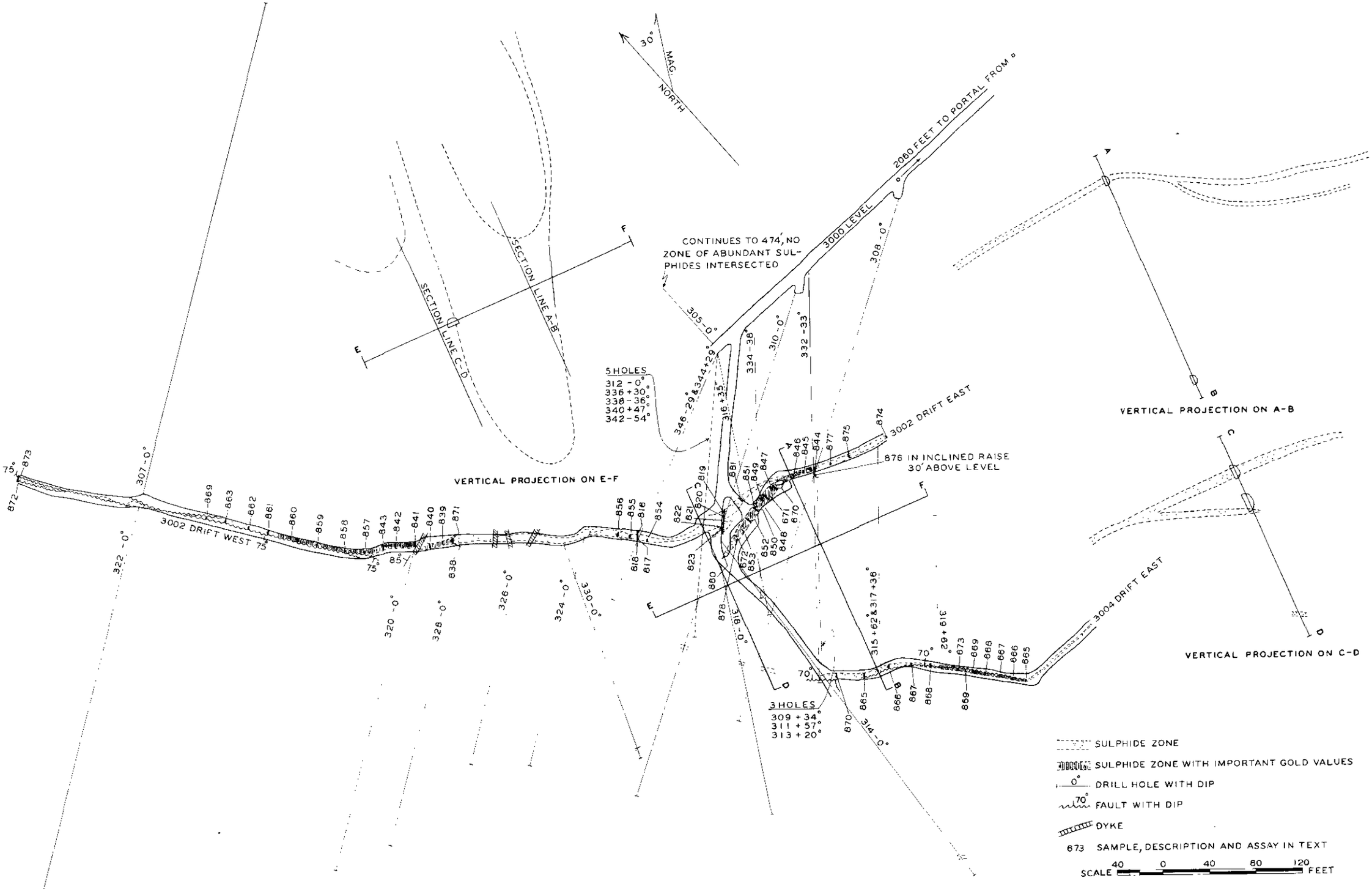

FIG. 2 MORRIS SUMMIT GOLD MINES LIMITED. PLAN OF 3000 LEVEL, AND VERTICAL PROJECTIONS, SHOWING MINERALIZATION, DRILL HOLES, AND LOCATION OF SAMPLES.

below the level. Therefore, the continuity of the shoot between the level and this intersection has not been confirmed, though from the shape of the shoot it seems probable that it does extend downward about as outlined. Outside of the outlined areas the drill-core intersections are narrower or less abundantly mineralized.

The intersections of pyrrhotite-pyrite mineralization of importance in all the holes are shown, except those near the three vertical projections. Most of the holes drilled from 3002 West drift did not intersect zones of pyrrhotite-pyrite mineralization.

From the projection EF it appears that the shoots rake steeply north-westward, and from the plan and projections it appears that the parts of the mineralized zones that have the highest values are where the zones curve or split.

The mineralization exposed on the 3000 level is similar to that exposed at the surface and on the 3600 level, indicating that changes in the mineralogy with increasing depth are slight.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1946, pp. 62–66; 1947, pp. 83–86.]

Salmon River (56° 130° S.E.).*

Gold-Silver-Lead-Zinc.

Silbak Premier Mines, Ltd.

Company office, 911 Birks Building, Vancouver; mine office, Premier. D. L. Pitt, managing director; J. G. Pearcey, manager, J. C. McCutcheon, mine superintendent. The mine is in the Salmon River valley, about 15 miles by road from Stewart, and for many years has been the only mine steadily producing in the Portland Canal district.

Silbak Premier suspended operations on July 15th, 1948, following a dispute between the International Union of Mine, Mill, and Smelter Workers (C.I.O.) and the management over the question of retroactive wage increases. For a month following the shut-down the staff was employed in cleaning up the mill, shipping the concentrates on hand, removing the portable machinery from the mine, and barricading the mine portals. According to company officials the mine was not abandoned, but was closed for an indefinite period. Two watchmen were left at the mine. During the winter the number of watchmen was increased to six to keep the buildings clear of snow. For several years the mine has operated at a loss, owing to the increased cost of materials and the shortage of efficient labour. No benefit was received from the "Emergency Gold Mining Assistance Act," as gold was less than 70 per cent. of the total production. Since the shut-down, world prices for lead and zinc have risen, and further increases in metal prices may prompt the reopening of the mine.

During the first half of 1948 several important changes were made to increase the efficiency of the operation. Mill equipment was added and the mill flow-sheet was changed to provide for the recovery of a zinc concentrate. In addition, two concentrate-bins were built at the lower end of the mill, close to the road, to allow the hauling of concentrates by dump-trucks instead of by aerial tram. The 13 miles of tramway was abandoned because it did not handle the smaller tonnages efficiently.

In the mine, development footages totalled 2,357 feet of drifting, 685 feet of cross-cutting, and 283 feet of raising. The principal development was the extension of drifts north-easterly on the 790-foot (6) level and on the 1,070-foot (5) level. In addition, two diamond-drills were operated on general prospect-work, and drilled a total of 19,235 feet.

Most of the ore mined came from stopes in the central area, north of the old Premier workings. Stopes were operated from the 790 and 1070 levels and from the 940 sub-level. A small tonnage of ore came from 781A stope on the Northern Light No. 1 Claim, under an agreement with the Premier Border Gold Mining Company. All

* By F. J. Hemsworth.

the ore was hoisted to the 1,350-foot (4) level and trammed to the mill, which was operated 166 days.

Production: Ore milled, 41,360 dry tons. Gross contents: Gold 8,556 oz.; silver, 60,447 oz.; lead, 1,636,505 lb.; zinc, 113,406 lb; cadmium, 1,208 lb.

Indian Mines (1946), Ltd.

Company office, 709 Credit Foncier Building, Vancouver. T. E. Blossom, secretary. Capital: 3,000,000 shares, 50 cents par value. In 1946 this company acquired the holdings of the Indian Mines Corporation on the west side of Cascade Creek, across the valley from the Premier mine. In 1947 the camp was rehabilitated, but during the following winter most of the buildings were caved in by the heavy snowfall. In 1948 some of the buildings were repaired and a geological survey was made.

Silver-Lead.

Silver Tip.

Company office, 211 Pemberton Building, Victoria. George Winkler, managing director. Capital: 3,000,000 shares, 50 cents par value. The Silver Tip group is on the south slope of Mount Dilworth, between the Unicorn and Silver Crest holdings. In the upper tunnel 100 feet of drift and crosscut was driven by miners on contract, using hand-steel. On the surface some open-cut work was done, across from the lower tunnel. The Silver Crest cabin was used for living-quarters for the four men employed during the summer.

Gold-Silver-Lead.

Unicorn Mines, Ltd.

Company office, 475 Howe Street, Vancouver. John Hovland, managing director. Capital: 1,000,000 shares, $1 par value. The Unicorn property adjoins the Big Missouri mine on the north and east. The tractor-road, started by Morris Summit Gold Mines, passes close to the Unicorn cabin, about one-half mile above the Big Missouri camp-site.

During 1948 some surface-stripping was done, and the No. 3 adit was extended 30 feet by hand-steel mining. This adit follows alongside a northerly striking mineralized zone and is being driven to intersect an easterly striking shear-zone. The projected position of this shear-zone, at the level of the adit, is about 100 feet ahead of the present face.

BEAR RIVER (55° 129° N.W.).*

Silver-Lead-Zinc.

Big Four Silver Mines, Ltd.

Company office, 675 Hastings Street West, Vancouver. W. B. Milner, president; D. F. Kidd, consultant; A. Bugnalli, manager. Capital: 4,000,000 shares, 50 cents par value. The property of this company is on Mount Rainier and is a consolidation of four groups of claims—the Silverado group on the north-west side, the Silver Key group at the top of the mountain, the Prosperity group on the south-east side, and the Porter-Idaho group on the south side.

In March, 1948, a bridge was built over the north fork of the Marmot River, but instead of the Marmot River trail the steep mountain trail over the Silverado Glacier was used. In April, 6 tons of supplies were flown in from Stewart and dropped near the Prosperity camp. Most of the work was done on the Sunday Mineral Claim, which is on the eastern end of the Porter-Idaho group. A crosscut was driven 55 feet to the Tessaro vein, which was drifted on for 90 feet northerly. A 4-foot winze was sunk on the vein at its widest place. A second drift on this vein was started about 100 feet below. Considerable open-cutting and shallow trenching was done on other showings on the property. On an average seven men were employed until work was suspended for the winter.

* By F. J. Hemsworth.

Gold.

Stewart Canal Gold Mines, Ltd. Company office, Stewart. J. Haahti, president and manager. Capital: 3,000,000 shares, 50 cents par value. The property is on the east side of the Bear River, directly opposite the town of Stewart. A silicified zone of tuffs and argillites is mineralized with pyrite, pyrrhotite, and chalcopyrite, and is cut by quartz-filled cross-fractures. In the spring of 1948 some open-cuts were made, and in July several short diamond-drill holes were drilled from the face of the bottom level (elevation, 500 feet approximately). The length of the longest holes was 96 feet; the total drilling amounted to 250 feet. The drill was small and was unable to overcome the strong water-pressure encountered. The results of the drilling were inconclusive.

Silver-Lead-Zinc.

Hansa Group. The Hansa group of four claims is about 5 miles up the north fork of Glacier Creek from the Bear River road. The claims are held by location by A. Cameron (grub-staked prospector) and L. Robichaud, of Stewart, and cover the ground formerly known as the Angelo group. During the summer of 1948 the trail up Glacier Creek was repaired. The main showing is a quartz-filled fault-fissure that strikes north-east and dips vertically. It has been traced for several hundred feet. It is well exposed on both walls of the canyon formed by Glacier Creek, and it is on the east side of this canyon that new work has been done. Several open-cuts have been made, from which sorted ore was sacked and packed by horses to the main road. The vein is about 2 feet wide and sparsely mineralized over most of this width, but on one wall 2 to 4 inches of it are heavily mineralized with sulphides.

Production: Ore shipped, 5 tons. Gross contents: Gold, 0.77 oz.; silver, 1,004 oz.; lead, 1,050 lb.; zinc, 931 lb.

ALICE ARM.

Silver-Lead.

Torbrit Silver Mines, Ltd.* (55° 129° N.W.) Registered office, 309 Royal Bank Building, Vancouver; executive office, 350 Bay Street, Toronto, Ont. J. H. C. Waite, president; H. D. Forman, manager; W. Jewitt, mine superintendent; R. W. Burton, mill superintendent. Capital: 3,000,000 shares, $1 par value. East of Kitsault River this company owns four Crown-granted claims—the Anglo, Toric, Moose, and Lamb—and has located fifteen claims up the slope from the Crown-granted claims; west of Kitsault River the company has eight claims—the Kitsol No. 2, Kitsol No. 1, Red Point Extension, Red Point No. 1, Sunset No. 2, Sunset No. 1, Maud McPhee, and Sportsman—under lease from the owners.

The property is about 18 miles by road up Kitsault River valley from Alice Arm. A tractor-trail continues up the valley for about 5 miles to the mouth of Clearwater River, the site of the power plant.

Although Kitsault River, near the mine, flows in a canyon, and the east slope of the valley above the mine is steep, outcrops are few and, because of the dense undergrowth, are difficult to find.

Silver-occurrences were explored, starting about 1916, by trenches, and the results obtained from these indicated that the occurrences were on two main zones of mineralization. Of these, the lower one was considered to be the more attractive, and it was explored, starting in 1924, by an adit-level, the 1900, now called the 1150. The workings on this level exposed a replacement deposit more than 100 feet wide, and in 1926–27 a mill, designed to treat 50 tons per day, was built. The efficiency of this mill

* By J. M. Black; incorporates data from note by F. J. Hemsworth.

in recovering the silver was less than expected. In 1928–29 the ore milled amounted only to 2,080 tons, yielding 30,533 oz. of silver and 29,107 lb. of lead.

In 1929 the property was acquired by Britannia Mining and Smelting Company, Limited. In 1929 and 1930 the property was explored by additional underground workings and diamond-drill holes. This exploration showed that the replacement deposit extends both above and below the 1150 level, with much the same width as on the level, but parts of the deposit are below ore-grade. Work was suspended in 1930, and the property remained idle until recently.

In 1946 the present company bought the property and started to build a road from Alice Arm. This road, constructed most of the way along what had been the right-of-way of the Dolly Varden railway-line, was completed in 1948 to the camp-site, a short distance beyond the terminus of the railway. In 1948 a camp was built and a mill, designed to have a capacity of 300 tons per day, was almost completed.

About 5 miles up the Kitsault Valley from the camp, near the mouth of Clearwater River, a 1,600-horsepower hydro-electric plant was installed and a transmission-line built to the camp. A dam built at Clearwater Lake raises its level and stores water for use in periods of low run-off. A sawmill built at Alice Arm has supplied the lumber used in the construction programme. Other construction in 1948 included a boiler plant 34 by 16 feet, with a low-pressure electric boiler 17 by 5 feet; compressor-house containing two compressors, with capacity of 1,800 cubic feet per minute; change-house 40 by 24 feet for 100 men; cook-house 76 by 41 feet for 122 men; single-story bunk-house consisting of two 152- by 24-foot buildings joined in the centre with centrally located bathroom; single-story bunk-house 128 by 24 feet; and three duplexes for families. During 1948 about 200 were employed on all projects.

In 1948 the lowest mine level, the 850 sub-level, was unwatered, and a series of holes drilled from it indicated that the mineralization extends below this level. A new adit-level, the 1000, which will be the main haulage-level, was driven. By the end of the year about 1,620 feet of working, 8 by 9 feet, had been driven. This working included 1,022 feet of crosscut to the replacement deposit and 598 feet of drifting and crosscutting to explore the deposit. Other underground work consisted of 216 feet of raising and 210 feet of drifting and crosscutting on other levels. From the portal of the main haulage-level a surface railway, 3,200 feet long, has been built to the coarse-ore bin at the crusher-house. Diamond-drilling in 1948 amounted to 2,762 feet in seventeen holes—fifteen from 850 level and two from 1150 level.

In the crusher-house, which is 95 by 110 feet, 300 tons will be crushed in one shift per day. The ore will be drawn from the coarse-ore bin by a 30-inch Jeffrey vibrating feeder, working under a heavy chain curtain, onto a grizzly. The oversize will be crushed in a 30- by 18-inch Allis-Chalmers jaw-crusher and will then be conveyed, with the undersize from the grizzly, to a 48-inch double-deck Dillon screen. The oversize from this screen, from which tramp iron will be removed with a magnet, will go to a 4-foot Symons crusher (short head). The discharge from this crusher and the undersize from the screen will be conveyed to the fine-ore bins at the mill building. All sources of dust are enclosed, and dust-laden air will be exhausted to a cyclone-collector.

The fine-ore bins are two 18- by 20-foot wood-stave tank bins. The ore will be drawn from these by variable-speed belt-conveyers into the mill building, which is 80 by 155 feet. The ore will go first to two Marcy ball-mills, 6 by 6 feet, fitted with screen discharge. In closed circuit with the ball-mills are two 48-inch submerged-type Aikens classifiers. Unit cells in this circuit will float a considerable proportion of silver in a galena concentrate that will be cleaned on Wilfley tables, dried, sacked, and shipped to a smelter for recovery of the lead and silver.

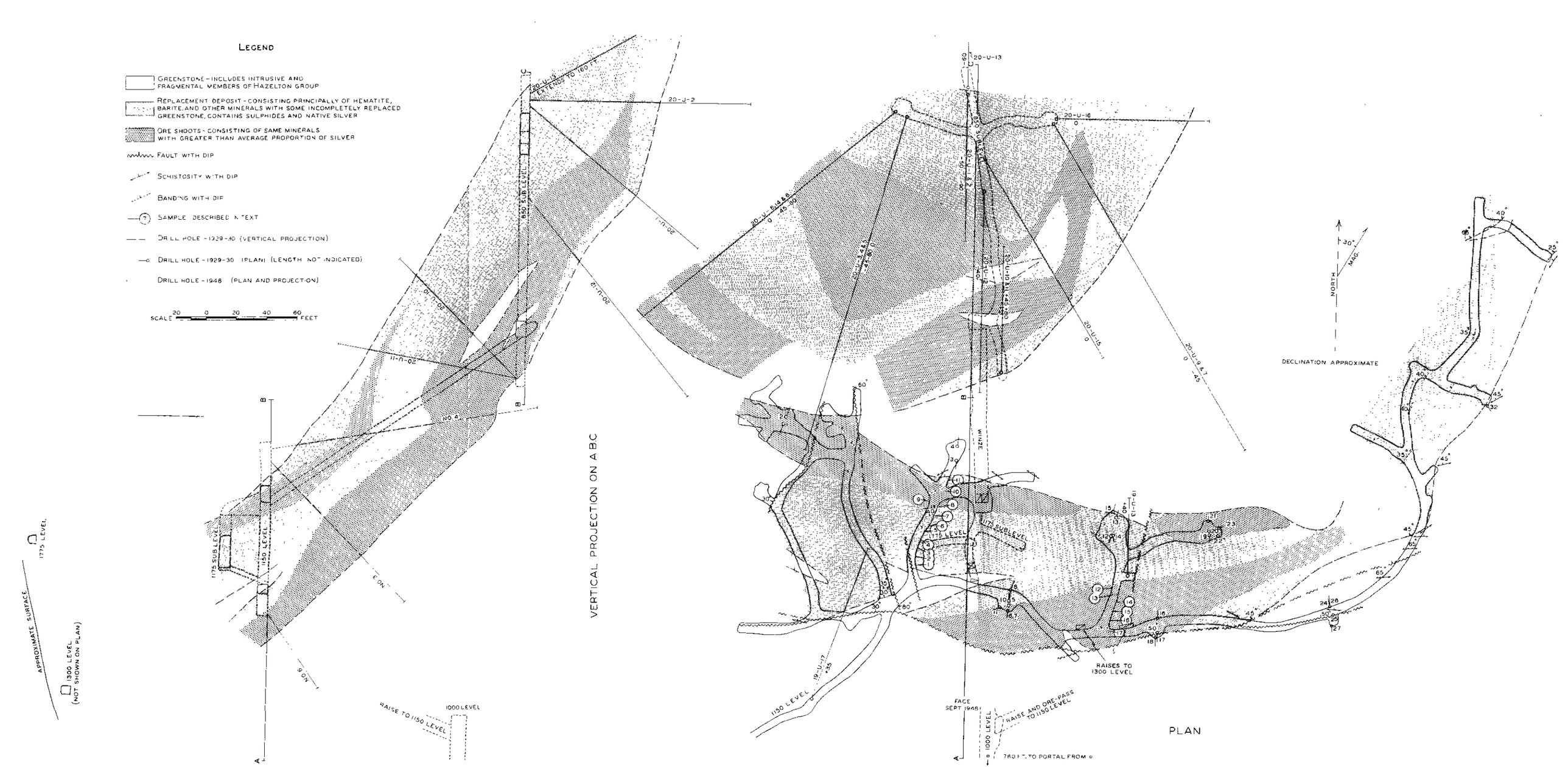

FIG. 3. TORBRIT SILVER MINES, LIMITED - PLAN AND VERTICAL PROJECTION.

The overflow from the classifiers will go to the cyanide circuit, which includes the following units: Three large Dorr thickeners, four Dorr agitators 18 by 20 feet, and a Northern Foundry and Machine drum filter 11½ by 14 feet. The silver in the cyanide solution will be precipitated by the use of zinc dust in a sock-type Merrill Crowe precipitation plant. In the refinery, built near the mill, the precipitate will be smelted in two Monarch Rockwell refining furnaces, and the refined silver will be cast as bars.

Fig. 3 (facing p. 73) is based on an examination of the 1150 level and the cores obtained from the 1948 diamond-drilling, and on the company plans of the 850 sub-level and records of the earlier drilling. This figure shows the replacement deposit, including the ore-shoots in it, and also shows the position of samples taken by the writer. The figure shows only the collars of some of the holes drilled. The outlines of the replacement-body and of the ore-shoots shown in the figure are based on an interpretation of the data from drilling and the exposures on the levels.

Sample No.	Width.		Silver.	Lead.	Sample No.	Width.		Silver.	Lead.
	Ft.	In.	Oz. per Ton.	Per Cent.		Ft.	In.	Oz. per Ton.	Per Cent.
1	6	0	10.2	0.3	10	6	2	13.5	0.2
2	6	0	10.4	0.2	11	6	0	4.7	Trace
3	6	0	21.1	0.3	12	6	0	24.0	0.4
4	6	0	6.4	0.3	13	6	0	28.3	Trace
5	6	0	11.1	0.2	14	6	0	23.7	Trace
6	6	0	3.7	0.4	15	6	0	42.6	0.1
7	6	0	6.1	0.4	16	6	0	20.2	0.1
8	6	0	9.0	0.5	17	6	4	21.0	0.1
9	6	0	28.1	0.4					

Sample No. 3 assayed: Gold, 0.01 oz. per ton. The remainder assayed: Gold, trace or *nil*. The zinc content estimated from spectrographic analyses of the above samples is about one-third that of the lead and, therefore, is probably less than 0.1 per cent.

The country rock consists of intrusive and fragmental members of the Hazelton group. The most common rock-type is a slightly schistose greenstone, much of which has fragments red, purple, brown, or green in colour. The original texture and the bedded or intrusive structures have generally been obliterated by shearing or crushing and alteration, so the attitude, shape, and size of the members of the greenstone group are not known. Examination of thin sections of the greenstones shows that the original minerals have been replaced to a considerable extent by carbonates, chlorites, and iron oxides.

Only the lower of the two known zones of mineralization has been explored and developed. It consists of a large replacement deposit and several small deposits. These replacement deposits consist of hematite, barite, and other minerals, including some native silver, and differ markedly in appearance from the greenstone. The ore-shoots are parts of the large deposit in which silver is sufficiently plentiful. The contacts between the greenstone and the replacement deposits are nearly parallel to the schistosity of the greenstone and are gradational, though in most exposures the gradation is complete in a few inches. Within the main replacement deposit are masses of unreplaced greenstone, some of which are shown on Fig. 3.

Minor replacement deposits, a few feet wide, occur near the walls of the main deposit and are separated from it by a few feet of greenstone. These minor bodies are similar in appearance to the main deposit, but have not been developed and are incompletely exposed.

The replacement in the main deposit, with the exception of the greenstone masses noted and a few incompletely replaced sections, is fairly uniform and does not decrease in intensity away from a central core. This suggests that the solutions that brought in the elements of the replacement minerals probably circulated along numerous channels.

The replacement deposit has an arcuate outline on the 1150 and 850 levels, dips northward and westward, and rakes north-westward. At the 1150 level the deposit is about 80 feet wide normal to the dip and is more than 680 feet long. The surface trenches did not expose much of the outcrop of the deposit, so little is known about its shape or dimensions near the surface.

The replacement deposit is composed principally of hematite, barite, quartz, jasper, and carbonates, and a small amount of incompletely replaced greenstone. It includes a small proportion of pyrite and galena, and a smaller proportion of native silver, sphalerite, chalcopyrite, and possibly of other metallic minerals. The major constituents are light-coloured barite and quartz, and red hematite and jasper. These constituents in general are fairly uniformly distributed throughout the deposit, except that the hematite is more plentiful near the hanging wall than elsewhere in the deposit.

In parts of the deposit the minerals are in unoriented aggregates, but most of it consists of narrow bands in which the arrangement or proportions of the minerals differs from that in the adjacent bands. In some of these bands, barite crystals up to several inches in length are oriented across the length of the band, and in other bands are oriented parallel to the length of the band. The bands range in width from a few inches to several feet and are parallel, or nearly parallel, to the contacts of the replacement deposit. The growth of the minerals was probably related to fractures, possibly shears, along which the replacing solutions circulated, and these fractures probably controlled also the shape of the deposit.

Parts of the replacement deposit in which the silver content is of economic importance constitute the ore-shoots. The boundaries of these ore-shoots must be determined by the results of sampling and assaying because the ore does not differ markedly in appearance from the rest of the deposit. The principal difference is the greater concentration of silver in the ore-shoots. Some of the ore includes remnants of greenstone, and some of the adjoining mineralization of lower grade appears to consist entirely of replacement minerals. The native silver is present as thin flakes. Probably it was deposited only near fractures open at a late stage of the replacement sequence, where the silver-bearing solutions could circulate. Some of the ore contains dark, watery-looking quartz, not seen in the lower-grade mineralization, and this quartz may be useful as an indication of ore.

The outlines of the ore-shoots shown on Fig. 3 are based partly on the results of samples, across the mineralization on 1150 level, taken by the writer (assays tabulated on p. 73) and partly on company data, including the results obtained from sampling the 1150 and 850 levels and the drill cores. The outlines are subject to change when the shoots are more completely explored. The 850 level was full of water at the time of examination.

On the 1150 level the shoots occur where the replacement-body has a westerly trend. One shoot is near the hanging wall of the deposit and the other near the foot-wall; the intervening mineralization is of lower grade. Each shoot is roughly conformable to the replacement deposit, to the bands within the deposit, and to the schistosity of the near-by greenstone. The dip is northward at about 45 degrees in the upper parts and less than that in the lower parts of the shoots that have been explored.

The eastern part of the replacement deposit is crossed by a lamprophyre dyke a few feet wide. It strikes south-westerly and has a steep dip.

The foot-wall greenstone of that part of the replacement deposit that strikes westerly and contains ore-shoots is sheared. The replacement deposit is cut by many longitudinal and cross faults, which curve and split. Some of the contacts between the greenstone and the replacement are marked by faults. The post-replacement faults appear to have caused a displacement generally less than 20 feet. Earlier some of

these faults, particularly the longitudinal ones, may have provided channels for the replacing solutions. Some of the faults are shown on Fig. 3.

The silver mineralization is found only in the replacement deposit and is most abundant within the ore-shoots which, as described above, are conformable to the shape and attitude of the deposit. The mineralization in the core from the deepest drill-holes is similar in appearance to that from near the surface. Native silver, the only silver mineral noted, appears to be fairly uniformly distributed laterally and vertically, and assays of the cores (company data) from below 850 sub-level are about the same as those obtained in the upper workings. These results show that the silver-bearing ore-shoots extend down the dip from the outcrops for more than 500 feet and that they extend at least that far vertically below the surface. No native silver was seen in the shear in the foot-wall greenstone, and no apparent increase in the amount of native silver is noted near the surface or near the numerous post-replacement faults. This distribution of the native silver suggests that it occurs as a primary mineral.

Except at faults, the walls of the deposit stand up well without support. The management intends to mine the ore-shoots by shrinkage and open stopes and to let the ore drop directly from the stopes to the levels. On the 1150 level the ore will be scraped to an ore-pass leading to the 1000 level, and on the 1000 level the ore will be loaded by mechanical loaders. The ore from both levels will be hauled on the 1000 level and on the surface railway to the coarse-ore bin at the crusher-house.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1925, pp. 76–78. *Geol. Surv., Canada*, Sum. Rept., 1928, Pt. A, pp. 44–49.]

Galena.* (55° 129° N.W.) This group of three claims, located in 1946 and held by G. Bruggy and the estate of W. McFarlane, is on the steep, wooded, east slope of Kitsault Valley, about 4 miles north of the Torbrit mill, which is about 18 miles by road from Alice Arm. The showings are about half a mile from the Kitsault trail, which is wide enough for a small tractor. This ground was previously part of the Tyee group.

A mineralized zone is partly exposed by four trenches, in a length of 400 feet, between elevations of 2,350 and 2,550 feet. This zone is within 50 feet of the foot-wall of a quartz vein. The vein is about 10 feet wide, can be followed for more than 3,000 feet, and is referred to in earlier Reports as the Bluebird vein.

The country rock, consisting of massive altered grey flows or tuffs, has been sheared along a zone striking north-easterly and dipping steeply north-westward. Within the zone, fine-grained galena occurs in replacement-bodies or veins generally less than 6 inches wide, parallel to the shear-zone. The galena is so fine-grained that some of the replacement-bodies are similar in appearance to the unreplaced wall-rock. Pyrite is less abundant than galena and is more uniformly disseminated through the zone.

At the highest trench, that part of the zone mineralized with galena is 14 inches wide, and a sample across it assayed: Silver, 56.4 oz. per ton; lead, 18.7 per cent. In the second trench, about 200 feet south-west of the highest trench, 13 feet 8 inches of lead mineralization is exposed, and four chip samples, giving a complete section across this zone from hanging wall to foot-wall, assayed:—

Width.	Silver. Oz. per Ton.	Lead. Per Cent.
34 inches	14.0	10.7
46 inches	56.0	10.0
48 inches	18.7	2.8
36 inches	30.0	16.4

* By J. M. Black.

At the third trench, about 40 feet along the strike from the second, 7 feet 3 inches of lead mineralization is exposed. Three chip samples taken across this zone from foot-wall to hanging wall assayed:—

Width.	Silver. Oz. per Ton.	Lead. Per Cent.
36 inches	20.3	22.5
29 inches	6.2	5.8
22 inches	8.7	4.3

The fourth and lowest cut seen on the zone, about 160 feet along the strike from the third trench, exposes 26 inches of lead mineralization and a higher proportion of pyrite than the upper showings. This cut may not be long enough to show the complete width of the zone. A sample taken across this mineralization assayed: Silver, 59.7 oz. per ton; lead, 3 per cent.

The gold value in all the samples is trace or *nil*. Estimates of the zinc content, based on spectrographic examination, indicate that there is less than 0.5 per cent. zinc in any of the samples, and that in most of the samples the zinc content is about 0.1 per cent.

These results show that mineralization of economic interest occurs at four points in a length of 400 feet; whether similar mineralization occurs in this zone between the four trenches, or elsewhere along the strike, or in parallel zones, and whether the values at depth approach those found in the trenches, can only be determined by further exploration. The outcrops of the Bluebird vein are only sparsely mineralized; however, the walls are sheared and further exploration might discover more valuable mineralization.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1933, pp. 48–50.]

Silver-Gold.

Esperanza Mines, Ltd.*

(55° 129° N.E.) Company office, 624 Columbia Street, New Westminster. A. MacDonald, managing director; J. B. Murray, foreman. Capital: 1,000,000 shares, $1 par value. The mine is on Esperanza Mountain, about 1 mile north by road from Alice Arm. In 1948 the company had from two to eight men working at the property from January till August, when the camp was closed. The trail to the upper workings was made wide enough for a jeep, and some prospecting was done in that area. Ore sorted from the No. 4 drift was sacked and shipped to the Tacoma smelter.

Production: Ore shipped, 34 tons. Gross contents: Gold, 10 oz.; silver, 1,705 oz.

COPPER RIVER (54° 127° S.W.).*

Gold.

Cascade Group.

Work was done by the Consolidated Mining and Smelting Company on the Cascade group under the direction of D. Malcolm. The old trail from the Dardanelles mine to the south fork of the Copper (Zymoetz) River was repaired, and 18 miles of new trail was built up the east side of the river to the property. The main showing, which is a flat-dipping quartz vein carrying gold and silver, was trenched by a crew of five men.

USK (54° 128° N.E.).*

Gold.

Nicholson Creek Mining Corporation.

Company office, 300 Insurance Building, Seattle, 4; mine office, Usk. A. M. MacNee, secretary; B. Shannon, manager. Capital: 5,000,000 shares, 1 cent par value. The camp is beside the Canadian National Railway, 2 miles east of Usk. Machinery and buildings were moved down from the Shenton tunnel to the portal of the Orion adit. The

* By F. J. Hemsworth.

Orion portal is at an elevation of 620 feet and is 300 feet above the camp. The adit follows a narrow shear and is being driven to go under showings exposed in open-cuts. During 1948 the Orion adit was extended to about 350 feet from the portal and a geological survey was partly completed. About twelve men were employed during the summer.

HAZELTON (55° 127° S.W.).*

Gold-Silver-Lead-Zinc.

Silver Standard Mines, Ltd.

Company office, 602 Hastings Street West, Vancouver. R. W. Wilson, managing director; H. B. Gilleland, superintendent. Capital: 3,500,000 shares, 50 cents par value. This company, formed in 1946, owns fifteen Crown-granted claims and thirty-seven claims held by location on the west slope of Glen Mountain, about 6 miles by road north of Hazelton.

Quartz veins with an important content of lead, zinc, silver, and gold were discovered in 1910. Until 1918, when a concentrator was built, selected ore was shipped, but thereafter most of the ore was concentrated before shipment. In the period 1913–22, 14,338 tons of ore was mined, which yielded (net): Gold, 1,118 oz.; silver, 595,668 oz.; lead 1,208,792 lb.; zinc, 1,640,768 lb.†

Production in 1948: Ore milled, 3,543 tons, yielding 131 tons of lead concentrates and 283 tons of zinc concentrates. Gross contents of concentrates: Gold, 195 oz.; silver, 46,559 oz.; lead, 62,805 lb.; zinc, 255,472 lb.; cadmium, 2,266 lb.

The quartz veins originally were developed on four levels—the 150, 250, 400, and 500 levels—connected by an inclined shaft. The 250 level is connected to the surface by an adit-crosscut and is now called the 1500 level. A second adit-crosscut, called the 1300, was driven about 200 feet lower than the 1500 level, and at the same elevation as the 500 level. Since 1947, when the mine was reopened, the 1300 level has been extended and a raise has been driven from it to the 1500 level. The 1300 level and part of 1500 level are shown on Fig. 4 (*see* p. 78 of present Report). The other workings, including those in the shaft area, and their relationship to the 1300 level, are shown opposite page 88 of the British Columbia Minister of Mines Annual Report for 1920.

In 1948 two raises were completed from the 1300 level—one to the surface and one to the 1500 level—and some drifting on veins was done on both the 1300 and 1500 levels. Development-work consisted of 575 feet of drifting, 50 feet of crosscutting, 287 feet of raising, and 500 feet of drilling. Four holes had been completed by September, when the property was examined.

A flotation-mill, designed to treat 50 tons per day, was built near the portal of 1300 level and was put into operation in September. Milling was curtailed for three weeks in December because of water shortage. Electric power is generated by a D 13000 Caterpillar engine and a UD 18A International engine rated at 175 and 50 kilowatts respectively. A water system capable of supplying the mill with 50 gallons per minute has been installed. Water is taken from Standard Creek at a point 2,000 feet distant from the mill and is pumped by an electrically driven centrifugal pump through a 4-inch pipe to a 20,000-gallon storage-tank. A small dam was built at Standard Lake, a mile from the mill, to control the flow of water in the creek. A bunk-house and three residences were built. The number employed underground and on the surface averaged about thirty-five. About fifty men were employed at the end of the year.

Four shrinkage stopes were started in 1948—three on the No. 4 vein and one on the No. 1 vein. Nearly one-third of the ore milled was from development. Explosives used included 429 cases of powder, 7,936 blasting-caps, and 80,000 feet of safety-fuse.

* By J. M. Black; incorporates data supplied by F. J. Hemsworth.

† *Minister of Mines, B.C.*, Ann. Rept., 1923, p. 106.

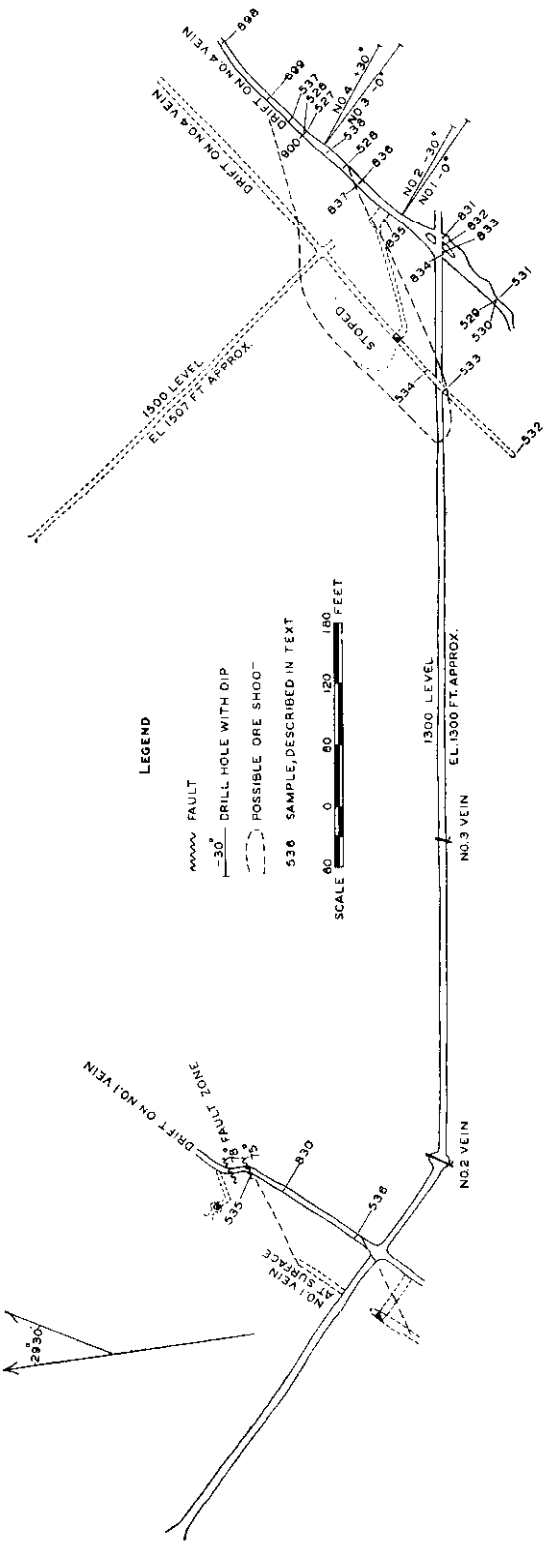

Fig. 4. Silver Standard Mines, Ltd.—plan showing 1300 level, part of 1500 level, position of samples, and drill-holes.

Ore is trammed from the mine on the 1300 level to the coarse-ore bin at the mill. The ore is drawn from this bin and passes over a ¾-inch grizzly, from which the undersize drops to the conveyer-belt running to the fine-ore bin. The oversize is washed and goes to a picking-belt where the waste is picked off, and the remainder, after being crushed to minus three-quarters of an inch by a 9- by 16-inch Denver jaw-crusher, goes to the fine-ore bin.

From this bin the ore is fed to a 5- by 5-foot Eimco ball-mill which discharges into an Aikens-type classifier in closed circuit with the ball-mill. The classifier overflow is laundered to a bank of six Denver Sub-A flotation cells, where galena, together with the minerals containing most of the gold and silver, is floated as lead concentrates. The tailings from these cells are conditioned and passed into another bank of six cells where the sphalerite is floated as zinc concentrates. The lead and zinc concentrates are filtered in a six-disk American filter and are shipped to the Trail smelter.

The country rock at this property consists of fine-grained argillaceous tuffs, some of which are limy. Most of the beds are massive and grey, and interbedded with these are thinner, dark- and light-grey beds. The bedding strikes northerly and dips gently, westward near the portal of 1300 level and eastward in the inner workings, indicating a gentle anticlinal fold.

The numerous veins exposed on the surface and in the workings of this property strike north-easterly and dip between 50 and 75 degrees south-eastward. The veins are numbered from 1 to 10, and the westerly veins, 1 and 4, are being developed. Veins 2 and 3 are exposed in the 1300 crosscut, and vein 5 is exposed in the 1500 crosscut but was not cut in the four holes drilled from 1300 level toward it.

The positions of samples taken, including those taken in 1947, are indicated on Fig. 4, and the results are tabulated below. These samples are not spaced closely enough to make a dependable estimate of the average grade, though they do indicate the widths and the range of values that occur.

Sample No.	Width.	Gold.	Silver.	Lead.	Zinc.
No. 1 Vein, 1300 Level.	*Inches.*	*Oz. per Ton.*	*Oz. per Ton.*	*Per Cent.*	*Per Cent.*
535	27	0.36	24.0	0.6	20.9
830	21	0.07	3.1	0.3	9.4
536	19	0.61	9.6	0.3	7.5
No. 4 Vein, 1500 Level.					
534	16	0.33	20.6	3.1	8.6
533	11	0.12	41.2	8.9	4.5
532	12	0.07	0.8	0.2	2.3
No. 4 Vein, 1300 Level.					
898	24	0.17	9.2	0.3	2.0
899	24	0.15	52.6	1.5	9.7
537	57	0.06	12.9	0.3	4.7
900	10†	0.21	106.7	3.2	11.0
526	46	0.14	13.3	1.1	11.9
527	19‡	0.04	1.1	*	*
538	42	0.02	18.2	4.2	4.0
528	20	0.05	7.4	0.9	*
837	36†	0.06	1.1	*	1.6
836	33‡	0.01	9.8	2.8	*
835	36	0.01	1.4	*	0.9
831	48‡	0.04	6.6	1.0	1.8
832	42§	0.01	*Nil*	*	*
833	54	0.08	21.2	0.58	1.8
834	36†	0.03	0.5	*	0.32
529	36†	0.06	6.5	2.0	5.5
530	26	0.09	31.5	5.2	3.0
531	40‡	Trace	0.4	*	*

* Less than 0.3 per cent. † Foot-wall section of vein. ‡ Hanging-wall section of vein.
§ Mineralized country rock.

The veins are in fractures that are continuous, with fairly constant attitude, for hundreds of feet. Vein 4 has been followed for 1,200 feet, and vein 7 in the shaft area has been followed for 700 feet, and each of these veins continues beyond the workings. The wall-rock near the veins is slightly sheared, and in places some gouge is present between the vein and the wall-rock. Short gash-veins with steep dip and northerly strike are common in the foot-wall of the veins. Similar gash-veins extend into the hanging wall of vein 4, south of the crosscut on 1300 level.

The veins range in width from a few inches to several feet; they consist of milky white quartz with a minor amount of cream-coloured carbonate and contain pockets and veinlets of sphalerite, pyrite, arsenopyrite, galena, chalcopyrite, pyrrhotite, and tetrahedrite. Generally the sulphide veinlets are parallel to the vein-walls, but in some places they extend into the walls. These latter veinlets are more common in the hanging wall, and sphalerite predominates in them. Disseminated pyrite and arsenopyrite are common in the walls of veins 1 and 4. In addition to the sulphides, the veins contain dark septa and inclusions of wall-rock. The dark septa are probably the remnants of almost completely replaced inclusions. Most of the wall-rock inclusions have their longest dimensions parallel to the vein. The gash-veins, most of which extend into the foot-wall from the major veins, have a similar mineral content.

A fault-zone consisting of fractured rock between two faults, 15 feet apart, cuts vein 1 near the north end of the drift on the vein. Southward from this fault-zone, the vein has a greater than average proportion of sphalerite and is 18 to 36 inches wide. In the drift, north of the fault-zone, is exposed a vein with about an average amount of sphalerite and less than 1 foot wide. If this be the faulted extension of vein 1, then probably the vertical movement in the fault-zone is much greater than the apparent horizontal displacement.

Sample 537 also contains 0.9 per cent. copper and samples 535 and 900 contain 0.8 per cent. Four other samples contain between 0.6 and 0.3 per cent. copper and the remainder less than 0.3 per cent.

From these results and from observations of vein 4, it appears that a shoot containing values of economic importance lies between 1300 and 1500 levels and may extend upward to the surface. This shoot is about 120 feet long on 1300 level and about 220 feet on the 1500 level. Some of it has been stoped above 1500 level. This shoot, which is indicated on Fig. 4, rakes north-eastward, the same rake as that of the shoots mined in the shaft area. Vein 1 contains a shoot from which only a few samples were taken because it was being prepared for mining and the back was not easily accessible. This shoot appears to have a similar rake because that part of it mined from the surface is south of the best mineralized section on the 1300 level. A section of vein 4 on 1300 level south of the crosscut also is of comparatively high grade, and additional development may outline another shoot.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1920, pp. 80, 84; 1923, pp. 105, 106; 1947, pp. 97, 98. *Geol. Surv., Canada*, Mem. 223, pp. 28–35.]

Gold-Cobalt-Molybdenum-Uranium.

Victoria.* The property, which includes three Crown-granted claims—Victoria, Belle, and Belle Fraction—is part of a larger property formerly operated by the New Hazelton Gold-Cobalt Mines, Limited, and later by Aurimont Gold Mines, Limited, and is owned by G. and R. C. McCorkell. One day

* By J. M. Black.

was spent in September, 1948, examining the cobalt mineralization and collecting specimens for the purpose of determining in the laboratory if they included radioactive minerals.

The Victoria group of claims is 5 miles south of Hazelton, on the north-west slope of Rocher Déboulé Mountain. The old camp at 4,100 feet and the workings, between 5,200 and 6,150 feet altitude, may be reached by a pack-trail that begins at Comeau's farm, at the foot of the mountain, about 2 miles east of Carnaby on the Canadian National Railway.

Between 1916 and 1928 a vein-zone was developed by four drift-adits and an open-cut, and several lots of gold-molybdenum-cobalt ore were shipped in the period 1918–28 and in 1940 and 1941. Data on the analyses of some of the shipments are based on information obtained from the Annual Reports of the Minister of Mines of British Columbia, as shown in the following table:—

Year.	Tons.	Gold.	Silver.	Arsenic.	Molybdenum.	Cobalt.	Zinc.
		Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1918	26.6	1.24	*	8.98	0.96	1.18	*
1926	22.0	4.65	*	42.3	*	4.6	*
1940	7.7	2.18	0.2	6.6	*	2.6	*Nil*
1941	7.3	2.02	0.2	6.1	*	1.4	0.6
1941	3.4	3.92	0.3	33.3	*	*	4.40

* Not available.

The vein-zone ranges from a few inches to several feet in width and consists of several nearly parallel faults, most of which contain some gouge and mineralization. This zone strikes about north 80 degrees east and dips between 40 and 75 degrees northward. It crosses a medium-grained grey granitic intrusive from near the contact eastward to the crest of the ridge and for a short distance down the Juniper Creek slope, a horizontal distance of 2,200 feet and vertical range of 900 feet. The adits are at elevations of about 5,250, 5,500, 5,750, and 5,900 feet, and the open-cut is at 6,150 feet at the crest of the ridge.

In the foot-wall of this sheared zone and with the same attitude is a dyke or replaced zone of hornblende up to 3 feet wide. This hornblende rock has been faulted and fractured and contains much of the mineralization.

Arsenopyrite, cobalt-nickel arsenides, cobalt bloom, molybdenite, and small amounts of other sulphides occur in veins in the fault-fissures and in fractures and are irregularly disseminated in the hornblende rock. In parts of the zone, gangue veins occur; they contain quartz, carbonates, white, brown, and flesh-coloured feldspar, and generally are without metallic mineralization. The sulphide veins and the gangue veins are generally less than a foot wide, but where several are present, the width of the entire zone, including the intervening mineralized rock (mostly hornblende), is several feet. Near the veins some of the hornblende rock is altered to a fine-grained brown rock.

At the time of examination, snow covered the crest of the ridge, and the open-cut at 6,150 feet altitude was not examined; however, specimens obtained from the open-cut by J. S. Stevenson in 1940 were available. Specimens were taken from what appeared to be typical mineralization, including the altered wall-rock from the 5250, 5750, and 5900 levels, and from the dump of the 5500 level. The portal of this level is partly buried in talus, and it was not entered.

All the specimens were tested for radioactivity with a portable Geiger-Mueller counter. All that emitted radiation detectable by the portable counter, and some of the other specimens, were tested with the Department's highly sensitive laboratory counter.

The counter measures radiation emitted by uranium and thorium, and with less intensity by several other elements. The results are reported as " equivalent percentage of uranium oxide (U_3O_8)." Spectrochemical tests indicate that the thorium content of the specimens is low, and as radiation emitted by other elements, except uranium, is slight in comparison, it may be concluded that the U_3O_8 equivalent of the specimens, determined by measuring their radiation, is a close approximation of the uranium oxide content. The results, including only those with a U_3O_8 equivalent greater than 0.01 per cent., follow:—

Location.	Description.	U_3O_8 Equivalent.
		Per Cent.
6150 open-cut	Moderate amount of sulphides	0.75
5900 level	Abundant sulphides	0.021
5500 level dump	Molybdenite, small amount of other sulphides	0.14
5500 level dump	Hornblende, small amount of sulphides	0.56
5900 level	Hornblende, very little sulphide	0.065
5250 level	Altered hornblende, very little mineralization	0.02
5500 level dump	Altered wall-rock	0.43
5900 level	Carbonate veinlets in hornblende	0.18

The highest U_3O_8 equivalent is from a specimen containing a moderate amount of sulphides, from the open-cut at 6,150 feet. Relatively high values are present in specimens with small proportions of sulphides from the dump of 5500 level. Other specimens, similar in appearance, from the same level and from other levels emit less radiation. These results indicate that the uranium mineral is erratically distributed and that it is not present in proportion to the amount of sulphides.

To determine the extent of the radioactive mineralization in this vein-zone, it will be necessary to use a portable counter and search for shoots that emit higher than average radiation. Any shoots found can then be sampled in order to determine the U_3O_8 content.

[References: *Minister of Mines, B.C.*, Ann Rept., 1918, pp. 112–113. *Geol. Surv., Canada*, Mem. 223, pp. 44–46.]

SMITHERS.

Gold-Silver-Lead-Zinc.

Duthie Mines (1946), Ltd.*

(54° 127° N.E.) Company office, 711 Hall Building, Vancouver. J. E. R. Wood, managing director. Capital: 3,500,000 shares, no par value. This company, formed in 1946, took over the assets of Smithers Mines, Limited, and controls the Henderson and several other near-by Crown-granted claims, 14 miles by road west of Smithers on the south-western slope of Hudson Bay Mountain.

The mineralized zones here were discovered in 1908, and the area was prospected by trenches. The Henderson zone was found in 1921, and starting in 1922 this zone was developed by several drift-adits and selected ore was shipped. In 1927 a mill was built, and from then until 1930, when development was stopped, shipments were mostly of concentrates. Shipments of ore to the smelter, principally by lessees, are recorded in 1939–42 and in 1947. In 1946 drilling from the surface, by the present company, explored the north-eastern extension of the Henderson zone. The plan of these holes is shown on Fig. 9, page 99, British Columbia Minister of Mines Annual Report, 1947. In 1947 holes were drilled to explore the south-western and central sections of the Henderson and related zones, and from the north-west end of 3800 level, which had

* By J. M. Black.

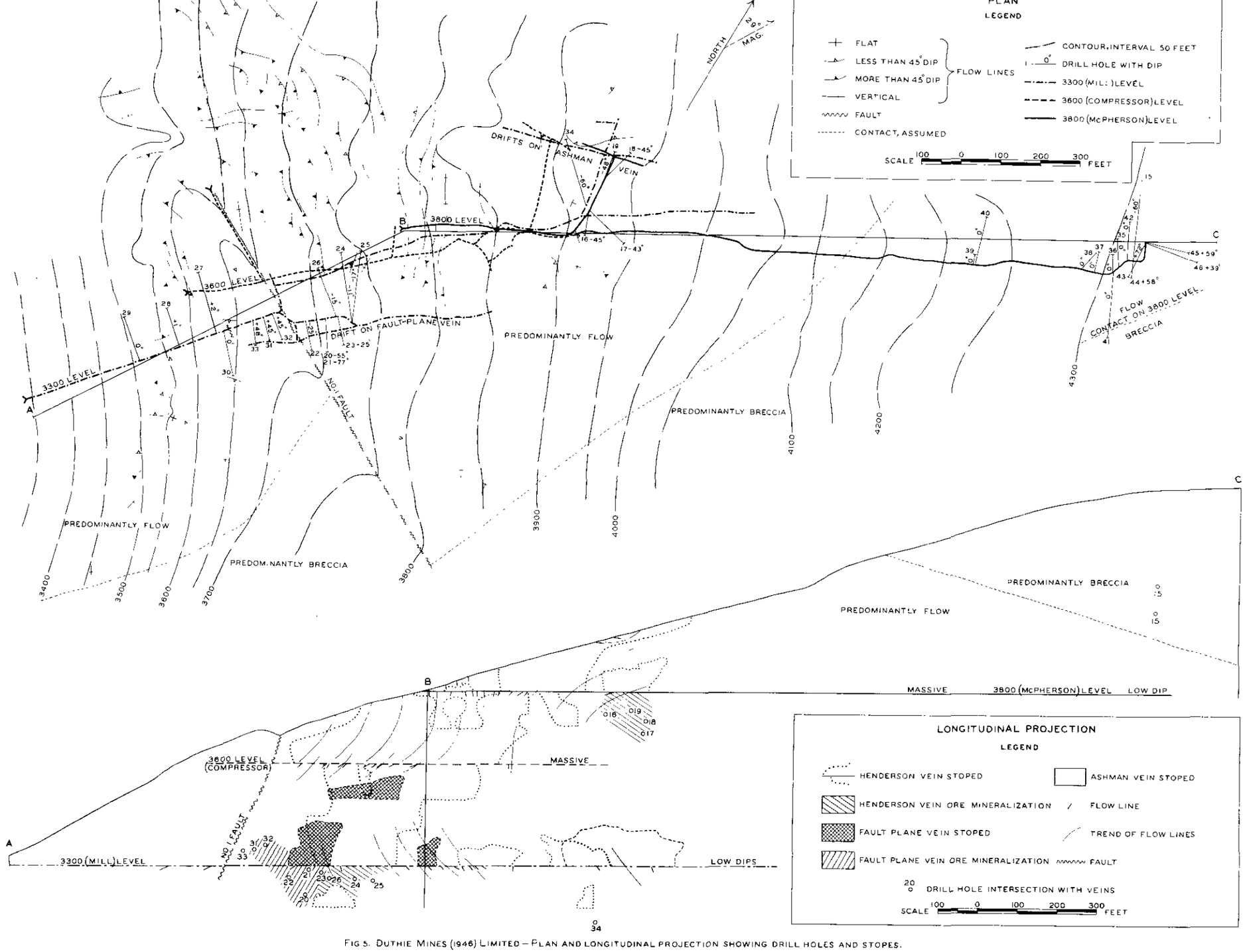

FIG 5. DUTHIE MINES (1946) LIMITED — PLAN AND LONGITUDINAL PROJECTION SHOWING DRILL HOLES AND STOPES.

been advanced about 450 feet that year, other holes were drilled. No exploration was carried on in 1948.

Production, beginning in 1923, as recorded officially: Crude ore shipped to the smelter in the period 1923–27, 4,700 tons; in the period 1939–42, 550 tons; in 1947, 1 ton; total crude ore shipped, 5,251 tons. Ore milled 1927–30, 31,776 tons. Gross contents of the products shipped: Crude ore, 5,251 tons; gold, 921 oz.; silver, 774,160 oz.; lead, 774,160 lb.; zinc, 2,249,952 lb. Lead concentrates, 1,601 tons; gold, 528 oz.; silver, 636,018 oz.; lead, 1,897,880 lb. Zinc concentrates, 1,736 tons; gold, 202 oz.; silver, 80,717 oz.; zinc, 1,758,459 lb. The official records do not cover zinc contained in early shipments of crude ore, zinc contained in lead concentrates, and lead contained in zinc concentrates.

The cores from most of the holes drilled in 1946–47, and the extension of the 3800 level, were seen at the end of the 1947 field season. In 1948 the surface geology in the vicinity of the ore-bodies was mapped and the three main adits were examined. Exposures are abundant in a burnt-over area near the portals of the 3600 and 3800 levels and a plane-table survey was made of this area.

The rocks are flows and flow-breccias. The flows are rhyolitic and are light-coloured, pale grey and brown. Some of these rhyolitic flows are spherulitic and have flow-structure so well developed that the rock tends to break along the planes between the closely spaced dark and light layers. The remainder of the flows are massive. All the workings are within the flows.

The flow-breccias are darker than the flows, generally greyish-green, with fragments of a considerable range of colour. These flow-breccias occur south and east of the flows and appear to overlie them. The contact is gradational and dips, between the surface and intersecting diamond-drill holes from 3800 level, about 35 degrees eastward. Some breccia occurs within the predominantly non-breccia part of the flow series, though this breccia is generally lighter coloured than the breccia that occurs in the south-east part of the area mapped.

Numerous dykes, most of them dark green, cut the flows and flow-breccias.

Cutting the volcanic series are several nearly parallel vein-zones that strike north-easterly and have steep dips.

The Henderson zone, together with the Ashman and Fault-plane zones that diverge from the Henderson, has been developed. These vein-zones consist of one or more faults filled with carbonate, quartz, arsenopyrite, pyrite, sphalerite, galena, pyrrhotite, chalcopyrite, tetrahedrite, and ruby silver, and the rock between the faults and in the walls is partly replaced by the same minerals. Widths of mineralization up to 4 feet occur, although the average width in the stopes is about a foot. The Henderson zone, where drifted on in 1947, averages less than a foot in width.

The Henderson zone is continuous for more than 3,000 feet and has been developed for a length of 2,200 feet and in a vertical range of 700 feet from three main levels, as shown on Fig. 5, and on several sub-levels.

The attitudes of the flow-structure are shown on Fig. 5 and do not indicate folding. The flow-planes resulted from movement about the time that the flows were crystallizing, and apparently there has been no movement along these planes since that time. These flows have yielded to stress, not by folding, but by fracturing.

Several minor faults cut the flows and displace the Henderson and related mineral zones a few feet to the right. A major fault, called No. 1, parallel to the minor faults consists of several fault-planes, with some shattered rock and gouge between the outside walls of the fault-zone which are as much as 15 feet apart. Where exposed by the 3600 level, the walls have grooves which dip about 60 degrees north-westerly. The shape of these grooves indicates that they were caused as the south-west or hanging wall moved down relative to the foot-wall, and although these represent pos-

sibly only the direction of the most recent movement in the fault-zone, nevertheless this direction of movement corresponds to the displacement noted at the minor faults and to the displacement of the flow-breccia contact, which seems to be about 500 feet.

Holes 27 to 30 did not intersect either the Henderson or Fault-plane zones. The other holes drilled in the south-western and central part of the vein-zones intersected the vein-zone toward which they were directed. Although the intersections are narrow, mostly less than a foot wide, the appearance of most of them is similar to that of the ore mined.

On the vertical projection (Fig. 5) these intersections are plotted, and the outline of the stopes is extended to include those parts of each zone in which the intersections are near ore-grade at present prices.

In the extension of the 3800 level drift, two better than average sections 68 and 30 feet long respectively were exposed between 430 and 225 feet from the north-east end of the drift. Although the average width is only 7 inches, the proportion of sulphides is so high that these sections are near ore-grade. However, no other development-work was done on them.

Holes 43 to 46, drilled upward to explore under long mineralized intersections indicated by holes 14 and 15, cut numerous narrow veins. None of these holes are drilled nearly normal to the vein-zones, and the long sections of mineralized core from holes 14 and 15 may have resulted from the holes deviating slightly from their course to become nearly parallel to the vein-zones.

The vertical projection shows that the ore-shoots that have been mined occur where the Henderson and related zones intersect flows that have well-developed flow-structure. No ore-shoots have been developed in the massive flows or in the flow-breccias. It may be noted that the north-eastern limit of the shoots corresponds in a general way with the dip of the flow-structures. Therefore, it appears that the flows with flow-structure, because of the difference in the way they fractured, or for some other differences, were more suitable for the formation of ore-shoots.

The south-west limit of the known ore-shoots is near No. 1 fault, and inasmuch as the ore-zones continue to this fault, on the levels where exploration has extended westward to the fault it appears that the ore-zones are faulted here or else the mineralizing solutions could not circulate and deposit their minerals west of the fault. The numerous minor faults are younger than the mineralization, and, therefore, it is likely that the parallel major fault is also younger, as it appears to be from inspection. Also some mineralization occurs west of No. 1 fault, and, therefore, it may be concluded that the mineralized zones are displaced at the fault. Since the rocks immediately south-west of this fault are rhyolites with well-developed flow-structure and are apparently similar to those in which ore-shoots occur, the question arises as to where are the mineralized zones west of No. 1 fault.

A shear-zone with much less mineralization than the Henderson zone is exposed near one portal of the 3600 level, and it is nearly aligned with the Henderson zone. It appears to be displaced a few feet to the left from the projected extension of the Henderson zone. This is only about the same displacement that is found on the minor faults and is in the opposite direction. Judging from the width of No. 1 fault, and its surface expression, it has been the locus of much greater movement than the other faults, although the direction of movement probably is the same. For these reasons, together with the fact that the contact between the flows and breccias looks as if it were displaced several hundred feet, it seems unlikely that the weakly mineralized zone referred to is the Henderson zone. No other mineralized zone is exposed south-west of the No. 1 fault; therefore it appears that the Henderson zone and the zones branching from it have not been found here and that the holes drilled west of the fault are not long enough to intersect the faulted extension of the vein-zones.

To determine where to look for the faulted extension of the Henderson zone, the displacement on the fault was calculated, assuming that the contact between the flow and breccia dipped 45 degrees eastward and that the grooves on the walls of the fault indicated the direction of movement. The displacement of the hanging wall works out to about 475 feet downward and westward, and the displacement of the Henderson zone at the surface to about 320 feet. Near this point a prominent gully heads in an area of few outcrops, which has not been explored. The coincidence of this gully with the postulated surface trace of the Henderson zone could mean that a sulphide-bearing zone, readily eroded, occurs here and may be the Henderson zone. In any case, this area west of the present workings should receive consideration if additional work is planned for the property.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1925, p. 135; 1928, pp. 159–161; 1934, pp. C 9–C 11; 1947, pp. 98–100. *Geol. Surv., Canada*, Mem. 223, pp. 84–92.]

Silver-Lead-Zinc.

Cronin Babine Mines, Ltd.*

This is a new company, with offices in the Rogers Building, Vancouver; mine office, Smithers. J. M. Baker, manager. Capital: 3,000,000 shares. International Mining Corporation (Canada), Limited, 622 Federal Building, Toronto, of which G. F. MacDonnell is president, took an option on 73 per cent. of the stock and financed the exploration-work carried out during 1948.

The property, formerly known as the Cronin and as the Babine Bonanza, is on the east slope of Cronin Mountain, about 20 miles north-east from Smithers. The Cronin ore-bodies are replacement deposits along a contact between rhyolite and argillite. Work was started in August, and supplies were trucked to the LaMar camp, then packed on horses 4 miles over the divide to the Cronin camp. A geological survey was made of part of the surface and of all the underground workings. Two diamond-drills were operated, one on the surface and one underground on the 5,000-foot level. The only mining done was slashing for diamond-drill set-ups. Sixteen men were employed until November, when work was suspended for the winter.

CARIBOO.†

Copper.

SINCLAIR MILLS (53° 121° N.W.).

Trilobite and Ena.‡

A. H. Wales, of Wells, holds twelve recorded claims lying on both sides of the Fraser River 6 miles south of Sinclair Mills, just north of the Grand Canyon. A cabin was built on the west side of the river and is reached by boat from Sinclair Mills. The rocks exposed along the river are lower Palæozoic§ limestone, quartzite, and shale, striking about north 40 degrees west and dipping 65 degrees south-west. The main showing is on the Graptolite claim on the west side of the river, about 400 feet south of the south-east corner of Lot 920. Copper mineralization is exposed near the edge of the river at the mouth of a small creek that occupies a pronounced depression trending about north 45 degrees east. It is possible that the depression marks the course of a fault which appears to have displaced the beds exposed near the river's edge.

On the showing at the river-bank a triangular area about 50 feet across had been stripped but, when examined, overburden from the latest stripping had covered all but a small area of bedrock. Mineralization could be seen across a width of about 50 feet;

* By F. J. Hemsworth.

† By J. E. Merrett, except as noted.

‡ By Stuart S. Holland.

§ Lower Cambrian trilobites have been identified from limestone about 1 mile up stream. *See* B.C. Department of Mines Bull. No. 11, 1941, p. 20.

the full width was not apparent. Interbedded quartzites and calcareous rocks are cut by numerous irregular quartz veinlets, sparingly mineralized with pyrite and chalcopyrite, which have silicified the adjoining rock, and by occasional short sulphide-lenses up to 6 inches wide, consisting of pyrite and some chalcopyrite. Little disseminated sulphide mineralization was seen in the silicified rock.

The owner supplied assay results of samples taken by examining engineers when the showing was better exposed. The highest assay was 5 per cent. copper across a width of 6 inches, and the weighted average of sixteen samples is about 1.1 per cent. copper.

Some trenches, dug many years ago by E. Short, through 2 to 4 feet of overburden about 250 feet south-west of the main showing, expose replacement quartz sparingly mineralized with chalcopyrite. Copper mineralization is also exposed in a cut in the depression about 600 feet south-west of the river. These cuts suggest that the copper mineralization may be localized along a south-westerly trending zone.

Small irregular veinlets of chalcopyrite up to an inch wide appear in outcrops on the east side of the river and on several of the islands lying up-stream from the main showing.

Wells-Barkerville Area.

Gold.

Cariboo Gold Quartz Mining Co., Ltd.

(53° 121° S.W.) Company office, 1007 Royal Bank Building, Vancouver; mine office, Wells. W. B. Burnett, president; G. A. Gordon, general manager; L. Walker, mine superintendent. Capital: 2,000,000 shares, $1 par value. The Cariboo Gold Quartz mine is a short distance south of the town of Wells, which is 56 miles by road from Quesnel. The enlarging of No. 1 shaft was completed in November. This shaft will now service the mine section between the 1500 level and the 2000, or bottom, level. New development-work comprised 85 feet of new shaft and 194 feet of enlarged shaft, 1,756 feet of drifting, 434 feet of crosscutting, 1,249 feet of raising, and 4,028 feet of diamond-drilling.

As the No. 1 shaft programme occupied most of the year, all ore mined was from above 1500 level. This ore was obtained principally from the Rainbow, Saunders, and Pinkerton zones. On the surface some ore was obtained from shallow workings 90 feet long in the B.C. vein, but work was stopped when it was found the ore did not continue to depth. Development-work on the 53 vein in the B.C. area exposed a strong vein, which is now being mined. The Walker vein, a replacement ore-body of high-grade bedded sulphides, was found in 13 A.R. stope in April. Diamond-drilling for possible similar occurrences is being done in this area.

In April G. A. Gordon succeeded C. D. Stevenson as general manager. Thirty-five units of the fifty-unit housing programme, started in 1946, were completed. Work on the remaining fifteen units has been suspended. The average number of men employed during the year was 260.

Production: Ore milled, 73,726 tons. Gross contents: Gold, 22,757 oz.; silver, 2,322 oz.

Island Mountain Mines Co., Ltd.

(53° 121° S.W.) Company office, 744 Hastings Street West, Vancouver; mine office, Wells. F. W. Guernsey, president; J. A. Pike, mine manager; T. Bethune, mine superintendent. Capital: 1,100,000 shares, 50 cents par value. This company, a subsidiary of Newmont Mining Corporation, operates the Island Mountain mine, just west of the town of Wells.

During the year 4,516 feet of development drifting and crosscutting, 445 feet of raising, and 10,325 feet of diamond-drilling were completed. Development-work was confined chiefly to the lower levels—3125, 3000, and 2850—where long drives were necessary to follow the favourable Rainbow-Baker contact. A small amount of develop-

and on Silverado Creek. It is nearly 15 miles by water route from Nootka. Weekly steamer service connects Nootka with Port Alberni and Victoria. Daily air service also connects Nootka with Vancouver.

By the end of 1948 rehabilitation of 3,400 feet of road from the mouth of Silverado Creek to the portal on the A.M. Fraction had been completed.

A portable compressor had been installed and underground development started from this portal to prospect for the possible downward extension of a surface exposure of sphalerite.

ALBERNI (48° 124° N.W.).*

Gold.

Black Panther (Nitinat Mines, Ltd.).

This property was operated by Nitinat Mines, Limited, registered office at 800 Hall Building, Vancouver, on a lease with option to purchase. The property is 22 miles by motor-road from Port Alberni. Work consisted of mining a narrow quartz-sulphide vein at the intersection of a main shear and a branch. On the second level, elevation 2,927 feet, a winze was sunk on this intersection to a depth of 60 feet. Material from stopes and the winze was milled intermittently. The average number of men employed was eleven.

Production: Concentrates shipped, 39 tons. Gross contents: Gold, 308 oz.; silver, 627 oz.; lead, 7,817 lb.; zinc, 4,478 lb.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1944, p. 158; 1947, p. 183.]

UPPER QUINSAM LAKE (49° 125° N.W.).*

Iron.

Coast Iron Co., Ltd.

Company office, 475 Howe Street, Vancouver. Capital: 500,000 shares, no par value. The property is on Iron Hill, near Upper Quinsam Lake, nearly 25 miles south-west of Campbell River. It is reached by road, which has a good grade, rising approximately 1,725 feet from sea-level to the quarry. The ore, a magnetite and magnetite-garnetite replacement, is mined by quarrying. Ore is loaded by a ¾-yard gas-shovel into 5-ton trucks and transported to Duncan Bay. There it is loaded into barges for shipment.

Prior to 1914 several tunnels were driven and open-cuts made by Seattle interests who acquired this property under lease from the Esquimalt & Nanaimo Railway. In 1916 and later the property is referred to as being under the control of the Quinsam Lake Iron Syndicate. No work had been done on the property since then until the Coast Iron Company, Limited, started diamond-drilling and quarrying late in 1948.

The present quarry is on the south-east slope of Iron Hill. Preparations are being made to start a second quarry approximately 200 feet to the north and east of this on the east slope and at the same elevation.

Since the operation started in December, ten men have been employed by the company. Loading and transportation of material is contracted and employs one shovel operator and twenty to twenty-three truck-drivers.

Approximately 1,000 tons of material has been shipped to Wenatchee, Wash., for smelting.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1916, pp. 296, 297. Iron Ores of Canada, Vol. I.]

CHEMAINUS RIVER (48° 124° N.E.).

Copper.

Comego.†

The three adjoining mineral claims, Comego, Comego No. 1, and Comego No. 2, recorded in July, 1938, are held by Duncan Powell, Thomas H. Service, and G. Lomas, of Duncan. The claims are reached from

* By R. B. King.

† By James T. Fyles.

ment-work was done on 3500, 3375, and 3250 levels. On 2700 level, ore-pockets have been cut and the station prepared for crosscutting to the Rainbow-Baker contact.

Ore was mined on all levels from the 4000 level to the 2850 level. Stoping is done by cut and fill methods in the quartz veins and by long-wall advance in the flat-lying replacement-bodies. In both types of stopes, scrapers are used to move broken ore and waste fill.

Materials and equipment are being removed from the Shamrock tunnel at Barkerville.

During the summer some test-pitting was done on a placer lease on the north fork of Cariboo River. The results were not encouraging.

A new and larger office building was constructed, and rooms provided above the office for single members of the staff.

The average number of men employed was ninety-nine.

Production: Ore mined and milled, 40,752 tons. Gross contents: Gold, 16,907 oz.; silver, 2,487 oz.

Canusa Cariboo Gold Mines, Ltd.* (53° 121° S.W.) Company office, 789 Pender Street West, Vancouver. John Dunsmuir, president; W. F. McGowan, mine manager. The company holds nineteen recorded claims and fractions and two Crown-granted claims, the Black Bull and the Waoming, lying south-west of the heads of Stouts Gulch and Lowhee Creek. On the north-east the company's holdings adjoin the American, Cariboo, St. Laurent, and Mucho Oro claims, owned by Cariboo Gold Quartz Mining Company, Limited. The mine buildings and shaft are about 2 miles by road up Stouts Gulch from Barkerville and are about 2,000 feet south of the B.C. shaft of the Cariboo Gold Quartz Mining Company.

In 1946 the company sank a shaft to a depth of 300 feet and in 1947 started driving a crosscut southward on the 260-foot level. A large vein, named the Canusa vein, was intersected at 175 feet from the shaft. In 1948 underground work was continued until the mine was closed at the end of August, and the workings were allowed to flood. Underground work on the 260-foot level consists of a crosscut 350 feet long and about 600 feet of drifting on the Canusa vein.

Bedrock for the most part is covered with a thick mantle of glacial drift, and natural exposures are rare. Good artificial exposures are to be seen in the bottom of the old hydraulic pit at the head of Stouts Gulch (*see* Fig. 6), in the hydraulic pit on Emory Gulch, in the spillway from the Lowhee ditch, and in the bottom of Lowhee hydraulic pit. These exposures, in large part, provide the basis for the bedrock geologic mapping.

The rocks exposed in and adjacent to the two pits belong to the B.C., Lowhee, and Basal members† of the upper Richfield formation. The Lowhee member lies in a band about 1,000 feet wide between the Basal and the B.C. members.

Rocks exposed in the upper part of Stouts Gulch, in the Lowhee hydraulic pit, and in the spillway leading north from Lowhee ditch are largely light-grey to white, fissile and non-fissile quartzites of the Lowhee member. A band about 20 feet wide of pale to dark green chlorite schist crosses the Waoming claim and terminates against a fault at its western end (*see* Fig. 6). All rocks exposed underground in the Canusa workings, except for those at the south face of the crosscut, are considered to belong to the Lowhee member.

Black argillite and argillaceous quartzite of the Basal member is exposed in Watson's Gulch, in the side of Lowhee pit south of the east end of the Black Bull vein, in Cariboo Central adit and beneath the Lowhee camp, along the Lowhee ditch 200 feet south of the head of the spillway, and in Emory Gulch. The argillite in the south

* By Stuart S. Holland.

† See *Geol. Surv., Canada*, Mem. 181, 1935, pp. 6 and 7, for descriptions of these members.

face of the crosscut underground is considered to be Basal. The position of the Lowhee-Basal contact is inferred from these exposures.

Black argillite of the B.C. member lies to the north-east of the Lowhee rocks in Stouts Gulch and the Lowhee pit. The B.C. vein is flanked by the B.C. member which is exposed in the crosscut leading to the B.C. vein on the 100-foot level, for about 200 feet in a diamond-drill hole on 1500 level of Cariboo Gold Quartz mine, and downhill to the south of the vein for possibly 300 feet, as indicated by the dump of black argillite which lies north of the old dam on the north side of the Lowhee pit. Outcrops are too few to determine the position of the Lowhee-B.C. contact on Fig. 6.

The rocks, for the most part, strike north 40 to 60 degrees west and dip 35 to 60 degrees north-east. They are well cleaved and are involved in large isoclinal folds and rumpled by small, close drag-folds.

The claims are crossed by two major northerly striking faults and possibly by a third. A band of chlorite schist 750 feet south-east of the Canusa shaft terminates against the Waoming fault which is exposed in a second place on the south side of Stouts Gulch. The Waoming fault strikes about north 10 degrees east, and presumably has a right-hand displacement of possibly 400 feet.

The B.C. vein is unbroken by major cross-faults for about 1,800 feet. At 720 feet north-west of the B.C. shaft the vein is cut by the B.C. fault, strike north 17 degrees west, which displaces the vein about 180 feet to the right. The B.C. fault appears underground on 1500 level of the Cariboo Gold Quartz mine, and its average dip is about 70 degrees to the east. If the fault continues southward in a straight line on the average strike, it would be 100 to 300 feet west of the Canusa crosscut and should have been crossed in the drift on the Canusa vein. Either the fault lies ahead of the west face of the Canusa drift or, alternatively, may have curved and swung to a more south-easterly course and have passed into a bedding or strike fault.

The abrupt termination of the Black Bull vein at its eastern end suggests that it is cut off by a fault, but no broken ground or gouge was observed in the Lowhee pit, nor is there positive indication of beds having been displaced.

An interpretation of the outcrops suggests that the outcrop-width of the Lowhee member west of the head of the Lowhee pit is narrower by possibly 400 feet than it is east of the Lowhee spillway and the head of Stouts Gulch. Furthermore, there is a southward shift of the Basal-Lowhee contact east of the Lowhee spillway that is considerably greater than the 180-foot displacement of the B.C. fault. Moreover, there appears to be little correspondence between the section of rock exposed in the Lowhee spillway, lying immediately north of the Basal contact, and the rocks in the Canusa crosscut extending northward from the Basal contact at the face of the crosscut. These discrepancies in part may be due to drag-folding. The information now available is insufficient to explain the relationship of the rocks in this critical zone.

The main surface showings on the Canusa holdings are a group of narrow quartz veins, lying 100 to 300 feet south of the shaft, and the Black Bull vein exposed in Lowhee hydraulic pit. The Canusa vein, found by underground exploration, is not known to outcrop. There has been no underground exploration of the narrow veins, which since the erection of the buildings have been partly covered with tailings and debris. These veins, though narrow and short, are well mineralized with pyrite, from which gold assays up to 0.14 oz. per ton have been recorded.* Near the veins and spreading from them into thin quartzite beds are narrow pyritic replacements which have yielded gold assays of 0.70 oz. per ton.

No work has been done on the Black Bull vein which is exposed for about 800 feet along the bottom of the Lowhee hydraulic pit. At its eastern end the vein is about 12 feet wide and, as it terminates abruptly, may have been faulted. The vein is mineral-

* *Minister of Mines, B.C.*, Ann. Rept., 1945, p. 81.

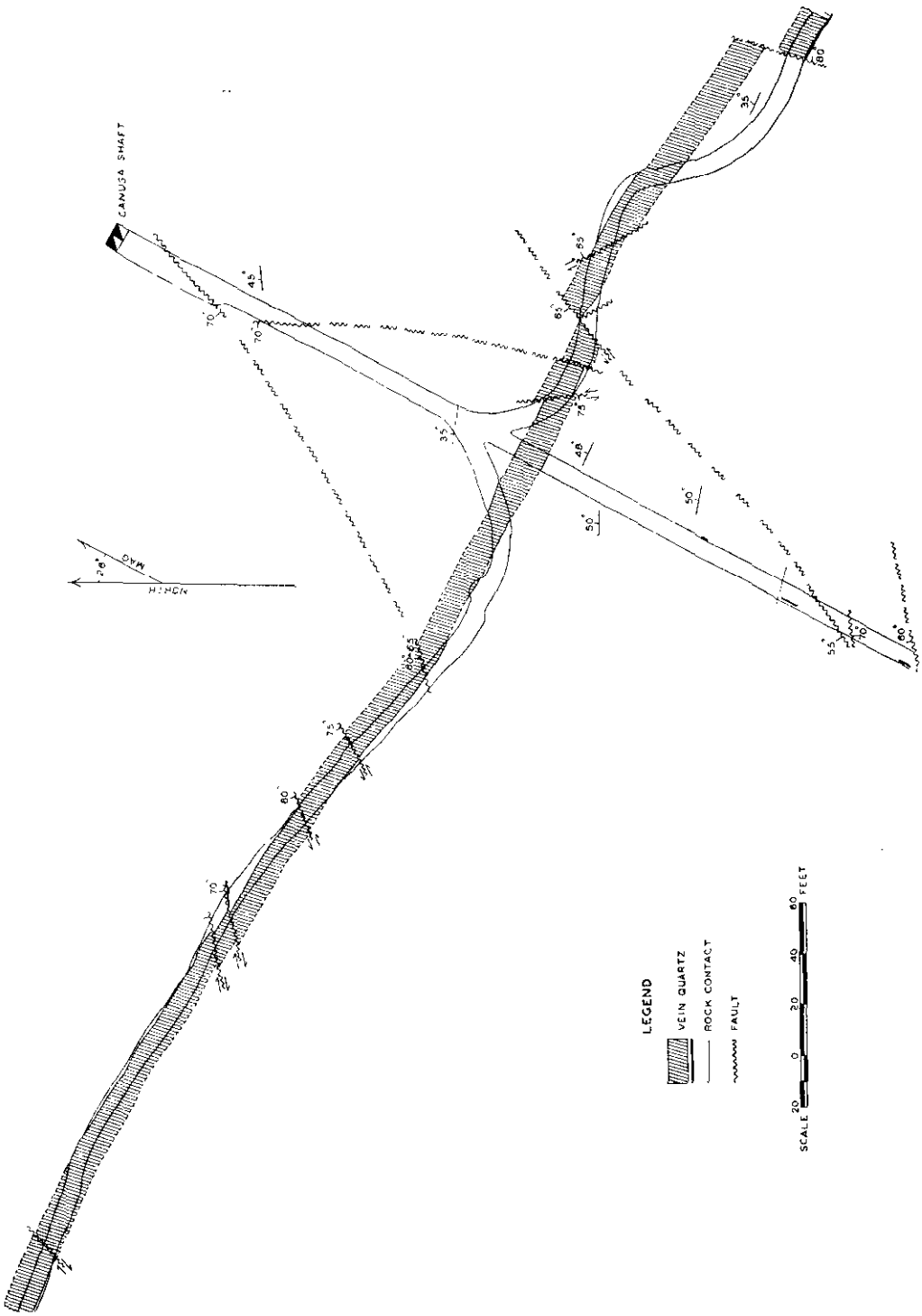

Fig. 7. Canusa Cariboo Gold Mines, Ltd.—plan of Canusa vein on 260 level.

ized with pyrite, but in most exposures the pyrite has been completely leached from the quartz. Two samples of selected, well-pyritized quartz assayed: Gold, 0.14 oz. and 0.32 oz. per ton.

The underground workings on the 260-foot level from the shaft comprise some 950 feet of crosscutting and drifting. The crosscut is driven south 27 degrees west for 350 feet (*see* Fig. 7). For 150 feet the crosscut intersects medium- and dark-grey argillaceous schist and argillaceous quartzite belonging to the Lowhee member. The next 145 feet is also in Lowhee rocks, consisting of light-grey to white quartzite with thin argillaceous layers, grey ankeritic carbonate layers, and thin beds of rice-grained quartzite. For the last 55 feet to the face the rocks are grey argillaceous schist and dark-grey and black slate, with the black slate at the face. They are considered to belong to the Basal member. The rocks strike north 85 degrees east to north 75 degrees west and dip 35 to 60 degrees northward.

At 175 feet south of the shaft the crosscut intersects the Canusa vein, which ranges from about 9½ to 11 feet wide, dips northward at about 65 degrees, and strikes about north 60 degrees west. The vein is drifted for 200 feet south-east of the crosscut and for 390 feet north-west (*see* Fig. 7).

The vein is cut by ten faults having lateral displacements of from 1 to 3 feet and by two with displacements of 12 and 16 feet. Their direction of movement is not constant, nor do they fall into a definite pattern. They strike north-east or north-west and have variable dips.

The quartz in some places is fractured at right angles to the strike of the vein and in others is crossed by a network of younger quartz-filled fractures. It is mineralized rather sparingly with pyrite and contains galena, some sphalerite, cosalite, and occasionally some visible gold. The vein was systematically sampled at 10-foot intervals by the company in July, 1948. The samples were taken across the quartz exposed in the drift, but do not represent the full width of the vein. The numerical average of forty-nine samples is 0.17 oz. gold per ton, thirty samples assayed less than 0.11 oz. per ton, nine lay between 0.11 and 0.2 oz. per ton, two lay between 0.2 and 0.3 oz. per ton, four between 0.31 and 0.4 oz. per ton, and four assayed more than 0.5 oz. per ton. There is an indication that the better than average assays usually come from sections where the vein is shattered near a crosscutting fault. However, the best assays were from samples containing cosalite taken 50 feet from the nearest fault.

One selected sample, well mineralized with pyrite, taken by the writer near the fault 25 feet south-east of the crosscut, assayed 0.18 oz. of gold per ton. Another selected sample well mineralized with pyrite and cosalite from the stringer on the east wall of the crosscut 70 feet south of the Canusa vein also assayed 0.18 oz. of gold per ton.

The last work on the Canusa vein was the continued driving of the north-westerly drift toward the southward projection of the B.C. fault. The fault was expected to be 100 to 300 feet north-west of the crosscut, but at 390 feet still had not been encountered. The B.C. fault is of interest because of the hypothesis that better values might be expected in the Canusa vein in the shattered zone on either side of the fault in a similar situation to that at the surface on the Cariboo Gold Quartz Mining Company's ground where the B.C. vein contains a 75-foot ore-shoot on each side of the B.C. fault, and on 1500 level where the B.C. vein had an ore-shoot (now stoped) on the south-east side of the B.C. fault. Consequently there is good reason to expect that the Canusa vein, because of its size and because it contains appreciable though sub-marginal gold values, will contain ore-shoots under similar favourable structural circumstances.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1945, pp. 80–81; Ann. Rept., 1946, pp. 90–91; Ann. Rept., 1947, pp. 112–113. Skerl, A. C.: Geology of the Cariboo Gold Quartz Mine, *Ec. Geol.*, Vol. XLIII, No. 7, 1948, pp. 571–597.]

Cariboo Hudson Gold Mines (1946), Ltd. (52° 121° N.E.) Company office, Royal Bank Building, Vancouver. W. B. Burnett, president. Capital: 3,000,000 shares, 50 cents par value. This property is on Pearce Gulch and is reached by 21 miles of road from Barkerville. No work was done on this property in 1948. However, the sale of the company's 125-ton mill to Discovery Yellowknife Mines, Limited, has provided sufficient funds to maintain the property in good standing. The rest of the mine-plant equipment has been retained with the intention of resuming development-work at some future date.

LIKELY.

Silver-Lead.

Providence Mining & Milling Syndicate. (52° 121° N.E.) Mine office, Williams Lake. L. O. Gostling, mine manager. Mr. Gostling and associates hold eight claims by record. This property is reached from the highway bridge across Spanish Creek by 3 miles of trail which extends up the east side of Black Bear Creek. A winze, of 32 degrees slope and bearing north 65 degrees east, immediately west of the upper adit, has been sunk from the surface a slope distance of 100 feet. At a point 90 feet down the slope a crosscut with the same bearing as the winze extends 300 feet into the mountain. The crosscut was driven in an endeavour to intersect the downward projection of the quartz vein exposed on the surface and in two old adits. The work was done by a crew of five men working under a partnership agreement.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1902, p. 86; 1926, pp. 177, 178; 1947, pp. 127, 128.]

CLINTON (51° 121° S.W.).

Manganese.

Clinton Manganese.* Several years ago L. T. Olson, of Clinton, held mineral claims covering two manganese-occurrences near Clinton. The claims have now been cancelled. One occurrence lies about 3½ miles south-west of the town and the other is 4 miles south-east of Clinton. The occurrence southwest of Clinton is just west of the Pacific Great Eastern track on a small ridge that trends about north 10 degrees west. The showings extend along the ridge for about 325 feet and rise to about 400 feet above the track.

The rocks in the vicinity are largely grey and grey-green chloritic and quartzitic schists belonging to the Cache Creek group. They strike about north 25 degrees west and dip 45 degrees to the south-west. About 100 feet below the highest manganese-showing the rocks are cut by a 6- to 8-foot diorite porphyry dyke striking north 45 degrees east.

Bedrock outcrops only along the top of a small ridge. A stratigraphic thickness of about 50 feet of manganiferous rock is exposed, of which the lowest is a bed of hard pink to brick-coloured cherty quartzite with thin films of black manganese oxides along fracture surfaces. This rock assays about 0.75 per cent. manganese.

Higher up the ridge the rocks are grey quartzitic schists and pale green-grey schists with interbeds of white, flesh, pink, and brick-coloured cherty layers. Although the colour of the rock suggests the presence of rhodonite, none was identified with certainty, and the source of the manganese could not be definitely determined. Evidently the oxidation of some manganese mineral, possibly rhodonite, has provided manganese, which has been redeposited as pyrolusite in fractures and irregular replacement areas in the rock. Manganese oxides appear in the outcrop and in several open-cuts that have been dug across the top of the ridge. The best mineralization is

* By Stuart S. Holland.

in a 10-foot open-cut about 260 feet north of the lowest exposure. This open-cut discloses rock well mineralized with pyrolusite in stringers up to three-quarters of an inch wide, striking about north 45 degrees east and standing vertically. A sample across a width of 10 feet assayed 15.8 per cent. manganese.

The second showing, 4 miles south-east of Clinton, is at an elevation of about 3,650 feet on the south-east side of Hart Ridge. Manganese oxides occupying narrow fractures in a white or yellow-stained quartzite outcrop for a length of 110 feet and irregularly across a maximum width of 20 feet. The trend of the mineralized zone is north 35 degrees west.

Pyrolusite in narrow stringers and irregular areas makes up a variable part of the rock, and the manganese content depends on the number, spacing, and thickness of the veinlets. No mineral from which the manganese oxides may have been derived was seen.

LONE CABIN CREEK.

Gold.

Porcupine Mountain.*

(51° 122° S.E.) In May, 1948, Lawrence Frenier recorded eight claims covering ground on the upper part of the western side of Porcupine Mountain,† at the head of the north fork of Lone Cabin Creek. These claims were staked two abreast with common location-lines running east of north. Continuing southerly from these claims are eight claims, also two abreast, recorded by Norman Hillborn. West of the southern part of Frenier's ground, four claims were recorded by W. G. Osborne, of Bralorne. Osborne also recorded two claims east of Frenier's ground. A total of thirty-two claims on Porcupine Mountain were recorded by Walter Fenton, Henry Fenton, Mary J. Fenton, K. J. S. Chisholm, and Hugh McLeod.

In the following notes, statements relating to mineral claims are subject to the reservation that the boundaries of the claims have not been established by survey.

Rising from the plateau about 10 miles west of the Fraser River, the summit of the mountain is a conspicuous peak, with an altitude of about 7,500 feet; locally the sharp dark peak is also called Black Dome. The area is uninhabited and is essentially unmapped. Porcupine Mountain may be reached from Big Bar Ferry by several routes involving travelling over 25 to 40 miles of trail. The local road from the Gang Ranch through Empire Valley suggests another route which would require building 10 to 15 miles of trail from the road to the claims.

The claims were visited in August, when Frenier and Osborne were on the ground. The northern and eastern slopes of Porcupine Mountain were not examined. The western and southern slopes of the mountain expose a thick accumulation, largely of greenish-grey fine porphyritic andesitic rocks with some tuffs and some brown platy rhyolites. Near the peak fine-grained greenish volcanic rock appears to intrude the andesites as thick steeply dipping dykes. Flat-lying lavas, with occasional brownish layers, probably of rhyolite, are exposed on the north fork of Lone Cabin Creek, over a vertical range of about 2,500 feet. Some folding is apparent south of and on the southern part of Hillborn's ground. A few granitic erratics are scattered on the upper slopes of the mountain. Much of the ground covered by the claims is open, with grassy or talus-covered slopes.

Numerous leads, some of which contain visible gold, have been found on the claims. The leads are sheeted and brecciated zones in slightly altered volcanics. Some contain a little quartz in tiny lenses and veinlets. Drusy veins or lenses of quartz up to a foot or so thick occur in some leads, and quartz 2 or 3 feet thick occurs in a few of the leads. Locally, across widths of 3 to 8 feet, quartz makes up to 20 to 50 per cent. of a lead.

* By H. Sargent.

† *See* Map 3K, Pre-emptor's Series, British Columbia Department of Lands and Forests.

A few masses of such material stand several feet above the weathered surface. Zones with little quartz are quite inconspicuous, and some have widths of 10 to 15 feet. Scattered grains of pyrite are found in the quartz and in the altered volcanics within the leads. Loose material overlying the leads, on panning, yields a concentrate containing pink and dark garnets and some magnetite. Some pans yield gold as numerous fine "colours," few of which are as much as a thirty-second of an inch across. Free gold, as nests of tiny grains in jasper, was exposed in one of the highest cuts. Similar nests are seen in some of the quartz veinlets. Fine grains of gold were seen in numerous specimens of well-crystallized quartz, and at the edges of decomposed pyrite crystals. Visible gold has been found over a vertical range of about 500 feet, in which there is no apparent change in the character of the vein-matter.

The leads trend from 15 to 60 degrees east of north and dip steeply, some to the north-west and others to the south-east.

Much of the material in the exposed leads is barren or very low grade. The assays of some samples, the gold that may be panned from soil at the outcrops of some of the leads, and the gold seen in some of the leads, indicate that parts of some leads may be of moderate grade, and some parts may be rich in gold. As the overburden is generally shallow, it should be possible to gain much additional information on these leads in a short period of intensive work.

Frenier discovered gold-bearing leads on Porcupine Mountain in 1947. He built a shelter on the western slope, near the head of a tributary of Churn Creek, arranged granitic boulders for crushing and grinding, and worked on material from some of the veins. He also built a flume close to timber-line on his Saddle claim, intending to sluice unconsolidated material at the outcrop of his No. 14 lead. In 1948 he built a small cabin, at approximate altitude of 6,800 feet, near the south-western corner of the Saddle claim. By early August he had made more than a dozen trenches or open-cuts on several leads. Several other leads are resistant to weathering and stand above the surface, or are almost free of overburden and can be distinguished as slightly reddish bands, containing some quartz. He devoted a good deal of energy and ingenuity to attempts to recover gold from the leads single-handed. At the cabin he set up boulders for crushing and contrived an ingenious amalgamator consisting of a granite boulder, chipped out to form a basin, in which another boulder, properly shaped, is rotated by turning an iron crank. Gold recovered by such means is costly in labour.

Only some of the leads found by Frenier are mentioned in the following notes. The leads will have to be opened up more completely before their possible value can be determined satisfactorily. Since visible gold is contained in some of the leads, and since gold can be panned from the soil on some outcrops, it may be necessary to take a decidedly large quantity of ledge-matter uniformly across any section sampled. Samples mentioned in these notes were taken by the writer. Material panned was taken and panned by Frenier in the presence of the writer.

Between 400 and 500 feet from the northern end of Frenier's location-line, at 6,950 feet altitude, on the eastern side of a low rocky ridge, an altered zone containing some quartz stringers is exposed naturally. A chip sample across the width of 12 feet, toward the northern end of the exposure, assayed a trace in gold. A pan of surface material, from about 4 square feet near this sample, yielded a few tiny colours. A second chip sample, across 12 feet, 60 feet south of the first, contained slightly more quartz; it assayed 0.01 oz. of gold per ton.

About a quarter of a mile southerly from this exposure, weak sheeting is apparent in tuffs on the top of the low ridge for a length of about 100 feet. Vuggy quartz veinlets cut the tuffs, and near the veinlets the tuffs contain tiny grains of pyrite. This material was not sampled.

Some 200 yards north-easterly from the cabin, two trenches exposed a sheeted zone with numerous tiny drusy quartz veinlets. A pan from the western end of one trench yielded a few small colours. About 500 feet to the south, on the southern bank of a small easterly flowing creek, No. 13 lead has been exposed in a small cut. It also is a sheeted zone containing tiny quartz veinlets, some pyrite and some calcite. No colours were obtained from a pan of decomposed material on bedrock. About a hundred yards to the south-east a cut exposed No. 14 lead. The exposure consists of a rib of brecciated volcanic rock containing minute quartz veinlets, and on each side, at 3 feet below the surface, the cut was still in loose rusty material. Frenier had attempted to bring water to this site for sluicing, but had found it impracticable to bring enough water in a flume built of alpine timber. This lead strikes north 50 degrees east and dips 80 degrees to the north-west. A pan of rusty soil from the south-east side yielded about twenty tiny colours and three flakes of gold about a thirty-second of an inch across. A pan of decomposed material from the central part of the rib yielded about a hundred tiny colours and two or three flakes a thirty-second of an inch across. This lead should be prepared for sampling by shooting down to fresh material. The three leads just described are on the Saddle claim.

Near the location-line, about 250 feet southerly from the northern boundary of the Whisky Jack and Pinon Pine claims, No. 12 lead stands up several feet above the slope on the south-eastern side of a north-easterly flowing creek. This lead consists of silicified volcanic rock cut by numerous quartz veins striking north 30 degrees east and standing about vertically. The width is at least 7 feet. The exposure has a length of about 40 feet. The width at the northern end was sampled in a 5-foot and a 2-foot sample; both assayed *nil* in gold.

Cuts have been made on the Eldorado and Bonanza claims on several leads up the slope from No. 12 lead. Only two of these leads will be described. Several cuts expose No. 4 lead, from which Frenier has tried to recover gold for revenue. The lead has been exposed on the steep slope over a length of about 100 feet. It is deeply weathered, strikes north 25 degrees east and stands vertically. At the higher end (altitude, 7,275 feet) there is some mineralization across 3 feet; at the lower end the fracture is only about 10 inches wide. Numerous specimens of free gold had been obtained from this lead. It was not sampled. No. 2 lead has been exposed near the location-line at 7,300 feet altitude in a cut, where a width of at least 5 feet is indicated. About 150 feet up the slope a lead, presumably the same one, is exposed in a trench. Here the writer took a sample across 2 feet of rusty decomposed andesite with crumbly quartz veinlets; it assayed 0.01 oz. of gold per ton and 0.12 oz. of silver per ton. A pan of fine dirt from this part of the trench yielded a few small colours of gold.

This last trench is about 125 feet south-westerly from a group of four location-posts—initial posts of the Ptarmigan and Black Dome and final posts of the Eldorado and Bonanza claims. The peak of Porcupine Mountain is on the Ptarmigan claim. The four claim posts are in a little grassy saddle west of the peak on the Eldorado claim. About 100 yards north-easterly from the posts a cut at about 7,350 feet altitude exposes a lead containing a good deal of jasper cut by white quartz veinlets. The zone exposed is about 7 feet wide and trends north 35 degrees east. The following assays are of four adjoining samples, successively from south-east to north-west, their combined width being that of the zone exposed:—

Width.	Gold. Oz. per Ton.	Silver. Oz. per Ton.
42 inches	0.11	*Nil*
15 inches	0.26	0.1
10 inches	0.19	0.2
18 inches	0.01	Trace

Extending south-westerly from the central part of this cut a trench 15 feet long exposed jasper cut by quartz veinlets. In this trench several nests of tiny specks of gold were seen in the jasper.

Hillborn has built a small log cabin, near the north-eastern corner of his Silver Cup claim, at about 6,800 feet altitude. He has prospected a lead traceable southerly down the slope from the boundary between his Dolly Varden claim and Frenier's Black Dome claim. Two long trenches following the contour cross this lead, exposing altered andesite with some quartz. The lower trench (altitude, about 7,100 feet) exposed more quartz than is seen in many of the leads. A sample taken in this trench across a width of 3 feet, consisting largely of quartz with some altered andesite, assayed 0.34 oz. of gold per ton and 4 oz. of silver per ton. Below this trench, on the open slope, veins or lenses of quartz up to 3 feet wide may be followed for considerable distances. Some of the quartz veins branch. These quartz veins trend about north 20 degrees east, dip steeply, and are much stronger than the quartz veins in most of the leads seen. Exposures continue for 500 feet down the slope. Quartz of similar strike is exposed about 125 feet east of the southern part of these exposures, about 30 feet west of the location-line. It is reported that similar quartz ribs outcrop some distance east of the location-line on the Marilyn claim.

Toward the southern end of his ground (on the Bedrock claim) Hillborn had made two trenches crosscutting a strong lead containing a good deal of quartz. The quartz, 6 feet wide in the southern and larger trench, narrows to the north. It strikes about north 30 degrees east and stands almost vertically. Two samples were cut in this trench, across a combined width of 7 feet consisting largely of quartz. The one sample assayed *nil* and the other trace in gold; both assayed *nil* in silver. This trench extends about 60 feet westerly from the lead, exposing rusty andesite with some quartz stringers and, in the western part, northerly striking steeply dipping rhyolite.

On Osborne's Fairless No. 2 claim, at about 6,700 feet altitude, a lead is exposed at the top of a steep slope to a small tributary of Churn Creek. This lead strikes about north 50 degrees east and dips 75 degrees north-westward. Reddish altered andesite 26 inches wide contains a fair amount of quartz in narrow stringers, one of which contained a nest of fine grains of gold. A sample taken across the 26-inch width, 2 feet from the nest of fine gold, assayed 0.02 oz. of gold per ton, and silver, *nil*. The adjoining 42 inches, consisting of slightly altered andesite and of altered andesite containing yellow-weathering quartz veinlets, was sampled as a 10-inch and a 32-inch sample. They assayed *nil* and trace in gold. About half a pan of material taken at this outcrop yielded a fragment of andesite and several fragments of quartz showing fine free gold, some of which was at the margins of partly decomposed pyrite grains. The pan also yielded several dozen fine "colours." The lead can be traced for some distance on the talus-slope below the outcrop.

BLUE CREEK (51° 122° S.E.).*

Gold.

Elizabeth, etc. (Bralorne Mines, Ltd.).

This property, comprising fifty-three claims wholly owned by Bralorne Mines, Limited, is on Blue Creek, a tributary of Yalakom River. It is reached by 48 miles of road from Lillooet by way of Moha. In 1948 the main crosscut was extended 954 feet to a total length of 2,204 feet. A few quartz veins were intersected in the drive, two measuring better than 5 feet in width; the first or "B" vein was intersected at 1,611 feet and the second or "C" vein at 2,103 feet from the portal. On the "C" vein 544 feet of drift was driven to the north and 460 feet to the south. On the "B" vein 146 feet was driven to the north and 132 feet to the south.

* By J. E. Merrett.

Diamond-drill holes from the face of the crosscut intersected a 2-foot quartz vein at 218 feet and a 7-foot quartz vein at 436 feet from the collar. Eight hundred and seventy-one feet of drilling was done.

Flood-waters destroyed road communications to the property on June 1st, and the road was not reopened until September 23rd. During this period mining operations were suspended. As the season was too far advanced for reopening the property satisfactorily, it was decided not to resume operations until the spring of 1949.

The crew averaged twenty-two men and was under the supervision of J. Mollard. Two men were killed in a blasting accident on February 5th.

BRIDGE RIVER (50° 122° N.W.).*

Gold.

Bralorne Mines, Ltd. Company office, 555 Burrard Street, Vancouver; mine office, Bralorne P.O. A. C. Taylor, president; M. M. O'Brien, vice-president and managing director; D. N. Matheson, general manager; C. M. Manning, superintendent; D. Cameron, assistant mine superintendent. Capital: 1,250,000 shares, no par value.

Bralorne mine is on Cadwallader Creek and about 53 miles by road from Shalalth Station on the Pacific Great Eastern Railway.

Development during 1948 consisted of 7,058 feet of drifting and crosscutting, 625 feet of raising, and 4,591 feet of diamond-drilling.

Drifting was carried out on the 51, 53, 55, 75, and 77 vein systems. Ore-shoots of better grade than mine average were developed in the 51 vein on 1100 level east and in the 75 and 77 veins on 1800 level.

Diamond-drilling was exploratory and was confined to the 2000 level, in 51 east crosscut, and in 53 drift.

A connection was made on the 1900 level between the Empire and Crown shafts. These shafts are now connected on all levels common to both.

The installation of the trolley haulage system, started in 1947, has been completed on the 800, or main, level. This system extends from the portal to both the Crown and Empire shafts.

Preparations are being made to sink the Empire shaft another 900 feet. Sinking will very likely commence early in 1949.

Work on the Taylor Bridge River drive ceased in March because of labour shortage.

Building of thirty houses was finished on the Empire, or Bradian, townsite; the change-houses at Bralorne and Bradian portals were also completed.

The number working underground averaged 270 a day in January and February. Spring and summer exodus reduced this number to a low of 195 in September, but an increase in the last three months of the year gave an average of 240 for the year.

Accident frequency was again one of the lowest in the Province. One fatality occurred during the year.

Bralorne Mines, Limited, declared a dividend of 10 cents a share in December, the first dividend payment since 1946.

Ore mined amounted to 150,240 tons, and ore milled amounted to 148,119 tons. Gross contents: Gold, 75,459 oz.; silver, 21,946 oz.

Pioneer Gold Mines of B.C., Ltd. Company office, 711 Yorkshire Building, Vancouver; mine office, Pioneer Mines P.O. Victor Spencer, president; H. T. James, managing director; E. F. Emmons, mine manager; H. A. Rose, general superintendent. Capital: 2,500,000 shares, $1 par value. The Pioneer mine is on Cadwallader Creek and about 55 miles by the Bridge River road from Shalalth Station on the Pacific Great Eastern Railway.

* By J. E. Merrett, except as noted.

Further development of the 27 vein was done in conjunction with the extension of No. 3 shaft and its connections to the 27 vein; 3,090 feet of drifting was completed, mostly on No. 23 and No. 24 levels. Drifting, which started in 1945 on No. 25 level, continued until the vein was exposed for 2,000 feet. In this section, ore is almost continuous for 1,570 feet.

On No. 24 level 100 feet of drifting was completed on the 29 vein, a foot-wall branch of the 27 vein. It is planned to do further work on this vein after the present development programme for the 27 vein is completed.

In the Taylor tunnel 405 feet of drifting was done on the 40 vein, exposing 55 feet of ore. These workings are now within 350 feet of the Bralorne boundary. Two hundred and thirty-one feet of crosscutting was done. This footage is composed mainly of crosscuts between No. 3 shaft and the west drifts on Nos. 20, 23, and 25 levels, between No. 3 shaft and the No. 16 crosscut on No. 26 level, and between No. 3 shaft and the 27 vein on No. 25 level. The last-mentioned crosscut was driven large enough to permit the installation of a trolley haulage system.

In 1947, on No. 25 level, a crosscut in the centre of the 27 vein ore-body was driven into the hanging wall at right angles to the strike of the veins. From the end of the crosscut a heading parallel to the 27 vein was advanced 200 feet. In 1948 ten holes were diamond-drilled from this heading; the total footage drilled was 11,880. Seven holes cut the 27 vein in its projected position. It is reported that core assays from a true width of 3.26 feet of vein have a weighted average of 0.5 oz. of gold per ton. The vein-section outlined by this drilling is 500 feet long and extends 650 feet below No. 25 level. Four of the deeper holes cut through another vein that is possibly a foot-wall split of the 27 vein. It is reported that this new vein averaged 2.9 feet in width and that its grade averaged 0.41 oz. of gold per ton.

No. 3 shaft was sunk 1,396 feet from No. 14 level to No. 26 level. In addition, 1,542 feet of raising was done. Most of the raises were driven on the 27 vein, between No. 25 and No. 20 levels.

Ore for milling is being obtained from development-headings and stopes on the 27 vein and from a few remaining sections of the main vein.

A new 30,000-cubic-feet-per-minute pressure fan operating at 8 inches water gauge was installed on 2500 level. This fan, together with the raises on the 27 vein, has greatly improved the ventilation in the mine.

In December working shifts averaged 280 daily; of these, 166 shifts a day were worked underground. The average number of men employed during the year was 251. One fatality occurred during the year.

Production: Ore mined, 55,821 tons; ore milled, 52,211 tons. Gross contents: Gold, 23,643 oz.; silver, 5,046 oz.

Pinebrayle Gold Mines, Ltd.

Company office, 602 Rogers Building, Vancouver. G. Allan McPherson, president. This company holds thirty-four claims and fractions adjoining the Bralorne mine on the north and west. In 1948, 230 feet of crosscutting was done on the Ogden claim. The adit was started several years ago, approximately 20 feet above Cadwallader Creek and directly opposite the Mines Hotel at Ogden.

Tungsten-Copper.

Chalco.*

This property, adjacent to Cadwallader and Piebiter Creeks, is owned by Mrs. D. C. Noel, Bralorne P.O., and includes the Peridot No. 1 and Peridot No. 2 claims located in 1944, the Chalco No. 1 and the Chalco No. 2 located in 1945, the Chalco No. 6, Chalco No. 7, and Chalco No. 8 fractional located in 1946, and the Chalco No. 9, Chalco No. 10, and Chalco No. 12 located in 1948.

* By John S. Stevenson, based on examinations made July to September, 1948.

Most of these claims were located by Mrs. Noel, but some were acquired by transfer. Ground between the Chalco No. 2 and Chalco No. 8 fractional, formerly covered by the Chalco No. 3 claim, is at present covered by the Chalco No. 5, staked in 1948 by Jacob Holgerson and transferred to Mrs. Winnifred Spence for further transfer, it is understood, to Mrs. Noel.

The Peridot claims are along Cadwallader Creek, principally on the north-east side down-stream from Piebiter Creek, and the Chalco claims are principally on the north side of Piebiter Creek, where they extend up-stream for roughly five claim-lengths from the confluence of Piebiter Creek with Cadwallader Creek.

As present exploration is principally on the Chalco claims, the property is referred to as the Chalco.

The two principal groups of showings on Mrs. Noel's ground are widely separated. A camp, built several years ago on Cadwallader Creek on Peridot No. 2 claim, is referred to as the Peridot camp, and another built in the summer of 1948 on Piebiter Creek on a Chalco claim is referred to as the Chalco camp.

The Peridot camp may be reached from Pioneer Mine P.O. by following the new road up the south-west side of Cadwallader Creek for 1 mile to the Pacific Eastern camp, and thence up the old road on the north-east side of the creek for 2½ miles to Hawthorne Creek. From here the road is poor, but a further 0.7 mile is passable for a car; the remaining 1¾ miles to the Peridot camp on the east bank of Cadwallader Creek is deeply rutted and may be travelled safely only by truck. The Chalco camp is reached by following the old road up Cadwallader Creek for a further two-thirds of a mile to Piebiter Creek, thence up the north bank of Piebiter by a new trail, suitable for pack-horses, for about a mile to a new log cabin at 4,900 feet elevation on the north bank of the creek.

Peridot Claims.—The workings near the Peridot camp consist of two short adits and near-by open-cuts on the hillside above the camp. They prospect pyrrhotite-chalcopyrite mineralization in lime-silicate rock associated with limestone and cherty argillite near a dyke of granodiorite.

These showings appear to have been staked several years ago by Hans Pedersen, and later acquired in 1933 by Bramoose Gold Mines, Limited, of Vancouver. The company dug some open-cuts and drove a northern adit for 28 feet and a southern adit for 48 feet. The ground was allowed to lapse and was restaked in 1944 by the present owner, who drove the adits additional distances of 8 feet and 38 feet respectively to the present faces.

The southern and main adit, 86 feet long, at 4,470 feet altitude, is 900 feet (plan distance) northerly up the hillside from the Peridot cabin. This adit has been driven from the portal as follows: 38 feet at north 36 degrees east, 19 feet at north 48 degrees east, 20 feet at north 20 degrees east, and 9 feet at north 4 degrees east to the face.

The first 73 feet of the adit is in white medium-grained granodiorite and the remainder in cherty argillite. The argillite, strike north 40 degrees west and dip 85 degrees south-westward, consists of bands of dark-grey chert 1 to 2 inches thick, alternating with thin films of black argillite. The contact between the granite and the argillite is marked by 2 inches to 2 feet of lime-silicate rock. This rock consists principally of green diopside and white crystalline wollastonite, and probably represents the alteration of a lens of limestone in the sediments. The granodiorite in the adit contains poorly defined areas, about 3 feet in diameter, that consist of light-green diopside and a little quartz and pyrrhotite with patches of unreplaced granodiorite. A seam, strike north 80 degrees west, dip 40 degrees south-west, that consists of about one-quarter to one-half inch of rust-coloured decomposed granite and a few fragments of quartz, cuts the granodiorite near the portal. Samples of the pyrrhotite and of the rust-coloured material from the seam assayed *nil* in gold and silver.

The northern adit, elevation 4,500 feet, 320 feet north 30 degrees east from the southern adit, has been driven north 30 degrees east to the face at 36 feet, across cherty argillites, strike north 43 degrees west and dip 80 degrees south-west. No mineralization was observed in this adit.

The open-cuts, three in number and some 30 feet above the main adit, are old, badly caved, and overgrown, but they appear to have prospected chalcopyrite-pyrrhotite mineralization in a lens of lime-silicate rock. The largest open-cut, 75 feet north 25 degrees east from the portal of the main or southern adit, is directly above and 36 feet higher than the granodiorite-argillite contact where cut in the adit. Two other cuts, now badly caved and overgrown, have been dug short distances north-westerly from this cut, apparently along the same contact. The northern adit appears to be a short distance north-east of the contact. Mineralization, as seen in scattered specimens around the overgrown dumps from these cuts, consists of pyrrhotite and chalcopyrite in epidote-garnet rock.

Chalco Claims.—Interesting showings of scheelite and chalcopyrite have been found on the north valley-wall of Piebiter Creek between 700 and 900 feet above the creek on the Chalco No. 12 claim. They are reached from the Chalco cabin by a route that follows up the north side of the creek for 600 feet and then proceeds northerly up a wide rock-slide to the foot of the rock bluffs, elevation 5,500 feet, about 600 feet above the creek.

The showings, four in number, consist of lenses of mineralized lime-silicate rock that occur in laminated quartz-hornblende schist, strike north 60 degrees west and dip 80 degrees south-west, west of and within 1,000 feet of the northerly trending western contact of the Bendor batholith. The known lenses of lime-silicate rock appear to have been localized near the batholith by two tongues of granodiorite extending westerly from the main contact. The lime-silicate rock in the showings consists of quartz, green diopside, brown garnet, epidote, chalcopyrite, pyrrhotite, and scheelite. The quartz and the diopside are massive, but the garnet and epidote are strikingly well crystallized. The chalcopyrite and the pyrrhotite occur in patches of solid mineral up to several inches in diameter, but the scheelite occurs in widely scattered grains up to about 1 inch in maximum dimension.

The mineralized lenses occur at widely spaced intervals for a distance of about 300 feet along and about an equal distance across the bedding of the schists. Although the showings are not known to be associated with any unaltered limestone, they most probably represent the replacement of small lenses either of limestone or of limy sediments bedded with more siliceous sediments now altered to quartz-hornblende schists. In general the sedimentary formation in which the schists occur is limy, and elsewhere contains large lenses of limestone, as exemplified by one lens about 1,000 feet long and about 200 feet thick that outcrops lower on the mountain side, about half a mile westerly from the showings.

Although rusty boulders of mineralized lime-silicate rock containing considerable chalcopyrite are numerous in the rock-slide up from Piebiter Creek, the first indication of mineralization in-place, No. 1 showing, is along the schist-granodiorite contact in an inaccessible portion of a rock chimney at elevation about 5,600 feet, about 100 feet above the base of the bluffs on the north side of Piebiter Creek. The showing consists of a strongly oxidized zone about 5 feet wide and 30 feet long, generally rust-coloured but stained green in places, that outcrops on the west wall of the rock chimney. The green stain on the surface of the zone is probably a film of copper carbonate and suggests that chalcopyrite is present; however, as it was impossible to examine the material closely, it was impossible to verify this possibility. The oxidized zone, strike north-westerly, is along the contact of quartz-hornblende schist on the west and granodiorite on the east. The granodiorite at this point belongs to a tongue that extends

for about 500 feet westerly from the main contact of the batholith to No. 1 showing, in the chimney, and extends for about 25 feet northerly up the hillside from the showing to schist and for about 100 feet below the showings before being covered by talus. In addition to the oxidized zone, mineralization near here also includes two veins, up to 2 feet thick, of brown lime-garnet mineralized with widely disseminated grains of chalcopyrite that cut the granodiorite for a distance of 50 feet east of the chimney.

No. 2, the principal showing, elevation 5,710 feet, is quite accessible and is reached by following northerly up a rock-slide 200 feet east of the chimney. The work on this showing consists of an open-cut, 15 feet wide at the mouth, driven north-westerly for 10 feet to a face 10 feet wide and 7 feet high. In the cut, numerous masses of chalcopyrite and smaller masses of pyrite and pyrrhotite are associated with blebs of clear, watery vein-quartz and light-green diopside rock, through all of which are scattered grains and crystals of scheelite. Because of its similarity in colour and lustre to the enclosing silicates, the scheelite is not readily recognizable in ordinary light, but it is clearly recognizable in ultra-violet light. It appears to be most abundant in a vertical 2-foot zone of light-green diopside-epidote rock, containing a little chalcopyrite, along the north-eastern end of the face of the cut. However, more widely scattered grains of scheelite may be seen elsewhere in the lime-silicates of the cut. The lens of lime-silicate in the cut extends for 15 feet north-westerly up the slope beyond the face of the cut before it pinches out and is succeeded along the strike by quartz-hornblende schist and extends south-easterly down the hill, narrowing at 36 feet from the cut to 3 feet of lime-silicate rock that contains a moderate amount of magnetite and a small amount of chalcopyrite. Farther south-easterly the lime-silicate rock is covered with overburden, and the next outcrops, about 100 feet distant, along the strike of the formation, are of the unmineralized, laminated schist. The lens of lime-silicate rock exposed in the cut is in quartz-hornblende schist, strike north-westerly, about 500 feet west of the main contact of the batholith and 200 feet up the slope from the tongue of granodiorite near No. 1 showing.

Descriptions and assays of samples across the mineralized lens of lime-silicate in this cut are given in the following table. Although a few flakes of molybdenite may be seen, the samples contain less than 0.3 per cent. molybdenite.

Sample No.	Width.	Location.	Gold.	Silver.	Copper.	WO_3 (Tungstic Oxide).
	Feet.		Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.
1	9	Horizontally across face, 1 foot from floor	Trace	1.7	4.7	1.2
2	9	A check sample horizontally across face, 1 foot from floor	0.01	1.6	4.1	1.2
3*	....		Trace	1.5	4.4	1.4
4*	....		*Nil*	1.1	3.5	0.3
5†	....		Trace	1.2	3.0	0.9
6†	....		*Nil*	1.5	3.9	0.5
7	4	Down south-west wall, across high-grade chalcopyrite portion	0.01	2.2	5.7	0.9
8	5	Vertical, across centre portion of the face	Trace	2.3	5.2	0.8
9	2	Across a vertical zone, north-east part of face, showing most scheelite	*Nil*	1.4	4.1	1.8
10	....	*Selected high-grade from dump*	*Nil*	2.5	6.6	1.5

* Sample Nos. 3 and 4 were cut as one large sample, taken horizontally for 11 feet across the face at 18 inches from the floor. Sample No. 3 consisted of scheelite-bearing material hand-sorted under an ultra-violet lamp, and represented about one-quarter of the original sample; Sample No. 4 was the scheelite-poor material and represented about three-quarters of the original sample.

† Sample Nos. 5 and 6 were also cut as one large sample, taken horizontally for 11 feet across the face, but at 3 feet from the floor. Sample No. 5 consisted of the scheelite-rich material and represented about one-third of the original sample; Sample No. 6 was the scheelite-poor material and represented about two-thirds of the original sample.

No. 3 showing, elevation 5,750 feet, is in the face of a rock bluff on the west side of a small southerly flowing creek about 500 feet west-north-west of the cut at No. 2 showing. The showing is about 300 feet south-westerly across the strike of the lens of mineralization and enclosing schist in No. 2. At No. 3 showing a lens of lime-silicate rock up to 6 feet wide, strike north 60 degrees west and vertical, is exposed for a slope distance of 30 feet, beyond which it narrows and peters out. The silicate-lens is enclosed in sugary grey quartz-hornblende schist, which lies about 50 feet northerly from the upper contact of a small patch of granodiorite about 50 feet wide. This granodiorite extends for about 100 feet southerly down the hillside into overburden and appears to be a tongue-like mass from the batholith to the east. As in No. 2 showing, the mineralization consists of scheelite grains scattered through the lime-silicate rock, chalcopyrite in patches up to 1 inch diameter, and water-white quartz in patches up to 1 foot in diameter. A small amount of molybdenite, but no pyrrhotite, was seen in this cut. A 1-foot sample taken across the south-western part of the face, where some blasting had been done, assayed: Gold, 0.01 oz. per ton; silver, 1.7 oz. per ton; copper, 3.4 per cent; molybdenite, trace; and tungstic oxide, 1.3 per cent. A 1-foot sample taken across the north-eastern part of the face assayed: Gold, *nil;* silver, 0.2 oz. per ton; copper, 0.8 per cent.; molybdenite, trace; tungstic oxide, 0.9 per cent.

No. 4 showing, at an elevation of 5,820 feet, is about 70 feet north-westerly from No. 3 showing, but is about 25 feet south-westerly across the strike of the formation as projected from No. 3. The showing consists of a lens of lime-silicate rock, which, as with the other showings, is enclosed in quartz-hornblende schist and is mineralized with disseminated scheelite and a few patches of chalcopyrite, up to 1 inch in diameter, associated with irregular patches of quartz up to 6 inches wide. A selected sample assayed: Gold, *nil;* silver, 0.1 oz. per ton; copper, trace; molybdenite, trace; tungstic oxide, 1.2 per cent.

A patch, 5 feet in diameter, of rust-coloured wet muck occurs at the base of a granodiorite-outcrop in the creek between Nos. 2 and 3 showings and at about the same elevation as No. 2. This rust-coloured material has resulted from the oxidation of abundant pyrite in the granodiorite at this point, the process being accelerated by an abundance of spring water issuing at the base of the outcrop. Samples of the muck assayed *nil* in gold and silver.

These showings, Nos. 1 to 4, are of particular interest, in that they demonstrate the presence of copper and of tungsten mineralization along the western contact of the Bendor batholith. They further demonstrate the localization of the tungsten-copper mineralization in limy beds in the sediments where close to projections or tongues of granodiorite extending up to 1,000 feet from the main contact. Consequently these two geological conditions may be used in prospecting the contact-zone of the batholith for further and perhaps more promising occurrences of scheelite or chalcopyrite.

Limestone.—A large lens of crystalline limestone of exceptional purity occurs between elevations of 5,200 feet and 5,300 feet, sloping south-westerly about half-way between the Piebiter Creek and Cadwallader Creek showings. The limestone-lens trends north-westerly along the hillside, dipping steeply north-westward, and measures 185 feet in width on an approximately 35-degree slope and 900 feet in length, but, because of the overburden, is incompletely exposed and the dimensions may be somewhat greater than these figures. The analyses of chip samples taken across this limestone-bed are given in the following table:—

Sample No.	Width: Zero Footage Top Side of Limestone-lens.	CaO.	MgO.	R_2O_3.	Insol.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.
931K	0 to 64 feet	54.19	0.49	0.16	1.56
935K	64 to 137 feet, general chip sample	55.00	0.25	0.04	1.10
936K	137 to 186 feet, general chip sample	54.39	0.47	0.16	0.84
932K	2-inch bed of medium-grained limestone at 74 feet	54.62	0.56	0.34	0.60
933K	6-inch bed of coarse-grained limestone at 74 feet	55.25	0.33	0.12	0.38
934K	2 feet of platy fine-grained limestone at 79 feet	53.59	0.17	0.30	3.20

Although this lens of limestone is large and consists of a relatively good grade of rock, it is a considerable distance from the existing markets at the Coast, and any inherent value depends on the development of some local market in the Bridge River valley.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1933, pp. 272, 273. *Geol. Surv., Canada*, Mem. 213, 1937, p. 88.]

Gold.

Conbra.* This property consists of seventeen Conbra claims, staked between 1944 and 1948, on the south-east side of Chism Creek, and the Conbra Gold Nos. 1 to 4 claims, staked in 1946, farther to the south-east between Aggie and Copp Creeks. These claims were located by the present owner, William Haylmore, of Haylmore.

Work, chiefly surface prospecting, has been done every summer since the claims were staked. The writer examined the showings in August, 1947, but has not seen the 1948 work, which is understood to have been prospecting, principally on the Chism Creek stope.

Mr. Haylmore has worked part of the time from a main camp on Chism Creek and part of the time from a "fly-camp" on Aggie Creek. The Chism Creek camp is reached from Pioneer Mine P.O. by motor-road for 3½ miles to Hawthorne Creek, 4,350 feet elevation, thence by about 3 miles of good trail, suitable for pack-horses most of the distance, across to the south-west bank of Cadwallader Creek and up the north-west side of Chism Creek to the tent camp, 5,210 feet elevation, on the same side of the creek. The Aggie Creek camp, 1½ miles distant, in the basin of Aggie Creek, is reached from Chism Creek by steep foot-trail easterly up the mountain over the divide, 6,920 feet elevation, and to the tent camp, 6,280 feet elevation.

The principal showings on the Conbra claims are on the precipitous south-eastern slopes of Chism Creek valley, 740 to 1,000 feet higher than the creek. Some of the showings are exposed in outcrop only, but many have been opened up by open-cuts and strippings; no underground work has been done.

The showings consist of quartz veins, some in carbonate-zones and some in unaltered rock, in an easterly trending tongue of augite diorite. The tongue is about 750 feet wide and is bordered on the north by massive greenstone and on the south by serpentine. The tongue is not all augite diorite, but contains many patches of unreplaced greenstone, such as found along the southerly contact with the serpentine at Nos. 1 and 2 showings.

Apart from an occasional rust patch and in one place some green malachite stain, none of the many quartz veins exposed in outcrop or in the cuts contains visible mineralization. Samples were taken by the writer across nearly all the quartz veins and across any shears showing rust; the highest assay obtained was 0.01 oz. gold per ton. However, as there are many showings, it was quite possible to miss an occasional

* By John S. Stevenson, based on examination made in August, 1947.

occurrence of higher-grade material that may have been found at the time the showings were first opened up.

The relative positions of the showings were obtained by pacing, compass bearings, and aneroid barometer readings.

The showing nearest Chism Creek camp is about 1,000 feet along the trail from the camp and 100 feet north of the trail at 5,820 feet elevation. It is a pit, exposing an easterly trending carbonate-zone 1 foot wide that is followed by a rusty shear 2 inches wide, containing a quartz stringer about one-quarter of an inch thick.

The other principal showings and workings on the Chism Creek slope are a considerable distance from the one just described and will be described consecutively from No. 1, the most southerly.

No. 1 stripping, at 5,950 feet elevation, is a few feet north of the trail and is 740 feet higher than the Chism Creek camp. It exposes a northerly trending quartz-lens 25 feet long by 6 feet wide in schistose greenstone close to the serpentine contact.

No. 2 stripping, 5,960 feet elevation, is 30 feet north of No. 1 and consists of a flattish northerly trending lens of quartz 12 feet long by 5 feet wide by about 5 feet thick in greenstone; this quartz does not appear to be a continuation of the quartz in No. 1.

No. 3 cut, 60 feet north 45 degrees east of No. 2, is 3 feet wide and for 5 feet northerly along the hillside exposes tan carbonate rock which does not appear to contain any quartz lenses or stringers. The zone, of a width about that exposed in the cut, appears to extend westerly down and easterly up the hillside.

No. 4 cut, 5,980 feet elevation and 50 feet northerly from No. 3, exposes a 16-inch lens of quartz, strike north 10 degrees east and dip 80 degrees south-eastward, for a length of 6 inches.

No. 5 cut, 15 feet north of No. 4 at the same elevation, has been dug across a width of 5 feet for 15 feet northerly along the hillside to uncover a projecting piece of vuggy quartz 4 feet in diameter that may be a boulder.

No. 6 cut, 15 feet north of No. 5, at the same elevation, is 6 feet wide and extends 12 feet northerly along the hillside to expose tan carbonate rock containing gash-veins of quartz up to 2 inches thick; some of the material in this cut may be slide-rock.

No. 7 cut, 5,960 feet elevation, is about 40 feet westerly down the hill from No. 6, extends over a width of 5 feet for 15 feet northerly along the hillside, and exposes tan carbonate rock which contains a few stringers of quartz less than an inch wide. This may be the same carbonate-zone exposed to the east in No. 6.

Nos. 8, 9, and 10 cuts are northerly from No. 6; all are along an easterly trending carbonate-zone that ranges from 4 to 8 feet in width and is followed by a narrow shear containing narrow discontinuous lenses of quartz. No. 8 cut at the lower or westerly end of the exposed length is 50 feet northerly from No. 6 and at the same elevation. The cut extends northerly along the hillside and exposes 8 feet of carbonate rock that is cut by an easterly trending shear up to 3 inches wide containing about an inch of quartz for a length of 1 foot.

No. 9 cut, 50 feet easterly up the hill from No. 8 and at 6,025 feet elevation, is on the same carbonate-zone as No. 8. This cut exposes an easterly trending shear for a length of 15 feet that contains up to 1 inch of decomposed rusty rock and disconnected lenses of quartz up to 1 inch thick.

No. 10 cut, 125 feet easterly up the hill from No. 9 and at an elevation of 6,200 feet, exposes a short lens of quartz 4 inches wide by about 2 feet long in a 4-foot width of carbonate rock. This is an easterly extension of the carbonate-zone in Nos. 8 and 9.

No. 11 cut, 100 feet northerly from No. 9 and at an elevation of 6,250 feet, was dug in talus at the foot of a cliff in an unsuccessful attempt to find the downward continuation of an 8-inch quartz vein, strike north 40 degrees west and dip 70 degrees south-west, exposed for a few feet in the face of the cliff just above.

Nos. 12 and 13 cuts, northerly from No. 11, are both on an easterly trending carbonate-zone from 2 to 12 feet wide.

No. 12 cut, 240 feet north-easterly from No. 11 and at the same elevation, has been dug easterly up the hillside to expose an easterly trending shear, up to 2 inches wide, that contains discontinuous lenses of quartz from a fraction of an inch to 2 inches in width. In one place the shear cuts a diagonal quartz vein, strike north 60 degrees east and dip 40 degrees south-eastward, that is 4 inches wide. The shear is accompanied by a zone of carbonate rock up to 2 feet wide.

No. 13 cut, on the same carbonate-zone as No. 12, is 30 feet westerly from the lower end of No. 12 at an elevation of 6,210 feet. This cut extends for 12 feet northerly along the hillside across carbonate rock that contains a short, flat, diagonal quartz-lens 3 inches thick.

Five small cuts or pits were dug between 50 and 75 feet down the hillside from No. 13, but some of these were entirely in talus, and those that reached the solid were too far southerly to intersect the carbonate-zone found in Nos. 12 and 13 cuts.

No. 14 showing is 100 feet north-easterly up the hillside from No. 12, at an elevation of 6,350 feet, and consists of a little stripping on five quartz-lenses exposed in a rock bluff. These veins, strike north-easterly and dip 10 to 50 degrees south-eastward, are usually a few inches wide by about 2 feet in length, but one large lens is up to 5 feet wide by 12 feet long.

Three quartz veins have been found near the top of the ridge easterly from and above the Chism Creek showings just described. As inaccessible rock bluffs prevent reaching these upper showings directly from the lower showings, they are necessarily reached by following the Aggie camp trail for three-quarters of a mile from the Chism Creek camp to the saddle or pass, 6,920 feet elevation, thence northerly up the nose of the ridge for 800 feet to the first showing, which is at an elevation of 7,260 feet on the westerly side of the ridge and 20 feet below the top of the ridge. At this place a quartz vein about 4 feet wide, strike north 60 degrees east and dip 45 degrees south-eastward, is exposed partly in outcrop and partly by stripping for 100 feet.

A cut, driven 5 feet easterly at a point 100 feet north-easterly from the north-eastern end of the quartz vein just described and on the same side of the ridge, but 65 feet below the top, exposes another quartz vein, 8 inches wide, strike north 62 degrees east and dip 70 degrees south-eastward, that contains lenticular streaks of calcite and is abundantly stained with green malachite, but does not appear to contain any of the original copper mineral from which the malachite may have formed. Because of the malachite stain, this is referred to by the owner as the "copper cut."

About 500 feet northerly along the hillside from the last cut on the same side of the ridge and at about the same elevation, a quartz vein, 2 to 4 feet wide, strike north 50 degrees west and dip steeply north-eastward, is exposed for several feet in natural outcrop.

South-east along the ridge, 540 feet from the point where the Aggie Creek trail goes through the pass, a cut has been dug on a north-westerly trending zone, 5 feet wide, of quartz stringers, some of which are up to 2 inches in width. The cut is in an easterly trending lens of tan carbonatized serpentine, 120 feet wide, bordered on the north and south by black unaltered serpentine.

At a point, 6,850 feet elevation, on the Aggie camp trail, about 500 feet along the trail north-easterly from the pass, a cut has been driven 6 feet southerly through talus to a narrow shear in diorite, strike north 68 degrees east and dip 75 degrees south-eastward, that contains up to 2 inches of discontinuous quartz and gouge.

On the ridge between Aggie and Copp Creeks, easterly from the Aggie Creek camp, three cuts have been dug. At these cuts the rock formation is principally slaty argillite, but serpentine lies about 200 feet north.

At an elevation of 6,410 feet, about 1,500 feet south-easterly from the camp, a cut 10 feet wide extends 10 feet south-easterly along a shear-zone, 3 feet wide, that follows the contact between argillite on the north-east and a 4-foot dyke on the south-west. The shear contains quartz, with a maximum width of 3 inches, that is badly leached, so that it is difficult to tell what the original mineralization may have been.

Two other near-by cuts, 100 feet down from the crest on the Copp Creek side of the ridge, failed to reach bedrock.

The large number of showings and workings on these two groups of claims not only testifies to the extent of mineralization and fracturing in the area, but also to the industry of Mr. Haylmore, who, although occasionally assisted by one man, has done nearly all the work himself.

B.R. Jewel Syndicate.

Company office, 208 Pacific Building, Vancouver. This is a private syndicate with a capitalization of 1,000 units, all issued. This syndicate holds fifteen claims on the east side of Hurley River, 3 miles above its confluence with Cadwallader Creek. The property is reached by 1 mile of trail from the road between Bralorne mine and the Pioneer dam on the Hurley River. It includes part of the Ho-Bo group worked in 1938 by Pioneer Gold Mines.

In 1948 a crew of three hand-miners extended the Ho-Bo tunnel 125 feet eastward and exposed a length of 60 feet of mineralized quartz.

Bridge River Noel Gold Mines, Ltd.

Company office, 800 Hall Building, Vancouver. President, A. E. Sjoquist, Kamloops. *Capital: 3,500,000* shares, no par value. This property, comprising fourteen claims, is on Noel Creek, 1 mile above its confluence with Cadwallader Creek. It is 2 miles by road and trail from Bralorne mine. In 1948 five exploratory diamond-drill holes, totalling 514 feet in length, were completed.

Golden Ledge Syndicate.

Company office, 503 Rogers Building, Vancouver. J. S. Harrison, president and manager. This private syndicate is doing exploratory tunnelling on its group of twenty-one Crown-granted claims, which straddle the Hurley River below its confluence with Cadwallader Creek. The camp is half-way between Bralorne and B.R.X. mines on the Bridge River road.

The present work is confined to the bottom level, the adit of which is 80 feet above the river.

Approximately 450 feet of drifting was completed between April 15th and September 5th in four headings, following narrow quartz leads lying along or close to a contact between greenstone and sedimentary rocks.

The average number of men employed was five.

B.R.X. (1935) Consolidated Mines, Ltd.

Company office, 616 Stock Exchange Building, Vancouver. A. E. Jukes, president; E. R. Shepherd, managing director. Capital: 7,000,000 shares, 50 cents par value. The property, comprising forty-two claims, lies east of the Hurley River, and the main camp is 3½ miles north of Bralorne on the Bridge River road. During 1948, 458 feet of drifting on the California vein was done on C 8 level north. On the same level, crosscuts totalling 25 feet in length were driven to provide diamond-drill stations.

The inclined California shaft was extended 109 feet to a depth of 925 feet. At 900 feet a station for C 9 level was cut, and crosscuts have been started to the east and west from this station.

On C 8 level nine diamond-drill holes, totalling 2,473 feet in length, were completed. Chalcopyrite, sphalerite, and pyrite were exposed in a zone east of the California shear and almost parallel to it. These sulphides were also found in the lower portion of the new shaft section and at C 9 level station. It has not yet been determined whether these two exposures are in the same zone.

A compressed-air locomotive was purchased during the year. It was used successfully to haul broken rock from the shaft-sinking operation.

The compressor-house was enlarged to provide room for a compressor of a capacity of 425 cubic feet of air per minute. A timber-shed was also constructed. The average number of men employed was fifteen.

L.A.P. Mining Co., Ltd. Company office, 626 Pender Street West, Vancouver. L. A. Prosser, manager; M. Retan, superintendent. Capital: 3,000,000 shares, $1 par value. This private company holds seventeen claims and seven fractions formerly held by Wayside Gold Mines, Limited. The property is on the Bridge River road approximately half-way between Minto and Gold Bridge.

In 1948 the winze was unwatered. On 5 level a hoist-room and two 500-ton capacity ore-pockets were cut and 86 feet of rope-raise was driven. On 9 level south the main drift was extended 20 feet; two diamond-drill crosscuts, totalling 35 feet in length, were driven on the foot-wall side of the main drift; 125 feet of raise was driven between 9 and 8 levels; and a crosscut, to be used for a diamond-drill station, was started in the hanging wall at a point 230 feet south of the winze.

Diamond-drilling to the west from the south end of 9 level disclosed a 5-foot quartz vein 713 feet from the drill-hole collar. Total diamond-drilling completed was 1,002 feet. The average number of men employed was ten.

Gold-Antimony.

Congress Gold Mines, Ltd.* Registered office of company, 640 Pender Street West, Vancouver; mine office, Minto Mine P.O. A. E. Jukes, president; Miss J. Whitehouse, secretary-treasurer. Capital: 4,000,000 shares, $1 par value. This company owns the following Crown-granted mineral claims: El Dorado (Lot 6618), Stibnite No. 1 (Lot 7236), Stibnite No. 2 (Lot 7237), Stibnite No. 3 (Lot 7238), Stibnite No. 4 (Lot 7239), David Fraction (Lot 7241), Robert Fraction (Lot 7242), Snowflake Fraction (Lot 7243), T.X. No. 1 Fraction (Lot 7244), Turner X (Lot 7245), Turner X No. 2 (Lot 7246), Turner X No. 4 (Lot 7247), T.X. Fraction (Lot 7248), T.X. No. 6 Fraction (Lot 7249), R.E. (Lot 7250), Ramsen No. 1 (Lot 7251), Ramsen No. 2 (Lot 7252), Mac Fraction (Lot 7253), Mac No. 1 Fraction (Lot 7254), and R.E. Fraction (Lot 7255). Some of these claims were staked in 1928 and 1929, but most of them were staked in 1933 and 1934; they were all brought to Crown grant on September 21st, 1936. These claims lie immediately north of the Bridge River, and most of them south-west of Gun Creek; their exact position is shown on Mineral Reference Maps Nos. 21T269 and 25T269 of the British Columbia Department of Lands and Forests.

The mine buildings and principal workings are adjacent to the Bridge River motor-road, about three-quarters of a mile west of the settlement of Minto Mine P.O. The underground workings are shown in Figs. 8 and 9, and include three adit-levels, an internal inclined shaft and, from it, three short levels.

The property has been described by O'Grady† and Cairnes.‡ The developments since 1943 and features of the geology and mineralization disclosed by the recent work are described in this Report.

This property was originally known as the Stibnite, first located by E. J. Taylor and J. Shuster and relocated in 1915 by C. H. Allan and associates. During that year the upper adit was driven 85 feet and several tons of high-grade antimony ore bagged, ready for shipment. It was again relocated in 1929, and in 1934 it was acquired by

* By John S. Stevenson, based on examination made in July, 1946.

† O'Grady, B. T.: Congress Gold Mines, Ltd., *Minister of Mines, B.C.*, Ann. Rept., 1936, pp. F 10–F 13.

‡ Cairnes, C. E.: Geology and mineral deposits of Bridge River mining camp, British Columbia, *Geol. Surv., Canada*, Mem. 213, 1937, pp. 102–105; Geology and mineral deposits of Tyaughton Lake map-area, British Columbia, *Geol. Surv., Canada*, Paper 43-15, 1943, pp. 29–30.

the present company, which increased the holdings from the original four claims to twenty-one and started the first important underground work. During 1934 and until early 1935 this company did the initial work in Nos. 1, 2, and 3 levels. For about three months during the summer of 1935 Victor Spencer and associates held an option and did considerable drifting, principally on No. 3 level, and completed the raise from No. 2 to No. 1 levels. After rebuilding the camp, destroyed by fire late in 1935, Congress Gold Mines, Limited, renewed mining operations, drove the raise from the No. 3 to the No. 2 level and cut the station, with rope-raise and ore-pocket, for the new shaft. In 1936, at a point 1,200 feet east of the Congress workings, the company started a new adit to intersect a principal shear parallel to the one developed in the mine; in 1946 the portal was caved and the adit inaccessible. It is reported that early in 1937 about 500 tons of antimony ore from No. 3 level was tested in the Wayside mill, but the results do not appear to have been satisfactory. Work was discontinued in 1938, and nothing more done on the property until 1940, when P. Shultz and E. Lorntzsen obtained an option on a part of the property north of the underground workings, found several mineralized showings, and had several open-cuts and strippings dug on them. This option was relinquished and nothing more done on the property until 1945, when the company itself renewed underground development. During that year a compressor-house housing a 500-cubic-foot compressor, a blacksmith-shop, change-house, office, pump-house, and water-tank were built. At the same time the portal of the No. 3 level was cleaned out and retimbered, a new track laid from the portal to the shaft-station, and the rope-raise for the present shaft completed. During 1946 a two-compartment inclined shaft was sunk at an angle of 56 degrees on the foot-wall of the shear, and the No. 4 and 5 levels were driven at points 125 feet and 280 feet slope distance down the shaft from No. 3 level. On No. 4 level a total of 180 feet of drifting and crosscutting was done, and on the No. 5 level a total of 167 feet, all crosscutting, was done. From the end of the crosscut on the No. 5 level, four diamond-drill holes were drilled. Shaft-sinking was continued below No. 5 level and by the end of 1946 was 150 feet slope distance below the level.

In 1946 Sheep Creek Gold Mines, Limited, began providing funds for development-work; this arrangement was terminated and work was suspended in February, 1947. An air-lift was installed in the shaft, all equipment left intact, and a watchman left at the mine. When work was stopped in February, 1947, the shaft had reached a total depth, on the slope, of 430 feet and the station for No. 6 level had been cut. The property is still (October, 1948) under the care of a watchman.

The property was examined by the writer in July, 1946; the work done between then and February, 1947, when the property was closed down, is not covered in this Report but the extent of the additional work is indicated in Fig. 9.

The rocks in the workings include lavas, argillites, and a feldspar porphyry dyke, but the lavas, including both green and purple varieties, are the predominant rocks. The green lava shows well-developed pillows in many places, and in some places good amygdaloidal texture. The purple lava also shows pillows, but is usually much more amygdaloidal than the green lava. The green lava is widespread throughout the workings, but purple lava is much less abundant and in the new workings is found only on No. 5 level 80 feet from the station. The contact between the purple and green lavas on No. 5 level and the attitude of the pillows seen in several places indicate that the lava-flows strike from north 10 to 15 degrees west and dip from 75 degrees north-eastward to almost vertical.

Argillites, conformable with the lavas, and a 60-foot wide feldspar porphyry dyke, strike north-westerly and dip steeply south-westward, occur in the upper workings (Fig. 8) but not in the lower workings. However, films of argillite found in slips within the purple lava on No. 5 level suggest that argillite may be near-by.

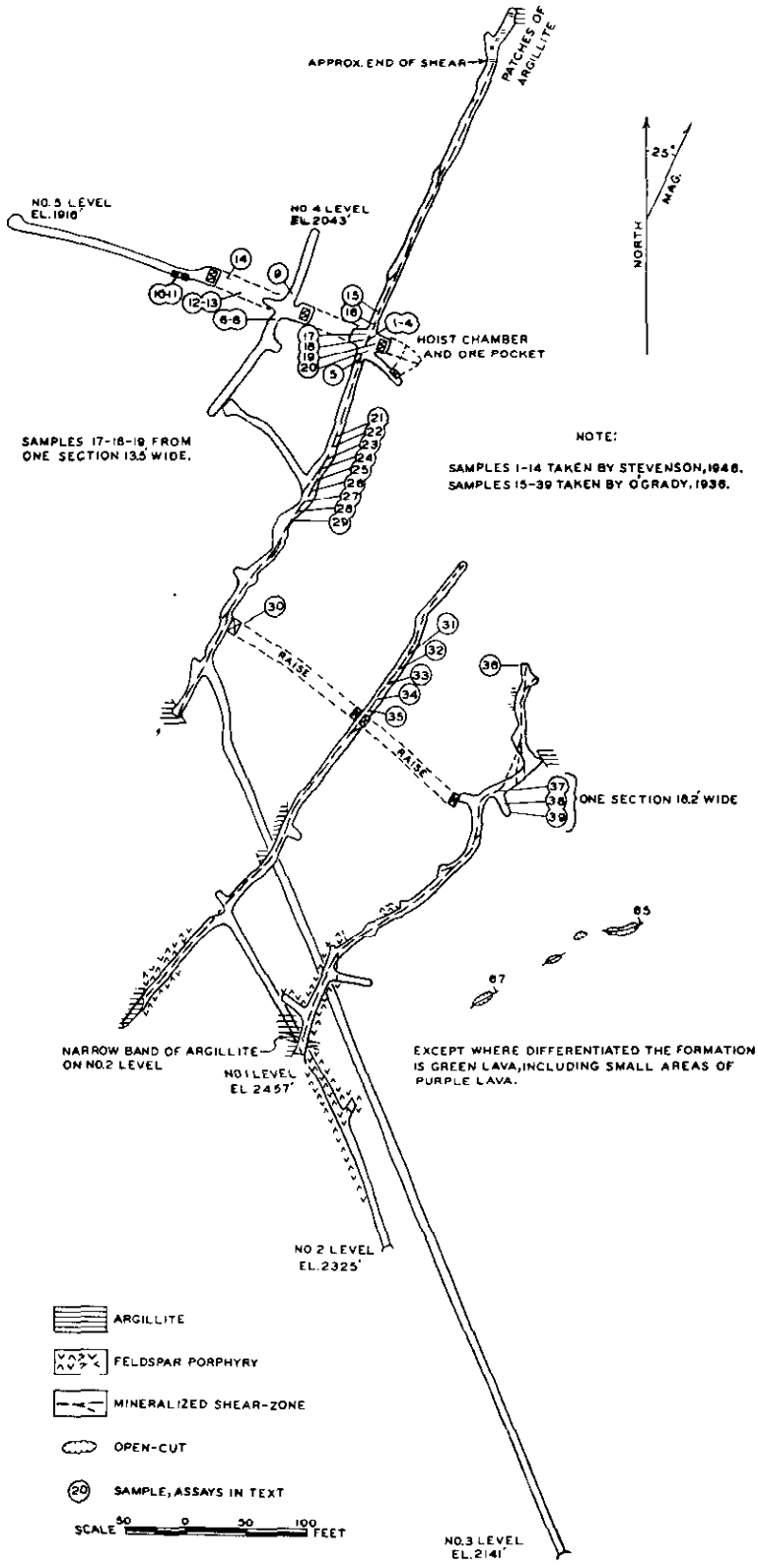

Fig. 8. Congress Gold Mines, Ltd.—plan of workings.

Sample No.	Width.	Gold.	Silver.	Antimony.	Description of Sample.
Taken by Stevenson, 1946.	Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.	
1	42	0.30	Trace	*	Samples Nos. 1 to 4 were taken across the better-mineralized parts of the carbonate-zone near the shaft on No. 3 level.
2	42	0.24	Trace	*	
3	18	0.36	Trace	*	
4	18	0.18	Trace	*	
5	6	0.05	*Nil*	*	Quartz vein within the carbonate-zone.
6	24	0.63	Trace	*	Mineralized carbonate-zone in south-west corner of face, July 23rd, 1946.
7	6	0.14	0.4	1.5	Quartz vein in same face as No. 6.
8	4	0.04	7.4	39.6	Across lens of stibnite, 4 inches wide by 5 feet long, in south-east corner of same face as No. 6.
9	6	0.56	Trace	4.3	Quartz vein containing scattered stibnite, north-east face, July 23rd, 1946.
10	3	0.24	Trace	*	Quartz vein, 3 feet from top of raise.
11	2	0.35	Trace	*	Quartz-calcite vein, 6 feet from top of raise.
12	6	0.66	Trace	1.4	Quartz vein.
13	15	0.28	Trace	*	Tan carbonate rock bordering No. 12.
14	24	.....	.....	.....	Mineralized carbonate rock.
Taken by O'Grady, 1936.	Feet.				
15	5.8	Trace	Trace	.....	
16	5.8	0.20	0.2	.....	
17	4.4	0.54	Trace	.....	
18	4.7	0.46	Trace	.....	
19	4.4	0.28	0.1	.....	
20	11.0	0.40	1.0	.....	
21	4.6	0.14	Trace	.....	
22	3.7	0.02	0.4	.....	
23	4.6	0.04	Trace	.....	
24	7.0	0.20	0.2	.....	
25	5.0	0.42	0.6	7.2	
26	5.0	0.34	0.05	.....	
27	5.0	0.34	0.6	.....	
28	6.0	0.10	0.2	.....	
29	5.2	0.08	0.6	.....	
30	3.2	0.36	0.05	.....	
31	5.1	0.20	0.6	.....	
32	4.5	0.20	0.6	.....	
33	4.0	0.09	0.2	.....	
34	4.2	0.09	0.6	.....	
35	5.0	0.06	0.6	.....	
36	3.6	Trace	Trace	.....	
37	3.5	0.22	0.1	.....	
38	6.0	0.29	Trace	.....	
39	8.7	0.24	Trace	.....	

* Antimony in sample less than 0.3 per cent.

Where cut by shears, the rocks have been altered to tan carbonate rock. In the lavas the alteration has been extensive, but it is only slight in the feldspar porphyry dyke and practically absent in the argillite. Intermediate stages in the carbonate alteration of the lavas are shown by elliptical masses of unreplaced lava within the area of alteration.

A principal mineralized carbonate-zone, 2 to 30 feet wide, borders a shear several inches wide, strike north-easterly and dip 35 to 55 degrees north-westward, that along much of its length and depth is followed by a quartz or quartz-sulphide vein. This carbonate-zone and shear have been developed by underground workings along the strike for approximately 900 feet and down the dip for approximately 830 feet. The shear cuts the lavas, argillaceous sediments, and the feldspar porphyry dyke. It is

well defined in the lavas and feldspar porphyry dyke, but peters out in the argillites, possibly because of the weakness and incompetency of the argillites in comparison with the other rocks.

Other less well-mineralized carbonate-zones have been found, mainly in the new workings and diamond-drill holes; one of these on the No. 5 level is 30 feet wide and is approximately parallel to and apparently separate from the principal zone; some carbonate-zones, from a few inches to 2 feet wide, strike toward and are flatter than the principal zone, and are apparently along shears that branch from the principal shear. The carbonate-zones, formed by alteration of greenstone outwards from fissures, consist principally of ankeritic carbonate, but in many places the zones are cut by hair-like stringers of fine-grained sulphides, including pyrite, arsenopyrite, and rarely sphalerite.

The antimony, for which the property was originally staked, occurs in short, discontinuous lenses along a quartz vein, from a few inches to 1 foot wide, that follows the central shear of the principal carbonate-zone. The stibnite-lenses are usually a few inches wide and a few feet in length, but lenses up to a foot wide and 25 feet long have been found. In addition to the lenses, a small amount of stibnite occurs disseminated as fine needles throughout much of the vein-quartz. Short quartz veins that branch from the main vein into the drift-walls at a few places contain small lenses of stibnite.

The gold on the property is mainly found in the mineralized carbonate rock and appears to be associated with the narrow sulphide stringers.

Small amounts of cinnabar are reported (Cairnes, 1937, p. 104) in narrow fractures and as scattered grains between the fractures in the hanging-wall rocks in the west drift in No. 2 level.

Work done prior to 1945, and directed to the general exploration of the principal shear and associated carbonate-zone, encountered mineralized material that was generally low in gold and, except for occasional lenses of solid stibnite, was generally low in antimony. However, gold values were reported to have been better on the No. 3 than on the No. 1 or No. 2 levels, the improvement being correlated with an increase in arsenopyrite and decrease in stibnite below No. 2 level. Twenty-three samples, taken by O'Grady from the Nos. 1, 2, and 3 levels, gave assays from a trace to 0.54 oz. of gold per ton and from a trace to 1 oz. of silver per ton, over widths from 3.5 to 18.2 feet, and one section 5 feet wide, typical of strong stibnite mineralization, assayed 7.2 per cent. antimony (*see* table on p. 109 and Fig. 8). Cairnes* reports an assay value of 0.196 oz. of gold per ton over an average width of 5.6 feet along the drift on No. 3 level and reports ore reserves, estimated officially late in 1936, as 301,144 tons averaging $5.48; 168,818 tons averaging $7.44; and 58,000 tons averaging $11.11.

The work done during the period 1945–47 was more localized than the earlier work and was directed toward exploring mineralization in a wide part of the principal carbonate-zone exposed on No. 3 level near the top of the inclined shaft. This part of the carbonate-zone is up to 20 feet wide and is unusually well mineralized. The mineralization consists of numerous hair-like veinlets of quartz and one persistent quartz vein 3 to 6 inches wide, all approximately parallel with the shear along which the carbonate occurs. The grade of this material is indicated by Samples Nos. 1 to 5 and 15 to 20 (*see* table of assays on p. 109 and Fig. 8).

The downward extension of this mineralized carbonate-zone from the shaft-station, following the strike and dip of the shear as developed in the upper levels, was found in a short test-raise 50 feet down the shaft from No. 3 level and on No. 4 level, where mineralization within the carbonate-zone is moderately strong. Sample Nos. 6 to 9 indicate the grade of this mineralization.

* Cairnes, p. 29.

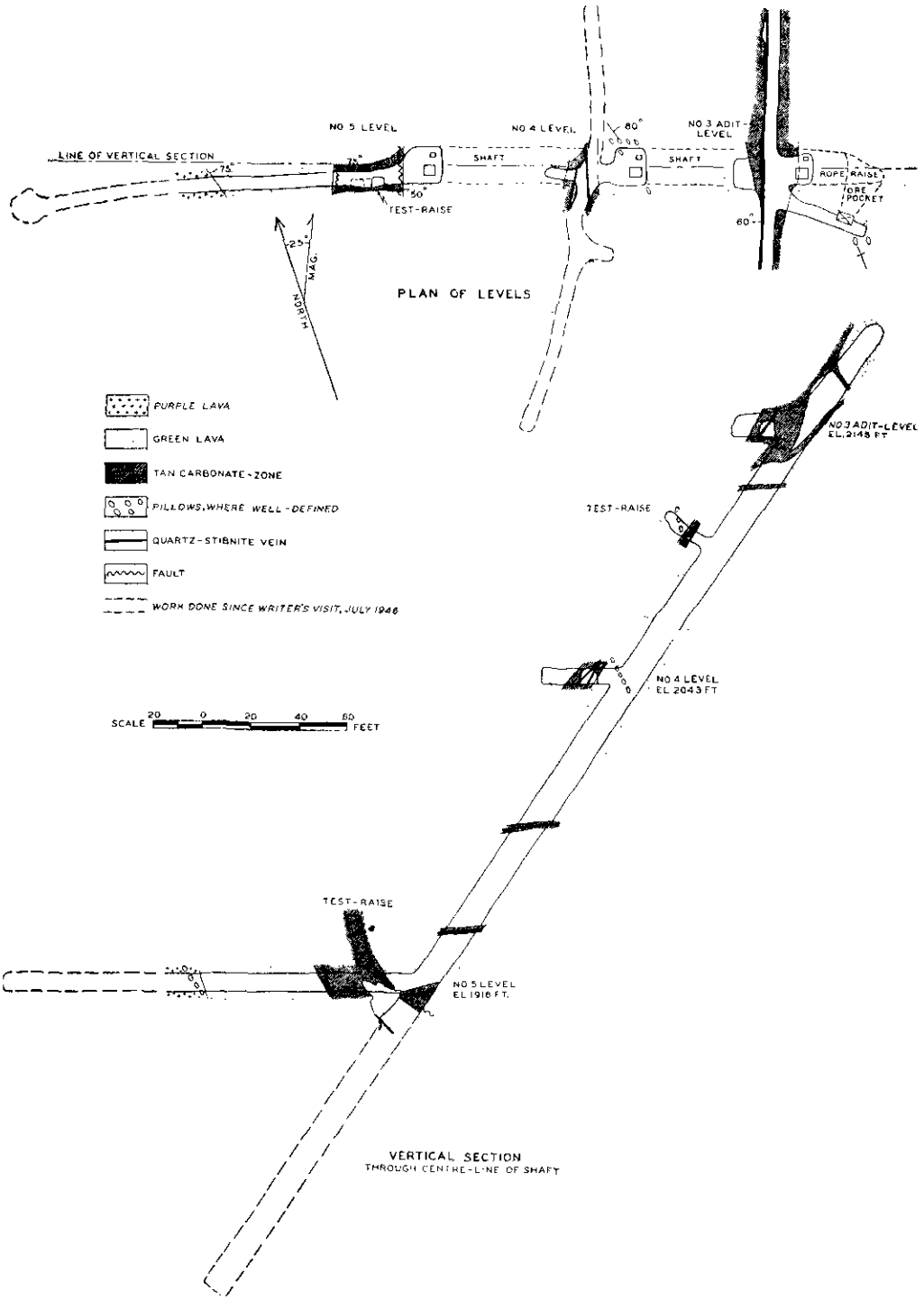

Fig. 9. Congress Gold Mines, Ltd.—plan and section of recent workings, tape and compass survey.

A wide mineralized carbonate-zone was found in No. 5 level (Fig. 9). Although this is mineralogically similar to the upper zone that extends from No. 1 to No. 4 levels, it is doubtful that it is the downward extension of the upper zone. The carbonate-zone on this lower level possesses hanging-wall and foot-wall dips that are in the opposite direction to those of the carbonate-zone in upper levels. It also lacks the central quartz vein dipping north-westward with the dip in the zone above, and has instead several, almost flat, narrow veins of quartz, well shown in the test-raise, on No. 5 level (*see* vertical section, Fig. 9) that dip across the zone. These flat veins are not correlated either with the quartz vein along the principal carbonate-zone in the upper levels or with any of the branches from this vein. Sample Nos. 10 and 11 were taken across the two best-defined veins in the test-raise. Five channel samples, taken across the carbonate-zone on No. 5 level, assayed *nil* in gold.

Four flat-lying carbonate-zones, from 2 to 3 feet wide, are intersected by the shaft (*see* vertical section, Fig. 9). In each of those between Nos. 4 and 5 levels and at the station on No. 5 level, a flat central quartz vein, 2 to 4 inches wide, is found. Sample Nos. 12 to 14 indicate the grade of these quartz veins and the associated carbonate rock.

Several samples of unaltered and unmineralized rock taken underground assayed *nil* or trace in gold.

The work done by Schultz and Lorntzsen in 1940 between 1,400 and 2,000 feet north of the portal of No. 3 adit on the Stibnite No. 4 and T.X. No. 1 Fraction claims exposed several well-mineralized carbonate-zones. These showings are north-west of the projected position of the principal carbonate-zone developed by the underground workings, but may correlate with some of the carbonate rock reported to have been intersected by the diamond-drill holes drilled north-westerly from the face of No. 5 level.

Gold.

Conannex Mining Co., Ltd. Company office, 800 Hall Building, Vancouver. President, A. E. Sjoquist, Kamloops. This private company owns eight claims adjoining the Congress Gold Mine's property on the Bridge River road, 2 miles west of Minto. In 1948, 350 feet of trenching and 500 feet of surface-stripping was done with the aid of a bulldozer.

Cobalt-Gold-Uranium.

Little Gem.* This property, on Roxey Creek, consists of the mineral claims Little Gem No. 2 (Lot 7566), Little Gem No. 4 (Lot 7567), and Little Gem No. 6 (Lot 7568), recorded in 1934 and brought to Crown grant in 1948, and the following claims held by record: Little Gem No. 11, recorded in 1935; Little Gem No. 15 and Little Gem No. 16, recorded in 1946; Little Gem No. 17 and Little Gem No. 18, recorded in 1947. The claims are owned jointly by J. M. Taylor, 2419 Forty-ninth Avenue West, and R. R. Taylor, 1320 Walnut Street, Vancouver. The claims were located to cover cobalt-gold-bearing mineralization, with which, in 1948, uranium was found to be associated.

The ground covered by the claims extends from Roxey Creek, a northerly flowing tributary of Gun Creek, easterly over a high ridge into the upper basin of Jewel Creek, also a northerly flowing but smaller tributary of Gun Creek. As the recorded claims have not been surveyed, their exact outlines and position are not known; however, the three Crown grants have been surveyed, and they are shown on Mineral Reference Map No. 21T269 of the Department of Lands and Forests, Victoria.

Access to the property is in part by motor-road from the Bridge River highway and in part by pack-horse trail. The Tyaughton Lake road, which leaves the highway

* By John S. Stevenson, based on examinations made in August and September, 1948.

at a point 2 miles east of Minto mine, is followed for 3½ miles to a branch road that follows up Gun Creek road for 8½ miles. From the end of this road, 3,440 feet elevation, Gun Creek is crossed by a bridge suitable for horses, and thence a pack-horse trail is followed for 1¾ miles to a fork in the trail at the crossing of Roxey Creek, and the right-hand fork, which crosses the creek, is followed for 1½ miles to a single log cabin at the camp-site, 5,580 feet elevation, on the south-east bank of Roxey Creek, near the middle of the Little Gem No. 6 claim. The principal workings, at about 6,200 feet elevation, are south-easterly up the mountain-side from camp in the north-eastern part of the Little Gem No. 2 claim and are reached by a foot-trail approximately three-quarters of a mile long, suitable part of the way for pack-horses.

The camp-site, on the creek, is in timber about 300 feet below timber-line, but the adits and showings are several hundred feet above timber-line on precipitous mountain-slopes characterized by steep rock bluffs and long talus-slides. Adequate mine-timber is available at the camp-site, and Roxey Creek appears to maintain a good flow of water from the many glaciers at its headwaters.

The principal workings consist of two adits, elevations of 6,182 feet and 6,240 feet respectively (Fig. 10), that explore ground immediately below lenses of cobalt mineralization exposed in natural outcrop and surface-strippings. Additional workings include two open-cuts and strippings farther up the mountain-side, just below the top of the ridge at a point 450 feet above and 600 feet easterly from the upper adit.

The original surface showings of cobalt-bearing mineralization on the Little Gem, recognized by the abundance of pink cobalt bloom on weathered material, are reported to have been found by W. H. Ball in 1934 while working as a partner of William Haylmore. Mr. Haylmore acquired one-half interest shortly thereafter and held a part or the whole interest in eleven mineral claims and fractions until 1937, when J. M. Taylor acquired four claims—the Gem Nos. 2, 4, 6, and 11. The other claims lapsed, but part of the ground formerly held was covered in 1946 and 1947 by the Gem Nos. 11, 15, 16, 17, and 18 claims.

In 1938 the United States Vanadium Corporation acquired an option on the property and held it until 1939. During the life of the option this company drove the upper adit and most of the lower adit, the work being under the general supervision of J. M. Hill. In 1940 the Bralorne Company held an option for part of the year, during which time the lower adit was extended and the two raises from that level were driven. Since 1940, although surface work has been done by the owners elsewhere on the property, little except sampling has been done on the cobalt showings.

The property is in an area of Coast Range intrusives, and the showings are only about half a mile south-westerly from a principal contact of these with older rocks. The enclosing rocks are, with the exception of three feldspar porphyry dykes, uniformly granodiorite. One of these dykes, about 25 feet wide, outcrops on a rocky spur about 200 feet south of the upper adit, with a northerly strike and an approximately vertical dip. Another dyke, 50 feet wide, outcrops in a draw about 100 feet north of the upper adit and is traceable, with strike north 60 degrees east and dip 75 degrees south-eastward, north-easterly up the draw and over a spur. In the upper adit the granodiorite is cut by a feldspar porphyry dyke 10 inches wide, strike north-easterly and dip 70 degrees south-eastward. These dykes do not appear to have any genetic or structural relation to either the ore-bodies or the carbonate-zones to be described later.

The ore-bodies consist of mineralized pegmatite-lenses containing cobalt, gold, and uranium. The cobalt and gold values are closely associated with mixed sulpharsenides that occur in large amounts within all the pegmatite-lenses. The uranium, in the mineral uraninite,* is associated with the non-metallic gangue minerals within the same pegmatite-lenses. These lenses occur sporadically as the "plums in a pudding" in an

* Uraninite is a crystalline mineral composed principally of uranium oxide.

easterly trending zone of partly bleached, sericitized granodiorite 40 feet wide and 130 feet long. The bleached granodiorite consists largely of sericite and residual quartz, sparingly mineralized with scattered needles and small diamond-shaped crystals of arsenopyrite. Although mineralized with arsenopyrite, this material contains insignificant amounts of cobalt, gold, and uranium as compared with the larger amounts in the pegmatite-lenses.

Individual lenses of pegmatite range from a few inches wide by a foot long to a maximum width of 7 feet and length of 16 feet. Most of the lenses are arranged within the 40-foot zone of altered granodiorite in two roughly parallel sub-zones, a northerly, above and north of the upper adit, and a southerly, just above the portal of and in the upper adit. Two other possible sub-zones may be defined by a lens on the surface 10 feet south of the upper adit-portal, and by material found in the lower adit.

Lenses of mineralized pegmatite, a few inches wide by a few feet long, are also exposed in the highest open-cuts, near the top of the ridge about 700 feet easterly from and 400 feet above the upper adit.

The material of the pegmatite-lenses in all the showings is a coarse-grained pegmatitic intergrowth of the following minerals, listed in approximate decreasing order of abundance: Iron-cobalt sulpharsenides, allanite,* apatite, orthoclase feldspar, quartz, chlorite, sericite, calcite, molybdenite, and uraninite. The pegmatitic material is unusual, in that quartz and feldspar are much less abundant, and the metallic minerals and the rare-earth silicate allanite much more abundant than is usual either in the common quartz-feldspar pegmatites or in the less common uraninite-bearing pegmatites found in other parts of the world.

The massive sulpharsenide ore, containing the cobalt and associated gold, is a mixture of the cobalt-bearing variety (danaite) of arsenopyrite† and loellingite-safflorite.† Although loellingite and safflorite possess physical features very similar to those of arsenopyrite, so that specimens of massive ore appear to be uniformly ordinary tin-white arsenopyrite, they may be readily distinguished in polished sections of the ore under a microscope. As seen under a microscope, the arsenopyrite and loellingite-safflorite are not intimately intergrown in equal amounts of each mineral, but the arsenopyrite predominates in some sections and in others the loellingite-safflorite predominates. As it is difficult to distinguish between loellingite and safflorite under the microscope, it is uncertain whether the cobalt-bearing low-sulphur mineral is cobalt-bearing loellingite or a mixture of loellingite and safflorite. Warren and Thompson‡ have identified the principal minerals as danaite and loellingite-safflorite, but they did not distinguish between loellingite and safflorite. On the basis of the chemical analysis of apparently massive material: Arsenic, 6.6 per cent.; iron, 22 per cent.; sulphur, 5 per cent.; cobalt, 6 per cent.; and nickel, 0.05 per cent., Cairnes§ concluded that the material analysed was probably cobaltiferous loellingite with a slight variation toward arsenopyrite. Chemical analyses of samples taken by the writer (Sample Nos. 3, 4, and 29, *see* table on p. 117) indicate that the loellingite is the principal low-sulphur mineral. The amount of cobalt present (6.6, 5.8, and 6 per cent. when calculated on the gangue-free basis) is much less than that (12.99 to 28.23 per cent.)‖ found in typical safflorite. The cobalt may be a constituent of the loellingite or may occur in small inclusions of safflorite in the more abundant loellingite.

* A sub-metallic black mineral of the epidote group containing small amounts of the cerium metals, Ce, Di, La, and smaller amounts of the yttrium group; found usually in granitic rocks and in pegmatites.

† Arsenopyrite, essentially iron sulpharsenide; danaite, arsenopyrite with less than 12 per cent. cobalt by weight; loellingite, iron diarsenide, may contain cobalt; safflorite, cobalt-iron diarsenide.

‡ Warren, H. V., and Thompson, R. V.: Mineralogy of two cobalt occurrences in British Columbia—*Western Miner*, Vancouver, May, 1945, pp. 38–40.

§ Cairnes, 1948, p. 21.

‖ Dana's System of Mineralogy, John Wiley & Sons, 1944, p. 308.

Gold is moderately widespread within the pegmatite-lenses. Several channel samples across the lenses assay between 1 and 2 oz. of gold per ton, and two specimens of selected material from the open-cuts near the top of the ridge assayed 23.34 and 45.92 oz. per ton (Sample Nos. 48 and 50 respectively in table on p. 117). No gold was seen in polished sections of ore running 1 to 2 oz. per ton, but in four polished sections of the higher-grade material, several pieces of gold ranging in size from a few microns up to 0.5 millimetres long were seen. In these sections the gold did not appear to have any preferred occurrence—some was wholly within sulpharsenide, some between sulpharsenide and the non-metallic minerals, and some wholly within the non-metallics.

The uraninite, found in the pegmatite-lenses, occurs as clusters of small black crystals of sub-metallic lustre that may be recognized upon careful searching of a known radioactive specimen with a hand-lens. Under the microscope, either petrographic or metallographic, the uraninite is seen to be in the form of cubes, octahedrons or fragments broken along cubic or octahedral cleavages, that may occur as individual grains widely scattered throughout the non-metallic minerals or may be gathered together into clusters of several grains of uraninite. The grain size of the uraninite is, in general, small. Although a few clusters of uraninite grains are up to 2 millimetres in diameter, the individual grains, in the clusters and those more widely disseminated, rarely exceed 0.03 millimetres (0.01 inch or less than 400 mesh) in diameter. The uraninite is disseminated without any particular preference throughout the other minerals. Although the uraninite may be associated with the sulpharsenides, it was formed before the sulpharsenides and is rarely entirely within massive sulpharsenide material.

The distribution of the uraninite-bearing material—that is, radioactive material—is extremely erratic. The highest concentration found is along a 25-foot section in the upper adit, between points 85 and 110 feet from the portal. This section shows a marked increase in radioactivity over even the usually strong radioactivity in other sections of this adit. Even where the radioactivity is relatively intense, individual hand specimens vary widely in radioactivity. As an individual hand specimen may be very strongly radioactive, a piece weighing an ounce or so is large enough for testing with a field Geiger-Mueller counter. Heavy sulpharsenide ore, lacking non-metallic minerals, is apt to be lacking in uraninite, and therefore lacking in radioactivity.

In studying the distribution of uranium, all the pegmatite-lenses, the rock between the lenses, and much of the disseminated type of mineralization making up the zone of bleached granite were sampled rather closely. In all, fifty-two samples were taken; of this number, thirty-nine were channel samples taken in the two adits and in surface showings immediately above the upper adit. The location of individual samples is shown in Fig. 10, and the assay results,* cross-referenced to Fig. 10, are shown in the table on page 117. The thirteen remaining samples were selected for general information; localities and descriptions of these samples are also listed in the table on page 117.

Near the showings and quite generally along the hillside, the rocks are cut by several shears, of several strikes and dips, from which carbonatization has spread to give prominent tan-coloured carbonate-zones. From near the upper adit a prominent or main carbonate-zone trends easterly up the mountain-side to the top of the ridge, crosses it, and presumably continues easterly under the overburden. At its lowest exposure this main zone outcrops at a point north 60 degrees east from and 65 feet above the upper adit. Here it is marked by a clean-cut shear, strike north 80 degrees east and dip approximately vertical, which is bordered by a foot of carbonatized rock. Near the bottom of this outcrop another carbonate-zone branches from the south wall of the first, with the same strike but a flatter dip and with a greater width, up to 5 feet,

* Radioactivity of each sample, measured in the laboratory, is reported as "equivalent per cent. U_3O_8" and may be due either to uranium or thorium. However, spectrochemical analyses of representative samples from the Little Gem indicate that on this property the radioactive element is uranium.

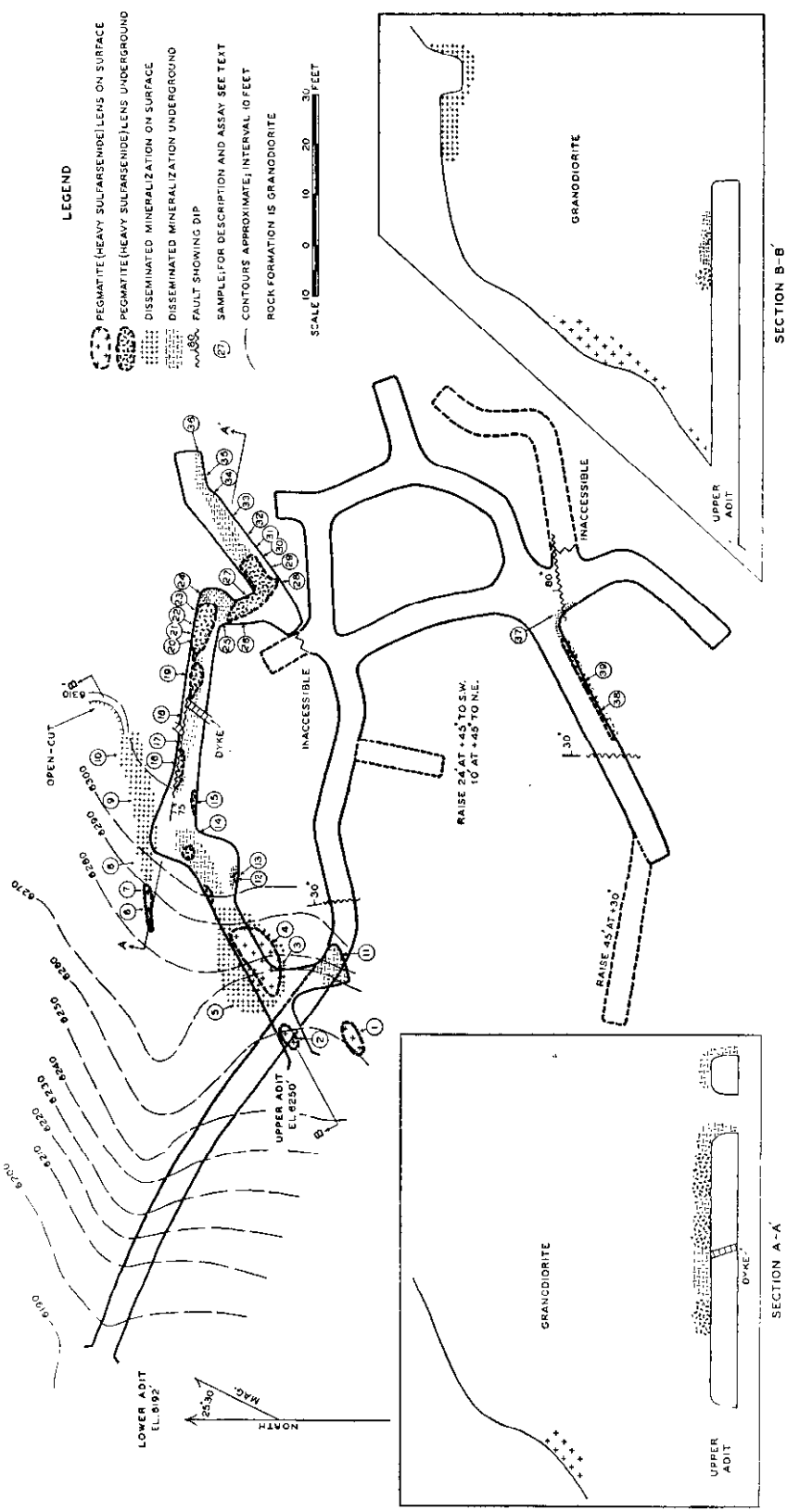

Fig. 10. Little Gem mine—plan of principal surface showings and underground workings, tape and compass survey.

Assays, Little Gem Mine.

CHANNEL SAMPLES.

Sample No.	Width.	Gold.	Silver.	Uranium-Oxide Equivalent.	Cobalt.	Iron.	Arsenic.	Sulphur.	Silica.
	Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1	24	1.04	*Nil*	0.0055	3.6	.....	.....	.....	.....
2	30	0.41	*Nil*	0.0300	1.3	28.7	42.6	14.5	6.3
3	72	0.52	*Nil*	0.0220	5.1	20.3	48.2	3.7	5.9
4	84	0.32	*Nil*	0.0025	5.1	20.0	61.2	1.6	3.7
5	24	0.24	1.1	0.0200	0.3	.....	.....	.....	.....
6	25	0.27	Trace	0.0035	4.4	.....	.....	.....	.....
7	24	0.35	*Nil*	0.0200	3.9	.....	.....	.....	.....
8	18	1.60	*Nil*	0.0070	4.3	25.2	42.2	14.2	2.7
9	60	0.27	*Nil*	0.0100	0.9	.....	.....	.....	.....
10	96	0.87	*Nil*	0.0030	0.8	.....	.....	.....	.....
11	60	0.22	*Nil*	0.0100	0.3	.....	.....	.....	.....
12	24	0.02	Trace	0.0140	0.5	.....	.....	.....	.....
13	13	1.24	0.1	0.0080	6.0	.....	.....	.....	.....
14	36	0.53	*Nil*	0.0380	3.5	.....	.....	.....	.....
15	12	0.61	Trace	0.0050	5.7	.....	.....	.....	.....
16	33	0.62	0.1	0.0220	4.1	.....	.....	.....	.....
17	36	0.51	*Nil*	0.0320	2.5	.....	.....	.....	.....
18	39	0.15	Trace	0.2100	1.5	.....	.....	.....	.....
19	36	1.09	0.1	0.0260	6.6	.....	.....	.....	.....
20	36	0.23	Trace	1.0100	1.3	.....	.....	.....	.....
21	38	0.48	0.3	1.5400	2.9	15.4	12.8	4.9	23.2
22	40	0.38	0.1	0.2400	3.0	.....	.....	.....	.....
23	53	0.84	0.3	0.5700	4.0	20.1	27.2	9.8	9.8
24	49	0.01	*Nil*	0.2300	0.7	.....	.....	.....	.....
25	52	0.51	0.4	0.2100	3.5	.....	.....	.....	.....
26	34	1.21	0.1	1.0400	5.3	21.7	36.8	13.0	9.5
27	23	1.78	Trace	0.5300	7.2	18.4	32.8	11.6	14.4
28	60	0.76	*Nil*	1.8900	5.4	.....	.....	.....	.....
29	39	1.58	0.1	0.0095	3.8	21.5	31.5	11.3	12.5
30	39	1.82	*Nil*	0.0100	1.3	.....	.....	.....	.....
31	38	0.58	Trace	0.0030	0.6	.....	.....	.....	.....
32	24	0.83	0.1	0.0030	0.5	.....	.....	.....	.....
33	48	1.00	*Nil*	0.0030	1.4	.....	.....	.....	.....
34	33	1.26	*Nil*	0.0025	1.1	.....	.....	.....	.....
35	26	1.40	Trace	0.0015	1.2	.....	.....	.....	.....
36	12	0.34	*Nil*	0.0020	0.4	.....	.....	.....	.....
37	60	0.12	Trace	0.0040	2.0	.....	.....	.....	.....
38	80	2.21	Trace	0.8700	3.1	.....	.....	.....	.....
39	72	2.14	*Nil*	0.0180	4.4	19.8	45.4	3.1	7.6

MISCELLANEOUS SELECTED SAMPLES.

Sample No.	Description.	Gold.	Silver.	Uranium-Oxide Equivalent.	Cobalt.
		Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.
40	Upper adit, near Sample No. 27, sulpharsenide and non-metallics	0.66	*Nil*	0.130	2.4
41	Upper adit, near Sample No. 27, massive sulpharsenide	1.46	*Nil*	0.003	3.6
42	Upper adit, dump; mixed sulpharsenide and non-metallics	0.01	*Nil*	3.200	0.2
43	Upper adit, dump; principally non-metallics	0.06	0.1	0.350	0.91
44	Lower adit, near Sample No. 38, mixed sulpharsenide and non-metallics	1.66	*Nil*	0.210	4.4
45	Surface, near Sample No. 7; selected sulpharsenide crystals; also assaying (per cent.) Fe, 10.3; As, 60.7; SiO_2, 2.7	0.28	0.1	0.005	6.2
46	Similar to Sample No. 45	0.33	*Nil*	0.002	6.5
47	Highest showings, higher of two open-cuts; across 3-inch rib of sulpharsenide and non-metallics	4.56	0.5	0.270	2.8
48	Location, ditto; check sample across same material as No. 47	23.34	0.6	0.375	4.6
49	Location, ditto; typical mineralization from ore-pile	7.04	Trace	0.750	4.5
50	Highest showings, lower of two open-cuts; across 15-inch wide lens of mixed sulpharsenide and non-metallics	45.92	1.8	2.800	5.7
51	Location, ditto; across a 2-inch rib of molybdenite in the sulpharsenide lens; Mo, 24.2 per cent	1.19	0.2	2.240	0.5
52	Location, ditto; typical mineralization from ore-pile	2.10	0.1	2.600	1.6

of carbonatization. From the bottom of a rock chimney 100 feet farther up the mountain-side, the main carbonate-zone is exposed continuously for about 100 feet north-easterly up the unscalable foot-wall of the chimney. This exposure is marked by a strong straight shear a few inches wide, strike north 80 degrees east and dip vertical or steeply southward, bordered by 2 to 10 feet of tan carbonate rock. From the lower part of the exposure in the rock chimney, a branch zone 1 to 8 feet wide, strike south 80 degrees east and dip 45 degrees southward, extends for about 75 feet easterly before dying out. In none of these lower exposures of the main carbonate-zone is there any sign of cobalt mineralization or of radioactivity.

Much farther easterly the main carbonate-zone is exposed in the open-cuts and strippings just below the top of the ridge 450 feet above the upper adit. Although the central shear of the carbonate-zone cuts two of the lenses of cobalt mineralization exposed in the cuts, the accompanying carbonate-zone, a few feet wide at the cuts and 25 feet wide just below the cuts, is entirely lacking in either lenses of sulpharsenides or in the disseminated type of mineralization seen in the adits.

The carbonate-zone just described attains a width of 25 feet in places and extends for a vertical distance of at least 450 feet and a horizontal distance of 600 feet. Other zones occur, but these are flatter in dip and, although frequently marked by strong central shears and in places by quartz, are not accompanied by such widths of tan carbonatization. One such zone up to 10 feet wide and including a narrow central shear, strike north 35 degrees east and dip 30 degrees south-eastward, crosses the crest of a low shoulder about 30 feet northerly from the portal of the upper adit. Although no well-defined central shear is found on the downward projection of this zone in the upper adit, a zone of carbonatized granodiorite, at least 5 feet wide, was entered in this adit by the first crosscut to the south-east from the portal, and a similar zone was cut in the main working between 35 and 55 feet from the portal. A shear-zone up to 1 foot wide, containing in places 6 inches of vein-quartz and bordered by a carbonate-zone up to 4 feet wide, is followed by the more easterly raise in the lower adit (Fig. 10) and may be the downward extension of the carbonate-zone that is found in the upper adit and in the shoulder north-easterly from the portal of this adit. Although cobalt mineralization occurs in the lower adit about 5 feet easterly along the level from the carbonate-zone, neither the shear nor the carbonate-zone actually intersect the zone of mineralization. A second carbonate-zone in the lower adit appears to lie in the foot-wall of the first (*see* Fig. 10). It strikes about north 10 degrees west, dips 30 degrees eastward, and is from 1 to 3 feet in width; like the first, this zone does not cut any pegmatite or cobalt mineralization.

As the main carbonate-zone cuts lenses of mineralized pegmatite in the upper open-cuts and, in the upper adit, cuts the zone of bleached and sparsely mineralized granodiorite, it is, therefore, later than the mineralization of both the pegmatite and the granodiorite. The absence of further mineralization either along this extensive carbonate-zone or in the several other carbonate-zones elsewhere on the mountain-side confirms the observation that there is no genetic or structural relation between the carbonate-zones and the mineralization of the pegmatite or of the bleached granodiorite.

Lenses of mineralized pegmatite have been found over a vertical range of approximately 460 feet and a horizontal range of 700 feet, but the only close grouping of them is in the upper adit and on the surface for 50 feet above, where they occur in a zone of bleached and sparingly mineralized granodiorite approximately 130 feet long by 40 feet wide. However, there does not appear to be any structural reason why other lenses should not be found within this zone either to the east along its strike or downward between the two adits, or even below the lower adit.

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LOWER BRIDGE RIVER (50° 122° N.E.).

Gold.

Power Dam Mines, Ltd.

Company office, 410 Seymour Street, Vancouver. Manager, N. Evans-Atkinson. Capital: 5,000 shares, $10 par value. This private company holds twenty-nine claims in the Yalakom Park area, in the vicinity of the British Columbia Electric Company's storage-dam on the Lower Bridge River. In 1948 a small crew was engaged in prospecting and X-ray diamond-drilling.

ANDERSON LAKE (50° 122° N.E.).

Gold.

Golden Contact Mines, Ltd.

Company office, 850 Hastings Street West, Vancouver; executive office, 318 Vancouver Block, Vancouver. M. McGregory, president and managing director. Capital: 3,000,000 shares, 50 cents par value. This company has a gold prospect consisting of seventeen claims and three options on the north side of McGillivray Creek, 4 miles by pack-trail from McGillivray Falls Station on the Pacific Great Eastern Railway.

Work was done on this property between May 6th and October 19th, during which time a crew averaging eight men was employed.

The diamond-drilling programme started in 1947 has been finished. In 1948 four holes totalling 373 feet of drilling were completed. The purpose of the holes was to check the extension of the west vein-segment, but three holes had to be abandoned in badly fractured ground. The fourth hole intersected a vein-structure 12 feet wide at a point 350 feet north of No. 1 adit.

In one of the two surface trenches made to locate the east segment, a quartz vein 9 feet wide was exposed.

The Mac tunnel was extended 120 feet to a total length of 295 feet. It is reported that a 50-foot length gave a weighted average of 0.21 oz. of gold a ton across 6 feet. The quartz is ribboned and mineralized with pyrite, arsenopyrite, and fine native gold.

The new "49-er" adit, at 3,187 feet elevation, was started on the west segment, 125 feet below the Mac adit. On this level 395 feet of crosscutting was done. At 382 feet from the portal the main vein was intersected. It is reported that at this point the vein is 9 feet wide, is fairly well mineralized with pyrite and pyrrhotite, and assayed 0.01 to 0.03 oz. of gold a ton in ribboned quartz.

Further work is planned for this level and the Mac level in 1949.

NICOLA (50° 120° S.W.).*

Copper.

Copperado Mine (Guichon Mine, Ltd.).

Company office, 124 Pacific Building, Vancouver. James D. Ferguson, manager. Capital: 750,000 shares, $1.33 par value. The Copperado property, east of Mill Creek and about 5 miles north-east of the village of Nicola, was formerly operated by Turlight Mines, Limited. It was inactive for many years until reopened by the present operators in 1947. Very little underground work was done at this property during 1948. On November 11th the shaft sump had been cleaned out, and preparations were being made to deepen the shaft. In addition to the manager, two men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1929, p. 246.]

LUMBY (50° 119° S.W.).

Lead-Silver.

Silver Star.—M. O. Lewis, of Vernon, shipped 2½ tons of ore from this property. Gross contents: Silver, 18 oz.; lead, 176 lb.; zinc, 40 lb.

COPPER MOUNTAIN (49° 120° S.W.).*

Copper.

Granby Consolidated Mining, Smelting, and Power Co., Ltd.

A. S. Baillie, president, Copper Mountain; J. C. Dumbrille, assistant to the president, Copper Mountain; W. I. Nelson, assistant general manager, Allenby; R. S. Douglas, mine superintendent, Copper Mountain; J. A. C. Ross, assistant mine superintendent, Copper Mountain; L. H. McKay, mill superintendent, Allenby; A. R. Eastcott, power plant superintendent, Princeton. Capital: 600,000 shares, $5 par value. The company's steam-electric power plant in Princeton supplies power to the concentrator at Allenby, 3½ miles south of Princeton. A branch line of the Kettle Valley Railway from Princeton serves the power plant, mine, and concentrator.

Surface elevation at the mine is about 4,000 feet. The main development of the mine is from two adit-levels—No. 2 and No. 6—and two vertical shafts. The No. 1, or main, shaft, handling all men and supplies for the upper part of the mine, extends from the surface to the No. 6, or main haulage, level. No. 2 shaft services No. 7 and No. 8 levels, and is an internal shaft, with the hoist on No. 5 level. All ore is passed to No. 6 level, on which it is taken out of the mine in Granby-type cars, hauled by electric-trolley locomotives. After crushing in the coarse-crushing plant, on the surface near the portal of No. 6 level, the ore is transported by railway to the concentrator at Allenby, 8 miles distant.

Compressed air for the mine is supplied by three Ingersoll-Rand compressors and one Sullivan compressor, the four units having a total capacity of 8,600 cubic feet of air per minute.

An outstanding feature at this mine is the advance made in underground mechanization. All ore is mined from diamond-drill shrinkage stopes and is then transferred from slusher-drift draw-points to grizzlies by electrically operated slusher-hoists. This practice has resulted in decreased costs, increased safety to workmen, and a greatly reduced amount of dust from drilling and transfer of ore. Ventilation-raises, equipped with auxiliary fans, ensure that each slusher unit is provided with fresh air, so that the dust and smoke from scraping and blasting are carried away quickly. A total of 200,987 feet of blast-hole diamond-drilling and 8,546 feet of core diamond-drilling was done during the year.

* By E. R. Hughes.

Automatic drifters are used in development-work. Test-work with tungsten carbide bits was continued with a fair degree of success, and it is intended to do further testing during the coming year.

Development-work was done in eight new ore-blocks, containing a total tonnage of 4,500,000 tons. The amount of ore broken during the year was 3,011,667 tons. Total development consisted of 10,547 feet of raising and 4,742 feet of drifting. Fourteen new chutes were built. Seven new 5-horsepower Canadian Ingersoll-Rand compressed-air hoists were added to slushing equipment and will be used in development-work.

Underground ventilation was well maintained, and three new auxiliary fans were added to the ten already in use. The total potential mechanical ventilation capacity is now in excess of 600,000 cubic feet of air per minute. The fans draw fresh air into the mine through the old glory-holes and ventilation-raises and force it to slusher-drifts and other working-places, and thence outside. Ventilation-doors are placed in the drifts and crosscuts to control the flow of air.

Increased activity was evident in 1948 in No. 7 and No. 8 levels, the lowest levels in the mine. These levels are serviced by the underground No. 2 shaft, through which the ore is raised to No. 6 level, where it is taken out of the mine on the main transportation system. Development was continued on the 7-10 and 7-20 ore-blocks, and work was commenced on the development of the 9-4, 165, and 8-20 ore-blocks. Because of the soft ground, slusher-drifts and draw-points are being lined with concrete. Ore from the No. 2 shaft workings is hoisted by a Nordberg 54- by 84-inch double-drum electric hoist, with fully automatic controls. This hoist was installed in 1947 and is capable of handling 3,000 tons daily.

Two 10-ton General Electric locomotives and eight new 130-cubic-foot capacity mine-cars were added to the underground rolling-stock. A model of the underground transportation system, complete with block-lights and throw-switches, has been installed near the No. 1 shaft station on No. 6 level. This model is intended to be of service to officials in giving more thorough instruction to motormen and brakemen on the safe running of trains on the various sections of the main haulage-level.

The mining of the 122 East ore-block has caused the subsidence of an area north of the No. 1 shaft. Because of this ground movement it was necessary to move four dwelling-houses to another part of the camp. The possibility of this subsidence engulfing the No. 1 shaft caused the company to drive a new service raise which could be used in place of the shaft if necessary. This new raise was completed in the fall of 1948 and connects the No. 6 level with the surface at a point 350 feet south-west of the collar of No. 1 shaft.

The coarse-crushing plant is at the surface near the portal of No. 6 level, on the east side of the Similkameen River, at an elevation of 3,170 feet, and 780 feet below the Copper Mountain camp. A new 5½-foot standard Symons cone-crusher was added to the plant in 1948.

Safety Committees make regular tours of inspection of all surface and underground workings, and their recommendations are discussed at subsequent meetings. The company employs a safety engineer. An emergency hospital with the customary equipment and supplies, including a supply of blood plasma, is maintained at the mine for the treatment of injured workmen. A trained nurse and an industrial first-aid attendant are on hand at all times. Aluminium-dust therapy is available for employees. A doctor visits the Copper Mountain camp twice a week and is available in emergencies. An ambulance is maintained for transporting sick or injured persons to the Princeton General Hospital, 12 miles from the mine. In 1948 nine workmen obtained certificates of competency in mine-rescue work after taking a complete course of training in this work. Three trained mine-rescue teams competed in the Similkameen Valley Mine Safety Association's annual competition, held in Princeton on June 5th.

The mine was worked continuously throughout the year. The average crew at Copper Mountain, exclusive of townsite and staff employees, was 389, of whom 254 were employed underground. The total pay-roll for Copper Mountain, Allenby, and Princeton was 742 on December 31st. The average pay-roll for the year was 813 employees.

Production: Ore mined, 1,705,624 tons; ore milled, 1,653,029 tons. Net contents: Gold, 8,362 oz.; silver, 191,462 oz.; copper, 26,593,152 lb.

HEDLEY (49° 120° S.E.).*

Gold.

Kelowna Exploration Co., Ltd.

Company office, 75 West Street, New York, N.Y.; mine office, Hedley. F. A. McGonigle, manager; Alex. Shaak, mine superintendent; E. W. Johnson, mill superintendent; J. Biggs, mechanical superintendent. This is a private company operating the Nickel Plate mine. The mill, machine-shops, and general offices are at Hedley. The mine is at Nickel Plate, 4 miles north of the town of Hedley, and at an elevation of 5,600 feet. The ore is hauled 1½ miles by an electric-trolley locomotive from the mine portal to the ore-bins at the upper terminal of a gravity-haulage system which extends 10,000 feet down the mountain to the mill.

The Nickel Plate mine is connected underground at several points with the Hedley Mascot mine, and as the upper outlets of the Nickel Plate are approximately 2,500 feet higher than the lowest internally connected outlet of the Mascot, the motive column is sufficient to provide natural ventilation during most of the year. A raise, driven from the Mascot 3700 level, connected with the Nickel Plate 4150 level during the month of May.

The main development of the mine is from two inclined shafts, called the Dickson shaft and the Morning shaft. The Dickson shaft is a 30-degree slope, 1,600 feet long, extending from the main adit down to the 1600 level. The levels are numbered according to slope measurement. The shaft is provided with a double-track skipway and a manway equipped with stairs. The shaft passes through the Mascot Fraction between the 1200 and 1500 levels. The Morning shaft is a 50-degree slope, 1,000 feet long, extending from the Dickson shaft 1500 level at 4,850-foot elevation down to the 4150 level. The levels in this shaft correspond to elevations above sea-level and have been established at 4,600 feet, 4,450 feet, 4,300 feet, and 4,150 feet. The dumping arrangements in the Morning shaft are so arranged that ore is dumped directly into an ore-pocket at the foot of the Dickson shaft, so no haulage of ore is necessary between the two shafts. The Morning shaft is provided with a double-track skipway and a manway equipped with ladders.

The ground is sufficiently strong in the upper levels to permit mining in open stopes. Weaker ground in the lower levels necessitates the use of square-set timbering and back-filling. On January 23rd extensive caving in the N44-A timbered stope delayed development in this area. The caving occurred on the Nickel Plate side of the Nickel Plate-Mascot mine boundary, and as it happened between shifts when the men were out of the stope, no one was injured.

Development during 1948 consisted of 3,358 feet of drifting, crosscutting, and raising. Of this total, 1,444 feet was done in exploration, and the work was about equally divided between the 400, 800, and 4150 levels. The remaining 2,104 feet of development was done in stope preparation. Tonnage of ore from the mine was maintained at 415 tons daily for the 5½-day week. There were no major additions to mine or mill equipment during the year.

Compressed air for the mine and mill is provided by two compressors at Hedley, which have a combined capacity of 3,600 cubic feet of free air per minute, and by two

* By E. R. Hughes.

compressors underground at the mine, which have a combined capacity of 1,000 cubic feet of free air per minute. The underground compressors are auxiliary to the larger surface plant and cut in only when more air is needed. The electrical power is purchased from the West Kootenay Power and Light Company, Limited.

Regular inspections on surface and underground are made by the Safety-first Committee, composed of representatives of the Miners' Union and of the management. Aluminium-dust therapy is available to both surface and underground employees. During 1948 twelve men obtained certificates of competency in mine-rescue work after taking a complete course in this work. First-aid rooms are provided at the mine and at the mill, and qualified industrial first-aid attendants are always available. At the end of the year 81 men were employed underground and 108 on the surface.

Ore mined and milled amounted to 115,556 tons. Gross contents: Gold, 42,397 oz.; silver, 3,155 oz.; copper, 94,286 lb.

Hedley Mascot Gold Mines, Ltd.

Company office, 908 Royal Bank Building, Vancouver; mine office, Hedley. V. J. Creeden, general manager, Vancouver; C. W. S. Tremaine, resident manager, Hedley; J. C. S. Moore, mine foreman. Capital: 3,000,000 shares, $1 par value. The company operated the Mascot mine and did some exploratory work at the Good Hope surface mine and the Horsefly Mineral Claim.

Hedley Mascot Mine.—The concentrator and mine offices are on the east bank of Hedley Creek, and the mine camp is on the western slope of Nickel Plate Mountain. The ore is transported from an ore-bin at the mine to the mill by an aerial tramway 5,000 feet long. The two ore-skips have a capacity of 2 tons each. The mine has been developed by an 8- by 8-foot adit 2,500 feet long, known as the 4800 level. This is the main haulage-level. Two 3½-ton Atlas battery locomotives and two Mancha trammers are used underground. The 4300 level is an adit, and ore from all levels between the 4800 level and the 4250 level is hauled from this adit and taken up the No. 2 surface tramway to the 4800 level. The ore from the upper workings, between 4800 level and 5000 level, is drawn from chutes on the 4800 level.

The workings of this mine are connected to those of the adjacent Nickel Plate mine at several points underground. These connections are open, permitting a joint ventilation system. The raise from the 3700 level, mentioned in the 1947 Report, was continued, and in May a connection was made with the Nickel Plate 4150 level. The 2700 incline, which was started during 1945, was advanced 1,805 feet when work was suspended because of the miners' strike on July 3rd, 1946, and has not since been resumed. The portal of this adit is about 1,600 feet east of the Hedley Mascot mill, and at an elevation of 700 feet above the mill. The incline was driven up on an angle of 24 degrees, and it was intended to intersect the 3700 level at a distance of 2,400 feet from the portal of the incline. The completion of this incline would permit the direct transfer of ore from the 3700 level to the mill, thus dispensing with the aerial tramway when the extraction of ore from the upper workings is completed.

During 1948 drifting was continued in the 3700 Level North drift in the direction of the Bradshaw fault area. Preparations were made for exploration below the elevation of 3700 Main level, but this work was discontinued.

The ground is sufficiently strong in the upper workings to permit mining in open stopes, but some parts of the lower workings are in weaker ground and square-setting with back-filling is required. The extensive caving in N44-A stope on the Nickel Plate mine side of the boundary, on January 23rd, also caused some movement and caving in parts of the Mascot timbered stopes. The caving took place between shifts when workmen were out of the mine, and no one was injured. After the ground had settled, work was resumed in this area.

Compressed air for the mine is provided by two Bellis & Morcom electrically driven compressors located near the portal of 4800 level; these compressors have a combined capacity of 1,500 cubic feet of free air per minute. Electrical power is purchased from the West Kootenay Power and Light Company, Limited. The mill was operated throughout the year at an average rate of 165 tons per day.

Regular inspections on surface and underground are made by the Safety-first Committee, composed of representatives of the Miners' Union and of the management. Aluminium-dust therapy is available to workmen. During 1948 fourteen workmen obtained certificates of competency in mine-rescue work after taking a complete course in this work. First-aid rooms are provided at the mine and at the mill, and qualified first-aid attendants are available. At the end of the year ninety men were employed.

Production amounted to 42,788 tons mined and milled. Gross contents: Gold, 13,880 oz.; silver, 3,639 oz.; copper, 118,749 lb.

Good Hope Mine.—This property, about 4 miles south-east of Hedley, is operated by the Hedley Mascot Gold Mines, Limited. During 1948 some exploratory diamond-drilling was done, and some ore, broken in 1947, was removed from the surface stock-pile. All ore produced at this property has been mined from surface excavations and no underground work has been done. No ore was mined during 1948.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1947, p. 142.]

Horsefly Mineral Claim.—This claim lies on the south slope of Nickel Plate Mountain, about three-quarters of a mile east of the Mascot mine. The claim was staked by Peter Scott in 1898, and was Crown-granted by F. H. Woolaston and C. H. Arundel on June 5th, 1901. Since that time several open-cuts have been made and some shallow test-shafts have been sunk. Hedley Mascot Gold Mines, Limited, now controls the claim, and during 1947 a development programme was commenced and 196 feet of drifting was done. This underground work was continued in 1948 and an additional 250 feet of drifting was done on the main shear. Other development-work done in 1948 included 700 feet of diamond-drilling and some surface-stripping. Work was suspended on December 15th for the winter. Four men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1937, p. D 11.]

OLALLA (49° 119° S.W.).*

Gold.

Hedley Monarch Gold Mines, Ltd.

Company office, 470 Granville Street, Vancouver. Capital: 3,000,000 shares, 50 cents par value. The property of this company is at Olalla, about 4 miles north of Keremeos. The newly paved and reconstructed Southern Trans-Provincial Highway runs through Keremeos and Olalla, bisecting the property. This company did no mining at Olalla during 1948. In August D. Cameron and three partners took a lease to mine and ship ore from the Shepherd adit. Their activities were confined to drifting and cutting box-holes on the Sweetener vein. A bunker was built at the portal of the Shepherd adit, and the mined ore was trucked from the bunker to Keremeos, where it was loaded for shipment over the Great Northern Railway to the Tacoma smelter. On November 17th two men were employed.

Production amounted to 320 tons mined; 255 tons of ore was shipped. Gross contents: Gold, 137 oz.; silver, 128 oz.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1946, p. 126; 1947, p. 151.]

FAIRVIEW CAMP (49° 119° S.W.).*

Silica-Gold.

Fairview Mine.

Consolidated Mining and Smelting Company of Canada, Limited. G. E. Clayton, mine superintendent. This mine is about 5 miles west of Oliver. During 1948 a new change-house was completed, two houses

* By E. R. Hughes.

were built for officials, and a battery-charging shed was erected for the mine locomotive. A Sheldon fan, with a rated capacity of 1,400 cubic feet of air per minute, was installed underground to ventilate the face of 612 drift. The main ventilation is natural.

This property was formerly operated by the Fairview Amalgamated Gold Mines, Limited, but was idle for several years until reopened by the present operators in 1946. The No. 6 adit is the haulage-level, and shrinkage stoping is being done between this level and the No. 5 adit, 135 feet higher in elevation. No work is being done on any of the other levels. Development-work during 1948 consisted of 609 feet of drifting, 431 feet of raising, and 197 feet of crosscutting. Electrical power is provided by the West Kootenay Power and Light Company, Limited. An average of 82 tons of quartz was mined per calendar day and was shipped to Trail for use as flux in the smelter. The quartz contains a small amount of gold. The number of men employed averaged twenty-five for the year, and at the end of December twenty men were employed.

BEAVERDELL (49° 119° S.E.).*

Silver-Lead-Zinc.

Highland Bell, Ltd. Company office, 844 Hastings Street West, Vancouver; mine office, Beaverdell. K. J. Springer, president; P. L. Clark, mine manager. Capital: 2,000,000 shares, $1 par value. The Highland Bell mine, on Wallace Mountain, is served by a 4-mile road from the main camp at Beaverdell. The major part of the 1948 production came from the 736 stope in the south-west corner of the mine, where some very good ore was found by diamond-drilling during the latter part of 1946. The numerous faulted segments of ore in this area have been mined with the intervening waste, so that this important stope has been extended to a length of more than 200 feet and a width of up to 25 feet. The ore is removed by slushers, hoisted in cars up a 30-degree winze, and the waste rock sorted from it at a small surface plant. The sorted ore is shipped to the Consolidated Mining and Smelting Company at Trail.

For every one and one-half machine shifts on stoping, three machine shifts were maintained on development and one shift was kept on diamond-drilling. This intensive exploration is essential to the life of the mine because of the complex fault pattern. Although the faults are fairly well understood, they have so broken up the ore that drifting on a piece of ore often removed it entirely. Blocking out ore reserves is very difficult, but detailed mapping, close geological study, and good mining have made it possible to keep production at a rate of more than 400 tons per month.

On the No. 9, or bottom, level a considerable amount of development-work was done into the Idaho claim. At the adjoining old Sally mine the No. 3 level was cleaned up, a portable compressor was installed near the portal, and some underground diamond-drilling accomplished. Total mine development: Drifting and crosscutting, 1,583 feet; raising, 206 feet; diamond-drilling, 10,677 feet.

On the surface three water-storage tanks at the mine were enclosed in an insulated building to aid water conservation—a major problem here. In the main camp, buildings were altered to provide two new dwellings for married personnel. The number employed throughout 1948 averaged thirty-three; the labour turnover was small. Only one shift a day was worked.

This mine, which has been a consistent shipper since 1916, was the second largest silver producer in British Columbia during 1948. Production: Ore shipped, 5,467 tons. Gross contents: Gold, 239 oz.; silver, 740,117 oz.; lead, 415,410 lb.; zinc, 526,535 lb.

* By J. W. Peck.

Rambler, etc. (Highland Silver Mines, Ltd.).

Company office, Room 404, 470 Granville Street, Vancouver. Dr. W. Rutledge, president; B. I. Nesbitt, consulting engineer. Capital: 2,000,000 shares, 50 cents par value. The company was formed in 1946. The property is served by a good road from Beaverdell. The claims held are Rambler Fraction, Standard Fraction, Relief Fraction, Buster, Gold Drop, Gold Drop Fraction, Gold Drop No. 2 Fraction, Homestake, and Alaska, on Wallace Mountain.

During 1948 work was restricted to drifting on the Buster vein toward the Wallace formation. On the Standard Fraction an old adit, about 30 feet in length, was cleaned out and extended into the Buster by 650 feet of drifting. The adit remained in the quartz diorite of the Westkettle batholith, and the expected favourable contact with the Wallace formation had not been reached when operations ceased about March. A short section of ore found in the vein about 600 feet from the portal was faulted off in the back of the drift. It was sunk on for 40 feet. Five tons of sorted ore was obtained and stored at the portal.

It is further reported that 10 to 15 tons of ore is stored at the Rambler portal. D. W. L. Fairbairn was the engineer in charge.

Wellington, etc. (Silver Bounty Mines, Ltd.)

Company office, 208 Pacific Building, 744 Hastings Street West, Vancouver; mine office, Beaverdell. G. S. Eldridge, president; B. I. Nesbitt, consulting engineer; John Broatch, mine manager. Capital: 3,000,000 shares, no par value. This company owns the Wellington, Tiger, Bounty, Bounty Fraction, Highway, Byway, and Advance Mineral Claims on Wallace Mountain and during 1948 acquired an option on the adjoining Henderson group. Work in 1948 was concentrated on the Wellington claim, which is located about half-way along the Beaverdell–Highland Bell Mine Road.

In the No. 5 level of the Wellington the short section of high-grade silver ore encountered in 1947 at about 630 feet from the portal was mined out by underhand stoping. At about 710 feet from the portal a narrow vein, called "Air Receiver," was exposed; a drift was driven due east on this vein for 110 feet. The vein widened out and made ore for short sections; overhand and underhand stoping removed most of this ore. All this work was done by two miners, using air supplied by a portable compressor.

On the surface, diamond-drilling, totalling 777 feet in five holes, was done on the Wellington claim. The results were not encouraging; it is reported that no veins were encountered.

Production: Ore mined, 30 tons. Gross contents of ore shipped: Silver, 3,736 oz.; lead, 1,944 lb.; zinc, 2,795 lb.

WESTBRIDGE (49° 118° S.W.).*

Silver-Lead-Zinc.

Zamora.

O. D. Fieth, with his partner, G. White, worked intermittently on this group of claims 3 miles up James Creek, which flows into the Kettle River 3 miles south of Westbridge. The property was at one time called the Crown Point. Ore removed by surface-stripping was trucked to a loading-ramp at Westbridge in December.

Production: Ore shipped, 5 tons. Gross contents: Gold, 0.94 oz.; silver, 193 oz.; lead, 719 lb.; zinc, 646 lb.

RHONE (49° 119° S.E.).

Enterprise.—A shipment of 10 tons was made to the Trail smelter from this property by O. Johnson. Gross contents: Gold, 5 oz.; silver, 42 oz.; lead, 813 lb.; zinc, 1,179 lb.

* By J. W. Peck.

GREENWOOD-GRAND FORKS.*

JEWEL LAKE (49° 118° S.W.).

Gold-Silver.

Dentonia Mines, Ltd.

Company office, 572 Howe Street, Vancouver; mine office, Greenwood. J. C. Adam, president; A. E. Stromberg, manager. Capital: 3,500,000 shares, no par value. Milling, commenced in October, 1947, was suspended in March, 1948. Exploratory work done by the company prior to the erection of the mill was mostly within the boundaries of the old workings. Sampling done in connection with this work showed erratic assays, which, if properly interpreted, would have indicated that a mill was not justified. It developed, however, that too much significance was attached to occasional high assays, with the result that grades in areas selected as mineable were estimated to be much higher than they actually were. This company made a voluntary assignment in bankruptcy in April, 1948.

Production: Concentrates shipped, 48 tons. Gross contents: Gold, 140 oz.; silver, 865 oz.; lead, 1,152 lb.; zinc, 125 lb.

GREENWOOD (49° 118° S.W.).

Silver-Lead-Zinc.

Dynamo Syndicate.

This syndicate continued to explore the Dynamo group at Greenwood. The drift, collared in May, 1947, on the Mamont claim, was advanced an additional 70 feet by hand-mining during 1948 to advance the face 140 feet from the portal. The vein, which is quartz carrying small amounts of galena within granodiorite walls, splits into two narrow veins for the last half of its length. The average strike of the adit is south 10 degrees east. Stoping was done in 1948 on the two widest sections, at 58 feet and 110 feet respectively from the portal, the first section being carried through as a raise to the surface about 40 feet above.

Approximately 500 feet north-east and at the same elevation an adit was started on the Mamont claim on a vein which strikes north 45 degrees east into the adjoining Barbara claim. At the collar of the adit the vein, dipping to the south-east, was 18 inches wide, but the width then decreased rapidly, and when the adit had been driven 34 feet by November 25th, the vein was only 1½ inches wide in the face. The vein was quartz in granodiorite walls and carried only sparse galena. J. McDonell was in charge and employed two men.

Production: Ore shipped, 20 tons. Gross contents: Silver, 91 oz.; lead, 4,535 lb.; zinc, 278 lb.

PHOENIX CAMP (49° 118° S.W.).

Copper-Gold.

Brooklyn-Stemwinder Gold Mines, Ltd.

Company office, 470 Granville Street, Vancouver. A. E. Sjoquist, president; E. H. Kellner, managing director. Capital: 2,500,000 shares, 50 cents par value. This company owns the Brooklyn-Stemwinder property in the Phoenix Camp. The adit collared in 1947 on the Standard Fraction claim, 360 feet south-west of the old Stemwinder shaft and 114 feet lower in elevation, was advanced north 24 degrees east for 315 feet. At 265 feet from the portal this adit intersected a small lenticular vein up to 12 inches wide which dipped northerly at 80 degrees. This vein, which was indicated by diamond-drilling in 1946, was mineralized with chalcopyrite carrying gold and silver. A drift was driven on it for 85 feet in a direction north 45 degrees west. From the face of this drift two flat 30-foot diamond-drill holes were drilled, one into the foot-wall and one into the hanging wall, but no further veins were encountered.

* By J. W. Peck.

A flat hole was also drilled for 64 feet from the face of the crosscut adit and in the line of the adit. It also failed to intersect any veins.

A drift was then driven on the vein, in a direction south 50 degrees east, until a fault was encountered at 60 feet. When more diamond-drilling indicated the vein had faulted to the north-east, the drift was driven in this direction for 70 feet, and a vein was intersected at 60 feet. A 12-foot drift on this vein in a southerly direction broke into the flooded Stemwinder workings on June 24th.

The old workings were explored, resurveyed, and checked for any remnants of ore. Diamond-drilling, consisting of four holes totalling 294 feet, was done to the east of the old Stemwinder shaft on the 114, or new adit, level. As the results were reported encouraging, unwatering of the shaft, said to be 344 feet deep, was started in order to explore this section at depth.

A hole was put down to explore a small vein reported in the timbered section of the portal, but the hole was abandoned before the vein was reached.

A total of about 500 feet of diamond-drilling was done on the New York claim, which adjoins the Brooklyn claim on the north. This was done to investigate a showing of pyrite carrying gold. Although considerable pyrite core was obtained, the assays were not encouraging.

On the surface the old Stemwinder head-frame was repaired and an air-hoist installed; air was supplied by a portable 220-cubic-feet-per-minute compressor. W. E. McArthur supervised the work until November 1st, when J. A. Hanna took charge. Six men were employed.

Franklin Camp (49° 118° N.E.).

Copper-Lead-Zinc.

McKinley. This property, which has been optioned by W. E. McArthur, of Greenwood, is reached by 1½ miles of newly constructed road that starts from the main Granby River road at a point 42 miles north of Grand Forks. After constructing the road, living-quarters and an ore-bin were built near the site of a caved portal approximately 3,500 feet in elevation. Surface-stripping was done on a copper-lead-zinc showing about 75 feet above the portal-site. Though snow considerably hampered the work, about 40 tons of sorted ore was obtained for shipping. Four men were employed.

Burnt Basin (49° 118° S.E.).

Halifax.—This claim and several others in the Burnt Basin area were acquired or leased by W. W. Schwartzenhauer and associates in 1948. A shipment of 14 tons was made to the Trail smelter. Gross contents: Silver, 148 oz.; lead, 5,072 lb.; zinc, 5,128 lb.

Rossland (49° 117° S.W.).*

South Belt.

Gold-Silver-Lead-Zinc.

Rossland Mines, Ltd. Head office, 675 Hastings Street West, Vancouver; mine office, Box 360, Rossland. W. B. Burnett, president; E. H. Lovitt, manager. Capital: 5,000,000 shares, no par value. The company controls about 10 square miles of ground, extending 2 miles south from Rossland and from Tiger Creek on the east nearly to Little Sheep Creek on the west. The property consists of seventy-five recorded claims and twenty-seven Crown-granted claims, including the Mayflower group.

* By J. W. Peck.

After completing a rather extensive geophysical and geological survey on its holdings during 1947, this company remained comparatively inactive during 1948. In the latter part of the year E. H. Lovitt, Limited, obtained a lease on the Mayflower group. The road to the Mayflower adit was relocated, an ore-bin was constructed, and a compressor and change house built.

The Mayflower adit was started in 1939 and has been driven since then as a crosscut in a southerly direction for about 300 feet. A vein intersected at 100 feet from the portal has been drifted on in an easterly direction for approximately 300 feet. The present lessee reports three short sections of ore in this drift, and mining of this ore was started in November. All ore obtained was trucked to the Whitewater mill at Retallack for milling so that a reward could be obtained for the base metals. Five men were employed.

A road was also built to the Bluebird workings, but other than some bulldozer stripping no work was done on these.

Production: Ore shipped, 545 tons. Of this amount, 295 tons was stock-piled. Gross contents of 250 tons milled: Gold, 10.3 oz.; silver, 523 oz.; lead, 4,509 lb.; zinc, 14,355 lb.; cadmium, 164 lb.

Gold.

Midnight (Kootenay Central Mines, Ltd.).

Mine office, Room 2, 815 Victoria Street, Trail. E. R. Haynes, president; J. A. Cooper, vice-president and manager. Capital: 500 shares, $100 par value. The Midnight property was purchased from B. A. Lins early in 1948. Under the supervision of Mr. Cooper the equipment was overhauled and a new 390-cubic-feet-per-minute Sullivan compressor, driven by a 75-horsepower electric motor, installed. A pocket of ore above the main adit-level was taken out and then work was concentrated on the sub-level 75 feet below the adit-level. Here an offshoot of the mined main vein was found a few feet into the hanging wall. Stoping was commenced on this offshoot, and it was also explored by a drift to the north where the main vein has not been mined. Seven men were employed.

Production: Ore mined, 567 tons. Gross contents: Gold, 742 oz.; silver, 665 oz.

I.X.L. (Kootenay Central Mines, Ltd.).

In the first part of 1948 this property was operated under a lease held by Gunnar Nordholm and associates. Work was restricted to the area on the Baker vein above the No. 3 level, about 300 feet in from the portal. Old workings on which the lessees had incomplete information as to location were broken into on the foot-wall side above No. 3 level. In November the Kootenay Central Mines, Limited, took over the lease and reopened the No. 5 level adit. As the workings on this level are connected with the Midnight workings, this produced another exit. Mining was not started, but diamond-drilling was done on the No. 3 and No. 5 levels.

Production: Ore mined, 55 tons. Gross contents: Gold, 118 oz.; silver, 136 oz.

Snowdrop.

This claim on O.K. Mountain straddles the Cascade Highway on the north side of the Midnight claim. It was acquired by Warren Crowe, of Waneta, in 1947. An old adit, the collar of which is about 250 feet southerly down a 30-degree slope from the highway, goes north 35 degrees west for 100 feet. It then turns and extends another 75 feet north 45 degrees east, following a quartz vein. A stope above this extends from the bend to a point about 40 feet ahead of the face of the tunnel. The vein dips at about 45 degrees to the south-east.

In 1948 Warren Crowe procured a small diamond-drill and drilled one hole from a short crosscut about half-way along the north-easterly portion of the drift. This hole was flat, going north 30 degrees west under the vein to investigate for possible parallel veins. It is reported that some mineralization was obtained at about 20 feet from the collar and was investigated by extending the crosscut.

O.K.—S. J. Bowen, M. Dorran, Gunnar Erickson, and Gus Hansen have a lease on this mine. Only intermittent exploratory work was done.

NELSON.*

Eagle Creek (49°117° S.E.).

Gold.

Granite-Poorman (Kenville Gold Mines, Ltd.). Mine office, Box 390, Nelson. G. H. Rainville, president; W. B. Montgomery, manager. Capital: 3,500,000 shares, $1 par value. This company is controlled by Quebec Gold Mining Corporation and Noranda Mines. Production was maintained throughout the year, with the ore coming from the following veins in order of production: Midway, Yule, Hardscrabble, Flat, and Poorman. This mine has two main operating levels, the lower being the 2570 level and the upper the 2750 level. Toward the end of the year 75 per cent. of the ore came from above the 2750 level, where two sub-levels—the 2900 level and 3000 level—are operated.

The ore obtained from the Midway vein was disappointing, in that the grade was lower than estimated. From 15 to 20 per cent. of the material trammed to the mill as ore was sorted out as waste; the remaining mill-feed averaged $9.80 a ton in 1948. Benefits from the Federal gold subsidy were close to the maximum $50 an ounce, but this will cease in 1949 unless production greater than two-thirds of the 1948 production is obtained. The number of men employed averaged 135 until March 1st, then dropped to an average of 82 after that date.

Production: Ore milled, 35,939 tons. Gross contents: Gold, 10,036 oz.; silver, 4,152 oz.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1945, pp. 96–99.]

Toad Mountain (49° 117° S.E.).

Lead.

Silver King.—A lease on this property was obtained from the Consolidated Mining and Smelting Company by O. Gowing and associates, of Ymir. Repairs were made to the road and 23 tons was shipped to the smelter at Trail. Gross contents: Silver, 293 oz.; lead, 6,787 lb.; zinc, 1,002 lb.

Cottonwood Creek (49° 117° S.E.).

Shamrock.—This claim, about 5 miles south of Nelson, is owned by A. G. Hardy. He made a shipment of 3⅓ tons. Gross contents: Silver, 16 oz.; lead, 27 lb.; zinc, 632 lb.

Sitkum Creek (49° 117° N.E.).

Gold.

Alpine Gold Ltd. Company office, Room 2, Royal Bank Building, Nelson. J. B. White, president and treasurer; Martin Hurworth, mine foreman; C. McLanders, mill superintendent. Capital: 700,000 shares, 50 cents par value. Work done on this property was restricted during the early part of the year to ore-breaking in 716 and 718 stopes. The broken ore was stock-piled in the stopes until milling was resumed soon after the ground was clear of snow. The mill, however, did not operate very long before the crew of about twenty men was laid off in June, with the exception of a few maintenance-men. Working until November, two men did some exploratory work on the upper or No. 6 level, where a crosscut was driven into the hanging wall of the main vein.

* By J. W. Peck.

Concentrates shipped, 45 tons. Gross contents: Gold, 542 oz.; silver, 366 oz.; lead, 6,573 lb.; zinc, 2,385 lb. This includes 98 lb. of selected high-grade ore with a gross content of 24.729 oz. of gold.

Rover Creek (49° 117° S.E.).

Gold.

Whitewater Group.

J. Mulholland had a small crew of men on this property, owned by J. W. Gerard, doing assessment-work in an effort to find the source of high-grade float found in the stream. It was reported that the position of a vein was established, but because of the great depth of overburden no further work was done until arrangements could be made for diamond-drilling.

Hall Creek (49° 117° S.E.).

Gold.

Canadian Belle Mining Co., Inc.

Company office, Room 2, Royal Bank Building, Nelson. Mine office, Box 334, Nelson. R. E. Linquist, president and general manager; Wayne Clukey and, later, W. Linquist was in charge of operations. This is a Washington company formed to develop the Canadian Belle, 3 miles from Hall Creek Siding, south of Nelson. Work in 1948 was restricted to diamond-drilling.

Golden Eagle and T.S. Groups.

These groups are owned by W. Rozan and associates, of Nelson. Working alone for most of the season, Mr. Rozan mined and shipped 8.16 tons of heavily oxidized and honeycombed quartz from the open-cut started the previous year on the Sun Fraction. The adit started in 1947 to investigate the downward extension of this vein was in about 40 feet when the property was visited in July. Nothing corresponding to the vein reported last year was noted in this adit, which should have intersected the downward continuation of the surface vein had it maintained the strike and dip originally exposed in the open-cut. There was evidence in the cut, however, that the vein was bending both in strike and dip. At this point it is about 18 inches wide and intensely fractured and oxidized. Because of this it will be necessary to drive the adit well under the surface showing to determine what happens to the vein. It is quite possible that it is faulted or pinched out and that it will not be found without considerable work. Before proceeding too far with the adit, further work should be done on the surface showing.

Production: Ore shipped, 8.16 tons. Gross contents: Gold, 7.715 oz.; silver, 4 oz.

Ymir (49° 117° S.E.).*

Lead-Zinc.

Oxide.†

This group of claims is situated 3½ miles east of Ymir on the south slope and crest of the ridge separating Oscar (Bear) and Porcupine Creeks. The mine camp, part way up the southern slope of the ridge, can be reached by a branch of the Porcupine Creek road. The upper workings can be reached from the camp by a tractor-road which continues up the steep south face of the ridge and into a pass leading to Oscar Creek valley.

The claims, staked in 1943 by E. P. Haukedahl, of Ymir, have been optioned by the Leta Exploration Company in 1943, by the International Mining Corporation in 1945–46, and by New Jersey Zinc Exploration, Limited, since midsummer of 1948. Work carried out by the owners and by the various companies that have optioned the property consists of about a dozen open-cuts and adits and five diamond-drill holes.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1947, p. 160.]

* By J. W. Peck, except as noted.

† By W. H. Mathews.

The principal showings (*see* Fig. 11) lie in a fault-zone, trending north 20 degrees east and dipping steeply eastward, which separates a succession of contorted argillites, limestone, and minor quartzites on the east from a dominantly quartzitic succession on the west. The beds and structures on both sides intersect the zone at acute angles. The fault-zone is as much as 40 feet wide and is occupied by a heavily iron-stained, plastic, impalpable clay-like material which grades outward into bleached and altered wall-rocks. Thoroughly oxidized material extends at least to the deepest adit, whose face lies 300 feet directly below the surface and 600 feet lower than the highest outcrop on the ridge-crest. A drill-hole from the inner end of the lower adit (Ann. Rept., 1947, p. 161) is reported to have intersected a fault-zone at a point almost 300 feet below the adit. The intersection is about 100 feet east of the position of the fault projected downward from the line between the surface and the adit. The material recovered from the drill intersection includes several feet of pyritic quartz, with a few specks of zinc-blende, a type of mineralization not known either in oxidized or unoxidized form in the zone exposed on the surface and in the adit.

Low values in lead and zinc occur throughout the fault-zone between the surface and the lowest adit, and bodies of high-grade material are known, some many feet in width, but as yet of uncertain shape and distribution. Lead and zinc minerals reported to be present include zinc silicate (hemimorphite), zinc phosphate (parahopeite), and lead phosphate (pyromorphite). A few nodules of galena, found in the upper workings, represent the only sulphide mineral seen near the surface. Values in silver and gold are low to negligible.

A new adit was driven 78 feet in the early part of 1948 immediately below some surface cuts near the crest of the ridge. In September the inner end of this adit had caved, but the outer 65 feet was still accessible. Samples taken in the adit, which cuts obliquely into the fault-zone at an angle of about 30 degrees to the general structure, assayed as follows:—

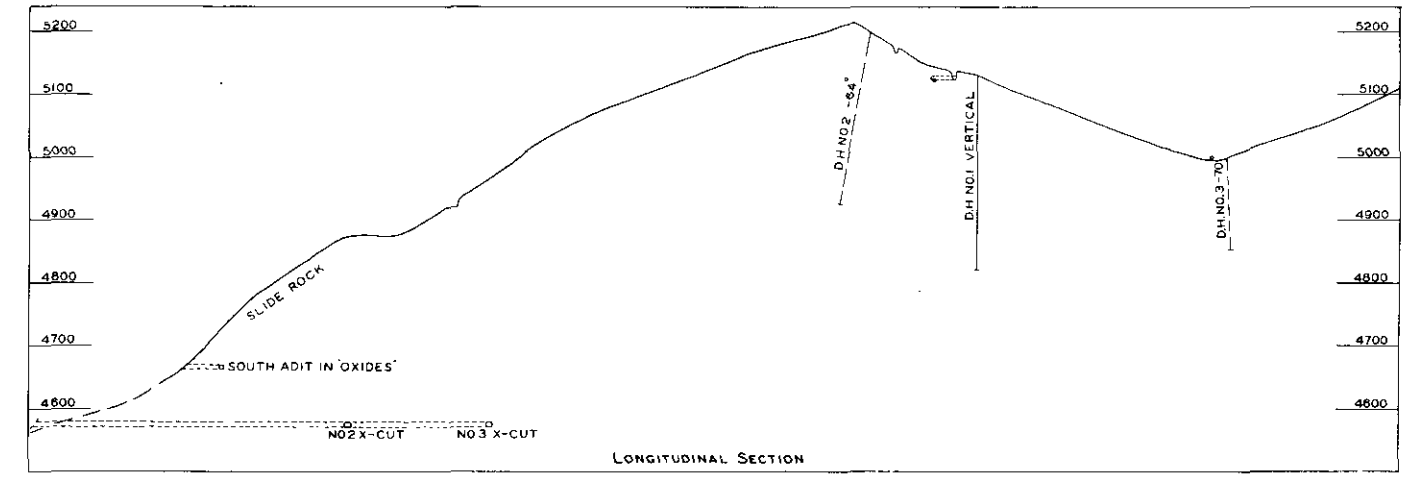
Location.	Gold.	Silver.	Zinc.	Lead.
	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.
Portal to 13 feet (lagged)	.....	.....	.....	.....
13 to 25 feet	*Nil*	0.4	16.7	0.7
25 to 35 feet	0.01	0.1	15.7	1.4
35 to 45 feet	Trace	*Nil*	2.5	2.0
45 to 55 feet	*Nil*	*Nil*	2.9	3.0
55 to 65 feet	*Nil*	*Nil*	2.0	1.3

Zinc.

Jack Pot.* This property includes eleven claims, located in June and July, 1948, by E. H. Barclay, E. P. Haukedahl, and S. W. Barclay, of Ymir, and several claims located later in the year. The claims cover ground south-east of Ymir on the crest and northern slope of the ridge separating Porcupine and Hidden Creeks, between the Hunter V and Carmencita Crown-granted claims. Late in 1948 New Jersey Zinc Exploration, Limited, took an option on the property.

The rocks exposed on the lower slopes in the northern part of the property consist of northerly trending, steeply dipping sediments, in which beds of white quartzite are conspicuous. The same succession is exposed west of the mineralized zone on the Oxide group, 2 miles to the north. The rocks on the upper part of the ridge, on the other hand, consist of a limestone member at least 100 feet thick resting conformably on argillaceous quartzite and argillite and showing for the most part comparatively low dips. These rocks differ markedly in lithology and structure from the succession

* By W. H. Mathews.



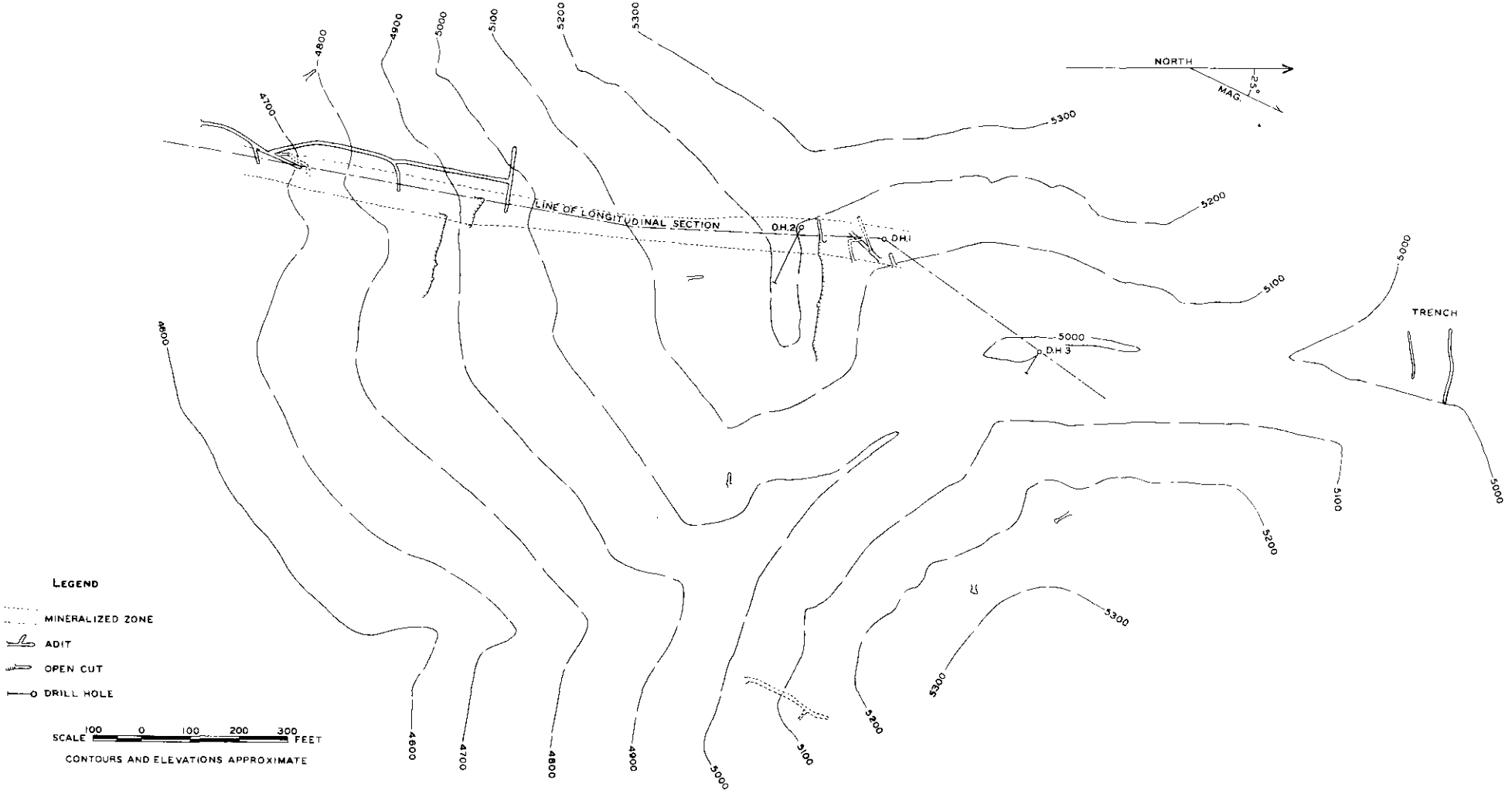


FIG.11. OXIDE GROUP-PLAN AND LONGITUDINAL SECTION OF WORKINGS

exposed farther north and may be separated from it by a major fault. Small dyke-like to irregular masses of intrusive rock are common in the limestone and argillaceous sediments and become more abundant to the south, toward a large body of granite exposed on both walls of Hidden Creek valley.

The principal showings of the Jack Pot group lie near the top of the steep northern slope of the ridge, at an altitude of approximately 5,500 feet above sea-level, about 3,500 feet east of the Hunter V glory-hole. These include several open-cuts and two adits in the limestone member mentioned above. Most of the cuts expose coarsely crystalline limestone with or without scattered grains of silicate minerals, notably tremolite and either olivine or serpentine. Mineralization in most of the cuts consists of widely scattered pockets of chalcopyrite. In the most westerly of the open-cuts, however, gently dipping beds of limestone are mineralized with disseminated sphalerite across a width of at least 8 feet. A channel sample of this material across the 8 feet of beds assayed: Gold, *nil;* silver, *nil;* zinc, 8.9 per cent. An adit, approximately 50 feet lower than the open-cut showing this zinc mineralization, has been driven about 180 feet south-easterly in the lowest beds of the limestone member. It intersects a shallow synclinal zone, whose axis is 18 feet from the face and almost directly below the open-cut. At this point 5½ feet of mineralized limestone is exposed, assaying: Gold, *nil;* silver, *nil;* zinc, 4.5 per cent. The second adit, now caved, lies about 250 feet east of the first and has been driven in more or less silicated limestone and dolomitic limestone mineralized with disseminated pyrite, chalcopyrite, galena, sphalerite, and pyrrhotite.

Other occurrences of limestone mineralized with pyrite and locally with sphalerite and galena lie about 1,500 feet south-east and 1,000 feet west of the showings described above.

Goodenough (Protection).—Three men—J. Turk, A. Fata, and F. Patula—continued to work this mine under lease. A sub-lease was also given to two other men. Production: Ore shipped, 345 tons. Gross contents: Gold, 253 oz.; silver, 2,172 oz.; lead, 53,307 lb.; zinc, 52,620 lb.

Silver-Lead-Zinc.

Maple Leaf Gold Mining Co., Inc. Head office, Spokane, Wash. This company has acquired the Ambassador, Easter, and Sun Fraction claims. These are on the south side of Porcupine Creek, 2 miles east of the railway. Three men were employed driving an adit during 1948, and a shipment of ore was made to the Consolidated Mining and Smelting Company's smelter at Trail. Ore shipped, 26 tons. Gross contents: Gold, 2.3 oz.; silver, 232 oz.; lead, 1,428 lb.; zinc, 3,832 lb.

Gold-Silver-Lead-Zinc.

Centre Star (Wesko).—Leasers continued to work on this property, and they were able to make several shipments of 10 tons each to the smelter at Trail. Production: Ore shipped, 147 tons. Gross contents: Gold, 113 oz.; silver, 898 oz.; lead, 17,919 lb.; zinc, 22,526 lb.

SALMO (49° 117° S.E.).*

Erie Creek.

Gold-Silver-Lead-Zinc.

Arlington. After the fire which destroyed the living-quarters in 1947, this property remained idle until the owners, A. Shrieves and R. and K. Golak, resumed operations in the spring. Work was continued intermittently by these three until the property was optioned in October to F. C. Buckland, of Vancouver. Work done by the new interests consisted of an intensive sampling

* By J. W. Peck.

programme employing six men under the direction of W. Baker. Much of the backfill in the mine was sampled, as it was thought to be of a grade to make mill-feed.

Production: Ore shipped, 330 tons. Gross contents: Gold, 212 oz.; silver, 714 oz.; lead, 9,474 lb.; zinc, 12,278 lb.

Gold-Silver.

Second Relief Mine.—This mine on Reste Creek is now owned by M. C. Donaldson, of Salmo. Some ore was mined during 1948 and trucked to the smelter at Trail. Production: Ore shipped, 18 tons. Gross contents: Gold, 18 oz.; silver, 16 oz.

SHEEP CREEK.

Gold.

Sheep Creek Gold Mines, Ltd. Company office, 616 Stock Exchange Building, Vancouver; mine office, Sheep Creek. A. E. Jukes, president; H. E. Doelle, managing director; A. G. Pentland, mine superintendent. Capital: 2,000,000 shares, 50 cents par value. Until June 1st the mill was operated at capacity. Mining was concentrated on the No. 4, No. 5, No. 7, and No. 9 levels on the 57, 68, 75, and 83 veins. After June 1st milling was suspended and the crew was reduced to a maintenance and development group. Development was concentrated on the No. 7 and No. 9 levels. On the No. 7 level the 75 and 68 veins were drifted on for several hundred feet, but no ore was found. On the No. 9 level the long crosscut drive to the 57 vein was continued, and by the end of the year the 68 and 64 veins had been intersected in their projected locations, their respective widths being 8 inches and 18 inches. Some mining was also done on the 83 vein on the No. 4 and No. 5 levels; the broken ore was stored in old stopes. By the end of October enough ore had been broken to operate the mill for several months. As the ore has a characteristic of "freezing" when stored, the mill was reopened November 3rd and an attempt was made to maintain a rate of 150 tons a day. The crew averaged 100 at the start of the year, dropped to about 20 during the mill shut-down, but rose to 65 at the end of the year.

Development: Drifting, 991 feet; crosscutting, 1,680 feet; raising, 456 feet; diamond-drilling, 1,169 feet.

Production: Ore milled, 25,432 tons. Gross contents: Gold, 8,260 oz.; silver, 2,485 oz. A shipment of 5.76 tons of refinery slag to the Trail smelter contained: Gold, 13 oz.; silver, 142 oz.; lead, 311 lb.; zinc, 564 lb.

Gold Belt Mining Co., Ltd.—The mill machinery was sold and removed from the property of this company on Sheep Creek. It is understood it was shipped to Keno Hill, Yukon Territory.

Kootenay Belle.—R. Thompson, lessee. Production: Ore shipped, 358 tons. Gross contents: Gold, 351 oz.; silver, 484 oz.

Nugget.—A. Endersby, Fruitvale, owner and operator. Production: Ore shipped, 271 tons. Gross contents: Gold, 109 oz.; silver, 275 oz.

Zinc.

H.B. This property, owned by the Consolidated Mining and Smelting Company, is a short distance up Aspen Creek in the Sheep Creek watershed. In March this company started an intensive diamond-drill programme on the property. Late in the year the tent camp was winterized so that drilling might be done throughout the winter. T. Connor's Drilling Company did the drilling.

IRON MOUNTAIN.

Tungsten.

Canadian Exploration, Ltd. (Emerald Tungsten Project).

Head office, Royal Bank Building, Vancouver; mine office, Salmo. R. E. Legg, general manager; J. B. Magee, mine superintendent; G. H. Grimwood, mill superintendent. Capital: 1,000,000 shares, $1 par value. This company owns the Emerald mine, 8 miles by road from Salmo. Routine stoping operations were carried out above the 3900 and 4000 levels, which were mined through to the surface during the summer; these operations maintained milling at an average rate of 250 tons a day. Preparations were also made to extend the mining to the bottom, or 3800, level. The ore lies in a trough of limestone against granite and plunges about 20 degrees to the south. The ore-body, the boundaries of which must be determined by the ultra-violet lamp, is reached by three adits; the second, or 3900 level, is the main haulage-level. The lowest adit is about 500 feet in length, and as mining is continued to depth, it will be increasingly difficult to reach the ore-body by adits. Preparations, therefore, were made to raise a vertical shaft from the 3800 level to 3900 level, with the intention of sinking below the 3800 level in the future. Mining is done by shrinkage methods, but the ore is dropped through to the sill and removed by mucking-machines; this method shows a decided increase in efficiency over the standard chute method.

Glass models on a scale of 30 feet to the inch were made to illustrate the ore-occurrence. Up-to-date information from diamond-drilling and other work is plotted thereon.

Surface diamond-drilling, with encouraging results, was done on the Jersey lead-zinc property, 5,000 feet south of the old Emerald mine.

The number of men employed averaged forty-two at the mill and eighty at the mine.

Development: Drifting, 488 feet; crosscutting, 276 feet; raising, 662 feet; diamond-drilling, 6,350 feet.

The company was able to sell high-grade concentrates with a low sulphur content throughout 1948, principally to the Atlas Steel Company. Lack of a market, however, for lower-grade material made it necessary to stock-pile about 600 tons of concentrates containing 13 per cent. tungsten.

Production: Ore mined, 81,476 tons; ore milled, 76,148 tons. Gross contents: Tungstic oxide, 1,409,297 lb.

[References: *B.C. Department of Mines*, Bull. No. 10, 1943. *Minister of Mines, B.C.*, Ann. Rept., 1947, p. 164.]

NELWAY (49° 117° S.E.).*

Silver-Lead-Zinc.

Reeves MacDonald Mines, Ltd.

Company office, 626 Pender Street West, Vancouver. Lewis P. Larsen, Spokane, president; Henry L. Hill, mine manager. Capital: 3,000,000 shares, $1 par value. This company is a subsidiary of Pend d'Oreille Mines and Metals Company, of Metaline Falls, Wash., and owns the Reeves MacDonald mine on the Pend d'Oreille River, 4½ miles west of Nelway, near the International Boundary. During 1948 an agreement was made with the Sullivan Mining Company whereby additional funds were made available for plant construction and underground development at this mine.

In March work was started on a 933-foot 55-degree raise to connect the River tunnel to the Reeves tunnel on the foot-wall of the Reeves ore-body. This is being driven as two separate parallel raises connected at 75-foot intervals. One side is used as a waste passage, and the other, which is equipped with a man-skip, is used for

* By J. W. Peck.

transporting men and supplies. Broken material from the manway side is deflected at the bulkhead timbers to the waste pass. When completed, this raise will provide the necessary ventilation and auxiliary exit as required by the "Metalliferous Mines Regulation Act." It will also act as a main service shaft for the mining of the ore-body. By the end of the year the raise had been advanced over 800 feet.

On the surface, erection of plant buildings for this projected 1,000-tons-a-day operation continued throughout the year. The crushing plant, consisting of a 1,000-ton circular concrete coarse-ore bin, new Holland 3030 breaker, and Allis-Chalmers lowhead screen, was erected a few hundred feet west of the River tunnel and below the Nelway–Waneta Highway. Across the highway and about 250 feet higher in elevation the mill building was erected, and the installation of machinery was in progress toward the end of 1948. The crushing plant and the mill are to be connected by two conveyers, totalling more than 800 feet in length.

In addition to the above, a large combined office and change-house, a new compressor building, and a warehouse were in various stages of completion at the end of the year. With electric power available from the West Kootenay Light and Power Company, it is expected mining and milling can be started early in 1949. From a few men employed at the start of the year, the crew was increased by December, 1948, to fifteen men underground and ninety-five men on the surface.

Red Rock (Michaely Silver Lead Mines, Ltd.). Company office, Bay Avenue, Trail. This property is reached by 3 miles of steep road from a point 1½ miles west of the Reeves MacDonald mine on the Nelway–Waneta Highway. M. Michaely and W. Holland, assisted by one man, drove a raise from a point 80 feet inside the portal of No. 2 adit through to surface-stripping, about 60 feet above. Ore from this raise and from surface-stripping was then dropped down the raise and trammed to an outside ore-bin. Air for mining was supplied by a small home-made compressor.

Production: Ore shipped, 208 tons. Gross contents: Gold, 2 oz.; silver, 2,251 oz.; lead, 85,910 lb.; zinc, 90,304 lb.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1936, p. E 28. *Geol. Surv., Canada*, Mem. 172, p. 64.]

Iron.

Lomond (International). A. Burgess, M. Burgess, and S. Lundgren leased this property from G. Shallenberger and proceeded to mine limonite ore and to ship it to the Lehigh Cement Works at Metaline Falls, Wash. By December a contract for 2,000 tons had been completed, and work was proceeding on a second contract for 1,500 tons. Small quantities of this material are apparently used in the manufacture of cement to improve its setting qualities.

The property is reached by one-quarter mile of road from a point about 2 miles west of Nelway on the Nelway–Waneta Highway. An earthy iron oxide formed as an irregular replacement of limestone has been opened up on the north bank of Lomond Creek. Where mining is being done, the material averages about 10 feet in thickness. Mining consisted of opening up shallow stopes into the bank and scraping the ore outside by means of a gasoline-winch. About 100 feet up-stream from here a caved adit into the north bank was opened. This adit is 50 feet long and at the end of it there is a raise; this work was done years ago, apparently to prospect the depth of the iron ore.

Mr. Shallenberger is prospecting the occurrence farther up-stream in an attempt to locate commercial quantities of lead and zinc minerals. Small cores of primary lead sulphides are occasionally found, but these are too small and scattered to be of interest in themselves. The property was drilled during 1947 by Sheep Creek Gold Mines,

Limited, in collaboration with Gold Belt Mining Company, Limited, and Calumet and Hecla Consolidated, but this drilling was probably not conclusive.

Production: (1) Shipped to Trail smelter by G. Shallenberger, 4.42 tons. Gross contents: Silver, 9.29 oz.; lead, 4,166 lb.; zinc, 106 lb. (2) Shipped to Lehigh Cement Works by A. Burgess and associates, 2,300 tons of iron oxide.

[Reference: *Geol. Surv., Canada,* Mem. 172, p. 62.]

SOUTH KOOTENAY LAKE (49° 116° S.W.).*

SUMMIT CREEK.

Gold-Silver-Lead-Zinc.

Bayonne. D. S. MacDonald and Mrs. H. Moore, of Ymir, leased and operated this mine during the summer of 1948. Under the direction of Mr. MacDonald four men were employed mining remnants of ore from the No. 8 level. Before the ore could be shipped, it was necessary to repair the road to Tye.

Production: Ore shipped, 309 tons. Gross contents: Gold, 177 oz.; silver, 1,783 oz.; lead, 41,342 lb.; zinc, 20,381 lb.

Spokane.—Karl Laib, of Tye, worked this property during the summer with the aid of two men. It was reported that ore shipped came from the No. 4, or lowest, level. Production: Ore shipped, 76 tons. Gross contents: Gold, 33 oz.; silver, 548 oz.; lead, 20,136 lb.; zinc, 1,224 lb.

SANCA.

Silver-Lead-Zinc.

Lakeview. This property, at Sanca on the Kootenay Bay–Creston Highway, was worked throughout most of 1948 by E. G. Timmons and son. The ore is essentially galena and sphalerite in a sheared band of calcareous sediments and is controlled by localized rolls in the formation. The lenses of ore are small but quite high grade. The ore mined by Timmons came from the first level off the shaft which is alongside the highway.

In November the property was sold to J. Powilson, W. R. Bullock, and associates, of Lethbridge. The crew was increased to eight men, and the lower adit was rehabilitated with the intention of doing development-work from this horizon.

Production: Ore shipped, 66 tons. Gross contents: Gold, 1 oz.; silver, 500 oz.; lead, 20,591 lb.; zinc, 51,283 lb.; cadmium, 268 lb.

CRAWFORD CREEK.

Humbolt. This property, situated near the headwaters of Crawford Creek, was operated under lease in the latter part of the year by R. Golak and K. Golak after these partners sold the Arlington mine on Reste Creek, near Salmo. Ore removed from the dump and from just inside the upper adit was shipped to Trail in October, but operations ceased soon after.

Production: Ore shipped, 19 tons. Gross contents: Silver, 839 oz.; lead, 19,774 lb.; zinc, 1,925 lb.

PILOT BAY.

Pilot Bay Concentrator and Smelter. This plant was erected in the period from 1891 to 1895 on the eastern shore of Kootenay Lake, opposite the West Arm. It was intended to treat ore from the Blue Bell mine at Ainsworth, but was partly dismantled in 1906. In 1947 Mr. and Mrs. H. T. Stearns, of Hope, Idaho, purchased the property from the Consolidated Mining and Smelting Company. In 1948 the late A. W. Davis drew their attention to dumps of crude ore

* By J. W. Peck.

around the old plant. Arrangements were then made whereby under his supervision this material was recovered and shipped to the Consolidated Mining and Smelting Company's smelter at Trail.

The old tailings from the concentrator were located in a shallow bay, and these may also be recovered.

Production: Ore shipped, 798 tons. Gross contents: Gold, 7.1 oz.; silver, 4,579 oz.; lead, 141,494 lb.; zinc, 246,751 lb.

NORTH KOOTENAY LAKE (49° 116° N.W.).*

AINSWORTH.

Silver-Lead-Zinc.

Kootenay Florence (Ainsmore Consolidated Mines, Ltd.).

Company office, 112 Yonge Street, Toronto; mine office, Ainsworth. A. E. Silverwood, president; W. J. Bull, manager. Capital: 100,000 shares, no par value. The Kootenay Florence mine and mill are 2 miles north of Ainsworth on the Nelson–Kaslo Highway. Production during 1948 came chiefly from the new 906 ore-body above the main No. 9 level adit, about 2,500 feet from the portal. This section, together with the No. 8 sub-level above, was about stoped out at the end of the year, except for pillars that can be extracted. Development-work at the end of 1948 consisted of drifting along the vein on No. 9 level past the stoped-out section.

Some production came from the sill of the 940 stope, which had been mined out by the former owners, Wartime Metals. Here a section of sill about 40 feet long was mined into the hanging wall for about 30 feet, but the operation ceased when dilution became too high.

The road to the Lakeshore property was improved, but no work was done there, other than a retimbering of the portal. The number of men employed averaged twenty-six.

Production: Ore milled, 13,661 tons. Gross contents: Silver, 15,432 oz.; lead, 627,882 lb.; zinc, 408,347 lb.; cadmium, 2,201 lb.

Yale Consolidated Lead and Zinc Mines, Ltd.

Company office, 208 Yorkshire Building, Vancouver. Capital: 5,000,000 shares, $1 par value. During the early part of the year work was largely restricted to a programme of geological surveying and mapping by B. W. W. McDougall and J. MacBeth. In late summer it was decided to reopen the old Highlander adit, which was started in 1899 and in which no work has been done since about 1911. The portal was retimbered, but before further underground work was attempted, a change-house, blacksmith-shop, fan-house, and warehouse were constructed, and a portable 210-cubic-feet-per-minute Sullivan compressor was set up for mining operations. Re-entering of the workings was done with great care, as the oxygen content of the air was at first insufficient to maintain a carbide light. Fan-pipe was laid along the floor of the drift to allow a quick examination of the workings. The adit, which is reported to extend westerly for about 2,900 feet, intersects the projected downward extension of the Highlander vein at 1,560 feet from the portal, and it is reported that drifts extend north and south on this vein for 350 feet and 1,016 feet respectively. The timber sets in these drifts had collapsed, and the only examination that could be made was on a small stope just south of the junction of the drift with the main crosscut. Work was then restricted to cleaning up, widening, and reconditioning the main adit. About 1,000 feet of this work had been done by the end of the year. The number of men employed averaged nine.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1905, p. 154. *Mines Branch, Ottawa*, Zinc Commission Report, 1906, p. 152.]

* By J. W. Peck.

Highland Leases. F. W. Robinson, J. Asher, and G. L. Green, of Ainsworth, hold a lease on the tailings of the old Highland mill, situated about a mile north of Ainsworth. The lease was obtained from the Consolidated Mining and Smelting Company. Milling machinery was installed during 1947 in the old mill buildings, and some oxidized beach tailings were treated. The present mill is reputed to have a capacity of 40 tons daily.

During 1948 tailings were scraped to the mill bin from under the surface of Kootenay Lake by using a drag-line scraper operated by a double-drum winch. The sheave-wheel of the drag-line was attached to a float anchored in the lake.

Production: Concentrates shipped, 220 tons. Gross contents: Silver, 1,290 oz.; lead, 101,732 lb.; zinc, 142,156 lb.; cadmium, 691 lb.

Messrs. McLellan and Hansen have acquired a lease on the Highland mine from the Consolidated Mining and Smelting Company. Ore that was spilled along the tramline, particularly at the towers, during the old operation was picked up and hauled to the highway by stone-boat. By this means they recovered 30 tons of crude ore, which was shipped to the Trail smelter for treatment. The gross contents were: Silver, 316 oz.; lead, 21,244 lb.; zinc, 3,320 lb.

Star, Sunlight. A. G. Norcross, of Nelson, purchased the Star and Sunlight Crown-granted claims at Ainsworth and leased the adjoining Crown-granted Ruth claim. Starting work in November, a road about 2 miles in length was built from a point on the main No. 1 road near the United mine. Supplies and some machinery were brought into the property before snow forced a shut-down.

Silver Hill Mines, Ltd. (No. 5). Company office, 920 Stock Exchange Building, Vancouver; mine office, Ainsworth. E. Borup, president; E. H. Kinder, manager. Capital: 150,000 shares, $1 par value. This is a company formed in 1948 to develop the Logan McPhee group of claims on Cedar Creek, 2 miles by road north-west of Ainsworth. The claims held are New York, Anna May, Kate, Ayesha, Cecilia May Fraction, No. 5, and No. 5 Fraction.

With four men employed, work was started December 1st under difficult snow conditions. The portal-site on the No. 5 claim was cleaned up and a small compressor installed. Two rounds were taken out at the face of the adit to extend it to 285 feet in length before work ceased for the year.

Silver Hoard.—This property was leased by W. Lane from Consolidated Mining and Smelting Company. Production: Ore shipped, 38 tons. Gross contents: Silver, 893 oz.; lead, 5,449 lb.; zinc, 5,248 lb.

Crow Fledgling.—E. Emilson operated this mine, leased from the Ainsmore Consolidated Mines, Limited, and made several small shipments of about 6 tons each to Trail. Production: Ore shipped, 38 tons. Gross contents: Silver, 370 oz.; lead, 9,601 lb.; zinc, 7,817 lb.

Daisy Bell (Cossetto Group).—W. J. Turner, of Ainsworth, obtained an option from J. Cossetto on the Florence M, the Daisy, and the Bell claims. The road was improved and a small shipment made from surface-stripping. Production: Ore shipped, 3 tons. Gross contents: Gold, 0.2 oz.; silver, 20 oz.; lead, 1,061 lb.; zinc, 474 lb.

Spokane.—T. Hawes operated this property, leased from Ainsmore Consolidated Mines, Limited. Production: Ore shipped, 107 tons. Gross contents: Gold, 1.4 oz.; silver, 1,426 oz.; lead, 73,254 lb.; zinc, 16,727 lb.

WOODBURY CREEK.

Scranton Consolidated Mining Co.—Mine office, Kaslo. Y. C. Bressie, president; C. J. Bailor, secretary-treasurer; W. T. Graham, in charge at the property. It was reported that buildings were erected and that underground work will be done during the winter.

A shipment of 9½ tons to the smelter at Trail yielded: Gold, 1.5 oz.; silver, 109 oz.; lead, 2,349 lb.; zinc, 1,451 lb.

August Fraction.—Dr. L. D. Besecker made a clean-up of ore around this property near the mouth of Woodbury Creek. He shipped 10 tons of lead ore and 48 tons of concentrates to the smelter at Trail. Gross contents: Silver, 297 oz.; lead, 19,766 lb.; zinc, 15,027 lb.

Shutty Creek.

Zinc.

Shutty Bench.—This property consists of four located claims above Shutty Bench, a few miles north of Kaslo. John Kuz made a shipment of 4 tons of ore. Gross contents: Silver, 11 oz.; zinc, 3,105 lb.; cadmium, 10 lb.

Riondel.

Bluebell (Consolidated Mining & Smelting Co. of Canada, Ltd.). Mine office, Riondel. W. Selby, mine manager; J. McDonald, mine superintendent. This old property was revived during 1947 when the Canadian Mining and Smelting Company of Canada, Limited, owners of the property, started a diamond-drilling programme. This work drew attention to bodies of ore at either end of the 4-mile peninsula, at the centre of which is the old mine. Early in 1948 a crew of men commenced to rehabilitate the camp buildings and the mine plant. When this was nearing completion in the late summer, the unwatering of the old mine shaft was started. This is a 35-degree inclined shaft sloping toward and under the lake but gaining cover with depth. There are five levels off this shaft, 120 feet apart on the slope, and known respectively from the top down as the "A" level, "B" level, "C" level, "D" level, and "E" level.

It is the intention of the company to unwater the workings to the "E" level and to drive both ways from the old workings on the "C" level to the new ore-bodies. By the end of the year the "C" level had been unwatered, the drive to the south started, and preparations were being made to start the north drive. About thirty-five men were employed.

Keen Creek (49° 117° N.E.).*

Silver-Lead-Zinc.

Cork Province. This is an old producer located on Keen (south fork of Kaslo) Creek, 10 miles by road from Kaslo. C. Lind, of Kaslo, acquired a lease and bond on this property in late summer. Several hundred tons of zinc ore were shipped to Trail. Of this tonnage, 49 tons came from the Cork dump alongside the main road, 15 tons from an old chute on No. 2 level, and the balance from the upper Province dump. The caved lower adit near the main road was reopened and timbered for about 100 feet. The main crosscut was then found in good condition, but the main vein at about 900 feet from the portal was found caved. Retimbering was done here in an easterly direction, the object being to get through the caved section to the main winze located about 400 feet ahead of the crosscut. It is Mr. Lind's intention to unwater the lower workings so that he can search for ore there. Retimbering was still in progress at the end of the year; about 200 feet remained to be done to reach the winze. Four men were employed.

Production: Ore shipped, 385 tons. Gross contents: Gold, 1 oz.; silver, 2,353 oz.; lead, 54,177 lb.; zinc, 75,627 lb.; cadmium, 120 lb.

Flint.—This old property is near the headwaters of Dago Creek, a tributary of Keen (south fork of Kaslo) Creek. It was restaked in 1948 by J. MacPherson, of Kaslo. A small shipment of 4 tons from a surface dump was made to Trail. Gross contents: Gold, 0.2 oz.; silver, 97 oz.; lead, 1,479 lb.; zinc, 1,618 lb.

* By J. W. Peck.

Kaslo Silver-Lead Co., Inc. (Index).

Company office, 470 Granville Street, Vancouver. This Washington company restaked a group of thirteen claims, including the old Index mine, north of Desmond Creek, a tributary of Keen (south fork of Kaslo) Creek. Under the direction of H. F. Kenward some work was done late in the year reconditioning the buildings before work ceased for the winter.

Comstock-Virginia.

Three Crown-granted claims—Comstock, Virginia, and Erie—lie at the headwaters of Long Creek, which is a tributary of Keen (south fork of Kaslo) Creek. Little or no work has been done on these claims for about forty years. During the summer of 1948 Mrs. Barbara and R. C. Gilker, who originally bought the claims at a tax sale, interested J. Armes, of Vancouver, through W. J. Sturgeon, of Nelson. Four men were employed clearing the trail and cleaning out the portal of one level.

The three adits on the Comstock claim have been driven on a quartz vein which cuts through the granite country rock at a strike of north 30 degrees east and a dip of 75 degrees to the north-west. Of the three adits, which are 75 feet apart vertically, only the second had been opened for entry. This adit, at elevation 6,925 feet, follows a quartz vein which ranges up to 2 feet in width. Strike-faulting is noticeable, and wherever the vein widened, small stopes about 10 feet in length had been taken out. These stopes were at distances of 22 feet, 58 feet, and 101 feet respectively from the portal. The total distance driven on the fissure is 185 feet, and there is a 9-foot crosscut to the south at the face. The last 40 feet of adit shows little or no vein, but at the face a flat quartz vein 2 to 18 inches wide is noticeable running at right angles to the main fissure.

All dumps, except the top level, showed uninteresting quartz. At the top level a few hundred pounds of quartz containing galena, pyrite, and zinc-blende have been stored. A grab sample of this dump assayed: Gold, *nil;* silver, 79.1 oz. per ton; lead, 0.9 per cent.; and zinc, 6 per cent. It is stated in Geological Survey of Canada Memoir No. 184 by C. E. Cairnes that a 5-ton shipment was made in 1909 that averaged 100 oz. a ton in silver and 60 per cent. lead.

In November the claims reverted to the Crown again, but at the end of 1948 a lease had been applied for by Henry F. Kenward.

[Reference: *Geol. Surv., Canada,* Mem. No. 184, p. 203.]

PADDY PEAK (49° 117° N.E.).*

Silver-Lead-Zinc.

Utica Mines (1937), Ltd.

Registered office, 640 Pender Street West, Vancouver; mine office, Kaslo. D. M. Armstead, president; V. Dolmage, consultant; P. N. Pitcher, mine manager. Capital: 3,000,000 shares, 50 cents par value.

This company resumed operations in the spring and operated continuously, though work was hampered by snow from October onwards. The property is served by a road which leaves the Kaslo–New Denver Road at a point near Keen Station on the Canadian Pacific Railway. Communications were maintained with Kaslo by using a bulldozer and a four-wheel-drive vehicle. A telephone service was also in operation.

Two mineralized breaks have been investigated on the No. 7, or main haulage, level, the No. 4 level has been reopened to the west vein, and a raise connection made between these two levels. This raise is about 3,900 feet from the portal on the No. 7 level. In 1948 a new level, the No. 5, was started as a sub-level off this raise at a point 250 feet above the No. 7 level, or 120 feet below the No. 4 level. By the end of the year the sub-level drift had been driven 178 feet in a south-west direction, and good ore was reported showing up in the last 30 feet of this east vein. At 30 feet from the raise a crosscut was driven to the north-west, and the downward extension of the

* By J. W. Peck.

No. 4 level west vein was intersected at 80 feet, but no further work was done on it. It is the intention of the management to raise eventually on this vein to the No. 4 level, thus providing ventilation and another exit, rather than raise on the east vein, as it is caved on the No. 4 level.

A horse, hauling about 10 tons a trip, was used for haulage. Ore recovered during 1948 came from the west vein on the No. 7 level and was shipped to the Whitewater concentrator at Retallack. A cook-house and a change-house were built, and the bunk-house was repaired. The number of men employed averaged twenty.

Production: Ore shipped, 300 tons. Gross contents: Silver, 1,106 oz.; lead, 7,235 lb.; zinc, 18,591 lb.

RETALLACK-THREE FORKS (50° 117° S.E.).*

Silver-Lead-Zinc.

Lucky Boy Group. This group includes the Lucky Boy, Fourth of July, and Jocker claims, all held by right of assessment. It is located on Kaslo Creek at 14-Mile, 4 miles below Retallack. It was optioned from C. Lind, of Kaslo, by E. Lovitt, S. Bruce, and associates, but the option was later dropped. Ore removed from an old dump was milled at the Whitewater mill at Retallack.

Production: Ore shipped, 163 tons. Gross contents: Silver, 226 oz.; lead, 3,064 lb.; zinc, 30,987 lb.; cadmium, 94 lb.

Zinc.

Doherty. This property, situated at the confluence of Lyle Creek and the Kaslo River, was acquired in 1948 on a royalty basis from G. E. McCready and L. N. Garland by E. H. Lovitt, Limited. A road diversion was provided to permit mining the surface showings outcropping above the Kaslo–Three Forks Road. Drilling equipment was acquired and selective mining was done in late summer and fall under the direction of S. Bruce. It was estimated that 4,500 tons of ore was blasted down on the former road and river-bed below. This ore was loaded by a Mobil-loader for shipment to the Whitewater mill. Five men were employed.

Production: Ore shipped, 4,531 tons; of this amount, 932 tons was stock-piled. Gross contents of 3,599 tons milled: Gold, 1.8 oz.; silver, 2,493 oz.; lead, 30,725 lb.; zinc, 529,990 lb.; cadmium, 1,992 lb.

[Reference: *B.C. Department of Mines*, Bull. No. 22.]

Silver-Lead-Zinc.

Whitewater (Kootenay Belle Gold Mines, Ltd.). Company office, 475 Howe Street, Vancouver; mine office, Retallack. J. L. Trumbull, president; V. McDowell, mine manager. Capital: 250,000 shares, $1 par value. This company continued to treat the old Whitewater dumps. No provision was made to by-pass the fines around the crusher. It was, therefore, necessary to maintain a stock-pile under cover for a wet-weather source of supply in order to ensure continuous operation.

In the late summer the company commenced the recovery and treatment of old mill tailings from Kaslo Creek. A Mobil-loader was used for digging these tailings and proved very effective. It also proved useful for loading material blasted on the road and flats below the Doherty operation and for rehandling stock-piled material at the mill.

Production: Ore milled, 29,893 tons. Gross contents: Gold, 90 oz.; silver, 49,328 oz.; lead, 235,017 lb.; zinc, 1,210,859 lb.; cadmium, 10,296 lb.

* By J. W. Peck.

The company is also handling custom ore at $5.50 per ton, plus 20 cents a ton for any rehandling that may be required at the mill. Shipments were received and treated as follows:—

Shipper.	Shipped.	Milled.	Stock-piled.
E. H. Lovitt, Limited—	Tons.	Tons.	Tons.
Lucky Boy mine, Retallack	163	163	.....
Doherty mine, Retallack	4,531	3,599	932
Mayflower mine, Rossland	545	250	295
Total, E. H. Lovitt, Limited	5,239	4,012	1,227
Utica Mines (1937), Limited	297	297	.....
B.C. Slocan Rambler Mines (1947), Limited	568	568	.....
Santiago Mines	818	818	.....
Van Roi Mine (1947), Limited	711	711	.....
Totals	7,633	6,406	1,227

Lucky Jim (Zincton Mines, Ltd.). Company office, 616 Stock Exchange Building, Vancouver; mine office, Zincton. J. S. McIntosh, general superintendent; G. Avison, mill superintendent. Capital: 10,000 shares, $1 par value. This company, a subsidiary of Sheep Creek Gold Mines, Limited, owns and operates the Lucky Jim mine at Zincton. Capacity production was maintained throughout the year. Ore produced came from the No. 1 and No. 3 levels of the upper section and from the No. 9 and No. 10 levels of the lower section. The lower section produced zinc only, while the ore in the levels above No. 3 had an appreciable lead content. Connections were made between most of the stopes to materially improve ventilation. The main development in 1948 was the start of the No. 2 sub-level, about midway between the No. 1 and No. 3 levels.

Development: Drifting, 585 feet; crosscutting, *nil;* raising, 281 feet; diamond-drilling, 4,790 feet. The number of men employed averaged seventy-nine.

Production: Ore milled, 97,329 tons. Gross contents: Silver, 49,133 oz.; lead, 621,540 lb.; zinc, 12,192,016 lb.; cadmium, 68,850 lb.

Rambler Cariboo (B.C. Slocan Rambler Mines (1947), Ltd.). Company office, 67 Yonge Street, Toronto; mine office, New Denver. Arthur Cockshutt, president; E. K. M. Graham, secretary-treasurer; W. Maybank, mine manager. Capital: 1,300,000 shares, $1 par value. This company has acquired the old Rambler-Cariboo mine near the head of McGuigan Creek. The property extends from an elevation of 5,000 feet at the fourteenth level portal to an elevation of 6,000 feet at the third level portal. As the snowfall through the 1947–48 winter was particularly heavy, the commencement of work was delayed until May. The No. 14 level was then equipped with air and water lines, and these were extended to the No. 3 level via the shaft. A total of 4,495 feet of diamond-drilling was done. All of this was underground, except for 800 feet done on the surface above No. 3 level. Some ore from the No. 3 level dump was milled at the Whitewater mill. Operations stopped in October.

Production: Ore shipped, 641 tons. Gross contents: Silver, 6,485 oz.; lead, 16,357 lb.; zinc, 72,783 lb.; cadmium, 425 lb.

Lucky Boy.—This property is in Jackson Basin and is owned by L. N. Garland, of Retallack. Additional claims were staked during the year, and a cabin was built in anticipation of making a deal on the property.

Winona Boone.—This property in the Jackson Basin was leased from the Crown in 1948 by L. N. Garland and J. R. Tinkess. A small shipment was made to the smelter at Trail. Production: Ore shipped, 7 tons. Gross contents: Gold, 0.14 oz.; silver, 579 oz.; lead, 4,675 lb.; zinc, 2,239 lb.

Jackson Group.—This is another property in the Jackson Basin from which ore was shipped during 1948. B. I. Nesbitt, F. Crosby, and H. V. Dewis obtained an option on the property and made a shipment of concentrates salvaged from the old mill. Production: Ore shipped, 5 tons. Gross contents: Silver, 157 oz.; lead, 3,721 lb.; zinc, 1,694 lb.

Towser Fraction.—C. J. Garrett, owner of this claim in the Jackson Basin, shipped 12 tons to the smelter at Trail. Gross contents: Silver, 287 oz.; lead, 4,898 lb.; zinc, 5,156 lb.

Payne Mine.—This mine was formerly one of the principal producers in the Slocan. It was recently acquired by R. A. Grimes, of Nelson, who made some repairs to the road, erected a new building at the old camp, and started cleaning out No. 5 level.

SANDON (49° 117° N.E.).*

Silver-Lead-Zinc.

Ruth Hope and Carnation, etc. (Kelowna Exploration Co., Ltd.).

Company office, 75 West Street, New York, N.Y.; mine office, Sandon, for this work only. This private company relinquished its option on the Ruth Hope group early in the year. It retained its claims in Carnation Basin, however, and continued the geological investigation of this ground. A road was made from the Silver Ridge road to the portal of the No. 2 level of the old Carnation mine. A crew of three men was then engaged in reopening this level until December 18th. The work was all done under the supervision of Dr. E. B. Mayo.

A small shipment of 6 tons to the Trail smelter was made by leasers, J. C. Black and Cecil Higgins. Gross contents: Silver, 326 oz.; lead, 3,010 lb.; zinc, 3,566 lb.

Silver Ridge Mining Co., Ltd.

Company office, 373 Baker Street, Nelson; mine office, Sandon. John B. Babbage, president; R. A. Grimes, vice-president; Harry P. Pearson, managing director. Capital: 3,000,000 shares, 50 cents par value.

This company is doing exploratory work on the Silver Ridge group at Sandon. An adit started in 1947 was stopped in 1948 at 2,265 feet from the portal. No veins were intersected.

In March the adjoining Wonderful group was acquired and a crosscut started about half-way in on the adit to explore for the possible extension of the Wonderful vein system. By October this crosscut had been advanced 1,500 feet, but no veins were intersected.

Considerable surface-stripping was then done with a bulldozer to try to locate a lower outcropping of a vein on the Wonderful claim believed responsible for the abundance of high-grade float. It was found, however, that the depth of overburden made this procedure impractical, and thus a crosscut adit was started; compressed air for this purpose was extended by a line down the hillside from the compressor-house at the main adit. It is reported that, after driving the adit 100 feet, an oxidized zone was intersected, and this was drifted on for 80 feet before it was decided to return to the main adit for winter work.

Corinth.—The Silver Ridge Mining Company gave a lease on this property to M. Ansaldo, W. Smith, and A. Olsen, who made a shipment of ore obtained from surface cuts. Production: Ore shipped, 35 tons. Gross contents: Gold, 2.52 oz.; silver, 1,065 oz.; lead, 27,588 lb.; zinc, 8,862 lb.

Sylverite Mines, Ltd.—Company office, 470 Granville Street, Vancouver. Capital: 3,000,000 shares, 50 cents par value. This company employed three men on its property above the Violamac mine at Sandon. From a dump on the Black Colt claim, leasers shipped 7 tons of ore. Gross contents: Gold, 0.354 oz.; silver 199 oz.; lead, 2,037 lb.; zinc, 2,971 lb.

* By J. W. Peck.

Silversmith.—E. Petersen and S. Marzoli continued in 1948 to ship sorted ore from the No. 3 level dump of the old Silversmith mine. Production: Ore shipped, 21 tons. Gross contents: Silver, 1,438 oz.; lead, 22,197 lb.; zinc, 4,397 lb.

Noble Five.—This property is at Cody, a few miles east of Sandon. L. P. Gormley made a shipment of 32 tons of salvaged concentrates. Gross contents: Silver, 497 oz.; lead, 4,116 lb.; zinc, 18,172 lb. E. Bakos also made a shipment of 1½ tons of ore. Gross contents: Silver, 58 oz.; lead, 672 lb.; zinc, 243 lb.

Violamac Mines (B.C.), Ltd.

Company office, 67 Yonge Street, Toronto; mine office, New Denver. Viola McMillan, president. This Company, which is a wholly owned subsidiary of Violamac Mines, Limited, purchased the old Victor mine from the estate of the late Mrs. D. Petty, of Nelson. The lease held by E. Doney was also purchased.

Old hand-steel methods of mining were discarded in favour of a small compressor and pneumatic rock-drills. Work was started to advance No. 4 level to the projected downward continuation of a vein mined in the upper levels. During the first week of October this drive, which had turned slightly to the left following oxidized material, unexpectedly intersected a 2-foot lead of galena and sphalerite. Drifting was done both ways on this high-grade showing, and ore obtained was immediately trucked to Trail.

While bulldozing at the portal of the No. 1 adit, a small lead of galena was uncovered a few feet to the left of the portal. By using hand-steel a crosscut was started 70 feet inside the portal, but after driving 20 feet, the vein was not intersected and work stopped temporarily.

This company also owns the adjoining Lone Bachelor mine. A road was bulldozed to a point about 140 feet below the No. 3, or bottom, level, and a portal-site cleared there. Underground work will be done after compressed-air lines are extended from the Victor site.

The old buildings were rehabilitated and a small dry erected. Toward the end of the year, work was started on a large bunk-house. About ten men were employed under the direction of George McMillan.

Production: Ore shipped, 220 tons. Gross contents: Gold, 10 oz.; silver, 26,592 oz.; lead, 237,382 lb.; zinc, 56,306 lb.

IDAHO PEAK (49° 117° N.E.).*

Silver-Lead-Zinc.

Alamo Silver Lead Mining Co., Ltd.

Company office, 11 King Street West, Toronto; mine office, New Denver. G. B. Webster, president; W. S. Ellis, mine manager. Capital: 3,000,000 shares, $1 par value. This company was incorporated in 1948 and acquired the Queen Bess, Alamo, and Idaho groups on Idaho Peak. A small crew repaired the road, cleaned out No. 10 portal of the Queen Bess, No. 5 portal of the Idaho, and the lower portal on the "C" vein, also on the Queen Bess. The option was then abandoned.

SLOCAN LAKE (49° 117° N.E.).*

Silver-Lead-Zinc.

Bosun (Santiago Mines, Ltd.).

Company office, 423 Hamilton Street, Vancouver; mine office, New Denver. R. Crowe-Swords, president; T. R. Buckham, mine manager. Capital: 6,000,000 shares, 50 cents par value. This property was operated throughout the year on a small scale. Development-work and stoping were restricted to a vein on No. 6 level about 1,000 feet from the portal. Foundations were poured for a 40- to 50-ton mill, and ore shipments were made to the White-

* By J. W. Peck.

water mill to obtain data on the milling requirements. Higher-grade ore was also shipped direct to Trail. Production: Ore shipped, 1,194 tons. Gross contents: Gold, 6 oz.; silver, 30,848 oz.; lead, 178,504 lb.; zinc, 236,236 lb.; cadmium, 759 lb.

Western Exploration Co., Ltd.—Company office, Silverton. A. M. Ham, general manager; R. A. Avison, mine superintendent. Capital: 2,000,000 shares, 50 cents par value. This company owns the Mammoth and Standard mines near Silverton and the Enterprise mine on Enterprise Creek, about 12 miles to the south of Silverton.

Standard.—At this mine the major part of the work was the extraction of ore remnants on the No. 5 and No. 6 levels and some new development in connection with a hanging-wall split off the main vein. The rehabilitation of No. 7 level was continued to a point about 4,000 feet from the portal.

Production from the mine was maintained at about 45 tons per day. In addition, during part of the year about 200 tons per day was shipped to the mill from No. 5 dump. Trucking costs between mine and mill were calculated to be 85 cents per ton. The number of men employed averaged fifty.

Mammoth.—This mine remained closed throughout 1948, but in September a new adit, called the No. 9, was collared about 320 feet below the No. 7, or lowest, level. The new adit is being driven to reach the downward extension of the Mammoth vein, which was diamond-drilled in 1944. With a contract crew of ten the adit was advanced steadily, and over half its estimated length of 1,050 feet had been completed when work stopped in December.

Enterprise.—At this mine, ore-bodies developed above the No. 6 and No. 7 levels did not prove to be as continuous as was first hoped. Nevertheless, stoping from this area was maintained at an average of about 30 tons per day, the ore being trucked 12 miles to the mill at Silverton. Some work was done in reopening the No. 8 level, and also some development on the No. 6 level. The number of men employed averaged thirty.

Standard Mill.—This mill at Silverton treated ores from the Standard mine and the Enterprise mine of the company and custom ore from the Galena Farm mine.

Production: Ore milled, 20,815 tons. Gross contents: Gold, 23 oz.; silver, 151,803 oz.; lead, 943,936 lb.; zinc, 2,694,205 lb.; cadmium, 11,672 lb.

Van Roi Mines (1947), Ltd. Company office, 520 Stock Exchange Building, Vancouver. K. G. Nairn, president; N. Nairn, secretary-treasurer; N. F. Brookes, managing director. Capital: 2,000,000 shares, no par value. This company owns the Van Roi mine near Silverton. Underground development-work was done during the year on the No. 3 and No. 5 levels. The No. 3 level was opened in 1947 and a 75-foot crosscut started toward the south vein. In 1948 this crosscut was completed, and an examination of the workings indicated the possibility of ore in the east face of this south vein. Because of an adverse grade, drifting could not be commenced here, and it was decided to drive a 60-foot crosscut to the projected vein location from a point in the adit 200 feet from the portal, or 180 feet east of the 75-foot crosscut. This work was completed in 1948, and the south vein drifted on to a break-through near the 75-foot crosscut. The vein averaged about 3 feet in width, and the ore obtained was trucked to the Whitewater mill; the results indicated that this section of drift averaged over $100 per foot. Thus a good ore-body is indicated in this south-east section of the mine, though diamond-drilling on the No. 5 level, 320 feet below, did not strike the ore.

On the north vein on the No. 5 level a 9-foot crosscut to the south at a point approximately 500 feet from the portal intersected a 2-foot vein carrying ruby-silver. The vein appeared to be parallel to the main north drift, but no further work was done here in 1948.

In the west section of the mine, diamond-drilling was done on the No. 4 level. In December drifting was started on the No. 3 level to explore possible upward extension of these drill results. It is the management's intention to also extend this drift beyond the Van Roi fault to establish a drill station for exploratory drilling. The Humbolt claim, which adjoins the Van Roi holdings to the west and the Hewitt mine to the east, was obtained, as it lies to the west of the Van Roi fault.

Development: Drifting, 310 feet; crosscutting, 137 feet; open-cuts, 43 feet; diamond-drilling, 2,010 feet. The number of men employed averaged seven.

Production: Ore shipped to Whitewater mill, 711 tons. Gross return of concentrates shipped to Trail: Gold, 2.5 oz.; silver, 6,476 oz.; lead, 31,090 lb.; zinc, 78,660 lb.; cadmium, 616 lb.

Galena Farm. This property continued to be operated under lease by F. Mills, of Silverton. With two partners he completed the mining of the surface ore-remnant he was mining last year. New ore possibilities were then found in the Main Lode off the main crosscut level. With the crew increased to five, the bulk of the 1948 tonnage came from this area. In December the Noonday Lode was reopened and good ore-remnants were discovered in a sub-level about 60 feet above the main level. Work was concentrated here at the end of the year. Ore obtained was crushed in a small jaw-crusher and then trucked to the Western Exploration Company's mill at Silverton, but 23 tons of high-grade ore was trucked directly to the smelter at Trail. Ore shipped, 815 tons. Gross contents: silver, 6,792 oz.; lead, 52,245 lb.; zinc, 151,964 lb.

[Reference: *Geol. Surv., Canada*, Mem. 184, p. 43.]

Metallic. This property is situated alongside the Silverton–Hewitt Road about 2 miles south of Silverton. It is owned by A. S. MacAulay, L. S. MacAulay, and R. S. White and was optioned to W. Crowe and A. K. Lotz, who optioned the property to F. L. Kersey, of Spokane.

Mr. Kersey started a raise between the two levels on the property about 350 feet in from the portal of the lower level. This raise was on the shear, but apparently did not expose any ore. Mr. Kersey then ceased work, and the property remained idle until fall, when Messrs. Crowe and Lotz made a small shipment.

Production: Ore shipped, 6½ tons. Gross contents: Silver, 559 oz.; lead, 2,244 lb.; zinc, 1,441 lb.

Buster.—This group lies below the Metallic and consists of the Buster No. 1, Buster No. 2, and Buster No. 3. It is owned by R. J. White, of Nelson. Some stripping was done by bulldozer.

Dumac Mines, Ltd. Company office, 744 Hastings Street West, Vancouver. At the property of this company, situated down-stream from the Enterprise mine on Enterprise Creek, the proposed development-work outlined in the 1947 Minister of Mines Report was not done. Operations were suspended early in 1948 after a little additional surface-trenching was completed. A trial shipment of 6.27 tons shipped to Trail yielded: Gold, 0.16 oz.; silver, 208 oz.; lead, 652 lb.; zinc, 1,454 lb.

Mabou, Ohio, and Svanhild (Terley Mining, Milling and Smelting Corporation). Head office, 1946 Gregory Way, Bremerton, Wash.; British Columbia office, 507 Baker Street, Nelson. R. D. Austin, president. Very little work was done in 1948 on the Mabou, Ohio, and Svanhild claims, situated on the southern side of Enterprise Creek valley. In December, however, some surface diamond-drilling was begun on the Svanhild claim under the direction of W. S. Hamilton. A trial shipment of 4.21 tons to the smelter at Trail from the Svanhild contained: Silver, 10.53 oz.; zinc, 76 lb.

White Hope (Spokane Slocan Co.). Company office, 626 Pender Street West, Vancouver. M. L. Craig, president. Capital: 2,500,000 shares, 10 cents par value. This Washington company was formed in September, 1948, to acquire the White Hope group of claims located alongside the highway a few miles north of Slocan City. The company also acquired the Homestake, the Senator, the Get-there-Eli, and V and M claims.

GWILLIM CREEK (49° 117° N.W.).*

Antimony.

Caroline Group (Antimony Mines and Metals (Slocan), Ltd.). Head office, Hutton Building, Spokane, Wash.; British Columbia office, 420 Broadway West, Vancouver; mine office, Slocan City. J. Birss, president; M. Hretchka, secretary and mine manager. Capital: 200,000 shares, 50 cents par value. This company purchased the Caroline group of seven claims from J. N. Russell, of Slocan City. The property is on the south side of Gwillim Creek, locally called Goat Creek, about 7 miles west of Slocan City. To reach the property, an old wagon-road to the base camp has been repaired and one-quarter mile of new trail has been built.

The showing consists of a quartz vein which lies in the bed of a northerly flowing tributary of Gwillim Creek. The country rock is a granite gneiss. The hillside is quite steep, and the vein is exposed along the creek-bed for a vertical height of 1,500 feet. The vein ranges in width from 2 feet to 5 feet and, where seen, appeared to be nearly vertical. Small lenses of stibnite, up to 3 inches in width, were seen in two exposures.

In 1948 work did not start until October. As the old logging-road to the property had been abandoned for many years, work was restricted to putting this in shape; a small portable compressor was used in the necessary rock-work. Snow forced a shut-down in December, but it is the company's intention to drive an adit near the bottom exposure of the vein.

SPRINGER CREEK (49° 117° N.E.).*

Silver.

Ottawa.—This property was leased during 1948 to J. S. Kleman and J. J. McDonell, who mined in the vicinity of the west drift, No. 7 tunnel. The partners worked until May 1st. Production: Ore shipped, 58 tons. Gross contents: Silver, 16,395 oz.

Silver-Lead-Zinc.

Arlington. This property was optioned by B. I. Nesbitt, F. Crosby, and H. V. Dewis, who proposed to erect a mill to treat an old dump. This plan has not been carried out, but the property was leased to J. J. McDonell, who made a shipment from the dumps in September. Production: Ore shipped, 69 tons. Gross contents: Silver, 1,144 oz.; lead, 12,390 lb.; zinc, 9,803 lb.

Silver Leaf. This property, which is owned by D. S. Webster, adjoins the Arlington on Speculator Creek, a tributary of Springer Creek. It was operated under lease by J. J. McDonell, who shipped ore from a dump that is reported to be ore mined in the Arlington workings and dumped on the Silver Leaf. Production: Ore shipped, 4½ tons. Gross contents: Gold, 0.02 oz.; silver, 117 oz.; lead, 973 lb.; zinc, 702 lb.

Southern Cross (Northern Light). The Southern Cross group of six claims is a restaking of ground that was formerly covered in part by the cancelled Crown-granted Northern Light claim. The claims are at the headwaters of the east fork of Robinson Creek and are accessible from Slocan City by 2½ miles

* By J. W. Peck.

of road plus 2½ miles of trail. The altitude of the workings is approximately 4,300 feet. The claims are owned by J. G. Tarnowski and associates, of Trail.

On the Southern Cross No. 1 claim, or former Northern Light, old workings were opened up. The upper working consisted of a 75-foot adit that had been driven in a direction north 70 degrees east on a narrow, nearly vertical quartz vein. As the adit had been driven just under the overburden, and some underhand stoping had also been done, examination of the vein was not possible as the workings were full of water. During 1948 the partners completed a large open-cut to intersect the westerly end of the tunnel. Here it could be seen that a 3-foot ribboned quartz vein striking at right angles to the adit had been sunk on for about 8 feet below the floor of the adit. Work was then concentrated in opening up the lower workings, which consisted of an adit about 25 feet lower in elevation driven on a narrow lead that appeared to strike about parallel to the upper workings. The portal was retimbered and the adit was driven by hand-steel, the object being to turn the tunnel to get underneath the upper workings for drainage. When work ceased in September, the adit had been driven 72 feet, with the face estimated to be still about 200 feet from the west end of the upper workings.

[Reference: *Geol. Surv., Canada*, Mem. 184, p. 182.]

Larry.—From this property, just south of Slocan City, Mrs. B. Ward shipped 3½ tons. Gross contents: Gold, 0.15 oz.; silver, 5 oz.; lead, 7 lb.; zinc, 28 lb.

LEMON CREEK (49° 117° N.E.).*

Silver-Lead-Zinc.

Piedmont (Hope).—This property, owned by R. D. Kennedy, of South Slocan, was operated under lease in 1948. Two shipments of ore from a dump were made to the Trail smelter. Production: Ore shipped, 25 tons. Gross contents: Silver, 138 oz.; lead, 2,861 lb.; zinc, 6,955 lb.

LARDEAU (50° 117° N.E.).*

FERGUSON.

Silver-Lead-Zinc.

True Fissure (Comara Mining and Milling Co., Ltd.). Head office, 815 Queen Street West, Toronto. This property, situated 3 miles by road from Ferguson, had very little work done on it in 1948. The crew of eight men was laid off in July after doing a little additional recovery work on No. 3 level and shoring up the mill building. At the time of shut-down a large portable compressor had arrived at Ferguson, and before installing it at the mine, the company had intended to use it for rock-work to widen the road.

DUNCAN RIVER.

Silver.

Surprise.—J. Gallo, one of the owners of this property, employed two men during the first part of the year building trail and removing a little ore for shipment to Trail. No work was done after June. Production: Ore shipped, 36 tons. Gross contents: Gold, 0.6 oz.; silver, 1,148 oz.; lead, 72 lb.; zinc, 864 lb.

UPPER ARROW LAKE (50° 118° N.E.).*

Zinc.

Big Ledge. The Consolidated Mining and Smelting Company has an option on this property on Pingston Creek, on the west side of Upper Arrow Lake. Starting in June and ending in September, an intensive programme

* By J. W. Peck.

of exploratory diamond-drilling was carried out. In ten holes a total of 4,550 feet was drilled. Eight men were employed.

LIGHTNING PEAK (49° 118° N.E.).*

Silver-Lead-Zinc.

Paycheck Mining and Development Co., Ltd. Company office, 804 Silica Street, Nelson. H. A. McKen, president and managing director. Capital: 4,000,000 shares, no par value. This company controls a group of claims on Lightning Peak, including the Director, Paycheck, Dictator, and Waterloo claims. During 1948 most of the work consisted of improving the 19 miles of road from the Monashee Highway. Two small trial shipments were also made from the Director dump. Eight men were employed.

Production: Ore shipped, 9½ tons. Gross contents: Gold, 0.06 oz.; silver, 230 oz.; lead, 1,539 lb.; zinc, 3,924 lb.

KINGSGATE (49° 116° S.E.).

Silver-Lead.

Blackmore.—This property is north of Kingsgate. H. D. Blackmore made a shipment of 5 tons. Gross contents: Silver, 12 oz.; lead, 19 lb.

MOYIE LAKE (49° 115° S.W.).*

Silver-Lead-Zinc.

St. Eugene Mining Corporation, Ltd.—Geological mapping of this property extended into 1948 under the supervision of A. Smith. Some magnetometor work was done over Moyie Lake during the winter.

Society Girl. M. Nicholson, owner, assisted by J. Sullivan, made a shipment of seven cars to Trail from the dumps of this old property, which is 2 miles east of Moyie. A 40-ton ore-bin was built at Moyie. Production: Ore shipped, 333 tons. Gross contents: Silver, 714 oz.; lead, 64,684 lb.; zinc, 3,177 lb.

KIMBERLEY (49° 115° N.W.).*

Silver-Lead-Zinc.

Sullivan (Consolidated Mining & Smelting Co. of Canada, Ltd.). Company office, 215 St. James Street West, Montreal; mine and smelter office, Trail. R. E. Stavert, Montreal, president; R. W. Diamond, Trail, vice-president and general manager. Sullivan mine office, Kimberley; J. R. Giegerich, mine superintendent; H. R. Banks, mill superintendent. Capital: 4,000,000 shares, $5 par value. The company owns and operates the Sullivan mine on Mark Creek, near Kimberley, and the Sullivan concentrator at Chapman Camp. The following report, drawn up by the management, covers the details of the 1948 operation.

Plant Additions.—Steel-work in No. 1 shaft, which was completed from the surface to the 3350 level in 1947, was extended a further 200 feet and loading pockets and cartridges were installed.

A new sub-station at the collar of No. 1 shaft was constructed to take care of power requirements for the new crusher plant, a proposed crushing unit on the 2800 level, possible new compressor equipment, and for extension of the present conveyor system.

An addition to the temporary steel-shop was constructed on the surface on the 3900 level. All drill-steel and bits are now prepared on the surface, and the use of underground shops has been discontinued.

* By J. W. Peck.

Mine Safety.—The underground school of instruction continued to function satisfactorily, and 608 men were given this training during the year. In addition, 32 men were also given a month's instruction in the mining-school.

During the year 12 men were trained in mine-rescue work and were successful in their examinations. The annual East Kootenay mine-rescue competitions were held in Chapman Camp this summer. No. 2 Sullivan Mine team placed first in competition with six other teams. Two fully trained mine-rescue teams are on call for emergencies in the mine and district. A fully equipped mine-rescue car has been constructed, is stationed at the mine portal, and is available on short notice.

St. John Ambulance awards were given to 150 men this year, and 29 employees passed the first-aid attendant's industrial examination. Eight district teams competed in the East Kootenay competitions, held at Chapman Camp; Sullivan Mine teams won the top three awards.

Ventilation.—Mechanical ventilation of the mine varied from 324,000 to 400,000 cubic feet per minute. Installation of two 125,000-cubic-feet-per-minute fans to operate on primary exhaust at No. 23 shaft was completed this fall. The main air-intake raise from the 3350 level through to the surface at 4450 elevation was completed. A 1,000-foot drift and 700-foot raise to the surface were also completed for ventilation of the new underground crusher plant which will be in operation in 1949.

Fourteen new fans were added to the ventilation equipment to bring the total units on hand to fifty-seven. All small units are being changed from 440/220 volts to 550 volts.

Average mine temperature was 53° F., with relative humidity from 65 per cent. to saturation. Routine monthly dust-sampling by Konimeter continued. A large-type air-water blast spray for development-headings was introduced and is proving satisfactory. Aluminium-dust treatments were given regularly in the main dry.

Sink-Float Project.—The new 3700 level tunnel was completed on September 17th; 6,469 feet was driven in 1948 for a total length of 10,375 feet. In addition, a passing-track, 783 feet in length, was completed. The excavation of the new 5,000-ton coarse-ore storage-bin and the new crushing-chamber was completed. Excavation of a 12,500-ton fine-ore storage-bin will be finished at the year-end. No start has been made on installing equipment. Permanent tunnel support where required, installing a concrete ditch, bringing the track to grade, and welding rails are now in progress. Erection of the sink and float mill at the concentrator is expected to be complete at the year-end.

Personnel and Housing.—Adjoining McDougall, a new townsite known as Lois Creek Subdivision has been laid out, and construction of 170 houses is well under way. On completion, these homes will be sold to employees on a plan financed by the company.

Labour turnover was again heavy, with new starts numbering 779 and quits 727.

Mine Developments.—Tungsten-carbide bits for drilling chert were introduced, and results have been very encouraging. Pillar-mining is increasing, and two methods, for small and large pillars, have been developed. Small pillars are first cut off at the hanging wall and the back is forced to cave until the pillar is surrounded by caved material. The remainder of the pillar is then drilled off by blast-hole machines. The pillar is usually blasted in one shot and the ore drawn off through draw-holes from a slusher-drift in the foot-wall.

Large pillars, which are always surrounded by fill or cave, are mined in sections. In each section a slot from hanging wall to foot-wall is cut. The shell on three sides of the slot is then drilled by blast-hole diamond-drills and blasted in one shot. The muck is drawn off through slusher-drifts in the foot-wall. Each successive section is mined in the same manner.

Development: Drifting, 6,236 feet; crosscutting, 14,001 feet; raising, 30,023 feet; shaft-sinking, 391 feet; diamond-drilling, 55,826 feet. Production: Ore milled: 2,283,625 tons.

Conwest Exploration Co., Ltd.—In 1947 this company held a large block of ground south-east of the Sullivan. Diamond-drilling begun in the latter part of that year was not satisfactory and was not continued into 1948, Only surface-prospecting was done; most of the claims were permitted to lapse.

WINDERMERE (50° 116° S.E.).*

Silver-Lead-Zinc.

Paradise. This property, approximately 19 miles by road to the west of Athalmere, is owned by Sheep Creek Gold Mines, Limited. Following an underground survey by Dr. A. G. Pentland, the company decided to reopen the mine in late summer. The road was made serviceable, and an underground programme was started under the direction of J. Crowhurst. A new adit was collared at the 7700 level, 100 feet below the 7800, or main and bottom, level. In addition to this, drifting was started on the 7930 sub-level with the intention of raising to the 8000 level to get around a caved area to provide ventilation and a second exit. This programme was soon abandoned for the winter, and work was concentrated on the building of a mill at Jackpine, 7½ miles below the mine. Mill equipment is to come from the Euphrates mill near Nelson.

SPILLIMACHEEN (50° 116° N.E.).*

Silver-Lead.

Silver Giant Mines, Ltd. During the early part of the year, work at this property, which is 7 miles by road west of Spillimacheen, was restricted to shipping ore from the dump. All available ore was shipped. Later some old mining and milling equipment purchased from the Dawson Gold Mines, Limited, was placed on the property with the intention of bringing the mine into production with no outside financial assistance.

Plans were changed, however, when an agreement was made with the Siscoe Gold Mines, Limited. This company put a crew of about twenty men on the property, together with necessary equipment to start underground development, under the supervision of C. M. Campbell. This work was started by the end of the year.

Production: Ore shipped, 294 tons. Gross contents: Silver, 415 oz.; lead, 37,549 lb.; zinc, 4,066 lb.

McMURDO CREEK (51° 117° S.E.).*

Silver-Lead-Zinc.

Crown Point Group. This property is at the head of a tributary of McMurdo Creek, 40 miles by road from Parson. The road was recently completed but is still impassable for cars. A diamond-drilling programme was started in 1948 under the direction of Wilson Mellen, president of Beverly Mines, Limited. It is understood that some assessment-work was done by the same company on the Ruth Vermont group on Vermont Creek.

FIELD (51° 116° S.E.).*

Silver-Lead-Zinc.

Monarch and Kicking Horse Mines (Base Metals Mining Corporation, Ltd.). Head office, 1309 Royal Bank Building, Vancouver. E. J. Gleason, mine manager; C. Disney, mine superintendent; L. N. Garland, mill superintendent. Capital: 3,000,000 shares, no par value. This company is mining zinc ore from the Kicking Horse mine and lead-zinc ore from the Monarch mine. At the former, production has been from No. 4 stope, but diamond-drilling on No. 1 level has revealed additional ore. This is being developed by drifting on that level. A raise to be

* By J. W. Peck

driven in conjunction with this development from No. 1 level to No. 4 level should greatly improve the ventilation of the mine.

At the Monarch mine, work has been restricted to that part known as the East Monarch. Diamond-drilling ahead of the 200 C stope has revealed an important body of high-grade lead-zinc ore. Mining of this flat-lying ore-body proceeded throughout 1948, the ore being removed by slushers to raises served by development-drifts below. Further development is also being done on a block of ore indicated by diamond-drilling as lying near the 200 A stope.

Both lead and zinc concentrates are now shipped to the Consolidated Mining and Smelting Company smelter at Trail. The Kicking Horse mine continued to produce the bulk of the zinc, with the lead production coming from the Monarch mine. The number of men employed averaged sixty. The mill operated 366 days.

Production: Ore milled, 34,394 tons. Gross contents: Silver, 23,709 oz.; lead, 2,116,092 lb.; zinc, 6,191,633 lb.; cadmium, 13,281 lb.

KINBASKET LAKE (51° 118° N.E.).*

Silver-Lead-Zinc.

Kootenay Exploration, Ltd.

Company office, 560 Baker Street, Nelson. W. S. Hamilton, president. Capital: 200,000 shares, 50 cents par value. This company, formed in 1948, obtained a group of ten claims on the south-west end of Kinbasket Lake. Two of the claims were the Crown-granted Mogul and Timbasket claims. Little work was done in 1948 other than an exploratory survey by W. S. Hamilton.

HOWE SOUND (49° 123° N.E.).†

Copper-Zinc.

Britannia Mining and Smelting Co., Ltd.

Head office, 730 Fifth Avenue, New York City; H. H. Sharpe, president; mine office, Britannia Beach; E. C. Roper, manager; T. M. Waterland, mine superintendent. Capital: 100,000 shares, $25 par value. This company operates the Britannia mine, situated at Britannia Beach, Howe Sound, where ships from Vancouver call daily. The ore deposits occur in shear-zones as veins and tabular bodies ranging up to nearly 60 feet in width. Chalcopyrite, pyrite, and sphalerite are the main ore minerals.

The tons of ore broken in the various sections of the mine by different mining methods were as follows:—

	Shrinkage.	Cut and Fill.	Powder Blast and Cave.	Blast-hole Diamond-drill.	Open Square Set.	Square Set and Fill.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
No. 8 mine	12,196	6,884	.....	38,805	17,972	.....	75,857
Bluff mine	20,762	.....	128,544	383,544	.....	.....	532,789
E. Bluff mine	.....	.....	6,071	.....	.....	.....	6,071
Fairview mine	49,861	.....	86,835	23,464	.....	.....	160,160
No. 5 mine	1,000	.....	.....	.....	.....	.....	1,000
Victoria mine	.....	13,694	.....	.....	.....	26,614	40,308
Totals	83,819	20,578	221,389	445,813	17,972	26,614	816,185
Development ore	.....	.....	.....	.....	.....	.....	8,773

* By J. W. Peck.
† By R. B. King.

The development-work, which totalled 7,871 feet for all sections of the mine, was made up as follows:—

	No. 8 Mine.	Bluff Mine.	E. Bluff Mine.	Fairview Mine.	No. 5 Mine.	Victoria Mine.	Miscellaneous.	Total.
	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
Drifts	634	842	11	364	.....	7	.....	1,858
Crosscuts	370	360	.....	32	.....	.....	.....	762
Raises	2,426	1,747	8	349	.....	492	.....	5,022
Powder-blast workings	.....	11	.....	218	.....	.....	.....	229
Totals	3,430	2,960	19	963	.....	499	.....	7,871
Diamond-drilling.								
Core-drilling	670	3,385	.....	.....	.....	.....	.....	3,763
Blast-hole drilling	12,907	38,453	.....	11,327	.....	.....	266	62,953
Totals	13,577	41,838	.....	11,327	.....	.....	266	66,716

The consumption of explosives and blasting accessories for the year was as follows: Powder, 13,516 cases; No. 8 electric blasting-caps, 8,967; No. 6 blasting-caps, 233,214; safety-fuse, 1,419,712 feet; Primacord, 16,235 feet.

An active ventilation and dust-control programme has been carried on throughout the year. Several new fan units were purchased and installed. Aluminium dust has been dispersed regularly in all change-rooms.

Blast-hole diamond-drilling has been applied successfully to stope-undercutting as well as in ore-breaking. Bits tipped with tungsten carbide are being used on a limited scale for long-hole drilling.

An invigorated accident-prevention campaign has been incorporated with job safety training for all employees. Employees taking the job safety training course with a special first-aid training course increased from 10 per cent. of the crew in 1947 to 50 per cent. in 1948. The Management-Labour Accident-prevention Committee has functioned successfully throughout the year. A quarterly safety-bonus plan for all workmen is in effect, and a monthly safety bonus is paid to underground supervisors in order to encourage the efforts toward greater safety. To further the interest in first aid, annual competitions are held for the Britannia First-aid cup and the St. John Ambulance Association cup.

The total number of men employed increased from 783 at the beginning of 1948 to 825 at the end of the year, and the mine-crew employees increased from 506 to 543 in the same period. The total shifts worked in the mining department for 1948 were 133,067, as compared with 116,561 in 1947.

The total production of all mines increased from 769,224 tons in 1947 to 824,958 tons in 1948. Metals produced, including copper from the copper precipitation plant: Copper, 15,957,549 lb.; gold, 11,698 oz.; silver, 62,279 oz.; zinc, 6,612,029 lb.; lead, 495,072 lb.; cadmium, 35,632 lb. The production also included 26,637 tons of pyrite concentrates.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1947, pp. 177, 178. *Geol. Surv., Canada*, Mem. 158.]

SKAGIT RIVER (49° 121° S.E.).*

Copper.

D and J Group.

This group of six claims, held by Mrs. Della Whitehead and associates, of Hope, was examined on July 14th and 15th. Four of the claims were formerly held under the name of Silver Bell and were reported upon in the Annual Report of the British Columbia Minister of Mines for 1938, pages F 11 to F 13.

* By J. H. Bennett.

The claims are in the Skagit River valley, about 2 miles south of the Hope–Princeton Highway. From the highway a poor truck-road extends southerly about three-quarters of a mile. From the end of this road a good pack-trail continues southerly on the east side of the Skagit River. The cabins on the D and J property are close to this trail.

The workings are on the west side of the river, on a steep, heavily wooded slope. In a steep draw, at an elevation of 1,700 feet above the river and north 53 degrees west from the cabins, three small open-cuts have been made in a layer of chert which strikes north 45 degrees west and dips 40 degrees to the south-west. The chert-band is limy; the rock on either side is argillite. A short distance down the draw is a large outcrop of limestone.

Sulphide minerals are exposed in the three open-cuts and consist mostly of pyrrhotite, with some chalcopyrite. A few specks of an unidentified grey mineral were observed. Two of the open-cuts, on the northern side of the draw, are small and expose a thickness of about 1 foot of pyrrhotite and chalcopyrite. This band of mineral is not continuous in either open-cut. On the southern side of the draw a vertical face of cherty material has been exposed, which contains two stringers of pyrrhotite and chalcopyrite and some disseminated sulphides. A sample across a width of 4 feet assayed: Gold, 0.01 oz. a ton; silver, 1.2 oz. a ton; copper, 4.1 per cent. Traces of nickel, cobalt, and zinc were present. This may be the same bed exposed in the first two cuts. Here a wider section is mineralized, but how far this mineralization continues along the beds was not apparent.

At the lower workings, about 300 feet in elevation above the river, work done in the past includes stripping, trenching, and an adit. Very little new work has been done, however, since 1938; for a full description of these workings see the report on pages F 11 to F 13 of the Annual Report of the British Columbia Minister of Mines for 1938. A little more stripping has apparently been done at the north-west end of the showings, exposing some patchy mineralization; the sulphides are mostly pyrrhotite with some chalcopyrite. A sample across a width of 4 feet assayed: Gold, 0.01 oz. per ton; silver, 0.5 oz. per ton; copper, 1.2 per cent. About 90 feet southerly from here, and a few feet north of the largest open-cut, is an exposure of loosely crystallized quartz containing appreciable amounts of pyrite and arsenopyrite. The exposure is roughly 6 feet by 4 feet in size. A random chip sample taken from it assayed: Gold, 0.01 oz. per ton; silver, 9 oz. per ton.

In a draw about 250 feet westerly from these workings and about 125 feet higher in elevation, an old adit has been driven. Above the portal some stripping has been done up the slope, following the mineralized band on which the adit was driven. In one exposure about 125 feet up the slope from the portal, a sample across 34 inches of solid sulphides assayed: Gold, *nil;* silver, 0.4 oz. per ton; copper, 0.6 per cent. The sulphides are pyrrhotite with minor amounts of chalcopyrite. Along this band some calcite is present.

A.M. (49° 121° S.E.) This group is 6 miles east of Mile 28 on the new Hope–Princeton Highway, on a small tributary of the Skagit River. It is now owned by J. W. Heffernan and associates, of Vancouver. After several years of inactivity, work was resumed in 1948 under the supervision of D. Burns. Available information indicates that work was done on the 6th, or lowest, level and that an inclined hole, drilled from the surface, was directed to intersect the chalcopyrite-bearing body below this level.

TEXADA ISLAND (49° 124° N.W.).*

Gold-Copper.

Little Billie Mine (Vananda Mines (1948), Ltd.).

Company office, 640 Pender Street West, Vancouver; mine office, Vananda. A. E. Jukes, president; H. E. Doelle, managing director; F. R. Thompson, mine manager. Capital: 3,000,000 shares, $1 par value. During the year Sheep Creek Gold Mines, Limited, obtained a 31.25-per-cent. interest in this company, thus holding an equal interest with Pioneer Gold Mines, Limited. Operational control and management were assumed by Sheep Creek Gold Mines. Shareholders, in an exchange of shares, received one share of the Vananda Mines (1948), Limited, for two shares of the former company, Vananda Mining Company, Limited. F. R. Thompson succeeded C. E. Gordon Brown as mine manager.

The Little Billie is situated nearly one-half mile south-easterly from Vananda on the east shore of Texada Island. Vananda is reached by regular ship service from Vancouver. Motor-roads connect the mine with Vananda and also Blubber Bay, nearly 5 miles distant.

Lime-silicate rocks consisting mainly of garnet, diopside, and wollastonite have been sufficiently well mineralized with chalcopyrite and bornite to form, in places, mineable concentrations of these minerals. The lime-silicate rocks represent replaced limestone and, in part, greenstone dykes where these rocks are close to bodies of quartz diorite. They have an irregular tabular shape that parallels either the attitude of the greenstone dykes where near the diorite-contact or the irregular contact of the diorite itself.

The workings consist of a shaft 620 feet deep serving six levels spaced at irregular intervals. The levels are developed southerly to explore the irregular limestone-diorite contacts. Ore-bodies are mined by shrinkage-stoping.

Records of intermittent mining from 1897 to 1916 show that 6,296 tons of ore has been mined during that interval by the Vananda Copper and Gold Mining Company. For the next six years lessees worked the property. In 1929 the Central Copper and Gold Company acquired the Little Billie and did some diamond-drilling and some geophysical surveying. The property was then inactive until 1943, when the Industrial Metals and Mining Company acquired the Little Billie and adjoining properties. In 1945 the Vananda Mining Company was formed to operate the property, and work has been carried on practically continuously since then. The present company was formed early in 1948.

The main shaft on the Little Billie was enlarged to three compartments, a 60-foot A-type head-frame erected, and balanced hoisting incorporated. Underground development totalled 298 feet of drifting and crosscutting and 335 feet of raising, made up as follows:—

	Fourth Level.	Fifth Level.	Sixth Level.
	Feet.	Feet.	Feet.
Level development	.....	.....	273
Drifting	25	.....	.....
Raising—			
20 ore-body	.....	21	45
30 ore-body	51	180	.....
40 ore-body	18	.....	.....
50 ore-body	.....	20	.....

One thousand eight hundred tons of ore was mined from development-headings and stope preparation; 4,300 tons was recovered from shrinkage stoping. Stoping operations are on the 20, 30, and 40 ore-bodies on the third, fourth, and fifth levels.

* By R. B. King.

The average number of men employed during the year was fifty-one. The bunk-house and cook-house were enlarged to accommodate seventy-five men.

Approximately 3,300 tons of crude ore was shipped this year to Tacoma smelter. In November a 120-ton flotation-mill was completed, in accordance with the operational agreement, and milling started. Only 2,800 tons of ore was milled in November and December. A copper-gold concentrate is made and shipped to the Tacoma smelter. Gross production: Copper, 82,235 lb.; gold, 495 oz.; silver, 897 oz.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1944, pp. 66, 163–174; 1945, p. 114; 1946, pp. 176, 177; 1947, p. 179.]

VANCOUVER ISLAND.

ZEBALLOS (50° 126° N.W.).*

Gold.

Privateer Mine, Ltd.

Company office, 602 Stock Exchange Building, Vancouver. D. S. Tait, president; N. E. McConnell, managing director; C. H. Hewat, mine manager. Capital: 3,000,000 shares, no par value. This company operates a consolidation of the Privateer and Prident mines in Spud Valley, about 4 miles by motor-road from Zeballos.

The mine-workings are on narrow quartz-sulphide veins which dip almost vertically. The ore-bodies are mined by shrinkage stoping.

The mine is serviced by levels developed from adits—that is, 200-, 400-, 600-, 800-, 900-, 1,000-, 1,100-foot levels—and from a three-compartment shaft sunk from the 1,100-foot level, with the 1,200- and 1,300-foot levels developed from it.

The original Privateer claims were staked in 1933, and others were added to these in 1934, 1936, and 1937. A great deal of development-work was done, which resulted in the construction of a 75-ton cyanide-mill in 1938. Operations continued until October, 1943, when they were stopped for the duration of the war. In October, 1945, the mine was reopened, though milling was delayed till November, 1946. In October, 1948, operations again ceased.

In 1948, 1,115 feet of development-work was completed as follows: Drifting, 723 feet; crosscutting, 142 feet; slashing, 25 feet; raising, 127 feet; stope-raising, 98 feet. Two hundred and fifty-two and one-half feet of exploratory diamond-drilling was also done. While the mine was operated, the number of employees averaged seventy-one.

Production: Ore mined, 23,648 tons; ore milled, 14,402 tons. Gross contents: Gold, 10,484 oz.; silver, 5,059 oz.

[References: *B.C. Dept. of Mines*, Lode-gold deposits of the Zeballos area, 1938. *Minister of Mines, B.C.*, Ann. Rept., 1937 to 1947, inclusive.]

Beano (Victory Mining Co., Ltd.).

Company office, 609 Bank of Nova Scotia Building, Vancouver. Capital: 10,000 shares, $1 par value. The property is on Beano Creek, 3½ miles from the mouth of the Little Zeballos River. Victor Davies and associates are driving a short adit 25 feet vertically below the outcrop of the quartz network near the top end of the tram-line.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1947, p. 181.]

MUCHALAT ARM (49° 126° N.E.).*

Zinc.

Danzig Mine.

Company office, 911 Birks Building, Vancouver. J. C. McCutcheon, mine superintendent. The Silbak Premier Mines, Limited, is operating this property. The claims are on the south shore of Muchalat Arm

* By R. B. King.

and on Silverado Creek. It is nearly 15 miles by water route from Nootka. Weekly steamer service connects Nootka with Port Alberni and Victoria. Daily air service also connects Nootka with Vancouver.

By the end of 1948 rehabilitation of 3,400 feet of road from the mouth of Silverado Creek to the portal on the A.M. Fraction had been completed.

A portable compressor had been installed and underground development started from this portal to prospect for the possible downward extension of a surface exposure of sphalerite.

ALBERNI (48° 124° N.W.).*

Gold.

Black Panther (Nitinat Mines, Ltd.).

This property was operated by Nitinat Mines, Limited, registered office at 800 Hall Building, Vancouver, on a lease with option to purchase. The property is 22 miles by motor-road from Port Alberni. Work consisted of mining a narrow quartz-sulphide vein at the intersection of a main shear and a branch. On the second level, elevation 2,927 feet, a winze was sunk on this intersection to a depth of 60 feet. Material from stopes and the winze was milled intermittently. The average number of men employed was eleven.

Production: Concentrates shipped, 39 tons. Gross contents: Gold, 308 oz.; silver, 627 oz.; lead, 7,817 lb.; zinc, 4,478 lb.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1944, p. 158; 1947, p. 183.]

UPPER QUINSAM LAKE (49° 125° N.W.).*

Iron.

Coast Iron Co., Ltd.

Company office, 475 Howe Street, Vancouver. Capital: 500,000 shares, no par value. The property is on Iron Hill, near Upper Quinsam Lake, nearly 25 miles south-west of Campbell River. It is reached by road, which has a good grade, rising approximately 1,725 feet from sea-level to the quarry. The ore, a magnetite and magnetite-garnetite replacement, is mined by quarrying. Ore is loaded by a ¾-yard gas-shovel into 5-ton trucks and transported to Duncan Bay. There it is loaded into barges for shipment.

Prior to 1914 several tunnels were driven and open-cuts made by Seattle interests who acquired this property under lease from the Esquimalt & Nanaimo Railway. In 1916 and later the property is referred to as being under the control of the Quinsam Lake Iron Syndicate. No work had been done on the property since then until the Coast Iron Company, Limited, started diamond-drilling and quarrying late in 1948.

The present quarry is on the south-east slope of Iron Hill. Preparations are being made to start a second quarry approximately 200 feet to the north and east of this on the east slope and at the same elevation.

Since the operation started in December, ten men have been employed by the company. Loading and transportation of material is contracted and employs one shovel operator and twenty to twenty-three truck-drivers.

Approximately 1,000 tons of material has been shipped to Wenatchee, Wash., for smelting.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1916, pp. 296, 297. Iron Ores of Canada, Vol. I.]

CHEMAINUS RIVER (48° 124° N.E.).

Copper.

Comego.†

The three adjoining mineral claims, Comego, Comego No. 1, and Comego No. 2, recorded in July, 1938, are held by Duncan Powell, Thomas H. Service, and G. Lomas, of Duncan. The claims are reached from

* By R. B. King.

† By James T. Fyles.

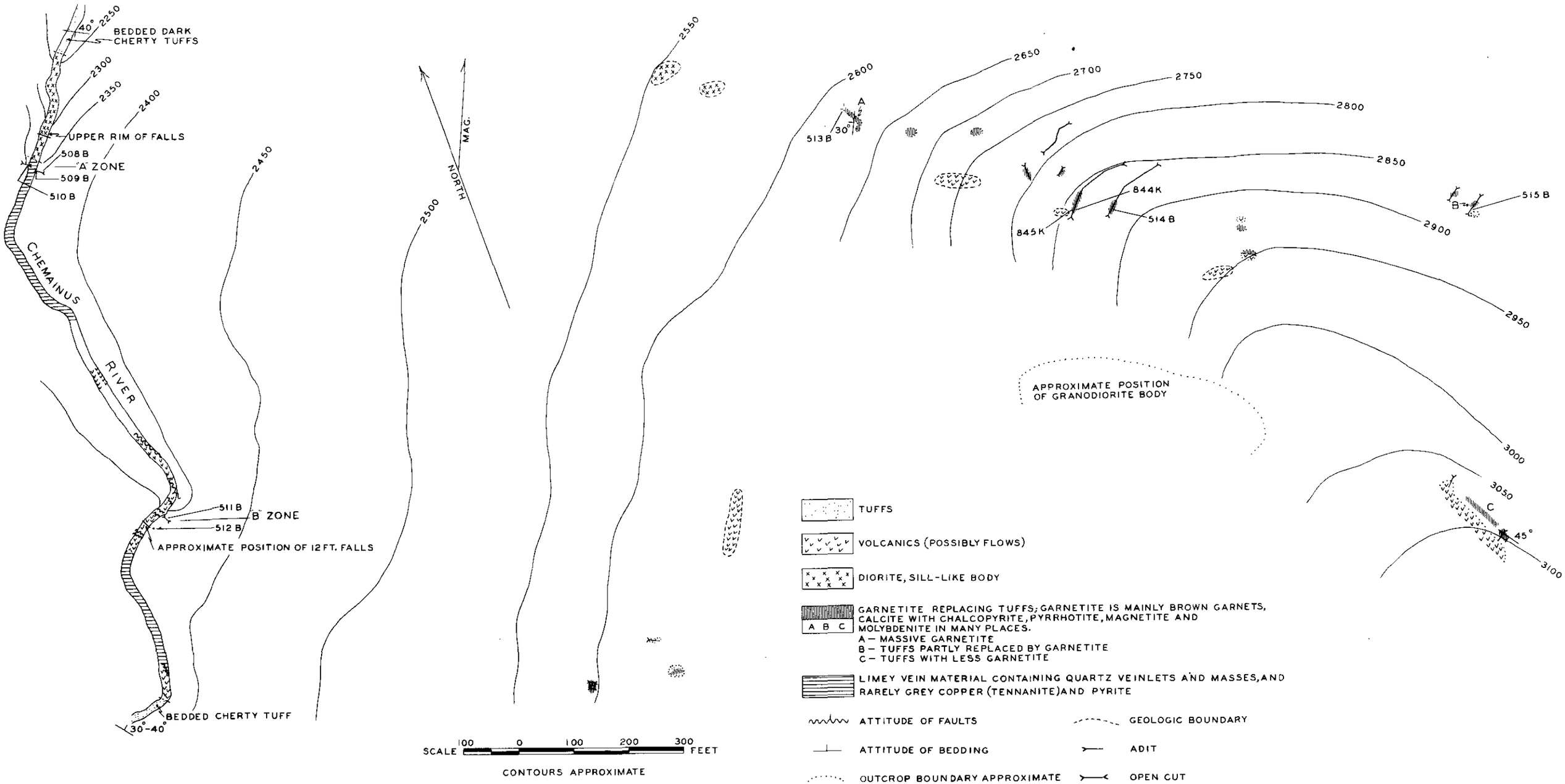


FIG. 12. COMEGO GROUP.

Youbou, a logging town on the north side of Cowichan Lake, first by 4½ miles of private logging-road, up Cottonwood Creek and its north-east tributary, Widow Creek, and then by a further half a mile of trail over the divide between the head of Widow Creek and Chemainus River. The claims are north of the divide (altitude, 2,500 feet) on the slope to Chemainus River, which here flows northward. The workings, including more than twenty open-cuts and several short adits, are between elevations of 2,300 and 3,100 feet on the east side of Chemainus River.

The area is heavily timbered and in the summer of 1948 was being logged. Outcrops are scarce, except in the bed of Chemainus River, where exposures of bedrock are almost continuous. Overburden on the claims is shallow. Where cut through by the workings, the overburden is generally less than 5 feet deep and along the banks of Chemainus River it is nowhere over 15 feet deep. The property is more or less covered with snow for three to five months of the year.

The mineralization of the Comego property is described in Memoir No. 13 of the Geological Survey of Canada (pp. 77, 164–170). A short description of the property appears in the British Columbia Minister of Mines Report for 1906 (p. 210). Most of the samples indicated on the accompanying map (Fig. 12) were taken by W. J. Lynott, who visited the property for the British Columbia Department of Mines in September, 1946. The positions from which samples were taken are shown on the figure; the assays are listed in the following table:—

Sample No.	Gold.	Silver.	Copper.
	Oz. per Ton.	Oz. per Ton.	Per Cent.
508B	0.26	0.1	9.8
509B	0.26	0.4	6.8
510B	0.02	0.2	2.3
511B	*Nil*	0.1	1.8
512B	*Nil*	*Nil*	0.2
513B	0.02	0.8	2.7
514B	0.06	0.8	3.0*
515B	*Nil*	0.4	2.5*
844K	0.02	0.5	1.8
845K	0.04	0.8	2.2

* Chip sample.

Samples 508B to 515B taken by W. J. Lynott in 1946.

Samples 844K and 845K taken by the writer in 1948.

Geology.—The claims lie within an area of tuffaceous sediments and volcanic rocks belonging to the Vancouver group and overlying or forming the upper part of the Sicker sediments. Green and light-coloured well-bedded cherty tuffs and massive purplish cherty tuffs outcrop in Chemainus River, while mineralized tuffs are exposed in the workings. Fine-grained green volcanic rocks (possibly andesitic flows) outcrop on the hillside south-east of the workings. In hand specimens of the volcanics, fine crystals of hornblende and feldspar can be distinguished, but primary structures indicating the origin of the rocks are lacking. The volcanics and cherty tuffs are probably conformable.

The tuffs are intruded by a dark sill-like body, probably diorite or gabbro in composition. The margins of the body are very fine-grained, but near the centre the texture becomes coarser and crystals of dark feldspar and pyroxene are distinguishable. The sill-like body, where it is exposed in Chemainus River north of the workings, is 200 to 300 feet thick. It outcrops east of the river for a distance of 1,200 feet.

Small, irregular feldspar porphyry dykes also intrude the tuffs and volcanics. In two open-cuts the dykes appear to be not more than 10 feet wide, but in Chemainus River, where they are well exposed, they are large and irregular in outline. The age of the dykes in relation to the other intrusives and to the mineralization is not known.

Granodiorite outcrops at several points on the hillside east of Chemainus River and just south of the workings between elevations of 2,700 and 3,000 feet above sea-level.

Because of the scarcity of outcrops on the Comego property and absence of primary structures in the volcanics, little is known of the structure of the underlying rocks. Most of the tuffs exposed in the workings and in Chemainus River north of the workings strike about north-west and dip 20 to 40 degrees south-west. In Chemainus River, south of the workings, cherty tuffs with about the same strike dip 40 degrees north-east. Mineralized tuffs in a short adit about 1,500 feet east of Chemainus River strike north 30 degrees east and dip 30 degrees north-west. Rocks of the same series in surrounding areas form a system of north-westerly trending folds. Knowledge of this structural trend, together with the above observations, suggest that the tuffs and volcanics on the Comego group may form an open north-westerly trending syncline, possibly complicated by minor cross-folds.

Many small shear-zones are exposed in Chemainus River for more than 1,000 feet up-stream and down-stream from the property. They are discontinuous, irregular in attitude, and appear to form a highly fractured area rather than part of a continuous fault-zone.

Two types of mineralization exist on the property. The first, exposed only in Chemainus River, consists of rusty-weathering quartz-carbonate veins which have developed along shear-zones. Most of the vein material consists of fragments of quartz about half an inch in diameter surrounded by carbonate veinlets, but in places the vein-matter is a fine-grained aggregate of limy and siliceous minerals and in others it is entirely fine white carbonate. The vein material is very conspicuous because it weathers an orange brown owing to the presence of iron-bearing carbonates and pyrite. It occurs in most places as tabular or lens-shaped bodies as much as 3 feet wide and 75 or more feet long in steeply dipping shear-zones. At two places along Chemainus River for distances of over 200 feet the outcrops are entirely of vein material, and the size, shape, and attitude of these bodies is obscure.

The vein material generally contains no sulphides other than pyrite, but at "A" zone* on Fig. 12 massive chalcopyrite and a grey metallic mineral, probably grey copper, occur in the carbonate as irregular masses up to 12 inches across and as disseminated grains. The mineralized carbonate at "A" zone is exposed over an area not more than 4 feet wide and 20 feet long.

The second type of mineralization is garnetite, a granular aggregate of brown garnet, other silicates, quartz, and calcite, replacing some of the tuffs. In many places the garnetite contains magnetite and sulphides which are mainly chalcopyrite, molybdenite, pyrite, and pyrrhotite.

Chalcopyrite occurs in most of the workings either as massive lenses or disseminated grains. At "A" zone two lenses of massive chalcopyrite some 2 feet wide and 4 feet long are exposed, and the surrounding garnetite over an area about 6 feet wide and 10 feet long contains disseminated chalcopyrite. At "B" zone (Fig. 12) blebs of chalcopyrite about an inch in diameter are disseminated through garnetite, but most of the chalcopyrite-bearing material appears to have been removed in trenching. A body of garnetite 300 or 400 feet long and 30 to 40 feet wide is exposed by open-cuts about 900 feet south and 1,500 feet east of "A" zone. Most of the garnetite exposed in these cuts contains chalcopyrite as massive lenses and disseminated grains. Two closely spaced cuts 1,200 feet south and 2,200 feet east of "A" zone show beds of tuff replaced by garnetite and containing considerable amounts of chalcopyrite. Chalcopyrite is the principal ore-mineral, and samples of the highest-grade material consistently contain about 2 per cent. copper over widths of 2 to 10 feet.

* "A" zone is at the point where main trail from Youbou to the Silver Leaf property crosses Chemainus River.

Molybdenite is widely distributed in garnetite in minor amounts, commonly associated with quartz and chalcopyrite. Molybdenite is conspicuous at the portal of a small adit 1,400 feet east of "A" zone, where a small irregular quartz vein, now largely removed, contains grains of chalcopyrite and molybdenite. In the adit, beds of unaltered tuff alternate with beds of garnetite free of sulphides.

Pyrrhotite and magnetite occur in minor amounts with the chalcopyrite. Pyrrhotite is the principal sulphide, and magnetite is fairly abundant in open-cuts at 3,000 feet altitude about 2,600 feet south-east of "A" zone and in others about 500 feet east and 1,200 feet south of "A" zone.

In several exposures the garnetite is seen to be confined to certain beds of tuff and larger bodies are roughly parallel to the bedding, but whether all the garnetite is conformable to the bedding is not known. Neither is it known what controls the degree and extent of garnetization nor the control and distribution of the sulphide-bodies within the garnetite.

[References: *Geol. Surv., Canada,* Mem. 13, 1912, pp. 77, 164–170. *Minister of Mines, B.C.,* Ann. Rept., 1906, p. 210.]

Sooke (48° 123° S.W.).

Introduction.

Copper.

Copper Deposits on the Sooke Peninsula.*

Copper ore was found at Sooke in 1863, and the deposits have received attention at intervals since. The copper deposits occur in a gabbroic intrusive that outcrops on the Sooke Peninsula some 15 miles west of Victoria. The numerous small rocky hills on Sooke Peninsula are largely free of overburden, but depressions between them are filled with glacial debris, which obscures the bedrock. Mount Maguire, the largest of the hills, rises to an elevation of 860 feet above sea-level. The timber cover is not heavy, but in many places the underbrush is dense.

The peninsula is bordered on three sides by the sea; Sooke Basin lying to the north, Sooke Harbour to the north-west, and Juan de Fuca Strait to the south-west and south-east. A gravel-surfaced road, a branch of the main highway from Victoria to Sooke, runs along the north-east and north-west shores of the peninsula, and trails and logging-roads connect it to some of the mine-workings. A trail a little over a quarter of a mile long runs from the main road to the Willow Grouse workings, and a logging-road about half a mile long runs from the main road to within a short distance of the King George workings. The Copper King workings are reached from the main road by an old logging-road about a mile long. This logging-road does not continue to the Old Copper mine on the south shore of the peninsula, less than a mile from the Copper King workings. A trail a little less than 1½ miles long runs from the main road along a valley east of Iron Mine hill to within a short distance of the showings on the Merryth zone.

History.

In 1863 it is reported that Capt. Jeremiah Nagle, of Victoria, discovered copper ore at Sooke. In 1864 the Sooke Copper Mining Company shipped copper ore from Nagle's property to England to be assayed. It is likely that this old prospect is the "old copper mine" referred to by Clapp in Memoir 13 (p. 180) and in Reports of the Minister of Mines of British Columbia.

In 1893 Herbert Carmichael, the Provincial Assayer, visited the copper deposits on the Sooke Peninsula and found shafts and open-cuts in rock mineralized with chalcopyrite.

In 1900 the Pacific Steel Company, of Tacoma, Wash., took a bond on several claims on Lots 79 and 83 near Iron Mine Hill, with the object of developing a large body of magnetite. They found the magnetite to be high in sulphur and contaminated with copper. In 1917 A. McVittie, of Victoria, unwatered a shaft, sunk a number of years previously, on Crown-granted land belonging to F. B. Pemberton. This shaft was probably part of the old workings of the Pacific Steel Company.

Sometime prior to 1902 the Ralph Mineral Claim, said to be near Lot 111, was located by William Ralph. A shaft was sunk and some underground development was done.

About 1901 Alexander Donaldson staked the following claims for himself and his associates: Garden Thrush, Willow Grouse, Willow Grouse Fraction, Blue Bird, Donaldson, Jack, and Sydney, on the north-west slope of Mount Maguire. Shortly afterwards the claims were acquired by H. B. Thomson and associates who had them Crown-granted in 1908. In 1915 and 1916 the Willow Grouse Syndicate, consisting of R. G. Mellin, R. Hincks, and others, leased the claims and shipped to Tacoma 834 tons of

* By James T. Fyles. The field-work on which the following notes are based was done in May and June, 1948, and was devoted to studying copper mineralization. Magnetite deposits low in copper are mentioned under "History" but were not studied in the field.

copper ore containing 9 oz. of gold, 217 oz. of silver, and 119,738 lb. of copper. In 1917 and 1918 the Ladysmith Smelting Corporation took over the Willow Grouse group and shipped 547 tons of ore, yielding 64 oz. of silver and 15,630 lb. of copper. The total recorded production during the years 1915, 1916, and 1918 was 1,413 tons, yielding 9 oz. of gold, 281 oz. of silver, and 135,368 lb. of copper. In 1925 the Willow Grouse was Crown-granted to Alice G. Brennan, and in 1931 the Willow Grouse, Donaldson, and Jack were owned by C. V. Brennan, of Britannia Beach. The remainder of the Willow Grouse group had reverted to the Crown.

In 1911 Frank Caffery staked the King George, which adjoins the Jack claim, of the Willow Grouse group. In 1916 several open-cuts were made to outline an ore-body.

Prior to 1916 the Margaret, Copper King, and Eureka Mineral Claims, on the southern slope of Mount Maguire, were staked by Dan Campbell and associates on Crown-granted land owned by A. R. Johnson and B. H. Johns. Some development-work was done by Campbell before it was realized that the mineral claims carried rights to the precious metals only. Some development-work was done by Johns on behalf of the owners of the Crown grant. Early in 1917 O. B. Gerle, of Pitt Meadows, leased the property and built a wagon-road from the mine-workings to a wharf on Dr. Francis' farm on Sooke Harbour. In 1917 and 1918, 559 tons of ore, containing 6 oz. of gold, 92 oz. of silver, and 42,245 lb. of copper, was shipped to Tacoma. In 1919 the Copper King, Copper King Fraction, Eureka, and Margaret were Crown-granted to W. H. R. Collister and J. R. Collister.

In 1947, of the old Crown grants, only the King George, owned by the estate of Frank Caffery, and the Sydney, owned by Harold P. Johns, were in good standing. Late in 1947 Frank Cooke obtained leases on the following reverted Crown grants: Blue Bird, Garden Thrush, Donaldson, Eureka, Margaret, and Copper King Fraction, and H. H. Huestis obtained leases on the Willow Grouse and Copper King. More than fifty mineral claims were located by Frank Cooke, H. H. Huestis, Frank Merryth, George Griffith, and associates over the old copper properties. Further stakings by Bert Goodridge and E. B. Johnson were recorded early in 1948.

General Geology.

The Sooke Peninsula is underlain by a differentiated gabbroic intrusive* of Tertiary age. Olivine gabbro underlies a large area of the central part of the peninsula. Augite gabbro outcrops around the edges of the intrusive, and small bodies of anorthosite occur principally near its centre.

Alteration of both types of gabbro to hornblende has taken place along zones of shearing. Some of these zones are more than 100 feet wide and half a mile long and are shown as major faults on Cooke's map of East Sooke.† The degree and extent of the alteration varies, and hence the boundaries of the shear-zones are not well defined. Partial alteration of the gabbro, in which the augite has been changed to hornblende, is widespread, and the resulting rock has been termed hornblendite. Complete alteration has produced veins of coarse-grained, almost pure hornblende. Fractures and faults in the hornblendite and hornblende have been filled by chalcopyrite. Disseminated chalcopyrite occurs throughout much of the hornblendite, and massive chalcopyrite is commonly associated with coarse-grained hornblende. Coarse hornblende and relatively high concentrations of chalcopyrite seem to occur at points where minor faults intersect the main shear-zones.

At least five of these mineralized zones have been explored by adits, shafts, or open-cuts, and ore has been shipped from at least two of them. The properties on which

* See *Geol. Surv., Canada*, Mem. 96, pp. 304–329, for a full description of the East Sooke intrusive.

† Map 167A accompanying *Geol. Surv., Canada*, Mem. 96.

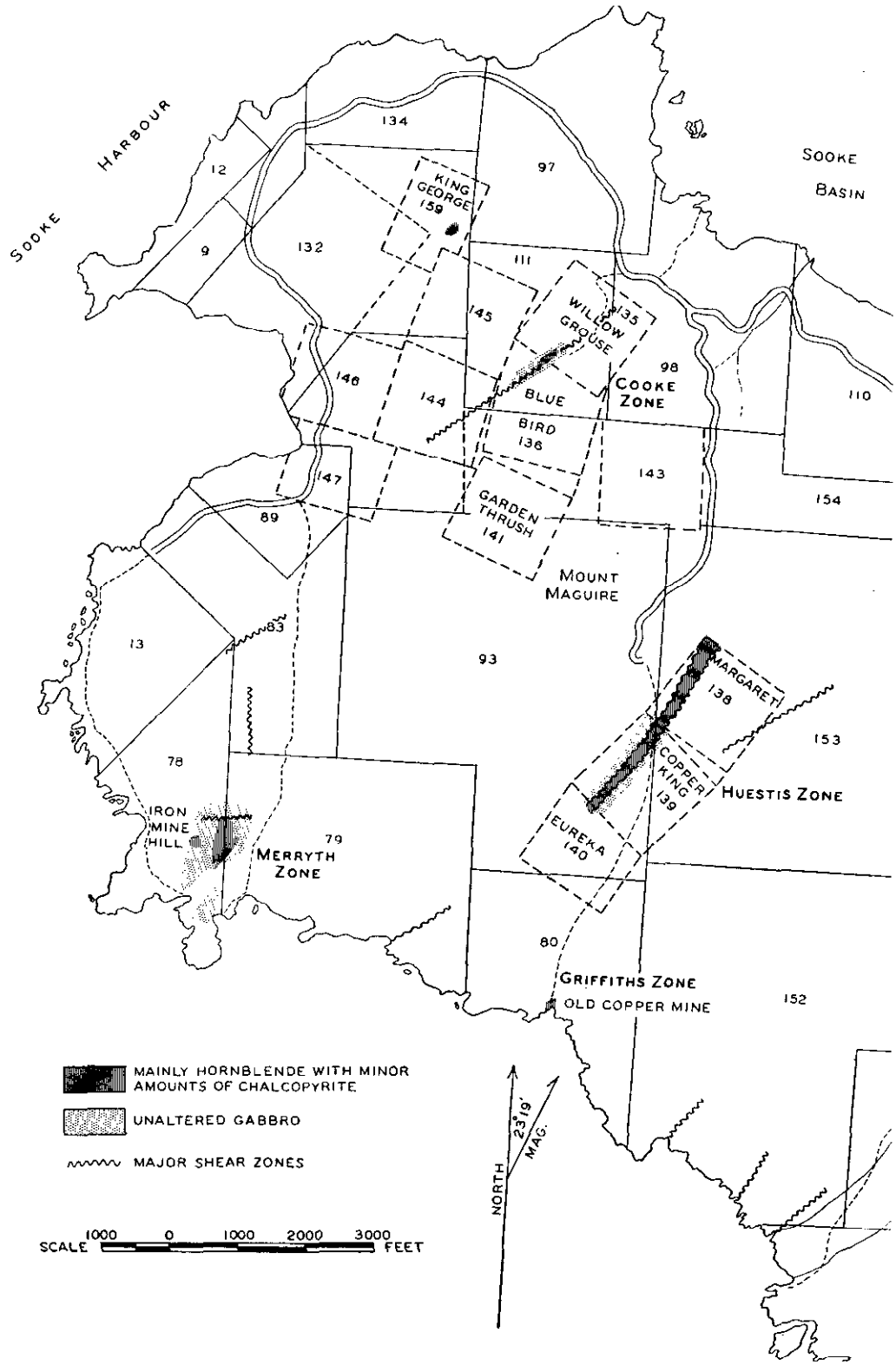


Fig. 13. Sooke Peninsula, showing location of mineralized zones.

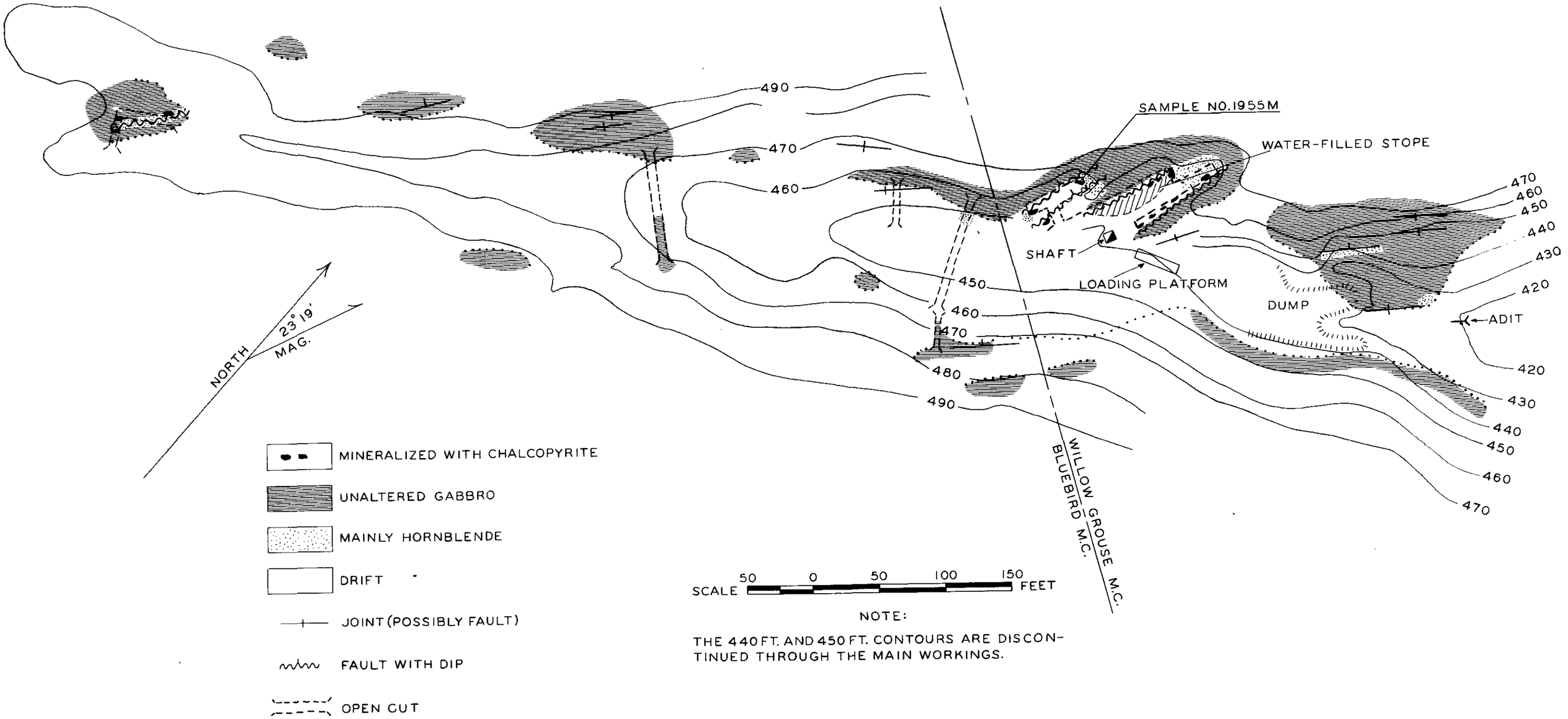


FIG 14 BLUEBIRD AND WILLOW GROUSE M.C. – GEOLOGY AND PLAN OF SURFACE WORKINGS.

these mineralized zones occur were originally named the Willow Grouse, Copper King, and Margaret, Old Copper mine and Iron Mine Hill, but recently the principal zones have been renamed the Cooke, Huestis, Griffith, and Merryth zones. The fifth zone lies within the King George Mineral Claim. Little work has been done on the showings for many years, and many of the workings are caved, filled with debris, or heavily overgrown with underbrush.

Detailed Descriptions.

Cooke Zone.—The principal showings on the Cooke zone lie within the Willow Grouse and Blue Bird Mineral Claims (*see* Fig. 13).

The mineralization (*see* Fig. 14) occurs in what appears to be a major shear-zone which, near the workings, strikes about north 50 degrees east. It can be traced for more than 2,000 feet and shows on the surface as sub-parallel cliffs or scarps, 2 to 10 feet high, and as much as 100 feet long. At the main workings (Fig. 14) the zone is intersected by cross-faults, and lenses of chalcopyrite have developed along the faults and in the fractures adjacent to them. Only minor amounts of disseminated chalcopyrite were seen at other places in the shear-zone. Veins of coarse hornblende are abundant in the main workings, and hornblendite occurs at other places along the shear-zone. The zone has been explored over a length of about 1,000 feet by an adit, a shaft, and several open-cuts and trenches.

A shaft and one large open-cut lie about 100 feet north of the boundary between the Willow Grouse and Blue Bird claims. The portal of an adit is about 275 feet north 65 degrees east from the shaft. The adit is caved and the shaft is full of water, but the cross-faults and mineralization can be seen in the open-cut. Several parallel faults striking about north 15 degrees east and dipping vertically or steeply to the west are exposed. Grooves on the fault-surfaces show that the movement has been nearly horizontal. Coarsely crystalline hornblende is present near the faults, and finer hornblende occurs farther away. The coarse hornblende which has grown with the length of the crystals about at right angles to the fault-planes has itself been sheared. Grains and lenses of chalcopyrite ranging from less than an inch to a foot in length and from a fraction of an inch to 2 inches in width cut the hornblende where it has been sheared. Most of the chalcopyrite seems to have been removed from the open-cut, as only a few stringers and small amounts of disseminated chalcopyrite appear in the walls. Hornblendite grades into unaltered gabbro 15 to 20 feet north of the north end of the cut, and little hornblende is present 10 feet west of the cut. The eastern edge of the mineralized zone is covered by waste rock, and hence the size of the hornblende-bearing zone is obscure. However, it is probably less than 150 feet long and 50 feet wide. A chip sample across a width of 4 feet of what appeared to be the highest-grade material from the south end of the open-cut assayed: Copper, 0.75 per cent.; silver, 0.1 oz. per ton; nickel, 0.07; no gold and not more than 0.05 per cent. cobalt.

About 500 feet south-west along the shear-zone from the main workings an open-cut (Fig. 14) exposes a vertical fault striking north 40 degrees east. Medium-grained hornblende containing small amounts of chalcopyrite has developed along this fault.

Several trenches have been made across the strike of the main shear-zone between the main workings and this last open-cut. Only in the first trench south of the main workings was any hornblende found, and in this only minor specks of chalcopyrite can be seen. Many of the trenches are filled with overburden, but bedrock that is exposed is relatively unaltered gabbro, and it seems probable that the zone contains lenticular mineralized masses that are not continuous between the workings.

Huestis Zone.—A zone at least 3,000 feet long and 100 to 200 feet wide (*see* Fig. 13) runs through the Copper King and Margaret Mineral Claims. This zone contains hornblendite and in places coarse-grained hornblende. It is bounded on both sides by parallel scarps, those on the north-west side being most prominent. Chalco-

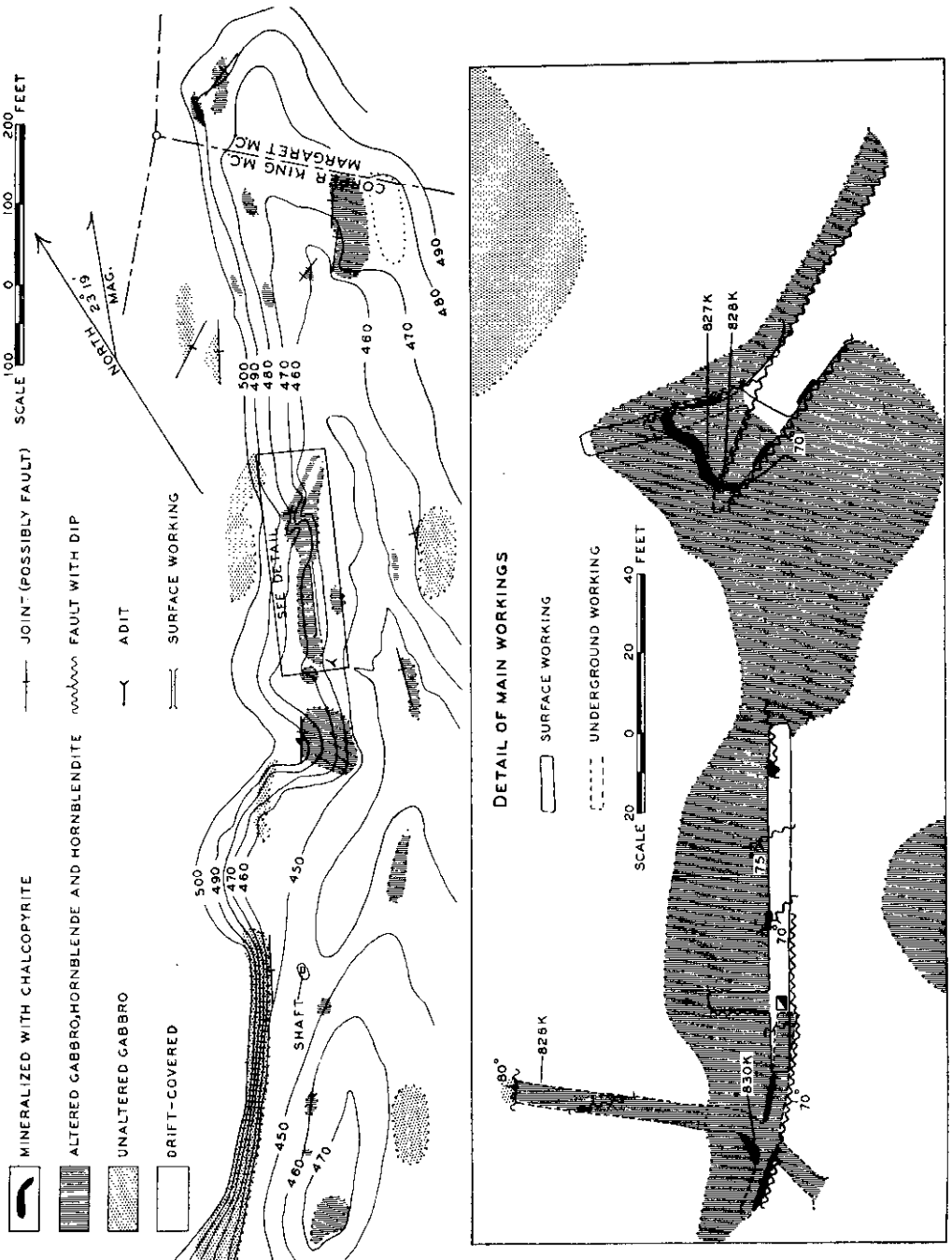


Fig. 15. Geology and workings on Huestis zone, Copper King and Margaret Mineral Claims.

pyrite occurs in minor amounts throughout the zone, and in two places relatively high concentrations of chalcopyrite have been developed by shafts, adits, and open-cuts.

The main group of workings is about 500 feet south of the north-west corner of the Copper King Mineral Claim (*see* Fig. 15). Two short adits and two open-cuts have been driven to follow vertical faults striking about north 55 degrees east. Grooves on the fault-planes indicate that the movement on them has been nearly horizontal. Little chalcopyrite is present in the adits, and channel samples across 8 feet of the highest-grade material in the open-cuts above the adits averaged§: Copper, 0.83 per cent.; gold, 0.01 oz. per ton; silver, *nil;* and not more than 0.05 per cent. nickel, cobalt, or molybdenum. Most of the chalcopyrite appears to have been mined out, and a few feet either side of the cuts no chalcopyrite can be seen.

The positions where samples were taken are indicated in Fig. 15, and the assays are listed in the following table:—

Sample No.	Gold.	Silver.	Copper.	Other Metals.
	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.
826K	0.01	*Nil*	0.31	*†
827K	0.01	*Nil*	0.76	*
828K	0.01	*Nil*	0.96	*
829K	0.01	*Nil*	1.35	*‡
830K	0.01	*Nil*	1.54	*†

* Spectrochemical determinations—cobalt, nickel, and molybdenum—not more than 0.05 per cent., except:—
† Molybdenum not detected in 826K and 830K.
‡ Nickel: 829K, 0.064 per cent.; 830K, 0.068 per cent.

About 100 feet south-west of these workings is a trench 100 feet long, trending north 30 degrees east, and near its south end a shaft some 25 feet deep connects the trench with underground workings shown in Fig. 15. Most faulting in the trench strikes north 30 degrees east, but several minor faults strike due east. Some chalcopyrite is exposed near the minor faults but does not continue more than a few feet west of the trench. In the underground workings below the trench, relatively high-grade chalcopyrite-bearing material seems to have existed along a fault striking north 30 degrees east, but most of it has been removed. A channel sample across 6 feet of the highest-grade material near this fault in the underground workings assayed: Copper, 1.54 per cent.; gold, 0.01 oz. per ton; nickel, 0.068 per cent.; silver, *nil;* and not more than 0.05 per cent. cobalt and molybdenum. A crosscut about 60 feet long has been driven north-west from this fault and exposes sheared hornblendite but little chalcopyrite. One sample was taken 12 feet from the face. It assayed: Copper, 0.31 per cent.; gold, 0.01 oz. per ton; silver, *nil;* and not more than 0.05 per cent. cobalt and molybdenum across 5 feet.

About 1,000 feet farther south-west along the main shear-zone is a second group of workings consisting of several open-cuts and a shaft, now full of water. In most of the cuts only minor chalcopyrite in hornblende is exposed, but near the shaft more concentrated chalcopyrite mineralization has been found. This mineralization, in an area some 20 feet square, seems to follow no prominent shearing. A chip sample (No. 829K) across 11 feet of this zone assayed: Copper, 1.35 per cent.; gold, 0.01 oz. per ton; silver, *nil;* nickel, 0.064 per cent.; and not more than 0.05 per cent. cobalt and a trace of molybdenum.

A length of about 1,000 feet of the main shear-zone between the two groups of workings has been tested by two or three open-cuts and a shaft. In these and at a few other points minor amounts of chalcopyrite can be seen. Concentrations of chalcopyrite are small, but the shear-zone carrying hornblende is extensive and may contain other concentrations of chalcopyrite which are not now exposed.

§ Where average assays are given, the width or character of the face being sampled made it necessary to take more than one sample. These have been averaged according to the width of the separate samples.

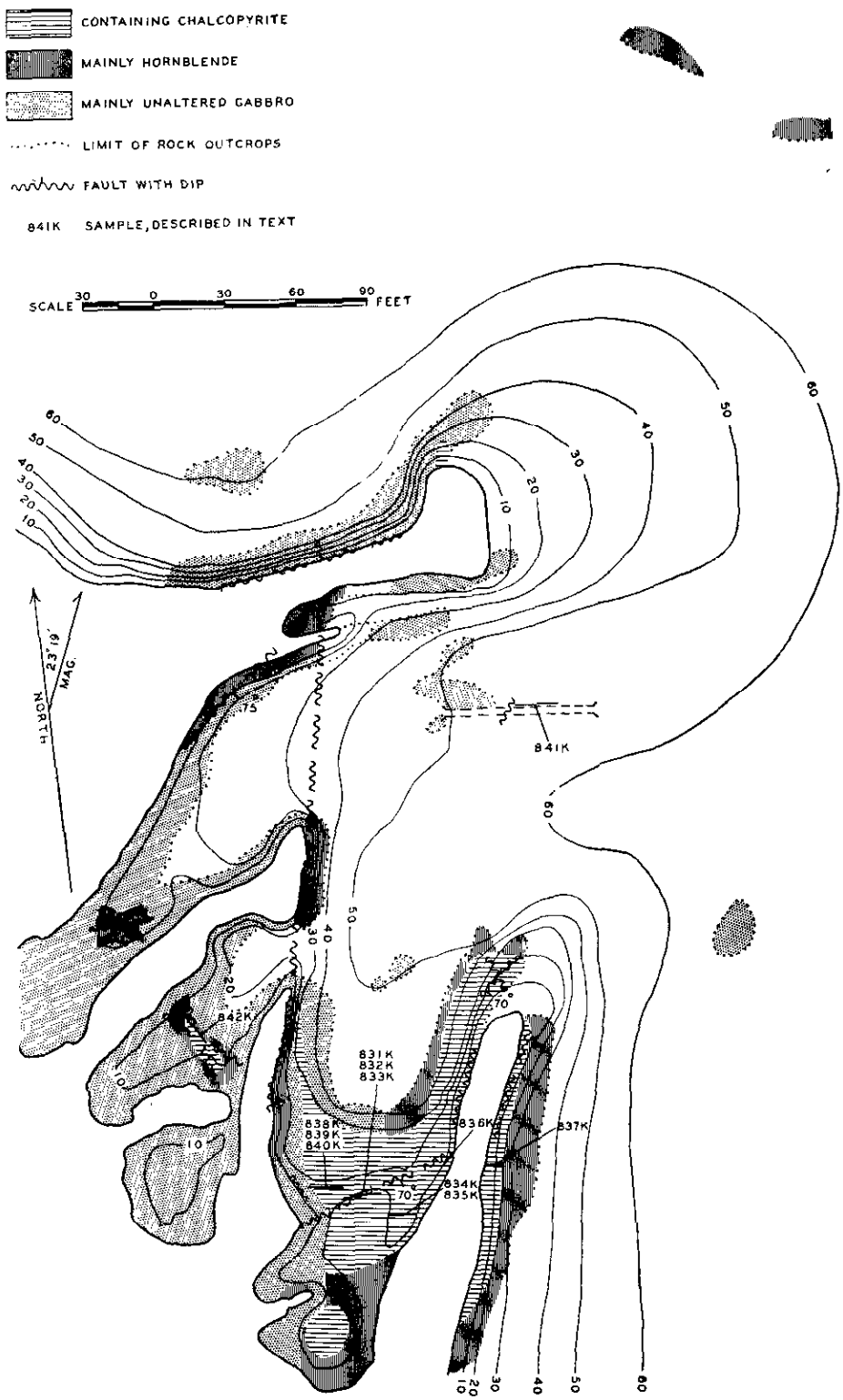


Fig. 16. Geological plan of Merryth zone.

Merryth Zone.—The Merryth zone is on the south-west shore of Sooke Peninsula due south of Iron Mine Hill (*see* Fig. 13). The main altered zone, containing hornblende and masses of unaltered gabbro, trends up the hill from the shore at about north 25 degrees east for 1,500 feet. The zone is irregular in width but averages 100 feet wide. It is not known to be continuous, as a drift-covered area separates the showings on the hill from those on the shore. Hornblendite is present not only in the main zone, but also in irregular masses several hundred feet on either side of the main zone. The Merryth zone, which is in augite gabbro, differs in this respect from the Cooke and Huestis zones, which are in olivine gabbro.

A little trenching and open-cutting has been done near the shore, and the mineralized zone is well exposed on the sea cliff (*see* Fig. 16). An area about 100 feet wide and possibly 200 to 300 feet long has been partly altered to hornblende. It is bounded on the east and west by vertical faults striking about north 20 degrees east and is cut by cross-faults, the most prominent of which strike north 60 degrees east and north 20 degrees west. The sea has cut chasms along the bounding faults, and on the west side of the mineralized zone the chasm has been filled by stratified sands and gravels. The mineralized zone contains irregular bodies of fine-grained relatively unaltered gabbro which increase in size away from the shore. Fine-grained magnetite, pyrrhotite, pyrite, and chalcopyrite occur in the hornblende and less commonly in the unaltered gabbro. Sulphides are relatively massive near the centre of the zone, but toward the edges they become disseminated and occur as tiny veinlets throughout the hornblende. A band of hornblende containing magnetite occurs along the east side of the main mineralized zone. On top of the sea cliff the rocks are covered by overburden, but hornblende and sulphides are less abundant in exposures there than on the shore; in a trench 300 feet from the shore very little sulphide could be found.

Samples* were cut along two lines on the face of the sea cliff. The lower line about 10 feet above high-tide mark averaged 0.83 per cent. copper across a width of 28 feet. These lower samples were taken in relatively unoxidized material from a section of the sea cliff that showed the highest-grade mineralization. The upper line of samples was taken across 16 feet of heavily oxidized material, and although the oxidized material was removed as far as possible before sampling, these samples may not be truly representative. They averaged 0.31 per cent. copper. A grab sample (No. 841K) across 20 feet of the highest-grade material in a trench about 200 feet north along the mineralized zone from the top assayed: Copper, 0.28 per cent. It appears from the assays and from field observations that the grade of the mineralization decreases upward and away from the shore.

* All samples on the Merryth zone were taken by cutting equal chips at 1-foot intervals across the face.

The positions where samples were taken are indicated in Fig. 16, and the assays are listed in the following table:—

Sample No.	Gold.	Silver.	Copper.	Other Metals.
	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.
831K	0.01	*Nil*	0.60	0
832K	Trace	Trace	0.39	*†
833K	Trace	*Nil*	0.79	*
834K	*Nil*	*Nil*	1.14	*
835K	Trace	Trace	1.42	*
836K	*Nil*	0.1	0.37	*
837K	*Nil*	0.1	0.17	*
838K	0.06	*Nil*	0.08	*
839K	*Nil*	*Nil*	0.53	*
840K	*Nil*	*Nil*	0.24	*
841K	*Nil*	Trace	0.28	*†
842K	*Nil*	*Nil*	0.25	*

* Spectrochemical determinations—cobalt, nickel, and molybdenum—not more than 0.05 per cent.
† Molybdenum not detected.

Irregular masses of hornblendite containing some sulphides lie west of the main zone and to a lesser extent east of the main zone. They apparently formed along cross-faults, especially where they intersect each other. One sample taken across 8 feet at such an intersection assayed: Copper, 0.25 per cent.

The showings on the hill some 1,500 feet north-east of the shore were not examined in detail. Several cuts and a short adit expose widespread hornblende with abundant magnetite, but only small amounts of chalcopyrite, pyrite, and pyrrhotite. The zone appears to end 1,400 feet north of the south-east corner post of Lot 78 at what appears to be a fault striking north 80 degrees east.

Griffith Zone.—The Griffith zone or Old Copper mine is a poorly exposed showing on the south shore of Sooke Peninsula (*see* Fig. 13). A shaft, now full of water but reported to be 102 feet deep, has been sunk 15 or 20 feet north of high-tide line. On the beach on either side of the shaft is a waste-dump containing chalcopyrite and highly oxidized material, probably hornblendite. Rocks on the shore contain hornblende and minor chalcopyrite and are cut by joints or faults striking about north 20 degrees east. Away from the shore there are no exposures of bedrock.

King George.—Two large open-cuts and several smaller ones on the King George Mineral Claim (*see* Fig. 13) have been made in what Cooke* describes as a "poorly defined shear-zone about 100 feet wide striking nearly east and west." No definite shear-zone is apparent near the workings, but an area of hornblendite perhaps 70 to 80 feet wide and 200 feet long is exposed. Faults in the open-cuts strike north 30 to 40 degrees west.

Cooke states that "14 tons of picked ore was shipped in the autumn of 1916, and the smelter returns showed an average copper content of 13.1 per cent." Most of the copper-bearing material appears to have been removed, as very little chalcopyrite could be found in the walls of the larger cuts. One small cut, however, exposes a mass of high-grade chalcopyrite perhaps 3 feet wide and 6 feet long which grades off on all sides into barren hornblendite. A sample across 5 feet of the highest-grade material assayed: Copper, 7.95 per cent.; gold, 0.06 oz. per ton; silver, 0.3 oz. per ton; and not more than 0.05 per cent. nickel, cobalt, or molybdenum.

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* *Geol. Surv., Canada*, Mem. 96, p. 328.

Placer-mining.

CONTENTS.

ATLIN.*

There were no large-scale operations, and only about fifty men were engaged in placer-mining in the Atlin district during the 1948 season. A monitor was used on Boulder Creek and another was used on McKee Creek. Atlin Ventures, Limited, brought in a ⅞-cubic-yard shovel, but the difficulties experienced in transporting it and the shortage of water resulted in low production. Northern Resources, Limited, made

* By F. J. Hemsworth.

a settlement with V. A. Brister and adjacent leasers on Spruce Creek for damage caused by the flooding of workings during the high water of 1947. To prevent a recurrence of flooding, Northern Resources, Limited, extended their flume and filled in the shovel-pit. No other work was done by this company, and their drag-line equipment on Spruce and Pine Creeks was idle throughout the season.

SPRUCE CREEK (59° 133° N.W.).

Calder Lease No. 387.—This leasehold was worked by Fred Graham, layman, who employed Otto Miller as helper. Cave-ins, caused when the mine was flooded in 1947, were cleaned out and the drifts retimbered. Drifting up-stream was continued, and during the 1948 season several rich pockets of gold were discovered.

Peterboro Lease No. 717.—S. Ivanic, A. Millar, M. Snyder, and C. Beziak operated ground on which they obtained a lay from Otto Miller and his son Albert. Entry to the workings was by a short incline to bedrock.

Joker, Poker, and Croker Leases Nos. 277, 278, and 279.—Ground held under these leases was worked by V. A. Brister and his son Jack on a lay from the Isaac Mathews estate. Rehabilitation of the underground workings and sluicing of tailings constituted the season's work.

Lynx Lease.—This leasehold was worked by the lessee, Maurice Bride.

St. Quentin Lease No. 577.—Duncan Falconer, lessee, worked on this leasehold.

Dream Lease No. 706. Noland Placers, of which J. W. Noland is owner and manager, employed six men during the first part of 1948. Work consisted of underground pillar-extraction at bedrock level in that section of the mine between the upper (Eastman) and lower shafts. Later in the year J. W. Noland gave a lay, on a 15-per-cent. royalty basis, to W. W. Wright and five partners.

PINE CREEK (59° 133° N.W.).

Tie Lease No. 705.—Fred Gilsen did some sniping on this lease.

Violet Lease No. 757.—Development-work only was done on this leasehold, held by E. H. Woodean.

BOULDER CREEK (59° 133° N.E.).

Norman Fisher and five partners hydraulicked ground leased from the Consolidated Mining and Smelting Company. Monitors were used to wash the gravel into the sluice-boxes; a drag-line scraper, powered by a Caterpillar tractor, was used to remove and stack the tailings. About 25,000 yards of gravel was sluiced. Working time was reduced considerably by a shortage of water at the end of the season.

OTTER CREEK (59° 133° N.E.).

Compagnie Française des Mines D'or du Canada holds all the leases on Otter Creek. Its agents, the Walter Johnson Company, of San Francisco, arranged that Neil Forbes and Walter Sweet do the assessment-work. This work consisted of some test-drilling and ditching opposite the old camp-site. Five men were employed.

RUBY CREEK (59° 133° N.E.).

Farmer Lease No. 492.—John Sunde, Fred Ohman, and Hugh Carter worked this leasehold, in which each held one-third interest. It is the old Torquist workings, and entry is by a short incline shaft to bedrock.

Birch Creek (59° 133° N.E.).

Victory Lease No. 1154.

Atlin Ventures, Limited. Company office, 904 Hall Building, Vancouver. W. W. Taylor, manager. Capital: 1,000,000 shares, $1 par value. The company worked the Victory lease under option from Ture Mattson, the owner. A gas-shovel of ⅞-cubic-yard capacity was brought in. On the way it broke through the barge, and this mishap delayed the start of work about three weeks. Lack of water early in the season also shortened working time. Thus only about 45 oz. of gold was recovered.

McKee Creek (59° 133° S.W.).

Lucky Strike Lease No. 914.—The lease is held by Mrs. J. M. Adams and was worked by Oscar Swanson and George Watt on a lay agreement. In this hydraulic operation, one monitor washed into the sluice and one monitor was used for disposal of tailings. In addition to the laymen, three others were employed.

Ruth Lease No. 1231 and Leftover Lease No. 1280.

These leases apply to ground held and worked by Louis and Joe Piccolo. The leaseholds are up-stream from the Lucky Strike leasehold, and work is concentrated on the north bench. Numerous short drives have been made into and along the rim, which is irregular and difficult to follow. The gold recovered appears to be slightly different in colour and texture from that found across the creek, and the Piccolo brothers believe that they are near or on the old channel of Eldorado Creek, a tributary of McKee Creek entering it from the north.

O'Donnel River (59° 133° S.W.).

Ethel M. and Grace M. Leases Nos. 650, 651.—These leases apply to ground held and worked by Nathan Murphy and Melvin Beckman, who continued drifting on the bench leasehold. Flat, soft bedrock containing an appreciable quantity of recoverable gold was excavated. Although shortage of water handicapped the sluicing, the clean-up was satisfactory.

Lease No. 688.—Tom Prpich, working up-stream from N. Murphy, has made several drives into the north bank on bench ground held under this lease.

Wilson Creek (59° 133° S.W.).

A. L. Stevens and C. S. Fraser are testing a group of six leases on Wilson Creek. Late in the 1948 season six prospect-holes were drilled on the Fame No. 3 leasehold. The drilling was supervised by Ture Mattson. The holes were from 80 to 100 feet deep, but results were inconclusive. It is planned to continue the drilling next year. Three men were employed on this work.

STIKINE.*

McDame Creek (59° 129° S.E.).

Moccasin Mines, Ltd.

Company office, 5261 Stockton Boulevard, Sacramento, Calif.; mine office, Lower Post, B.C., via Watson Lake, Yukon. J. P. Berry, manager. Capital: 1,000,000 shares, $1 par value. This private company is controlled by Larsen, Harms, and associates, of Sacramento. It owns and has under option fifteen ordinary placer leases and twelve special placer leases in the McDame Creek area .

* By J. H. Bennett.

Using its own and rented equipment, the company built 68 miles of truck-road from Mile 648 on the Alaska Highway to McDame Creek in the period from October, 1947, to January, 1948. A drag-line dredging plant was then moved in and assembled, and digging started on May 21st, 1948. Except for minor shut-downs for repairs and for clean-ups, operation was continuous. By September 5th about 300,000 cubic yards of gravel had been washed. This dredging was done on the old Pendleton workings on McDame Creek. Gold-recovery was reported to be satisfactory.

Both drag-line and washing plant are operated by diesel-electric power. Each has a 240-horsepower Fairbanks diesel motor. The drag-line bucket has a capacity of 4½ cubic yards, and in twenty-four hours the drag-line delivers from 4,500 to 5,000 cubic yards of gravel to the washing plant. The depth of gravel dug is about 15 feet. This gravel rests on a sand stratum which serves as a bedrock; it is reported that most of the gold is in the 4 feet of gravel immediately above the sand. Depth to bedrock is not known, but, according to report, bedrock was not struck in a drill-hole 90 feet deep.

Other equipment on the property includes three D-8 bulldozers, one diesel road-grader, three trucks, a drilling-rig to test the gravel, and a diesel light plant. The company intends to put another drag-line dredge into operation on the property in 1949.

About twenty-five men were employed. Gold produced amounted to 8,490 oz. The total amount of gravel washed was 565,000 cubic yards.

OMINECA.*

Slate Creek (55° 124° N.W.).

The Consolidated Mining and Smelting Company's Slate Creek and Manson Creek placers were sub-leased separately to G. A. Collins and D. L. Hings. Testing only was done, the work consisting of ground-sluicing and sinking test-pits.

Lost Creek (55° 124° N.W.).

Lincoln Gold Placers, Limited, operated a monitor on Lost Creek, between Manson and Germansen Creeks, testing ground optioned from Bert McDonald.

Plug Hat Creek (55° 124° N.W.).

G. H. Loper & Sons operated two monitors during the season on their leaseholds on Plug Hat Creek, tributary of Germansen River, 17 miles north-west of Manson Creek P.O.

Twin Creeks (55° 125° N.E.).

Mrs. Winifred Tait had two hydraulic operations 40 miles above Manson. She also supervised the construction of a tractor-road along the northern side of Germansen Lake.

Twenty Mile Creek and Kwanika Creek (55° 125° N.E.).

Yuba Consolidated Gold Dredging Company, of San Francisco, held 8 miles of leases on Twenty Mile Creek, a tributary of the Omineca River; and 19 miles on Kwanika Creek. Two holes, totalling 156 feet, were drilled on Kwanika Creek; the deeper hole had not reached bedrock when bottomed at 87 feet. Seven holes, totalling 380 feet, were drilled to bedrock on Twenty Mile Creek.

* By F. J. Hemsworth.

CARIBOO.*

HIXON CREEK.

Hixon Placers, Inc.—(53° 122° S.W.) C. J. Norris, superintendent. This Seattle company hydraulicked 30,000 cubic yards of gravel on Hixon Creek, on ground held by B. Briscoe, of Vancouver. Five hundred feet of flume and three-quarters of a mile of road were built.

WILLOW RIVER (53° 121° S.W.).

O. R. Hougen on Hyde Creek.—P. McColm hydraulicked 8,700 cubic yards of gravel on O. R. Hougen's lease on Hyde Creek, a tributary of Tregillus Creek.

Devil's Canyon.—L. Bedford and K. Huttula continued working the Barton lease on the west side of Devil's Canyon. Water under low head, obtained from Hong's ditch, was used to hydraulic 8,000 cubic yards of gravel.

W. Hong on Slough Creek.—On the Toon Sing Tong claim 20,000 cubic yards of gravel was hydraulicked between July 10th and October 25th by two men.

J. Andracki on Coulter Creek.—Andracki and one partner hydraulicked 4,000 cubic yards and ground-sluiced 500 cubic yards of gravel on Coulter Creek, a tributary of Slough Creek.

Lowhee Creek.—O. K. Nason and four partners, working the west rim at the upper end of Lowhee Pit, hydraulicked 85,000 cubic yards of gravel between April 15th and October 23rd. The recovery amounted to 251 oz. of gold.

K. Johansson on McArthurs Gulch.—Three thousand cubic yards of gravel was hydraulicked.

W. D. Ingram (Gridley, Calif.) on Pundata Creek.—A test shaft was sunk 50 feet and 100 cubic yards of gravel was hydraulicked.

A. Frankish (Calgary, Alta.) on Cooper Creek.—One thousand cubic yards of gravel was reported hydraulicked by one man on Cooper Creek, a tributary of Sugar Creek.

G. and T. Dunlop on Two-bit Creek.—One thousand cubic yards of gravel was reported sluiced on this tributary of Big Valley Creek.

J. J. Gunn on Williams Creek.—*Six hundred cubic yards was reported sluiced on* Williams Creek.

United Mining & Dredging Co., Ltd.—C. Williams, Quesnel, president; John McGowan, manager. This company is moving the dredge formerly operated by the Inland Dredging Company on the Cottonwood River, near Mile 18 on the Barkerville road, to leases on Big Valley Creek, 1½ miles up-stream from Lottie Creek. Six miles of road was constructed.

Q. C. Heppner and W. H. Armstrong on Big Valley Creek.—Seven test-pits were dug and 250 cubic yards of gravel was ground-sluiced on Big Valley Creek, on holdings adjoining and down-stream from the leases held by the United Mining & Dredging Company.

J. Lahay on George Creek.—Seven hundred cubic yards was reported sluiced from two pits on George Creek.

Beaver Channels, Limited, on Aura Fina Creek. The manager, K. K. Langford, reports 100 feet of drift completed, making the drift 600 feet long.

Shepherd Creek.—W. A. McLean and two men were employed drill-testing ground held by R. D. Rees.

Summit Mines, Ltd. Company office, 601 Royal Trust Building, Vancouver. R. H. Wallace, general manager; E. Krause, dredging superintendent. Capital: 1,000,000 shares, $1 par value. This placer company, owned by Larsen, Harms, and associates, of Sacramento, Calif., assembled a floating washing plant on Pine Creek, about 7 miles along the Bowron Lake road from Barker-

* By J. E. Merrett, except as noted.

ville. This all-steel washing plant, of a capacity of 3,500 cubic yards a day, is the largest so far assembled in the Cariboo. The drag-line dredge, a 40A Marion walking type, is equipped with a 3-cubic-yard bucket.

Washing began in May and continued on three shifts a day to October; the number of men employed averaged twelve. Production: Gravel washed, 275,000 cubic yards; gold recovered, 3,386 oz.

A crew of four men is employed continuously drill-testing the ground ahead of the dredge. The drill is now working on leases near Eight Mile lake.

ANTLER CREEK (53° 121° S.E. AND 52° 121° N.E.).

Sawflat Creek.* Exploratory work was done during the summer of 1948 for the account of A. F. Daily on three leases on Sawflat Creek. The three leases extend south from the junction of Sawflat Creek with Antler Creek. The valley of Sawflat Creek is 300 to 400 feet wide and slopes northward to Antler Creek with a gradient of about 0.75 per cent. and was thought to be potential dredging-ground.

Seven Keystone drill-holes, totalling 303 feet, were put down by Herb Brown, driller, under the supervision of Martin W. Jasper. Three holes in a line about 3,600 feet south of the mouth of Sawflat Creek reached bedrock at depths of 13, 26, and 30 feet. Two holes, 1,000 feet farther south, reached bedrock at depths of 31 and 38 feet, and two holes about 4,600 feet farther south at Two Mile Creek on the head of Swift River reached bedrock at 63 and 102 feet depth. All the material encountered was coarse slabby slide-rock and glacial drift. Only a trace of gold and very little black sand was recovered in any hole. The drill-holes indicate that the bedrock beneath Sawflat Creek slopes southward on a gradient of about 1.6 per cent., even though the surface slopes northward toward Antler Creek. This bedrock information provides conclusive proof that in pre-Glacial time, Antler Creek, up-stream from Sawmill Flats, flowed down through the valley of Sawflat Creek into the Swift River.

[Reference: *Geol. Surv., Canada,* Mem. 149, 1926, pp. 54-61.]

A. Holm and T. M. Peterson, near Headwaters of Antler Creek.—These partners sluiced 1,200 cubic yards of gravel, from which 15.85 oz. of gold was recovered.

C. Fuller and N. Hanson on Nugget Gulch.—These partners have sluiced 25,000 cubic yards of gravel since June, 1947.

Guyet Placer.—Mines Operating, Incorporated. Company office, Northern Life Tower, Seattle, Wash. A. G. Barnett, president; A. C. Stewart, superintendent. This company has acquired the ground previously known as Guyet Placer. Work was directed toward cleaning out the old pit so that both rims could be followed. In addition, considerable repair-work was done on the pipe-line. A crew averaging eight men was employed.

W. Barton on Shy Robin Gulch.—It is reported that 32,000 cubic yards of gravel was hydraulicked on this property.

G. Milbourne on Antler Creek below Empire Creek.—Five hundred cubic yards of gravel was hydraulicked and ground-sluiced, from which 4 oz. of gold was recovered.

CUNNINGHAM CREEK (52° 121° N.E.).

American Gold Fields. Executive office, 634 Sixty-ninth Street North-east, Portland, Ore.; company office, 513 Royal Bank Building, Vancouver. Manager, R. G. Collins. This company is registered in Oregon. A washing plant of a capacity of 2,000 cubic yards a day and a drag-line with a 2½-cubic-yard bucket were assembled at Whisky Flats on Cunningham Pass Creek. Mining was

* By Stuart S. Holland.

started in October and continued for ten days. Eighteen thousand cubic yards of gravel was washed, and considerable test-hole drilling was done ahead of the dredge. An average of fifteen men was employed; three shifts a day were worked.

LIGHTNING CREEK (53° 121° S.W.).

Trebor Placer Exploration, Ltd. Company office, 103 Royal Trust Building, Vancouver. J. M. Harper, Quesnel, manager. This company has leased ground held by Lightning Creek Gold Alluvials Company. A washing plant having a capacity of 3,000 cubic yards of gravel per day and a Marion drag-line with a 2½-cubic-yard bucket were installed on the west bank of Lightning Creek, one-half mile from the Barkerville road at Mile 31 from Quesnel. No gravel was washed, as installation of the plant was not finished until December 3rd.

Some test-hole drilling was done on Cunningham Creek on leases held by F. J. Tregillus, of Barkerville, and also on Antler Creek on leases held by H. McN. Fraser, of Vancouver.

Alex. Miller on Wormwald Creek.—About 1,800 cubic yards of gravel was hydraulicked and ground-sluiced by three men during May and June.

Slades Placer Lease.—L. Biggs reported a small yardage moved by hydraulicking at Slades Placer on Mosquito Creek.

Rottacker Placers.—In 1948, 10,000 cubic yards of gravel, up-stream from the 1947 workings, was hydraulicked in an endeavour to trace the Sundberg channel. Very little gold was recovered, and it was discovered that in this section of the pit the rim-rock is dipping below the level of the sluices. One man was employed.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1927, p. 168; 1931, p. 85; 1947, p. 193.]

Alf Brown on Last Chance Creek.—In 1948, 125 cubic yards of gravel was mined from 50 feet of drift at the bottom of a 90-foot shaft, located on Last Chance Creek, about 300 yards from Van Winkle on the Barkerville road.

Interior Development Co., Ltd.—This company, managed by H. G. Hadland, worked on one lease owned by Bowman Mines, Limited, on Amador Creek. This hydraulicking operation employed three men on an average and washed 150,000 cubic yards of gravel, from which 3 oz. of gold was recovered.

Mr. and Mrs. Leroy Biggs on Houseman Creek.—A small amount of ground-sluicing was done, and pipes were installed for hydraulic mining.

COTTONWOOD RIVER AREA (52° 122° N.E. AND 53° 122° S.E.).

Swift River Dredging Co., Ltd. Company office, 475 Howe Street, Vancouver. This company is controlled by E. A. Kent, 260 California Street, San Francisco, Calif., who has extensive holdings on the Swift, Cottonwood, and Quesnel Rivers. The company resumed operations on the Swift River in April and continued to November, employing an average of fourteen men on three shifts under the management of J. V. Rice. The washing plant of 2,000 cubic yards daily capacity worked its way about a quarter of a mile up-stream from its location at the end of 1947. It was then taken across the river to the west bank and worked its way about half a mile down-stream. Three separate floods which occurred on the Swift River during operations this year hampered progress.

A four-man crew was employed continuously, drill-testing the ground ahead of the dredge.

Part of the ground worked was on the McDonald leases on the Swift River, where 130,000 cubic yards of gravel was washed.

Cariboo Gold Dredging Co.

Company office, 104 Chamber of Commerce Building, Seattle, Wash. Mine office, Wells. J. B. Hardcastle, president; R. R. Moore, manager. Capital: 500,000 shares, $1 par value. This company has commenced dredging on the Cottonwood River, 1½ miles below the Wells–Quesnel Highway, on ground leased from the Umity Valley Gold Mines, Limited.

A drag-line with a 2-cubic-yard bucket and a plant capable of washing 2,000 cubic yards a day and equipped with a jig recovery system were assembled and put into operation on June 16th.

On July 31st the dredge sank in its pond, and a flood in the Cottonwood River that day deposited a load of gravel on the pontoons which caused them to collapse. The remaining part of the season was spent repairing the damage.

During the season 15,000 cubic yards of gravel was washed. In addition, 2½ miles of road was built to placer-ground held below the ground of the Beavermouth Dredging Company.

Beavermouth Dredging Co., Ltd.

Company office, 902 Rogers Building, Vancouver. E. Nipple, Seattle, Wash., president. This company operated a dredge of a capacity of 150 cubic yards per hour, embodying a jig recovery system and a 2-yard Lima shovel on placer leases on the Cottonwood River, 3 miles from Mile 18 on the Barkerville road. This company optioned its equipment and assets to the Cottonwood Syndicate (*see* below) in October. During its period of operation in 1948, 12,000 cubic yards of gravel was washed and the crew averaged five men.

Cottonwood Syndicate.

This syndicate is successor to Beavermouth Dredging Company, Limited. The Cottonwood Syndicate, composed of Marwell Construction Company, Limited, J. W. Boothe, and T. M. Gerety, at Princeton, and P. Fiorito, of Seattle, Wash., obtained an option to purchase all equipment and assets of the Beavermouth Dredging Company, Limited, in October. During this company's period of operation the 150-cubic-yards-per-hour washing plant and 2-yard shovel worked its way up-stream on the Cottonwood River a quarter of a mile, leaving a channel into which the river was diverted. The equipment was then on the opposite bank of the river, and washing proceeded for a quarter of a mile down-stream. Forty-five thousand cubic yards of gravel was washed, and an average crew of seven men was employed.

QUESNEL RIVER.

North American Gold Fields, Ltd.

(52° 122° N.E.) Company office, 513 Royal Bank Building, Vancouver. G.A . Collins, president. Capital: 2,000,000 shares, 50 cents par value. Dredging was started on leases on French Flats on the Quesnel River, about 24 miles by road from Quesnel. An advance of 400 feet was made before dredging was stopped to overhaul the gold-recovery equipment. At this time American Gold Fields, Incorporated, reclaimed the drag-line which was on loan to the North American Gold Fields. No further work was done.

Cariboo Metals, Ltd.

(52° 121° N.E.) Company office, 850 Hastings Street West, Vancouver. This private company continued work on its lease on the hill above Cedar Creek. The water-storage dam on Cedar Creek was repaired and earth-filled It is planned to install a Pitcher-type, dry-ground washing plant and a 1½-cubic-yard shovel. Alvo von Alvensleben was in charge of operations.

Geometal Mines, Ltd.

(52° 121° N.E.) Company office, Richmond Hill, Ont. N. A. Anderson, president and manager. Capital: 3,000,000 shares, $1 par value. This company is engaged in developing Richmond Hill Mining Company's placer leases at the junction of Black Bear and Spanish Creeks, one-half a mile from the bridge over the North Fork River. Much of the gold present

in the gravels here is fine. Consequently an attempt was made during 1948 to develop a process of washing which would recover a satisfactory percentage of this fine gold. Approximately 140,000 cubic yards of gravel was washed by a crew of seven men.

KEITHLEY CREEK AREA (52° 121° N.E.).

Harvey Creek Placers. This company, owned by Barney Boe, of Vancouver, continued operations on Nigger (Pine) Creek, 5 miles up Cariboo Lake from Keithley Creek. Before hydraulicking started, it was necessary to replace the sluice which was washed out by the heavy spring floods. Approximately 200,000 cubic yards of gravel was hydraulicked and ground-sluiced by a crew of three men working from May 10th to October 1st.

Keithley Creek.—The Perry & Schroeder Drilling Company, of Helena, Mont., drill-tested ground at the narrows in Cariboo Lake near Keithley Creek and at Rollie (Duck) Creek on the Keithley road. Placer Engineers, Limited, drilled nine test-holes on the Yanks Peak road, 2 miles from Keithley.

Lee Fournier on Keithley Creek.—Approximately 3,000 cubic yards of gravel was sluiced in an open pit, but old workings were encountered before any gold in appreciable quantities was found.

H. Asserlind and V. Johnson. These partners continued drifting in the north bank of Keithley Creek between Weaver and Four Mile Creeks. The drift, which was previously 160 feet in length, was extended 43 feet. In addition, 25 feet of crosscutting and 20 feet of 45-degree incline were completed. The last 61 feet is in a second channel where the gold appears to occur in two zones. The upper zone is oxidized ground which carries fine, worn, and flattened gold, while the bottom zone is a blue gravel with large boulders accompanied by coarse gold. The bottom of the blue gravel layer has not been reached, and it appears to be lower than the present water-level in Keithley Creek at this point. Recovery averaged 1½ oz. of gold from each 8-foot drift set.

A. E. McGregor and G. A. Goldsmith.—These partners have leases on Keithley Creek between Honest John and Donaldson Creeks. Approximately 6,000 cubic yards of gravel was moved with the aid of boom dams, in preparation for working a channel parallel to and in the south bank of Keithley Creek.

R. W. Youngash on Little Snowshoe Creek.—A shaft on the lease of R. W. Youngash near the mouth of Little Snowshoe Creek was deepened 13 feet to make it 23 feet deep. About 80 feet of open-cutting was also done for testing.

LILLOOET (50° 121° N.W.).*

BRIDGE RIVER.

Leases of G. Haycock on Bridge River.—Four men were employed on this property, and they ground-sluiced 4,000 cubic yards of gravel on the Bridge River between the British Columbia Electric Company's dam on the Bridge River and Moha. Twenty-seven ounces of gold was recovered.

Leases of W. L. Baker on Bridge River.—A small amount of hydraulicking was done on leases held below those worked by G. Haycock on the Bridge River. Four ounces of gold was recovered.

FRASER RIVER.

Leases of A. C. Hutton on Fraser River.—Two men and a slack-line were employed in moving 1,000 cubic yards of gravel on leases on the east bank of the Fraser River between the highway bridge at Lillooet and a point opposite the mouth of Cayoosh Creek. Eight ounces of gold was recovered.

W. H. Miller on the Fraser River opposite Riley Creek.—Three men were employed hydraulicking 24,000 cubic yards of gravel.

* By J. E. Merrett, except as noted.

Radioactive Material from Lytton Bar.*

(50° 121° S.W.) Black sands from Lytton Bar were tested in the autumn of 1948 and were found to be radioactive. The black sands were jig concentrates made by the Lytton Bar Company, Limited, while placer-mining in 1946 on Lytton Bar, on the west side of the Fraser River, about a mile up-stream from the junction of the Thompson River. Radioactive tests indicated the equivalent of 0.16 per cent. U_3O_8. The ratio of concentration represented by the black-sand concentrate is unknown. Spectrographic analysis of concentrates panned from a non-magnetic fraction of the original sample indicated the ratio of thorium to uranium to be about 3 to 1. No mineralogical examination was made of the material.

SIMILKAMEEN.

SIMILKAMEEN RIVER (49° 120° S.W.).†

Atkinson Dredging Co., Ltd.

Registered office, 902 Rogers Building, Vancouver. S. K. Atkinson, president; James W. Boothe, vice-president; W. Scott Ford, secretary; S. K. Atkinson, Jr., superintendent. Capital: 1,209 preferred shares, $100 par value, and 2,258,200 common shares, par value 50 cents. This company started dredging on the Similkameen River on November 7th, 1947, at a point approximately 1 mile south-west of Princeton and near the Granby Consolidated Mining, Smelting, and Power Company's steam-electric power plant. Before production commenced, it was necessary to dig a canal to ensure adequate clean water for the Granby Company's plant.

Dredging continued until April 11th, when high water forced a shut-down. Dredging was resumed on July 2nd and continued until August 14th. During this period about 1 mile of river was dredged and operations were approaching the Granby Company's Allenby concentrator water intake. It was decided not to continue dredging farther up-stream at this time, so the dredge was dismantled and moved down-stream to a point about 3 miles below Princeton, where dredging was commenced on September 17th and continued until October 17th. During this month of operation 2,174 lineal feet of river-bed was dredged. Operations will not be resumed until after high water in 1949, by which time it is expected to have a more efficient recovery plant installed. The equipment in use includes a diesel-driven Bodinson-type dredge, having a rated capacity of 5,000 cubic yards in twenty-four hours, and a Lima 3½-cubic-yard drag-line shovel. An Ainlay centrifugal separator is used, and refining is done at the company's retort-house at their camp on the Similkameen River. Other equipment includes a TD-18 International tractor and bulldozer, used for stripping debris and moving boulders, three trucks, and a Kirk-Hillman churn-drill for testing gravel. When dredging, operations were on a three-shift basis, employing twenty men.

Production recorded: Gravel washed, 299,935 cubic yards. Metals recovered: Gold, 986 fine oz.; silver, 120 oz.; platinum, 242 oz.

TULAMEEN RIVER (49° 120° N.W.).†

Slate Creek Placers, Ltd.

E. A. Goode, president; E. M. Morgan, secretary-treasurer; Louis N. Marcotte, contractor. An adit was started on Placer-mining Lease No. 1250, approximately 3½ miles west of the village of Tulameen. Louis N. Marcotte had a contract to advance the tunnel 400 feet to explore the gravels in the area. One other man was employed. The adit had been advanced 16 feet, under a cover of 10 feet, when the face set swung and the resulting caving of sand, gravel, and boulders caught Marcotte, who was working at the face, and caused fatal injuries. The accident occurred on July 5th, and further development was discontinued.

* By Stuart S. Holland.
† By E. R. Hughes.

Structural Materials and Industrial Minerals.*

CONTENTS.

* Notes in this section are by the Inspector of Mines for the proper district, except as noted.

ASBESTOS.

Shuttleworth Creek.*

(49° 119° S.E.) The Shuttleworth Creek asbestos showings are on the northerly sloping hillside, one-quarter to one-half mile south of Shuttleworth Creek. Access is by a logging-road 4½ miles long which joins the main Oliver–Penticton Highway at a point about 4 miles south of Okanagan Falls. The property, comprising twenty-six claims staked in 1948, is held under option and by location by W. J. Asselstine and associates.

The main showings are exposed in a series of nine bulldozer-cuts, the lowest (elevation, 2,800 feet) being directly above the road and the others arranged at intervals over a width of some 200 feet up the hill. The highest cut (elevation, 3,250 feet) is about 1,000 feet south of the road. Natural outcrops are rare, owing to the presence of 5 to 10 feet of overburden over most of the hillside and are restricted to exposures of hard resistant rocks in only a few places.

The area is underlain by gneissic rocks of granitic to granodioritic composition, in places exhibiting pegmatitic and schistose phases. In the immediate vicinity of the deposits, light-coloured micaceous gneiss is exposed in several places on both sides of the asbestos-bearing zone developed by stripping. The zone itself is composed of irregular lenses and bodies of amphibole asbestos intimately associated with mica schist and gneiss.

In general, two types of asbestos were noted in the cuts—a light greenish-grey variety with fibres up to 4 inches long and a pale-green variety with radiating fibres up to one-half inch long. Both have been determined as the mineral anthophyllite. The former type occurs in stringers and bands from a few inches to 30 feet wide, and is fairly free from impurities; the latter type is commonly associated with a smaller proportion of mica and other minerals over widths up to 15 or 20 feet. In a few places, lenses composed almost entirely of fine-grained biotite occur, and one of these has been mined to produce material for use in roofing-manufacture.

Despite the relatively large amount of stripping done, exposures were still insufficient when the property was visited to permit an intelligent estimate of the quantity of asbestos available or the proportion of impurities which would have to be mined. The widespread distribution of asbestos in practically all the cuts indicates that a relatively large tonnage is present, but only bulk sampling and mill tests would determine the mineable grade and recovery which might be expected.

Both varieties of asbestos are brittle and break down to a relatively short fibre powder on crushing and grinding. The following chemical analyses are of samples representing different types of material from the deposit:—

	Radiating Type.	Mixed Type.	Long Fibre.
	Per Cent.	Per Cent.	Per Cent.
SiO_2	54.42	55.66	57.50
Al_2O_3	1.32	1.94	0.36
Cr_2O_3	0.12	0.97	0.03
Fe_2O_3	2.17	1.15	1.10
FeO	4.65	4.24	5.69
MnO	0.14	0.15	0.25
MgO	31.73	29.06	29.21
CaO	0.42	1.56	2.24
H_2O+	3.56	4.32	3.60
H_2O-	1.20	0.86	0.22
Totals	99.73	99.91	100.20

* By J. M. Cummings.

BARITE.

Mountain Minerals, Ltd. Company office, Morris Building, P.O. Box 273, Lethbridge, Alta.; mine office, Parson. Ralph A. Thrall, managing director. Capital: 2,000 shares, $100 par value. Because of market conditions the operations of this company were restricted during 1948. During the early part of the year a small tonnage of impure barite was quarried from the Brisco deposit (50° 116° N.E.) and stock-piled at the Brisco railway-siding.

CEMENT.

British Columbia Cement Co., Ltd. Head office, corner of Fort and Wharf Streets, Victoria. N. A. Tomlin, managing director; C. S. Williams, general superintendent. This company operates quarries at Bamberton (48° 123° N.W.) on Vancouver Island and at Blubber Bay (49° 124° N.W.) on Texada Island for its requirements for cement-manufacture. The company produced 1,019,000 bbl. of cement in 1948.

Bamberton quarry is on the west side of Saanich Inlet, and is 22 miles by highway from Victoria. Two quarries are operated to produce limestone and greenstone for cement-manufacture. A third quarry is presently being prepared for production. This is located nearly 400 feet north-west of the present upper quarry face. The average number of men employed was 192. The total production of rock in 1948 was about 240,000 tons, compared to 116,865 tons for 1947.

Blubber Bay quarry is at Blubber Bay, Texada Island, and is nearly 1¼ miles from the Government wharf. Three quarry-faces are being mined. This limestone is crushed to 4 inches maximum size at the company's plant, about one-half mile from the quarry. This crushed material is loaded on scows by conveyer-belt and sent to the company's cement plant at Bamberton. The average number of men employed during the year was thirty-three.

CLAY AND SHALE.

Abbotsford Fire and Pressed Brick Co., Ltd.—Abbotsford (49° 122° S.E.). Mr. Blackmon, manager. This company operated a building-brick plant intermittently during 1948 until September.

Bear Creek Brick Co.—Surrey (49° 122° S.W.). Head office, Victoria Brick and Tile Supply Company, Vancouver; plant, Archibald Road, Surrey district. A. T. Ayling, plant manager. Surface clay is mined by hand from shallow pits near the plant. Bricks are formed by a soft-mud process and burned in wood-fired scove kilns. The company operated intermittently during 1948. The average number of men employed during the year was seven.

Clayburn Co., Ltd. Kilgard (49° 122° S.E.). Company office, Credit Foncier Building, Vancouver; plant office, Kilgard. R. M. Hungerford, managing director; R. Ball, superintendent. This company operates a mine and plant at Kilgard in which a variety of clay products are made. The clay and shale, from which the products are made, is mined from four gently dipping shale-beds. Three of these are mined underground and the fourth, the shale mine, by surface-quarrying. Underground mining is done by room-and-pillar methods. Electrically driven double-drum hoists have been installed recently to muck out the rooms and entries.

Diamond-drilling, totalling 1,447 feet, was done in 1948 to delineate shale deposits.

The average number of men employed in the mines during the year was 20, and the average number employed in the operation was 130.

The tonnage of clay and shale mined from the different mines during the year was as follows: Fire-clay mine, 26,150 tons; No. 4B mine, 5,925 tons; No. 9 mine, 5,450 tons; shale quarry, 1,865 tons.

A refractory, fusing at Cone 31 or 1750° C., is being made this year, in addition to the usual face-brick, flue-lining, vitrified sewer-pipe, standard fire-bricks, and special-shape fire-brick.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1947, pp. 205, 206.]

Gabriola Shale Products, Ltd. Gabriola Island (49° 123° S.W.). Evans, Coleman & Evans, operators, Vancouver; F. A. Higgs, resident manager, Gabriola Island. This quarry and plant are situated about 6 miles south of the ferry-landing and have been operated steadily during 1948. A crew averaging twenty-four men was employed at the brick-yard and two men in the quarry proper. The shale quarried is soft and requires no blasting. It is loaded on to trucks with a gas-shovel and transported to the crushing plant. The total output of the plant, amounting to 3,750,000 bricks, was marketed in Vancouver, Victoria, and New Westminster.

Port Haney Brick Co., Ltd. Haney (49° 122° S.W.). Company office, 846 Howe Street, Vancouver; plant, Haney. E. G. Baynes, president; J. Hadgkiss, plant manager. This company operates a clay-pit and brick plant near Haney. Clay is mined by a power-shovel from a pit near the plant. The clay is dried, mixed with sand, and shaped by stiff-mud extrusion. Eight down-draft kilns are operated for burning the products. Brick, flue-lining, and tiles are produced. During the year the average number of men employed was fifty.

Pacific Clay Products, Ltd. Pleasantside (49° 122° S.W.). Messrs. Bell and Mutter. Works at Pleasantside, near Ioco. Surface clay is obtained from shallow pits near the plant. Red rug-bricks are formed by stiff-mud extrusion process and fired in a rectangular down-draft kiln. Operations ceased temporarily in October, 1948.

Richmix Clays, Ltd. Kilgard (49° 122° S.E.). Works office, 2890 Twelfth Avenue East, Vancouver; mine at Kilgard. G. W. Richmond, manager. This property adjoins the Clayburn Company's property on the east. Clay from the same seam as in the fire-clay mine of the Clayburn Company is mined by room-and-pillar methods. The average number of men employed during the year was three. Production was approximately 150 tons of clay per week.

GRANITE.

Coast Quarries, Ltd. Head office, 1840 Georgia Street West, Vancouver; quarry office, Granite Falls P.O. J. H. Davidson, manager; T. H. Burrows, superintendent. This company operates a granite-quarry at Granite Falls (49° 122° S.W.), on the North Arm of Burrard Inlet. Jetty-rock, riprap, rubble, and crushed rock are produced.

Gilley Bros., Ltd.—Quarry office, Pitt Lake (49° 122° S.W.). Francis J. MacDonald, superintendent. The quarry, on the east shore of Pitt Lake, produces larger sizes of granite, chiefly jetty-rock. The average number of men employed during the year was twenty-one.

Valley Granite, Ltd.—Cheam View P.O. L. Hausler, owner. The plant and quarry are several miles east of Rosedale (49° 121° S.W.), on the main highway. Granite is quarried and crushed to make finely ground and crushed products for poultry-grit and stucco-dash.

GYPSUM.

Columbia Gypsum Products, Inc.*

(50° 115° S.W.) Head office, 40 Harrison Building, Bremerton, Wash; British Columbia office, 601 Royal Trust Building, Vancouver; quarry office, Windermere. Loren G. Brown, president; H. A. Andrews, general manager. The property of Columbia Gypsum Products, Inc., comprises thirty-one mineral claims situated about 5 miles north-easterly from the settlement of Windermere. The claims extend about 1½ miles north of Windermere Creek and about 2 miles along the creek-valley. Access to the showings under development is by road, of which 2.9 miles was constructed during the summer of 1948 to connect with existing roads in the main Columbia Valley. The total distance to Windermere Lake Station, on the Kootenay Central branch of the Canadian Pacific Railway, is about 9 miles.

Gypsum occurs in bedded form, overlain conformably by black limestone of the Beaverfoot-Brisco formation of Upper Ordovician or Silurian age. The rock immediately underlying the gypsum is not disclosed in any of the exposures examined. Three bands of gypsum are indicated on the property, but as yet the evidence is insufficient to determine whether these represent separate beds or repetition of the same one through folding or faulting.

In general the hillsides in this vicinity are heavily covered with glacial till or masked by cemented limestone conglomerate of Tertiary or Recent age. Natural outcrops of gypsum are restricted to deep sink-holes, slides, and rare exposures of gypsite overlying massive gypsum, but the deposits may be readily traced by numerous sink-holes and solution pits along their strikes. The dependability of these topographical indications has been established by pits and bulldozer-cuts at several places on the property.

Development during 1948 was restricted to the most southerly, and at present most accessible, of the above-mentioned bands. Bulldozer-stripping, in an area 600 to 1,200 feet north of and 400 to 500 feet higher than Windermere Creek, has exposed gypsum at close intervals along the strike for more than a quarter of a mile; the indicated outcrop-width is about 300 feet. Toward the western end of this section the hillside slopes steeply toward the creek. Here surface exposures indicate a width of about 300 feet of gypsum, and an area about 200 feet long and 100 feet wide has been completely stripped and a quarry-face has been started. In a length of more than 90 feet, diamond-drilling has proved that gypsum continues to a depth of more than 100 feet below the proposed quarry-face.

At its northern margin the gypsum is in conformable contact with black limestone which strikes south-easterly and dips steeply to the north-east into the hillside. At the southern margin of the exposure the gypsum-band is overlain unconformably by limestone conglomerate of Recent or Tertiary age, so that the true thickness of the deposit cannot be determined beyond the minimum stratigraphic thickness of about 200 feet shown.

To the south-east of the section discussed, gypsum is covered by overburden for several hundred feet but is again exposed along the strike in a cliff where a face of gypsum nearly 300 feet wide and up to 60 feet high is overlain unconformably by calcareous conglomerate about 50 feet thick. From the bottom of this exposure the continuation of the gypsum-band to the south-east is indicated by numerous sink-holes almost to Windermere Creek, a distance of more than a quarter of a mile.

To the north-west of the developed section the same gypsum-band may be traced by an almost continuous zone of sink-holes extending along and up the sidehill to an elevation of 5,200 feet, a distance of more than 4,000 feet. This zone has been stripped

* By J. M. Cummings.

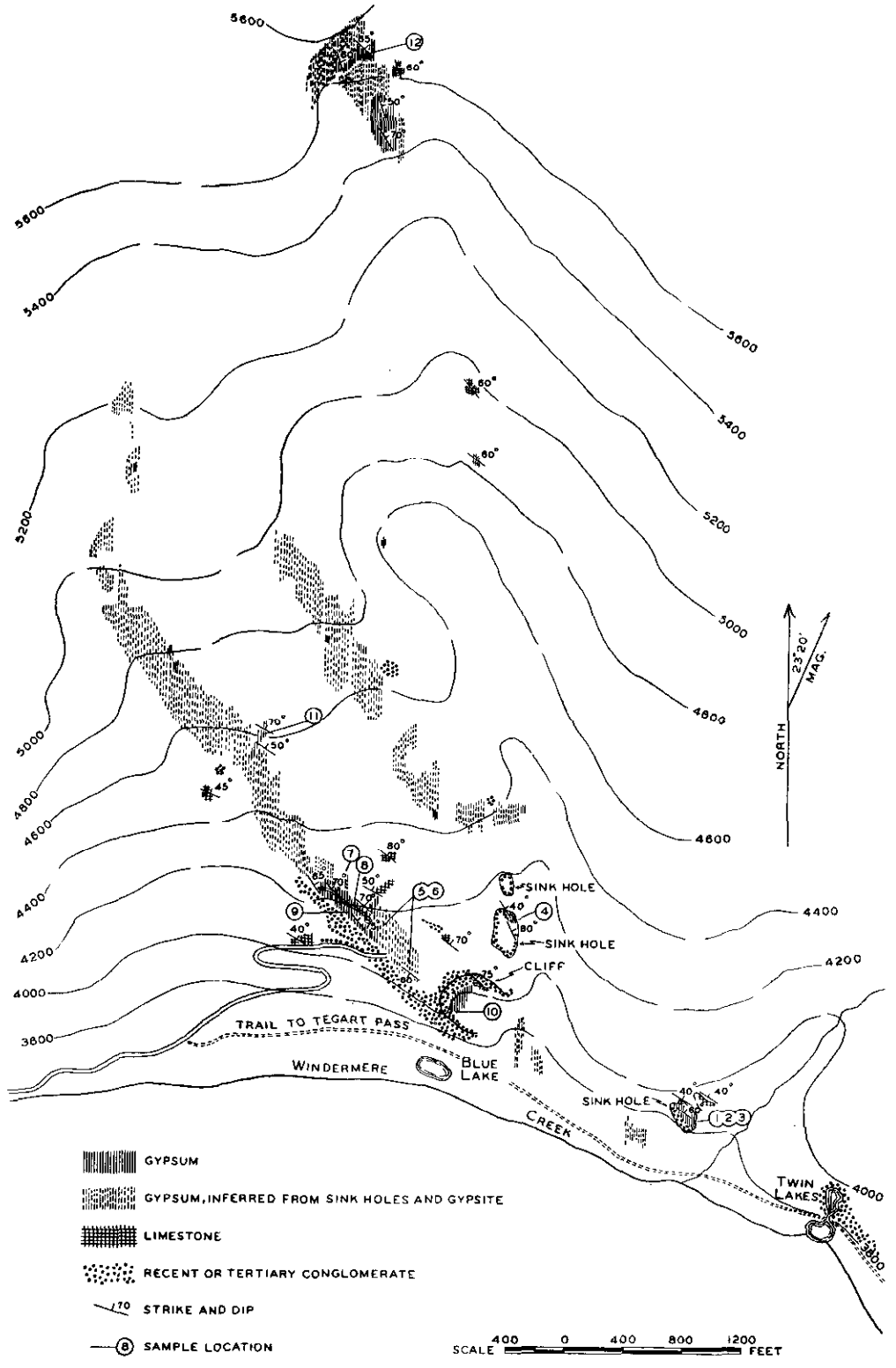

Fig. 17. Sketch-map of gypsum deposits, Windermere (Columbia Gypsum Products, Inc.).

by bulldozer to expose gypsum in-place at a point about 1,000 feet north-west of the proposed quarry-site. The bed under discussion may be concluded to have a proved length of about a mile and an average surface width of nearly 300 feet.

The second gypsum-band lies about one-quarter of a mile north-east of the one discussed and is approximately parallel to it. This deposit is traceable by sink-holes and occasional outcrops for a length of nearly 4,000 feet and appears to have an average width of 200 to 300 feet.

The third deposit outcrops in a saddle on a ridge about 1½ miles north of the workings and between elevations of 5,200 and 5,600 feet. Here a body of gypsum more than 400 feet wide and 1,000 feet long is exposed, having a similar strike and dip to the first band and, like it, conformably overlain by dark limestone.

Near the confluence of the north fork of Windermere Creek and the main creek, about half a mile up-stream from the proposed quarry-site, a large sink-hole near the bottom of the hillside exposes a thickness of 80 feet of gypsum overlain conformably by dark limestone. Farther to the south-east (beyond the margin of Fig. 17) gypsum is indicated by sink-holes, exposed in the creek-bed, or appears as extensive outcrops in slides along the steep southern slope of the valley for at least another 2 miles. There seems little doubt that a continuous bed of gypsum extends from the large sink-hole for several miles up-stream. The relationship of this gypsum to the three bands described previously is not clear, but it is probably a continuation of one of the lower bands.

The relationship of the various gypsum-occurrences described above, as well as the location of samples taken by the writer, are indicated on the accompanying map (Fig. 17). In general the gypsum, where exposed, ranges in colour from white to grey and is relatively free from visible impurities.

The analyses of the samples shown on the map are tabulated below:—

Sample No.	CaO.	SO_3.	H_2O.		Fe_2O_3.	Al_2O_3.	MgO.	CO_2.	SiO_2.
			45° C.	215° C.					
1	31.97	43.59	0.05	19.42	0.09	0.13	1.30	2.46	1.03
2	32.22	42.89	0.05	19.17	0.03	0.13	1.40	3.12	0.94
3	32.51	42.89	0.04	19.12	0.09	0.15	1.19	3.08	0.83
4	32.19	44.54	*Nil*	19.85	0.04	0.08	0.91	1.66	0.59
5	31.55	35.07	0.28	16.78	0.26	0.61	2.70	7.92	3.54
6	31.85	41.19	0.08	18.26	0.05	0.21	2.00	4.52	1.41
7	32.42	44.54	*Nil*	19.85	0.03	0.01	1.13	2.06	0.14
8	31.80	42.18	*Nil*	18.82	0.11	0.21	1.79	3.60	1.34
9	29.85	35.43	0.04	15.82	0.26	0.81	4.27	8.18	4.75
10	32.12	45.38	*Nil*	20.24	0.03	0.08	0.57	1.10	0.44

Description of Samples.

Sample No. and Description.	Gypsum.	Anhydrite.	Carbonates.
	Per Cent.*	Per Cent.*	Per Cent.*
1. From sink-hole, across 15-foot beds, grey gypsum	93.17	*Nil*	5.0
2. From sink-hole, across 40-foot beds, grey gypsum	93.3	*Nil*	6.4
3. From sink-hole, check sample below surface	92.3	*Nil*	6.5
4. From another sink-hole, across 40-foot beds, grey gypsum	95.3	*Nil*	4.2
5. Cream gypsite, composite from several pits, 2 to 3 feet below surface	73.5	*Nil*	17.0
6. Creamy white more massive gypsum directly below Sample No. 5 in pits	87.3	*Nil*	9.5
7. Chip sample from cut, 300 feet along strike, cream to white gypsum	95.8	*Nil*	4.2
8. Chip sample, 50-foot beds across strike, creamy white gypsum	90.6	*Nil*	7.6
9. Chip sample across 10-feet from pit on lower margin deposit	76.6	*Nil*	17.0
10. From cliff, across 25 feet, grey gypsum	97.7	*Nil*	2.3

* Approximate.

Partial analyses of Sample Nos. 11 and 12 follow:—

Sample No. and Description.	CaO.	SO_3.	H_2O (215° C.).	Gypsum.
				Per Cent.*
11. Creamy white, from bulldozer-cut, 12-foot beds	31.9	42.1	19.2	93
12. Grey gypsum, chip across 100-foot beds	32.0	45.3	20.3	98

* Approximate.

No analyses of the drill-core from the 115-foot and 90-foot holes mentioned previously are available. However, the cores examined by the writer showed little change in appearance throughout their length, except for a small proportion of clayey material in a few sections.

The Windermere gypsum-occurrence appears to be of sedimentary origin, representing a primary unit of the Beaverfoot-Brisco formation. In view of the observed extent of the deposits and the relatively light overburden over considerable areas, a large tonnage of good-quality material appears to be commercially available from this property.

Gypsum, Lime, and Alabastine, Canada, Ltd. Head office, Paris, Ont.; British Columbia office, 509 Richards Street, Vancouver. Norman Jessiman, manager. This company operates a gypsum property at Falkland, 40 miles from Kamloops on the Vernon–Kamloops Highway and on the Vernon branch of the Canadian National Railway. Gypsum is mined from open quarries 500 to 600 feet above the railway on the steep hillside north of the village. Compressed-air jack-hammers are used for drilling; 30-per-cent. Forcite and 25-per-cent. Stopeite blasting-powder is used for blasting. Broken rock is handled by power shovels and transported by trucks to a crushing plant and bunkers at the railway for shipment to the company's mill at Port Mann, near New Westminster. The quarries operated throughout the year. Twenty-seven men were employed.

LIMESTONE AND MARL.

LIMESTONE.

Adanac Lime Corporation, Ltd.—(49° 121° S.W.) Head office, 503 Randall Building, Vancouver; plant, Popkum. T. C. McAlpine, managing director. Pulverized lime for agricultural and animal-feed purposes is produced at the plant.

Beale Quarries, Ltd. (49° 124° N.W.) Head office, 744 Hastings Street West, Vancouver; quarry office, Vananda. W. D. Webster, superintendent. This limestone-quarry lies about 1 mile south-west of the town of Vananda on the east shore of Texada Island. Production consists of "man rock" and pulverized rock for agricultural and industrial uses and for rock-dusting coal mines. During the year the average number of men employed was twenty-one.

F. J. Beale.—(52° 127° S.W.) In July, 1948, F. J. Beale reopened his quarry at Gunboat Passage, 6 miles east by boat from Bella Bella. All the lime rock produced is taken by Pacific Mills at Ocean Falls.

Clinton Lime Holdings, Ltd. (51° 121° S.W.) Company office, 850 Hastings Street West, Vancouver; plant office, Clinton. F. E. Wilkes, president; J. M. Simpson, superintendent. Quarrying, with the aid of a bulldozer, was commenced by this company on a deposit of travertine or calcareous tufa, situated 3 miles west of Clinton on the Pacific Great Eastern Railway. In 1948, 1,440 tons of agricultural lime was produced. In September the plant was reconstructed and four storage-bins of 200 tons total capacity were added. Screens were installed to

produce a fine product, to be sold for use as a paint-filler and for various other purposes. The high moisture content of the raw material made screening separation impossible. Plans are being made to install a drying kiln to remove excess moisture. A crew averaging five men was employed.

Columbia Cellulose Co.—(54° 130° S.E.) The Columbia Cellulose Company did some test-drilling of a limestone deposit on the north side of Smith Island. Three diamond-drill holes, totalling 600 feet, were drilled and the cores sent out for analysis. Quarrying will start sometime in 1950 to stock-pile lime rock for use in the cellulose plant at Port Edward.

Consolidated Mining and Smelting Co. of Canada, Ltd.—Fife (49° 118° S.E.). Head office, Trail; quarry at Fife. During 1948 the company quarried limestone which was shipped to Trail to be used as flux in the smelter. The number of men employed averaged seven.

Hiram Cutler & Sons.—Agassiz (49° 121° S.W.). Agricultural limestone is produced at the plant situated nearly 2 miles from Agassiz. A second quarry has been started to replace the original quarry. The average number of men employed during the year was seven.

Koeye River Limestone Co.—Company office, Namu. P. Christensen, owner and manager. The quarry is 6 miles south by boat from Namu and 1 mile up the Koeye River. During the first half of 1948 a crew of six men was employed, but for the remainder of the year the quarry was operated by P. Christensen and his son. All the lime rock is loaded on scows and towed to Pacific Mills plant at Ocean Falls.

Marble Bay Quarry.—(49° 124° N.W.) Stanley Beale, manager. The Marble Bay quarry is situated less than 1 mile from Vananda, and on the west side of Marble Bay. Approximately 3,000 tons of "man rock" is shipped per month to Coast pulp-mills. A 310-cubic-feet-per-minute portable air-compressor was installed in August, 1948. On an average, five men were employed during the year.

Pacific Lime Co., Ltd. (49° 124° N.W.) Head office, 744 Hastings Street West, Vancouver; plant office, Blubber Bay. Capital: 100,000 shares, $10 par value. A. Harvey, general manager; A. M. Stewart, assistant general manager and works superintendent. H. S. Fowler resigned as works superintendent during the year. The plant is located on the south-western shore of Blubber Bay, Texada Island, half a mile from the Government wharf. Regular ship service is maintained between Blubber Bay and Vancouver. The company has been operating continuously since 1916, except for a short shut-down during 1933.

Two limestone-quarries, No. 2 and No. 4, were operated in 1948. The No. 2 quarry is adjacent to the plant, while the No. 4 is nearly 2 miles away, along the Vananda–Blubber Bay Road. The No. 4 quarry, on which operations started in May, supplied nearly 40 per cent. of the limestone quarried this year and will shortly supply all the limestone for the plant.

In the quarry, faces 45 feet high will be advanced on either side of the main haulage-road.

A 500-cubic-foot-per-minute diesel-driven compressor, with cooling-tanks and air-receivers, has been permanently installed at the new quarry. Trucks will be used for hauling limestone to the plant. The average number of men employed during the year was 155.

Limestone quarried during the year amounted to 150,000 tons, and 100,000 tons was burned for products.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1947, p. 218.]

MARL.

Allison (Burns) Lake Marl Deposit (B.C. Marl Co., Ltd.).—(49° 120° N.W.) E. W. Johnstone, manager, Princeton. Marl was produced in 1948 from this deposit, which is 20 miles north of Princeton on the highway to Merritt. A drag-line scraper was used to excavate marl from the southern shore of the lake. The moist marl is dried in a rotary drier and sacked for shipment to the Fraser Delta area and other Coast points. Three men were employed.

Roany Marl Deposit. (49° 120° S.W.) This deposit, owned by H. Knighton and W. R. Foster, was operated on lease during 1948 by L. Hansen and F. Gee. The deposit is in the bed of a dry lake on Roany Creek, 5½ miles south-east of Granite Creek. The marl is excavated by machines, dried in a rotary drier, and shipped to Fraser Valley points for agricultural use. Five men were employed during the spring and fall.

SAND AND GRAVEL.

Deeks-McBride, Ltd. Company office, 1051 Main Street, Vancouver. H. T. Hamilton, manager; J. Mills, general superintendent. This company operated continuously two sand and gravel pits, one on Seymour Creek (49° 123° S.E.) and the other near Coquitlam (49° 122° S.W.). The Seymour Creek plant, operating sixteen hours a day, produced approximately 1,200 cubic yards of sized products in that time. Average number of men employed was thirty. At the Coquitlam plant nearly 500 cubic yards of sized products were produced daily. Average number of men employed was ten.

Highland Sand and Gravel Co., Ltd.—(49° 123° S.E.) Company office, Seymour Creek. W. J. Barrett-Leonard, manager. This company operated its plant and gravel-pit continuously during the year, producing nearly 300 cubic yards of gravel a day. The average number of men employed was twenty-seven.

Maryhill Sand and Gravel Co., Ltd. (49° 122° S.W.) Company office, 902 Columbia Street, New Westminster. The company's sand and gravel pit is on the Fraser River, near Coquitlam. The washing, screening, and crushing plant operated continuously throughout the year, producing nearly 1,800 cubic yards of sized products a day. Average number of men employed during the year was fifty.

Road Materials, Ltd. (49° 123° S.E.) Company office, Lynnmour P.O. J. E. Priest, manager. This company operates a sand and gravel pit in conjunction with a processing plant for asphaltic road materials. The plant and pit are near Seymour Creek. The plant has a capacity of nearly 200 cubic yards per day. The average number of men employed was ten.

Inspection of Lode Mines, Placer Mines, and Quarries.

By H. C. Hughes, Senior Inspector of Metalliferous Mines.

CONTENTS.

PRODUCTION.

The output of metal mines for 1948 was 5,655,266 tons. This tonnage was produced from ninety-seven mines, of which fifty-one produced 100 tons or more.

FATAL ACCIDENTS.

During 1948 there were twenty-three fatal accidents connected with actual mining operations in underground metal mines, including underground placer mines. This was fourteen more than the number of fatal accidents in 1947. In addition, there were two fatal accidents on the surface—one arising from a man falling into a sand-hopper at a sand and gravel plant and one in connection with road construction. A description of these accidents is included.

There were 5,572 persons employed below and above ground in metal mines and 1,126 persons in concentrators in 1948. The ratio of fatal accidents per 1,000 persons employed was 3.43, compared with 1.42 in 1947.

The tonnage mined per fatal accident during 1948 was 245,881 tons, compared with 554,062 tons in 1947.

The tonnage mined per fatal accident during the last ten-year period was 530,865 tons.

The following table shows the mines at which fatal accidents occurred during 1948, with *comparative figures for 1947*:—

Mining Division.	Mine.	No. of Fatal Accidents.	
		1947.	1948.
Atlin	Polaris-Taku	1	1
Clayoquot	Privateer	....	2
Fort Steele	Sullivan	3	4
Greenwood	Dentonia	....	1
Lillooet	Elizabeth group	....	2
Lillooet	Pioneer	....	1
Lillooet	B.R.X.	1	....
Lillooet	Pacific Eastern	3	....
Lillooet	Bralorne	....	1
Omineca	Silver Standard	....	1
Osoyoos	Nickel Plate	....	2
Similkameen	Slate Creek Placers	....	1
Similkameen	Copper Mountain	....	2
Slocan	Zincton	....	1
Vancouver	Britannia	1	4
Totals		*9*	*23*

Road-construction and sand-hopper fatalities at the Van Roi mine and Deeks-McBride gravel plant have been omitted from this table.

The following table classifies the fatal accidents as to the cause and location:—

Cause.	Number.	Location.
Blasting	6	Underground.
Falls of ground	10	,,
Underground haulage	2	,,
Falling down raise	1	,,
Shaft inspection	1	,,
Slough of tailings	1	Surface.
Struck by crane	1	Crusher plant.
Falling into bin	1	Surface.
Road-construction	1	,,
Monoxide poisoning	1	Surface pump-house.
Total	25	

On January 12th, 1948, Eugene Edwin Willett and Edward Swirski, miners, were instantly killed as a result of a premature blast in the face of the 1103 drift of the Privateer mine. The men had drilled the usual type of round, loaded their holes, and were just finishing lighting when the cut holes exploded. No variation from normal conditions existed in the working-place, and the explosives and fuse used were in good condition. Both men were experienced miners. It is, therefore, very difficult to find the exact cause of this accident.

On January 25th, 1948, John Arvid Swanson, diamond-driller, died as a result of injuries he received on January 21st, 1948, when he fell 320 feet down an ore-pass in the Britannia mine. The ore-pass was used as a transfer raise and was open. It was off the main thoroughfare and was well lighted.

On January 24th, 1948, Robert Archie Pennington, miner's helper at the Dentonia mine, died following a slight explosion in a hole that he was drilling for practice while his partner was having lunch. The explosion drove a small piece of sharp quartz into his neck with sufficient force to sever an artery. There were two missed holes con-

taining powder in the face, but neither of these had been drilled into, and although there were several bootlegs, it was the impression of the mine official who had seen the face prior to the explosion that there was not an obvious bootleg where Pennington was drilling. His steel may have entered a "blind bootleg" containing powder, but it appeared more likely from the evidence that the powder had been introduced with the drill-steel.

On January 30th, 1948, Julian Kril, William Norman Natrasowany, and Irvin George Albert Boucher, miners, were instantly killed by a fall of rock in 27-15 stope of the Bluff section of Britannia mine. The men were drilling when a block of ground directly over them, estimated at 170 tons, fell. An examination of the back of the stope after the fall showed two slips or talc-filled fractures converging in the roof directly over the workmen. One of these slips could not be seen until after the ground fell. The other showed near the centre of the stope and a bulldoze charge placed in it the previous day failed to dislodge the rock.

On February 4th, 1948, John Clifford Shea, repairman, died as a result of injuries received when he was struck by a travelling crane in the surface crushing plant at the Sullivan mine. Shea was repairing the chute to the No. 2 crusher and was lying on the crawl-beam of the crane for this purpose. The crane operator was called to remove a jam in No. 1 crusher and did not know Shea was on the beam when he moved the crane.

On February 5th, 1949, Thorsten Tjader and George Stewart, miners, were instantly killed as a result of a premature blast in the face of Bralorne Yalakom cross-cut. The round was apparently spit in the normal manner, but one hole, for reasons not known, exploded prematurely. Both men were experienced miners. Careful tests of the fuse, both that found at the face and samples from the rolls from which this was taken, failed to reveal any defect.

On February 12th, 1948, George Victor Tewsley, a member of the shaft-inspection crew, was instantly killed when he was crushed between the skip and the apron of a loading-pocket in the 3901 shaft at the Sullivan mine. Tewsley and his partner were inspecting the shaft, and the deceased, absorbed in his work, evidently forgot the existence of the loading-pocket.

On March 18th, 1948, Johan Bysterbosch, tailing-storage operator, was killed by *suffocation when he was buried by a slough of tailings while repairing a washout in* the tailings-pond of the Nickel Plate mine. Bysterbosch had sent his helper into the washout and a small slough buried the helper to the waist. Bysterbosch descended into the washout to dig his helper out when a second slough buried him.

On March 30th, 1948, Leslie Elwin Hill, labourer, was killed by suffocation when he fell into a sand-hopper at the Deeks-McBride sand and gravel plant near Coquitlam. Sand was being drawn from the bottom of the hopper and had hung up and formed a funnel inside. Hill was loosening the sand with a bar from the top of the hopper when he fell in and was covered by the sand.

On May 8th, 1948, Oswald J. Flemming, miner, was instantly killed by a fall of ground in the 1900 level of the Pioneer mine. Flemming was drilling with a stoper when a slab of approximately 2 tons weight fell on him from the back. The ground in the working-place had been spragged up and was considered safe.

On July 5th, 1948, Louis N. Marcotte, placer-miner, was killed by suffocation when he was buried by a cave-in at the face of a short tunnel on the property of the Slate Creek Placers, Limited, near Tulameen. The tunnel was about 16 feet long and was being driven through unconsolidated surface material. It was apparently well timbered.

On July 9th, 1948, Nick Boyko, brakeman, received multiple internal injuries which resulted in his death on July 12th, 1948, in the 6 level of the Granby Company's mine

at Copper Mountain. The motorman was side-tracking his train preparatory to going off shift and Boyko was riding on the back of the train. When the motorman stopped the train, he heard groans and found Boyko in a sitting position against the wall. The injured man was not able to make a statement as to how the accident happened before he died.

On July 16th, 1948, H. V. Dewis, construction contractor, was instantly killed while operating a Caterpillar tractor on the road between the Hewitt and Van Roi mines. A newly filled piece of road gave way, allowing the tractor, with Dewis on it, to slide and roll about 50 feet.

On July 20th, 1948, Walter E. Rutledge, miner, was instantly killed while blasting a round in the 1351 No. 6 stope of the Bralorne mine. Rutledge and his partner were blasting a section of sill on the 1200 level. This was so situated that it was necessary to go past the first holes lit in order to get out of the stope. Two hot-wire lighters were used in lighting the round, and Rutledge did not have time to get out of the stope before the first shot went off. His partner left after the first lighter was used.

On August 25th, 1948, John Braun, miner, died as a result of injuries received earlier in the day from a fall of ground in the 345 stope south of the Polaris-Taku mine. The ground had been tested and was thought safe, but a hidden slickenside area allowed a block of about 12 tons weight to fall.

On September 1st, 1948, Donald Roy, brakeman, died as a result of injuries received earlier in the day on the 6 level of the Granby mine at Copper Mountain. Roy was riding the front car of a train and in some unexplained manner stepped or fell off and was struck by the moving cars. No one actually saw the accident happen.

On September 25th, 1948, Bruno Sylva Pattyn, stope miner, was fatally injured by a fall of ground in the 0-12 East undercut at the Sullivan mine. Pattyn and his partner had unsuccessfully attempted to bar a slab down and had decided to blast a hole drilled in it some days before. His partner left to work in another part of the stope, but Pattyn evidently remained behind for a final examination when the slab fell.

On November 6th, 1948, Thomas Smith Young, raise miner, was instantly killed by a fall of ground in a raise off the No. 1 pilot shaft at the Sullivan mine. Young and his partner were barring down the raise preparatory to drilling, when a piece of rock, estimated at over a ton, fell, striking Young and knocking him 57 feet down the raise.

On December 14th, 1948, Alexander Wallace Davidson, miner, was instantly killed by a fall of ground in a stope in the Nickel Plate mine near Hedley. Davidson and his partner were mucking out preparatory to putting in timber, when about 4 tons of rock fell, burying him. A hidden slip was revealed after the ground fell.

On December 21st, 1948, John Dahl, surface worker, was rendered unconscious from exposure to carbon-monoxide fumes in the surface pump-house of the Silver Standard mine near Hazelton. He died on December 27th, 1948, without recovering consciousness. Dahl was detailed to look after a gasoline-driven pump on night shift and evidently went to sleep in the building and was found unconscious the next morning. An unnoticed small leak in the exhaust of the engine supplied sufficient monoxide to have a lethal effect after an exposure of ten hours.

On December 24th, 1948, Kenneth Victor Allen, miner, was instantly killed when he was struck by a fall of ground in 310 stope of the Zincton mine. Allen, in company with the foreman, shiftboss, and another miner, was barring the stope down to make it safe when the fall occurred. Two of the other men were slightly injured.

In addition to the twenty-five fatal accidents, 445 accidents involving a loss of time of more than seven days were reported to this Department. These accidents were investigated and reported on by the Mine Inspectors.

The following table classifies the accidents as to occupation and gives the percentage of the total for each occupation listed. The twenty-five fatal accidents are included in this table:—

Occupation.	Number of Accidents.	Percentage of Total.
Underground—		
Barmen	4	0.9
Chute-pullers	17	3.7
Haulagemen	48	10.0
Miners	211	44.9
Muckers	72	15.2
Pipe-fitters and trackmen	14	31.0
Timbermen	22	4.7
Miscellaneous	12	2.6
Surface—		
Shops	17	3.7
Mill	6	1.3
Surface, general	47	9.9
Totals	470	100.0

The following table classifies the accidents as to cause and gives the percentage of the total for each cause listed below. The twenty-five fatal accidents are included in this table:—

Cause.	Number of Accidents.	Percentage of Total.
Blasting	15	3.2
Breaking of stagings, pipe, etc.	15	3.2
Fall of ground	54	11.4
Fall of material and flying material	60	12.7
Fall from ladders, etc.	6	1.3
Lifting and handling material and equipment	123	26.3
Machinery and tools	87	18.4
Slipping	70	15.0
Run of ore or waste	22	4.7
Burns and shock	9	1.9
Miscellaneous	9	1.9
Totals	470	100.0

The following table classifies the accidents as to parts of the body injured and gives the percentage of the total for each part listed in this table. The twenty-five fatal accidents are not included.

Location.	Number of Accidents.	Percentage of Total.
Head and neck	24	5.4
Eyes	27	6.0
Trunk	62	14.1
Back	59	13.2
Arms	26	6.1
Hands and fingers	117	26.0
Legs	66	14.8
Feet	52	11.7
Toes	12	2.7
Totals	445	100.0
Fatal accidents	25	
Total	470	

TESTS ON FUSE AND EXPLOSIVES.

As a result of six blasting fatalities, a large number of tests were made to check the burning speed of the fuse used at the places where these accidents occurred. In no test did the fuse show a variation in burning speed greater than that guaranteed by the manufacturers.

A number of tests were also made to see if the explosives used in underground mines could be ignited or detonated by a kinked, damaged, or faulty fuse which would spit out the side. None of the explosives tested could be ignited or detonated in this manner, although the tests they were subjected to were much more severe than could occur in actual practice.

DANGEROUS OCCURRENCES.

On January 13th, 1948, in No. 8 shaft at Britannia mine, the south cage was pulled into the timber above the shaft dumping-pocket, which is just above the 4000, or highest, level in this shaft. Hoisting is done both in and out of balance in this shaft. Timber was being landed on the 4000 level in the north compartment while men were being hoisted in the south compartment to the same level. After the south cage was released, the hoistman lowered it to a point below the 4000 level and engaged the clutch. The men unloading the timber completed their work and used the north cage to descend to the 4100 level. This caused the south cage to be pulled into the timbers. In this shaft the distance between the top dumping position and the top of the head-frame is limited, so that the limit-cam of the Lilly control requires very careful setting. Owing to this difficulty, it was disconnected at the time of the occurrence. The hoist-man was reprimanded, and steps taken to prevent another occurrence.

On January 14th, 1948, at the Pioneer gold mine a workman walked into a blast on the 2200 level, the approaches to which had been insufficiently guarded.

On January 23rd, 1948, at the Nickel Plate mine, extensive caving occurred in a timbered stope on the Nickel Plate side of the Nickel Plate-Mascot mine boundary. Except in one slot, back-filling had not been completed when the caving occurred. There were six slots in the area. The first signs of "squeeze" were noticed two weeks before the stope collapsed. The caving took place between shifts when the men were out of the stope, and no one was injured.

On February 24th, 1948, at the Hedley Mascot mine, a break was discovered in the main shaft of the No. 1 surface tramway hoisting-drum. The break occurred about 30 inches from the end of the shaft and inside the hub on the north end of the hoisting-drum. It was discovered by a repairman when the shaft started to work out through the bearing. Tramming was discontinued until the shaft was replaced by a new one.

On March 2nd, 1948, at the tailings-storage area of the Sullivan concentrator, the east wall of the tailing area collapsed and the iron tailings flowed to a railroad embank-ment about 2 miles below. The flume superstructure collapsed, and two men working on it were carried on blocks of frozen tailings for some distance before they could work over toward the edge of the flow. They escaped with minor injuries and shock.

On March 8th, 1948, at the Cariboo Gold Quartz mine, a workman was breaking rock with a hammer. He saw a stick of powder (Cilgel or Stopeite) in the muck pile and picked it up and put it aside. He then struck a large piece of rock, and an explo-sion occurred which blew dust in his eyes. The powder is granular; some grains evidently fell on the rock and were exploded by the next hammer blow. Injuries were slight, and no time was lost.

On May 22nd, 1948, at the Granby mine at Copper Mountain, a violent explosion wrecked the compressed-air lines leading from the compressor to the No. 1 shaft.

An 8-inch air-line was ripped open at seven points varying from 140 to 450 feet from the compressors. A 7-inch air-line was also damaged. Investigation revealed that one of the discharge-valves on No. 4 compressor had a flash mark, which indicated this to be the possible point of ignition. It is probable that a leaking and carbonized discharge-valve became sufficiently heated to burn or glow. This could ignite an explosive mixture of oil or vapour. Two workmen received slight injuries and suffered from shock.

On June 24th, 1948, at the Brooklyn-Stemwinder mine at Phoenix, a new adit broke into the flooded Stemwinder workings at the 114-foot level. This occurred when a drift round was blasted at the end of the shift. The force of water drove the muck-car out of the tunnel and washed away the dump. No one was in the adit at the time.

On July 17th, 1948, at the Tulsequah Chief mine, a fire, believed to have been caused by a spark from the diesel-engine exhaust, burned off about 5 acres of hillside above the Tulsequah Chief camp. The fire destroyed the surface skipway to the 5900 level, a small warehouse, and a powder magazine adjacent to the portal. Damage was estimated at $2,500. No men were at work in the tunnel at the time of the fire.

On July 20th, 1948, at the Nickel Plate mine, a rock fell from a loaded south-side skip at a point about 600 feet below the central station. The skip, travelling downward, evidently caught up with the rock which raised the dumping extension on the rear wheel, derailing the skip. It came to rest against the bank across the track. A complete examination of the rope was made and no damage was found. No one was injured.

On July 26th, 1948, at the Nickel Plate mine, four boxes of electric blasting-caps were to be taken from the main detonator magazine for transfer to the daily-storage magazine. They were put in a car on an empty ore-train going to the mine. In bringing up the train, the motorman forgot to tell the loader at the mine about one of the cars containing the detonators. Muck was loaded on top of the boxes, and the whole car dumped at the ore-bin. Three boxes of detonators were recovered more or less intact, but the fourth was broken and detonators were scattered through the muck. Most of these were picked up along the line, but some did go through and exploded in the primary crusher in Hedley. No person was injured. To prevent a recurrence, any cars carrying explosives now carry a red flag in such a manner that it is impossible to take the car under the loading-chutes.

On August 21st, 1948, at the Little Billie mine, the skip, hanging up on an accidentally opened loading-chute at the 480 level loading-pocket, caused the hoisting cable to kink in three places and resulted in damage to the guides. Balanced hoisting in this shaft is carried on with a cage in the west and a skip in the east compartments. The 480 level loading-pocket is equipped with a movable chute which swings vertically into the shaft when the skip is being loaded at this point. To ensure the chute remaining in a closed position, an additional positive lock has been installed.

On September 13th, 1948, in a scraper-drift on the 600 level of the Britannia mine, a bulldoze charge exploded, injuring two workmen. The charge, with a 5-foot fuse and tied to a 20-foot blasting-stick, was being placed on a large rock lying in a draw-hole. Some difficulty was experienced by the workmen in placing the charge properly, and before this was completed, the blast occurred.

On September 15th, 1948, on the main haulage-level of the Sullivan mine, an unattended motor ran away, picked up a string of eleven cars and travelled several thousand feet before being observed and stopped. Fortunately the line was clear and no accident resulted. The incident was caused by the motorman moving the motor a few feet while not in the cab and unknowingly leaving the controller one notch in the reverse position. Brakes were also not properly set. The motorman was reprimanded.

On October 22nd, 1948, at the Pioneer mine, a sudden large inflow of methane occurred while driving a raise from the 2200 level. Mining operations were suspended in the raise, and ventilation maintained until the flow of gas subsided.

On December 8th, 1948, in the Dickson incline in the Nickel Plate mine, two freight-nippers were loading refuse timber into a timber-truck when the hoistman raised the skip, causing a back injury to one of the nippers. The nippers claimed they had not given any signal. The hoistman, whose statement was corroborated by another workman, claimed that a raise signal had been received.

On December 24th, 1948, at the Sullivan mine, a repairman was adjusting the brake leverage on the No. 2 drum of the 3901 hoist. The air-brake engine was disconnected and set in the full braking position, and the reach-rod was held up and resting on the bell-crank. The reach-rod slipped off the bell-crank, possibly through vibration, and the weight of the magnetic plunger actuated the brake engine, releasing the brake. The skip fell about 90 feet to the sump. The safety-dogs did not act, possibly due to the length of trailing cable. No one was injured.

EXPLOSIVES USED IN MINES.

The table below shows the quantities of explosives and blasting accessories used in the metal mines and quarries in British Columbia in 1945, 1946, 1947, and 1948:—

	1945 Total.	1946 Total.	1947 Total.	1948 Total.	1948.	
					Mines.	Quarries.
High explosives (lb.)	3,677,200	3,960,150	5,464,900	6,209,950	5,977,550	232,400
Blasting-caps	1,151,000	1,464,300	1,780,700	1,816,000	1,607,000	209,000
Electric blasting-caps	28,200	4,910	117,650	61,150	47,375	13,775
Delay electric blasting caps	6,200	29,425	55,700	78,800	77,900	900
Primacord (ft.)	135,000	135,500	258,000	417,000	417,000	.....
Safety fuse (ft.)	7,315,000	11,625,300	13,722,100	16,053,900	15,226,700	827,200

This table shows a continuation of the trend toward the increasing use of electric and Primacord blasting.

PROSECUTIONS.

On January 30th, 1948, a miner at the Kenville gold mine, near Nelson, drilled in a hole that had previously been charged. An explosion occurred, injuring him slightly. He was charged with an infraction of section 39, General Rule 30, of the "Metalliferous Mines Regulation Act," found guilty, and fined $10 and costs.

On March 23rd, 1948, the manager of the Dentonia mine, near Greenwood, was charged with a violation of section 39, General Rule 6 (*b*), of the "Metalliferous Mines Regulation Act" as an aftermath of a fatal accident to a miner's helper on January 24th. He was given suspended sentence, accused to enter into recognizance for thirty days to the amount of $100, and to pay costs.

On June 30th, 1948, a motorman at the Copper Mountain mine was charged with failing to obey block light signals when bringing a loaded ore-train out of the No. 6 level on June 27th. This was a violation of Special Rule 62 of the special rules applicable to the Copper Mountain mine. He pleaded guilty and was fined $50. As a result of his failure, a collision occurred, and his brakeman received injuries which necessitated the amputation of a leg.

AIR-SAMPLING.

Air samples were taken wherever conditions indicated the possibility of the presence of noxious gases or the oxygen content being below normal. About

sixty samples were taken and analysed for oxygen, nitrogen, carbon dioxide, carbon monoxide, methane, hydrogen, etc. Particular attention was given to the possible presence of methane in the Bridge River area, where small flows of this gas are frequent. In this area, operators are required to have flame safety-lamps for the detection of methane and have been instructed in their use. In addition, Inspectors are supplied with the latest types of portable methane and carbon-monoxide detectors. Many of the operating companies have also provided themselves with this equipment. These new instruments are extremely sensitive and permit the detection of very small amounts of these gases. This allows ample time for their dilution and removal before they can reach dangerous concentrations.

DUST AND VENTILATION.

Problems in dust-control and ventilation have continued to receive attention from mine operators and Government departments.

MINE-RESCUE, SAFETY, AND FIRST AID.

The Mine Safety Associations in the different centres in the Province, aided by the Safety Engineers and Inspectors of Mines, continued to encourage first-aid work and safety education in their respective districts.

First-aid and mine-rescue competitions were held at Nanaimo, Princeton, and Kimberley, and the West Kootenay Mine Safety Association held its second annual competition at Nelson. At Princeton and Kimberley, mine-rescue teams from both metalliferous and coal mines competed. Participants in the first-aid competitions included teams of women, girls, and boys as well as teams of men from the adjacent mines and from other industries.

Local first-aid competitions were also held at Britannia and Pioneer. At the latter, competing teams from the Bralorne mine also took part. Teams of juniors and women competed in both these competitions. The efforts made to get the women, children, and those not actually engaged in mining to participate are very commendable and do much to keep up interest in this important work.

As in former years, the Department of Mines sponsored these meets and contributed to a large part of the expenses, but the credit for the success of these competitions is largely due to the enthusiasm and efforts of the officials and men at the various mines.

The results of the programme of training mine-rescue teams for metal mines was very gratifying. Carefully selected men from Britannia, Pioneer, Bralorne, Cariboo Gold Quartz, and Island Mountain received a complete course in mine-rescue work at Nanaimo. These men in turn trained teams at their respective mines. When their course was completed, the men were examined by the mine-rescue instructor from Nanaimo and the successful candidates granted a certificate of competency in mine-rescue work by the Department of Mines. Certificates were given to a total of 102 men during the year. The mining centres of Bridge River, Britannia, and Wells have now a nucleus of trained men and equipment which would be of tremendous value in the event of a mine fire or gas explosion.

All Mine Inspectors were also required to take a complete course in mine-rescue work.

This work is to be continued, with the object of having trained men and adequate equipment in all the important metal mines and mining centres in the Province.

The work of the Department in this effort has met with splendid co-operation from both men and officials.

Coal-mining.

By James Strang, Chief Inspector of Mines.*

CONTENTS.

* Information about the officers of the Inspection Branch will be found on pp. 47–48.

PRODUCTION.

The output of the collieries is now given in short tons. The output of the coal mines of the Province for the year 1948 was 1,809,018 tons, a decrease of 114,555 tons or 5.9 per cent. from 1947; 527,488 tons of the total output came from strip mines at Michel, Corbin, and Princeton.

Vancouver Island collieries produced 448,415 tons, a decrease of 104,862 tons or 18.9 per cent. from 1947.

The Northern District produced 19,781 tons, an increase of 2,987 tons or 17.7 per cent. over 1947.

The Nicola-Princeton District produced 51,637 tons, an increase of 54 tons over 1947.

The East Kootenay District produced 1,289,185 tons, a decrease of 12,732 tons or 0.9 per cent. from 1947.

The decrease in output for the year 1948 was entirely due to a labour dispute. The mines in the East Kootenay District were idle two weeks in January, and the mines on Vancouver Island were idle from January 13th to April 8th.

The following table shows the output and *per capita* production daily and for the year 1948 at the various mines:—

OUTPUT AND PER CAPITA PRODUCTION, 1948.

Colliery and Mine.	Total Coal mined during Year (Tons).	Days worked.	Total Number of Employees.	Coal mined per Employee daily (Tons).	Coal mined per Employee for Year (Tons).	Number of Employees Underground.	Coal mined per Underground Employee daily (Tons).	Coal mined per Underground Employee for Year (Tons).
Comox Colliery (No. 8 mine)	190,976	194	466	2.11	410	380	2.58	502
Tsable River Colliery	29,045	191	90	1.68	322	80	1.37	363
South Wellington No. 10 mine	172,281	190	257	3.52	670	219	4.14	786
White Rapids mine	46,644	190	118	2.08	395	107	2.29	436
Chambers' mine	2,773	162	7	2.44	396	5	3.30	554
Loudon mine	896	164	5	1.09	179	4	1.36	224
Cassidy mine	1,325	159	4	2.08	331	3	2.78	441
Lewis mine (Timberlands)	669	176	2	1.90	334	2	1.89	334
Deer Home mine	608	97	3	2.08	202	3	2.08	202
Wellington mine (Carruthers)	621	185	2	1.67	310	2	1.67	310
Stronach mine	1,574	167	6	1.57	262	5	1.88	315
Furnace Portal mine	1,003	161	3	2.07	334	2	3.11	501
Tulameen Collieries	22,580	180	56	2.24	403	48	2.61	470
Taylor-Burson mine	3,049	181	5	3.36	609	4	4.21	762
Coldwater mine	1,778	247	5	1.43	355	3	2.40	592
Black mine (strip)	24,230	138	59	.....	.....	.....	.....	.....
Bulkley Valley Colliery	11,151	209	33	1.60	338	27	1.97	413
Roschke mine	3,149	151	5	4.16	629	4	5.21	787
Peace River mine	4,474	188	8	2.97	559	4	5.94	1,118
Gething mine	1,007	165	6	1.00	168	5	1.60	201
Elk River Colliery	293,859	210	341	4.11	864	252	5.55	1,166
Michel Colliery	492,070	226	691	3.06	712	435	5.00	1,131
Michel strip mine	352,620	.....	114	.....	.....	.....	.....	.....
Corbin strip mine	150,638	38	180	.....	.....	.....	.....	.....

Collieries of Vancouver Island Inspection District.

The output of Vancouver Island collieries was 448,415 tons. Of this amount, 78,305 tons or 17.4 per cent. was lost in preparation for the market, 2,801 tons or 0.6 per cent. was consumed by the operating companies as fuel, 365,328 tons was sold in the competitive market, and 1,981 tons was added to stock. Of the amount sold in the competitive market, 296,979 tons or 81.3 per cent. was sold in Canada, 14,240 tons or 3.9 per cent. was sold in the United States, and 54,109 tons or 14.8 per cent. was sold in other countries.

Collieries of the Nicola-Princeton District.

Of the gross total of 51,637 tons produced by the collieries of the Nicola-Princeton District, 1 ton was added to stock and 51,636 tons was sold in Canada.

Collieries of the Northern District.

Out of a total of 19,781 tons, 126 tons was used by the operating companies as fuel, 165 tons was added to stock, and the remainder was sold in Canada.

Collieries of the East Kootenay District.

The output of the collieries in the East Kootenay District was 1,289,185 tons. Of this amount, 132,420 tons or 10.2 per cent. was lost in preparation for the market, 20,227 tons or 1.6 per cent. was consumed by operating companies as fuel, 154,342 tons or 12 per cent. was used in making coke, and 990,530 tons was sold in the competitive market. Of the amount sold in the competitive market, 798,485 tons or 80.6 per cent. was sold in Canada and 192,045 tons or 19.4 per cent. was sold in the United States; 8,334 tons was taken from stock.

The following table shows the *per capita* production of the various districts for the year 1948:—

Output and per Capita Production in Various Districts, 1948.

District.	Total Coal mined during Year (Tons).	Total Number of Employees at Producing Collieries.	Coal mined per Employee for Year (Tons).	Number of Men employed Underground in Producing Collieries.	Coal mined per Underground Employee for Year (Tons).
Vancouver Island District	448,415	963	455	812	552
Nicola-Princeton District	27,407	66	415	55	498
Northern District	19,781	52	379	40	494
East Kootenay District	785,927	1,032	761	687	1,144
Whole Province	1,281,530	2,113	606	1,594	804

Note.—The above table deals only with coal mined from underground operations. Coal-stripping operations and the men employed at strip mines are not included.

The following table shows the production and distribution of coal by the various collieries and districts, also distribution of men employed, compiled from returns furnished by the owners:—

COLLIERIES OF BRITISH COLUMBIA—PRODUCTION, 1948 (IN SHORT TONS).

Mine.	Sold. In Canada.	Sold. In U.S.A.	Sold. Elsewhere.	Total Sales.	Lost in Washing.	Used in making Coke.	Used under Companies' Boilers, etc.	Total for Colliery Use.	Stocks. First of Year.	Stocks. Last of Year.	Difference. Added to.	Difference. Taken from.	Output for the Year 1948.
Vancouver Island District.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Canadian Collieries (D.), Ltd.—													
Comox Colliery (No. 8 mine)	109,737	6,785	34,309	150,831	37,190	.....	1,749	38,939	1,723	2,929	1,206	.....	190,976
Tsable River Colliery	16,891	1,044	5,281	23,216	5,872	.....	269	6,141	1,056	744	.....	312	29,045
South Wellington No. 10 mine	122,077	4,865	11,017	137,959	32,899	.....	594	33,493	3,025	3,854	829	.....	172,281
White Rapids mine	38,805	1,546	3,502	43,853	2,344	.....	189	2,533	631	889	258	.....	46,644
Chambers' mine	2,773	.....	.....	2,773	.....	.....	.....	.....	.....	.....	.....	.....	2,773
Loudon mine	896	.....	.....	896	.....	.....	.....	.....	.....	.....	.....	.....	896
Cassidy mine	1,325	.....	.....	1,325	.....	.....	.....	.....	.....	.....	.....	.....	1,325
Lewis mine (Timberlands)	669	.....	.....	669	.....	.....	.....	.....	.....	.....	.....	.....	669
Deer Home mine	608	.....	.....	608	.....	.....	.....	.....	.....	.....	.....	.....	608
Wellington mine (Carruthers)	621	.....	.....	621	.....	.....	.....	.....	.....	.....	.....	.....	621
Stronach mine	1,574	.....	.....	1,574	.....	.....	.....	.....	.....	.....	.....	.....	1,574
Furnace Portal mine	1,003	.....	.....	1,003	.....	.....	.....	.....	.....	.....	.....	.....	1,003
Totals, Vancouver Island District	296,979	14,240	54,109	365,328	78,305	.....	2,801	81,106	6,435	8,416	2,293	312	448,415
Nicola-Princeton District.													
Tulameen Collieries	22,580	.....	.....	22,580	.....	.....	.....	.....	.....	.....	.....	.....	22,580
Taylor-Burson mine	3,049	.....	.....	3,049	.....	.....	.....	.....	.....	.....	.....	.....	3,049
Coldwater mine	1,777	.....	.....	1,777	.....	.....	.....	.....	2	3	1	.....	1,778
Black mine (strip)	24,230	.....	.....	24,230	.....	.....	.....	.....	.....	.....	.....	.....	24,230
Totals, Nicola Princeton District	51,636	.....	.....	51,636	.....	.....	.....	.....	2	3	1	.....	51,637
Northern District.													
Bulkley Valley Colliery	10,920	.....	.....	10,920	.....	.....	66	66	.....	165	165	.....	11,151
Reschke mine	3,149	.....	.....	3,149	.....	.....	.....	.....	.....	.....	.....	.....	3,149
Peace River mine	4,414	.....	.....	4,414	.....	.....	60	60	.....	.....	.....	.....	4,474
Gething mine	1,007	.....	.....	1,007	.....	.....	.....	.....	.....	.....	.....	.....	1,007
Totals, Northern District	19,490	.....	.....	19,490	.....	.....	126	126	.....	165	165	.....	19,781
East Kootenay District.													
Crow's Nest Pass Coal Co., Ltd.—													
Elk River Colliery	197,404	69,411	.....	266,815	23,552	.....	3,490	27,042	25	25	.....	.....	293,857
Michel Colliery	450,443	122,634	.....	573,077	108,868	154,342	16,737	279,947	8,601	267	.....	8,334	844,690
Corbin mine (strip)	150,638	.....	.....	150,638	.....	.....	.....	.....	.....	.....	.....	.....	150,638
Totals, East Kootenay District	798,485	192,045	.....	990,530	132,420	154,342	20,227	306,989	8,626	292	.....	8,334	1,289,185
Coal.													
Grand totals for Province	1,166,590	206,285	54,109	1,426,984	210 725	154,342	23,154	388,221	15,063	8,876	2,459	6,187	1,809,018
Coke.													
Crow's Nest Pass Coal Co., Ltd.—													
Michel Colliery	39,601	63,770	.....	103,371	.....	.....	.....	.....	1,004	2,206	602	.....	104,573

Collieries of British Columbia—Men employed, 1948.

Mine.	White Men.																Chinese.			Strip-mining.						Total Men employed.		
	Supervision and Clerical.			Miners.			Helpers.			Labourers.			Mechanics and Skilled Labour.			Boys.			Labourers.			Supervision.			Other Workmen.					
Vancouver Island District.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.
Canadian Collieries (D.), Ltd.—																														
Comox Colliery (No. 8 mine)	20	7	27	174		174				107	26	133	77	34	111	2		2		19	19							380	86	466
Tsable River Colliery	6		6	48		48				15	2	17	11	8	19													80	10	90
South Wellington No. 10 mine	10	4	14	108		108				76	20	96	25	11	36		3	3										219	38	257
White Rapids mine	7		7	60		60				23	6	29	17	5	22													107	11	118
Chambers' mine	1		1	4		4								1	1					1	1							5	2	7
Loudon mine		1	1	4		4																						4	1	5
Cassidy mine	1	1	2	2		2																						3	1	4
Lewis mine (Timberlands)				2		2																						2		2
Deer Home mine	1		1	2		2																						3		3
Wellington mine (Carruthers)				2		2																						2		2
Stronach mine	1		1	4		4					1	1																5	1	6
Furnace Portal mine				2		2					1	1																2	1	3
Totals, Vancouver Island District	47	13	60	412		412				221	56	277	130	59	189	2	3	5		20	20							812	151	963
Nicola-Princeton District.																														
Tulameen Collieries	4	1	5	36		36	3		3	2		2	5	5	10													48	8	56
Taylor-Burson mine	1		1	3		3				1		1																4	1	5
Coldwater mine		2	2	2		2	1		1																			3	2	5
Totals, Nicola-Princeton District	5	3	8	41		41	4		4	3		3	5	5	10													55	11	66
Northern District.																														
Bulkley Valley Colliery	3	2	5	13		13	9		9	1		1	2	3	5													27	6	33
Reschke mine	1	1	2	3		3																						4	1	5
Peace River mine	1	1	2	2		2				1	2	3		1	1													4	4	8
Gething mine	1		1	3		3				1	1	2																5	1	6
Totals, Northern District	6	4	10	21		21	9		9	2	4	6	2	4	6													40	12	52
East Kootenay District.																														
Crow's Nest Pass Coal Co., Ltd.—																														
Elk River Colliery	20	15	35	134		134				27	61	88	71	10	81		3	3										252	89	341
Michel Colliery	38	40	78	222		222				106	95	201	69	117	186		4	4										435	256	691
Totals, East Kootenay District	58	55	113	356		356				133	156	289	140	127	267		7	7										687	345	1032
Strip Mines.																														
Black mine (Princeton)																						7	7			52	52		59	59
Michel mine (Michel)																						20	20			94	94		114	114
Corbin mine (Corbin)																						19	19			161	161		180	180
Totals for strip mines																						46	46			307	307		353	353
Grand totals for Province	116	75	191	830		830	13		13	356	219	575	277	195	472	2	10	12		20	20		46	46		307	307	1594	872	2466

Note.—U.=Underground; A.=Above ground; T.=Total.

LABOUR AND EMPLOYMENT.

During 1948, 2,466 persons were employed in and about the coal mines of the Province, an increase of 41 over 1947.

The maximum number of working-days is rated as 290, but the largest mines only work five days per week by agreement with the Miners' Union. In the Vancouver Island District 35 per cent. of the working-days were lost, principally because of a labour dispute lasting seven weeks and because the mines are idle every Saturday. In the Nicola-Princeton District about the same percentage of days were lost because of the labour dispute and loss of business resulting from it. In the East Kootenay District the loss of working-days averaged about 25 per cent. A labour dispute lasting over two weeks and the mines being idle every Saturday were the principal reasons.

COMPETITION OF COAL PRODUCED OUTSIDE OF BRITISH COLUMBIA.

During 1948 the shipment of Alberta coal to British Columbia totalled 945,700 tons. Coke shipped was 45,718 tons and briquettes 38,111 tons. The following table shows the amount of Alberta coal brought into British Columbia during the past ten years:—

Year.	Short Tons.	Year.	Short Tons.
1939	239,227	1944	678,960
1940	311,232	1945	868,396
1941	304,928	1946	982,413
1942	652,222	1947	899,403
1943	963,000	1948	945,700

Of the 1,426,984 tons of coal marketed, 211,885 tons was sold for industrial uses in Alberta, Saskatchewan, Manitoba, and Ontario; 377,938 tons was sold for railroad use in Canada; 77,059 tons was sold for railroad use in the United States; 168,598 tons was exported to the United States and other countries; and 14,737 tons was sold for ships' bunkers. The tonnage used for domestic and industrial purposes in the Province was 576,767 tons.

ACCIDENTS IN AND AROUND COAL MINES.

During 1948, 2,466 persons were employed in and around coal mines, including coal-stripping operations. Five fatal accidents occurred during the year, as compared with two during 1947. The number of fatal accidents per 1,000 persons employed was 2.04, compared with 0.82 in 1947, 1.73 in 1946, 2.05 in 1945, 1.06 in 1944, 2.80 in 1943, 4.23 in 1942, 1.47 in 1941, 2.08 in 1940, and 0.67 in 1939. The average for the ten-year period was 1.89.

The number of fatal accidents per 1,000,000 tons of coal produced during 1948 was 2.77, as compared with 1.03 in 1947.

The following table shows the collieries at which fatal accidents occurred during 1948, with comparative figures for 1947:—

Name of Company.	Name of Colliery.	1948.	1947.
Canadian Collieries (D.), Ltd.	No. 8 mine, Cumberland	1	....
Canadian Collieries (D.), Ltd.	White Rapids mine	1	....
Canadian Collieries (D.), Ltd.	No. 10 mine, South Wellington	....	1
Crow's Nest Pass Coal Co., Ltd.	Elk River Colliery	1	1
Southern Trucking Co., Ltd.	Corbin Colliery (strip)	1	....
Fred Mannix & Co., Ltd.	Black mine, Princeton (strip)	1	....
Totals		5	2

The following table shows the various causes of fatal accidents in 1948 and their percentages of the whole and comparative figures for 1947:—

Cause.	1948.		1947.	
	No.	Per Cent.	No.	Per Cent.
By falls of roof and coal	2	40.00	1	50.00
By mine cars and haulage (underground)	1	20.00	1	50.00
By trucking and haulage (strip mines)	2	40.00	....	.....
Totals	5	100.00	2	100.00

The following table shows the number of tons of coal mined for each fatal accident in their respective classes in the years 1948 and 1947:—

Cause.	1948.		1947.	
	Number of Fatal Accidents.	Tons of Coal mined per Fatal Accident.*	Number of Fatal Accidents.	Tons of Coal mined per Fatal Accident.
By falls of roof and coal	2	640,765	1	1,923,573
By mine-cars and haulage	1	1,281,530	1	1,923,573
Totals	3	427,177	2	961,786

* Excludes coal from strip mines.

The following table shows the number of tons of coal mined in stripping operations for each fatal accident in their respective classes in the years 1948 and 1947:—

Cause.	1948.		1947.	
	Number of Fatal Accidents.	Tons of Coal mined per Fatal Accident.	Number of Fatal Accidents.	Tons of Coal mined per Fatal Accident.
By truck-haulage	2	263,744	....	.....

The following table shows the fatalities from various causes in coal mines during the year 1948 compared with 1947, according to Inspection Districts:—

District.	Number of Deaths from Accidents.			Totals.	
	Falls of Roof and Coal.	Mine-cars and Haulage.	Trucking and Haulage (Strip).	1948.	1947.
Vancouver Island	2	....	....	2	1
Nicola-Princeton	....	....	1	1	..
East Kootenay	....	1	1	2	1
Northern	....	....	....	....	....
Province, 1948	2	1	2	5	
Province, 1947	1	1	....	....	2

RATIO OF ACCIDENTS.

District.	Accident Death-rate.			
	Per 1,000 Persons employed.		Per 1,000,000 Tons of Coal mined.	
	1948.	1947.	1948.	1947.
Vancouver Island	2.08	0.95	4.45	1.81
Nicola-Princeton	8.00	.....	19.34	.....
East Kootenay	1.94	0.82	1.55	0.77
Northern	.....	.....	.....	.....
Province, 1948	2.04	.....	2.77	.....
Province, 1947	.....	0.82	.....	1.03

During 1948 there were three fatal accidents connected with actual mining operations in underground coal mines. This was one more than the number of fatal accidents in 1947. In addition, there were two fatal accidents on the surface, both in connection with haulage at strip-mining operations. A description of each accident follows.

On January 1st, 1948, Mike Broderick, miner, died as a result of injuries received on December 2nd, 1947, in No. 1 Right level, No. 8 mine, Cumberland. Broderick was clearing away loose coal to make room to set a post when a slab of rock fell, without warning, from the roof, pinning him against the high side cog. He received injuries in the region of his liver and kidneys, which caused his death.

On February 25th, 1948, Angelo Anebaldi, driver, was fatally injured in No. 6 slope of No. 9 mine at the Elk River Colliery. Anebaldi had assisted in putting a derailed car on the track. As the trip was being taken away, he evidently jumped on between two of the cars and was crushed between the car and the roof. His riding on the trip was a violation of the regulations.

On July 12th, 1948, Harry James Burns, truck-driver, died as a result of injuries received when his truck went off the road about a quarter of a mile from the tipple of the Big Showing strip mine, Corbin Colliery. There were no witnesses, but before he died, Burns made a statement to the effect that he was blinded by the lights of a passing truck.

On August 23rd, 1948, Uros Gregovich, miner, was instantly killed by a fall of ground in the Incline section of the White Rapids mine, Extension district. Gregovich was loading coal at the face of a crosscut when a piece of rock from the face of the top brushing fell, striking him on the head and shoulders. When the rock fell, a slip parallel to the lip of the brushing became apparent.

On August 27th, 1948, John Harvey Hanes, a truck-driver, was instantly killed when he was run over by a Euclid truck on the dump of the Black strip mine near Princeton. Hanes, unknown to the driver of the Euclid, was on foot and behind the truck when it backed up to let a carry-all pass. The accident happened at night.

In addition to five fatal accidents, a total of 372 accidents of a serious nature were reported to the Department by the management of the various mines. All these accidents were investigated and reported by the Mine Inspectors.

The following table shows the occupations of the men involved in these accidents and the percentage of the total number for each occupation. The five fatal accidents are included in this total.

ACCIDENTS IN COAL MINES, 1948, CLASSIFIED AS TO OCCUPATION.

Occupation.	Number of Accidents.	Percentage of Accidents.
Underground—		
Brusher	39	10.3
Drillers and facemen	91	24.2
Loaders and muckers	82	21.8
Panmen	9	2.4
Haulagemen	62	16.5
Trackmen and pipe-fitters	10	2.6
Firebosses	10	2.6
Timbermen	19	5.0
Miscellaneous	6	1.6
Surface—		
Shops	21	5.6
Labour	19	5.0
Miscellaneous	9	2.4
Totals	377	100.0

The following table shows the causes of the accidents and the percentage of the total number, from each cause. The five fatal accidents are included in this table.

ACCIDENTS IN COAL MINES, 1948, CLASSIFIED AS TO CAUSE.

Cause.	Number of Accidents.	Percentage of Accidents.
Fall of ground	75	19.8
Fall of material and flying material	66	17.5
Gas	4	1.1
Lifting and handling equipment, material	77	20.5
Machinery and tools	43	11.4
Slipping	91	24.1
Miscellaneous	21	5.6
Totals	377	100.0

The following table shows various parts of the body injured and the percentage of injuries to each part, of the total number. The five fatal accidents are not included *in this table.*

CLASSIFICATION AS TO INJURY.

Injury.	Number of Accidents.	Percentage of Accidents.
Head and neck	25	6.7
Eyes	18	4.8
Trunk	63	16.9
Back	35	9.4
Arms	26	7.0
Hands and fingers	90	24.2
Legs	75	20.2
Feet	20	5.4
Toes	16	4.3
Gassed	4	1.1
Totals	372	100.0
Fatal	5	
Total	377	

EXPLOSIVES.

The following table shows the quantity of explosives used in coal mines during 1948, together with the number of shots fired, tons of coal produced per pound of explosive used, and the average pounds of explosive per shot fired (these quantities include all the explosives used for breaking coal and for rock-work in coal mines):—

Vancouver Island District.

Colliery.	Quantity of Explosives used in Pounds.	Coal mined (Tons).	Total Number of Shots fired.	Tons of Coal per Pound of Explosive used.	Average Pounds of Explosive per Shot fired.
Comox Colliery (No. 8 mine)	45,600	190,976	73,550	4.19	0.62
Tsable River Colliery	19,700	29,045	31,500	1.47	0.62
South Wellington No. 10 mine	54,021	172,281	63,500	3.19	0.85
White Rapids mine	15,700	46,644	27,500	2.97	0.57
Chambers' mine	1,500	2,773	2,400	1.84	0.62
Loudon mine	1,750	896	3,300	0.51	0.53
Cassidy mine	250	1,325	450	5.30	0.55
Lewis mine (Timberlands)	1,200	669	2,400	0.55	0.50
Deer Home mine	400	608	850	1.52	0.47
Wellington mine (Carruthers)	476	621	760	1.30	0.62
Stronach mine	2,500	1,574	2,300	0.63	1.08
Furnace Portal mine	600	1,003	800	1.67	0.75
Totals for district	143,697	448,415	209,310	3.12	0.68

Nicola-Princeton District.

Tulameen Collieries	7,550	22,580	15,100	2.98	0.50
Taylor-Burson mine	1,950	3,049	1,700	1.56	1.14
Coldwater mine	900	1,778	1,900	1.97	0.47
Black mine (strip)	220	24,230	48	110.13	4.58
Totals for district	10,620	51,637	18,748	4.86	0.56

Northern District.

Bulkley Valley Colliery	3,750	11,151	5,150	2.97	0.72
Reschke mine	1,000	3,149	2,250	3.15	0.44
Peace River mine	2,000	4,474	650	2.23	3.07
Gething mine	600	1,007	960	1.68	0.62
Totals for district	7,350	19,781	9,010	2.69	0.81

East Kootenay District.

Elk River Colliery	14,345	293,857	12,891	20.48	1.15
Michel Colliery	49,450	844,690	70,540	17.08	0.70
Corbin strip mine	.....	150,638	.....	.....	.....
Totals for district	63,795	1,289,185	82,931	20.20	0.76
Totals for Province	225,462	1,809,018	319,999	8.02	0.70

Quantity of Different Explosives used.

	Lb.
Monobel of different grades	213,954
Permissible rock-powder	11,508
Total	225,462

MACHINE-MINED COAL.

During the year 1948 mining-machines produced approximately 835,000 tons or 65 per cent. of the total output from underground mining. All strip-mined coal is removed by mechanical means.

The following table gives the district, number of machines, how driven, and type of machines used:—

District.	Number driven by		Type of Machine used.	
	Electricity.	Compressed Air.	Chain Undercutting.	Puncher Type.
Vancouver Island	....	26	23	3
Nicola-Princeton	....	7	....	7
Northern	....	3	....	3
East Kootenay	....	35	17	18
Totals	....	71	40	31

In addition to the above, 130 air-picks were used in the mines of the Crow's Nest Pass Coal Company.

SAFETY-LAMPS.

There were 2,257 safety-lamps in use in the coal mines of the Province. Of this number, 182 were flame safety-lamps of the Wolf type and 2,075 were approved electric lamps, mostly the Edison model.

Approved Safety-lamps—Electric and Flame.

The following is a list of approved safety-lamps, electric and flame:—

The Wolf lamp, flame type.

The Koehler lamp, flame type.

The Edison electric lamp (cap) as approval No. 18 of the United States Bureau of Mines, and all Edison cap-lamps up to and including Model P carrying the approval Certificate No. 26 of the United States Bureau of Mines. The use of these lamps is subject to bulbs being the same as have been approved for use with these lamps by the United States Bureau of Mines.

The Wheat electric lamp and having approval No. 20 as issued by the United States Bureau of Mines.

The Wolf electric lamp No. 830C.

The electric lamp manufactured by the Portable Lamp and Equipment Company under approval No. 27 of the United States Bureau of Mines.

M.S.A. single-cell trip-lamp carrying United States Bureau of Mines approval No. 1009, approved for use on haulage trips in mines.

ELECTRICITY.

Electricity is used for various purposes on the surface at seven mines and underground at four. The total horse-power used in and about the mines amounted to approximately 16,251. Detailed information as to how and where this power is used is given in the report of the Electrical Inspector of Mines.

VENTILATION.

Detailed information regarding the amount of ventilation in the main airways, splits and working-places of the various mines is given in the reports of the District Inspectors. Blasting is prohibited in the working-places where methane can be detected

on the flame of a safety-lamp. In a few cases where blasting was prohibited, the gas-caps were plainly visible because of a temporary disarrangement in the ventilation system, but usually it was because of a decided increase in the flow of methane from the strata.

METHANE DETECTION.

The Burrell methane detector and the M.S.A. detector are the principal instruments used to ascertain very small percentages of methane in the airways.

The flame safety-lamp is used regularly by firebosses and other mine officials for everyday tests of methane in the working-places and airways.

The Inspectors in the various districts have insisted on firebosses making a study of gas-testing by means of the flame safety-lamp and in being able to give the percentage of gas present from the length of gas-cap visible.

Practically all the workmen underground use electric safety-lamps, but there are times when it is necessary for miners to have a flame safety-lamp in their working-place. It is, therefore, necessary that every candidate for a miner's certificate should know when a flame safety-lamp is in good order and how to test for gas with it.

MINE-AIR SAMPLES.

In addition to regular tests by means of the safety-lamp and methane detector, the Inspector of Mines in each district takes mine-air samples regularly in main return airways and the return airways of the various splits, so that a complete record may be kept of composition of the air passing through the mines. During 1948 sixty-six samples were taken.

INSPECTION COMMITTEES.

The provisions of the "Coal-mines Regulation Act," section 65, General Rule 14, require that an inspection committee of workmen shall inspect the mines regularly on behalf of the workmen and make a true report of the conditions found. This rule is fully observed at all the larger mines in the Province, and copies of the reports of these committees are sent to the Inspector of the district. The workmen are careful to appoint fully experienced miners to the inspection committee, and their reports have been of real service to both management and men.

COAL-DUST.

Recent studies and experiments, particularly at the research station in Great Britain, dealing with the dangers of coal-dust explosions, have shown the need of more careful rock-dusting in haulage-ways and working-faces. In the "Coal-mines Regulation Act" passed at the 1948 meeting of the Legislature, a completely revised set of rules, governing precautions against coal-dust, was inserted. These rules are in line with the findings of the Research Board in Britain and, if followed faithfully, should lessen the risk of coal-dust explosion.

Dust samples are taken regularly from roof, sides, and floor of the mine roadways, and the reports forwarded to the Inspector. In 1948, 1,549 dust samples from the various mines were analysed and, in almost all cases, showed the incombustible content to be well over 50 per cent.

DANGEROUS OCCURRENCES.

On February 15th, 1948, a snowslide occurred which did considerable damage to the No. 9 mine fan-house and equipment at the Elk River Colliery. Two walls of the house were partially carried away, and the roof collapsed on top of the motor and starting equipment. The motor was saturated with snow and water, and the starting equipment was damaged. Two working shifts were lost.

On February 19th, 1948, the slack coal coming off No. 406 room belt in the No. 3 Incline district, " B " South mine at the Michel Colliery, piled up in front of the drive-pulley and the return-belt dragged slack coal underneath the engine, jamming the jockey-pulley. The belt stopped, but the drive-pulley continued turning. This created sufficient friction to char the belt and make considerable smoke. The condition was discovered about ten minutes later, and the belt attendant stopped the engine and applied rock-dust to the scene of the fire, which was quickly extinguished. About 6 inches of belt was destroyed.

On June 9th, 1948, smoke was found in the No. 3 mine fan-house at the Michel Colliery by the watchman. It was found that one of the Texrope belts on the fan-drive had lost its tension and was slipping. The resultant friction charred the belt, which broke. A small piece lodged between the motor and its bed, where it continued to smoulder and create considerable smoke. This was quickly extinguished, and the loss of one belt was the only damage.

On November 15th, 1948, in No. 2 split off No. 5 Left room, Slope district, " B " South mine, Michel Colliery, the fireboss discovered a large body of explosive gas. This had accumulated because of a partial disarrangement of the ventilation. He fenced the place off by placing two posts on the floor, one on top of the other, and marked them " Danger, Keep Out," with chalk. The two miners who worked there were told to go to other separate places. One of the men, having no machine pick in his new place, went to No. 2 split to get his own and was overcome by the gas. His partner, noting that he was late in returning, went to look for him, and he also was overcome by the gas in No. 2 split. The fireboss and bratticeman, who went to No. 2 split to restore ventilation, discovered the two men. They were able, by breaking an air-line, to partially restore ventilation. The men revived shortly and were able to walk out without assistance. As a result, the fireboss and the first miner to enter the fenced-off area were prosecuted.

On December 20th, 1948, in the mine yard on the surface at the No. 8 mine, Comox Colliery, noxious gases issued from a smouldering fire below the surface. The ground had been recently frozen, and the gases could only escape through areas covered by buildings where freezing had not taken place. A man in the timekeeper's office was overcome and two others, who went into the time office to investigate, were affected by carbon monoxide. The burning material was subsequently dug out and removed.

On December 26th, 1948, a fire was discovered issuing from a pile of coke stored near the coke plant at the Michel Colliery. The fire was put out by the use of a tractor and water-hoses. Considerable coke was ruined for commercial use.

BUMPS.

On July 11th, 1948, at about 8.30 a.m., a rather severe bump occurred in No. 1 split off No. 10 Left room, in the " B " South mine (Slope district), at the Michel Colliery. Considerable heaving took place and resulted in numerous broken and displaced posts, together with partial disarrangement of the ventilation.

Several bumps of a very minor nature were experienced in No. 1 East mine at the Elk River Colliery.

OUTBURSTS OF GAS.

At the No. 8 mine, Comox Colliery, faulted conditions on the face-lines were responsible for an abnormal outflow of gas at times. Under such circumstances, blasting was prohibited, pending the effective removal of all visible gas-caps from the general body of the air.

There were no other outbursts reported during 1948.

PROSECUTIONS.

During 1948 there were five prosecutions for infractions of the "Coal-mines Regulation Act," as follows:—

Date.	Colliery.	Occupation of Defendant.	Offence charged.	Judgment.
Mar. 24...	Michel (Crow's Nest Pass Coal Co., Ltd.)	Supplyman.....	Workman had matches in his possession underground	Fined $10 and costs.
Oct. 4.....	Michel (Crow's Nest Pass Coal Co., Ltd.)	Miners (5).....	Jumped off man-trip while in motion	Fined $12 and costs each.
Nov. 10....	Michel (Crow's Nest Pass Coal Co., Ltd.)	Haulage.....	Jumped off man-trip while in motion	Fined $15 and costs.
Nov. 15...	Michel (Crow's Nest Pass Coal Co., Ltd.)	Miner..	Workman entered a part of the mine before it was stated to be safe	Fined $15 and costs.
Nov. 15...	Michel (Crow's Nest Pass Coal Co., Ltd.)	Fireboss..	Did not put a proper danger signal on a fence guarding a dangerous condition	Fined $15 and costs.

GOVERNMENT MINE-RESCUE STATIONS.

During the year 1948 the mine-rescue stations at Cumberland, Nanaimo, Princeton, and Fernie were fully maintained with modern equipment, with a trained instructor at each station. Each station is equipped with several sets of McCaa and Gibbs two-hour oxygen machines, Burrell all-service gas-masks, inhalators, methane and carbon monoxide testing machines, and a complete supply of first-aid equipment. Supplies and equipment for charging and servicing this equipment are also maintained. In addition, each station has now a complete set of Chemox one-hour oxygen machines.

Two of the larger metal mines—namely, Sullivan and Copper Mountain—each have a complete set of McCaa two-hour oxygen machines, and complete sets of Chemox are maintained by the mines at Hedley, Bridge River, Wells, and Britannia.

Training in the use of mine-rescue machines is given at the stations to all who apply for it, and, in addition, fully trained teams are given a regular monthly practice-training as a unit, not only to keep them familiar with the use of the machines, but to teach them the need and value of team-work in mine-rescue operations.

Teams trained at mines remote from the stations are visited and examined by one of the instructors from the stations. The Inspector of Mines and instructor for the district conduct the examinations and arrange the course of instruction at these mines. This procedure has been of great value in training and qualifying teams in the metal-mining centres.

The instructors from the stations also perform a valuable service to the mines with mine-rescue equipment in their areas, in that they periodically check the equipment of these mines and see that it is always in serviceable condition.

A certificate of competency in mine-rescue work is granted to each man who takes a full training course and passes the examination set by the Department of Mines.

During 1948, in addition to the regular teams in training, 108 men took the full training course and were granted certificates of competency.

Cert. No.	Name.	Where trained.	Cert. No.	Name.	Where trained.
2195	William H. Armstroug	Hedley.	2250	William Leslie Pratt	Kimberley.
2196	E. J. Carney	Hedley.	2251	William Frederick Jeske	Kimberley.
2197	Fred A. Collett	Hedley.	2252	William John Carnet	Kimberley.
2198	E. Dillabough	Hedley.	2253	Orville Theodore Robert Hopkins	Kimberley.
2199	J. Fosty	Hedley.	2254	Andre Woloschuk	Kimberley.
2200	R. E. Hicks	Hedley.	2255	William Fishborne Thomason	Kimberley.
2201	W. A. Lore	Hedley.	2256	Ronald James Campbell	Kimberley.
2202	R. C. Smith	Hedley.	2257	Harvey Donald MacDonald	Kimberley.
2203	H. Reimer	Hedley.	2258	Robert Ness	Kimberley.
2204	L. Roussel	Hedley.	2259	Orville Francis Troy	Kimberley.
2205	P. Sintich	Hedley.	2260	Robert Neville Donskin	Kimberley.
2206	Harold Wainwright	Hedley.	2261	Richard Nils Molander	Kimberley.
2207	Gordon E. Whitney	Hedley.	2262	Alex. Frew	Princeton.
2208	John W. Wylie	Hedley.	2263	Korey J. Hegseth	Wells.
2209	Leslie Wardman	Victoria.	2264	Dennis C. Douglas	Wells.
2210	F. J. Hemsworth	Victoria.	2265	Frank R. Janes	Wells.
2211	George Tennant	Pioneer.	2266	Danial V. Halverson	Wells.
2212	Hugh Towns	Pioneer.	2267	James T. McKelvie	Wells.
2213	Frank Holland	Pioneer.	2268	Frederick G. Tinsley	Wells.
2214	Roy Royston	Pioneer.	2269	Alan Meger	Wells.
2215	Gerald Rose	Pioneer.	2270	Norman Abraham	Wells.
2216	Kenneth Northwood	Pioneer.	2271	Reginald F. Patchett	Wells.
2217	William Parrinson	Pioneer.	2272	Ugo Peressini	Wells.
2218	Donald Broomfield	Pioneer.	2273	Garth Graham	Wells.
2219	Alexander Stelmock	Pioneer.	2274	Albert French	Wells.
2220	Fred Drewery	Pioneer.	2275	Rupert Fearnley	Wells.
2221	Adam Okranic	Pioneer.	2276	Arthur G. Corlett	Wells.
2222	Ronald Campion	Pioneer.	2277	Joseph Alfred MacDonald	Nanaimo.
2223	James McNelty	Pioneer.	2278	Steve Plecas	Nanaimo.
2224	Calder S. Smith	Pioneer.	2279	S. W. Allen	Nickel Plate.
2225	Alexander Carson	Pioneer.	2280	W. J. Fishley	Nickel Plate.
2226	Paul Applin	Pioneer.	2281	G. Griffin	Nickel Plate.
2227	Emil M. Almstrom	Bralorne.	2282	J. Hutchinson	Nickel Plate.
2228	Thomas W. Thomasen	Bralorne.	2283	Leonard F. James	Nickel Plate.
2229	James L. Miller	Bralorne.	2284	John A. Knox	Nickel Plate.
2230	Edward J. Marshall	Bralorne.	2285	E. R. Lea	Nickel Plate.
2231	James W. Allan	Bralorne.	2286	R. Little	Nickel Plate.
2232	Gregor McGregor	Bralorne.	2287	B. M. Neville	Nickel Plate.
2233	John Beachkowski	Bralorne.	2288	C. D. Nicholson	Nickel Plate.
2234	Ivan E. Meghan	Bralorne.	2289	E. D. Peck	Nickel Plate.
2235	Emmanuel P. Geiger	Bralorne.	2290	W. Richkum	Nickel Plate.
2236	Masse J. Mitchal	Bralorne.	2291	John E. Merrett	Victoria.
2237	Allan W. Poole	Bralorne.	2292	H. C. Hughes	Victoria.
2238	Henry W. Dodd	Copper Mountain.	2293	Robert B. King	Victoria.
2239	Larry A. Fraser	Copper Mountain.	2294	Paul Billwiller	Britannia Beach.
2240	Fred Graham-Stevenson	Copper Mountain.	2295	John Roper	Britannia Beach.
2241	Bruno Kobish	Copper Mountain.	2296	James Elliott	Britannia Beach.
2242	Curtis R. Lomon	Copper Mountain.	2297	Gordon Stewart	Britannia Beach.
2243	Robert W. Meikle	Copper Mountain.	2298	Lawrence Stewart	Britannia Beach.
2244	J. H. E. Nelson	Copper Mountain.	2299	John McKichan	Britannia Beach.
2245	Michael Thomas Pero	Copper Mountain.	2300	James Carter	Britannia Beach.
2246	John A. C. Ross	Copper Mountain.	2301	John Graney	Britannia Beach.
2247	Joseph Knowles	Cumberland.	2302	Stanley Cole	Britannia Beach.
2248	Lachlan MacMillan	Cumberland.			
2249	George Mack	Cumberland.			

SUPERVISION OF COAL MINES.

During 1948 nineteen companies operated twenty-seven mines, employing 1,594 men underground. In the supervision of underground employees there were 8 managers, 17 overmen, and 101 firebosses, or 1 official for every 12½ men underground.

"COAL SALES ACT."

LIST OF REGISTERED NAMES OF BRITISH COLUMBIA COALS, APPROVED BY THE CHIEF INSPECTOR OF MINES, IN ACCORDANCE WITH THE PROVISIONS OF THE "COAL SALES ACT."

Registered Names of Coal.	Colliery and District.	Producing Company.
Comox	Nos. 5 and 8 mines, Comox Colliery (Cumberland)	Canadian Collieries (D.), Ltd.
Old Wellington	No. 9 mine (Wellington)	Canadian Collieries (D.), Ltd.
Ladysmith-Wellington	No. 10 mine (South Wellington)	Canadian Collieries (D.), Ltd.
Hi-Carbon	Mixture of Canadian Collieries' coal and B.C. Electric coke	Canadian Collieries (D.), Ltd.
Lantzville-Wellington	Lantzville (Lantzville)	Lantzville Colliery.
Chambers-Extension	Chambers' (Extension)	R. H. Chambers.
Wellington Big Flame	Richardson mine	A. B. Richardson.
Biggs-Wellington	Biggs' mine (Wellington)	Biggs mine.
Berkley Creek-Little Wellington	Berkley Creek Colliery (Extension)	Hugh McLean Davidson.
Cassidy-Wellington	Cassidy mine (Cassidy)	A. H. Carroll.
Middlesboro	Middlesboro (Merritt)	Middlesboro Collieries, Ltd.
Tulameen Valley Coal, Princeton	Tulameen (Princeton)	Princeton Tulameen Coal Co.
Granby Tulameen	Granby (Princeton)	Granby Consolidated M.S. & P. Co., Ltd.
Hat Creek	Hat Creek (Lillooet)	Canada Coal and Development Co., Ltd.
Tulameen Gem	Tulameen Collieries (Princeton)	Tulameen Collieries.
Bulkley Valley	Bulkley Valley (Telkwa)	Bulkley Valley Colliery, Ltd.
Crow's Nest, Elk River	Elk River (Coal Creek)	Crow's Nest Pass Coal Co., Ltd.
Crow's Nest, Michel	Michel (Michel)	Crow's Nest Pass Coal Co., Ltd.
Black Yale	Black mine (Princeton)	Inland Collieries, Ltd.
Jackson Tulameen	Jackson Colliery (Princeton)	British Lands, Ltd.
Merritt Diamond Vale	Diamond Vale Colliery (Merritt)	Merritt Coal Mines, Ltd.
Telcoal	Telcoal Colliery (Telkwa)	Telkoal Co., Ltd.
Black Prince	Black mine, Princeton	Fred Mannix & Co., Ltd.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS.

FIRST-, SECOND-, AND THIRD-CLASS CERTIFICATES AND MINE-SURVEYORS' CERTIFICATES.

The Board of Examiners, which was formed on July 10th, 1919, consists at present of James Strang, Chief Inspector of Mines, chairman; Robert Bonar and John MacDonald, members.

The meetings of the Board are held in the office of the Department of Mines in Victoria. The examinations are held in accordance with the amended rules of the Board of Examiners and approved by the Minister of Mines. The examinations are held at least once a year and oftener if necessary. One examination was held on May 5th, 6th, and 7th, 1948.

The total number of candidates at the examination was as follows: For first-class certificates, 2 (1 passed); for second-class certificates, 4 (2 passed); for third-class certificates, 9 (5 passed); for mine surveyors, 4 (2 passed).

The following is a list of the candidates who were successful in the various classes:—

First class: William Dinsdale.

Second class: Abel Edward Hampton and Lloyd Morgan Gething.

Third class: James Weir Brown, Ralph Baker, John Cairns, Henry John O'Neill, and Lawrence C. Gething.

Mine surveyor: George Herbert Lancaster and John Douglas Graham.

EXAMINATIONS FOR CERTIFICATES OF COMPETENCY AS COAL-MINERS.

In addition to the examinations and certificates already specified as coming under the Board of Examiners, the Act further provides that every coal-miner shall be the holder of a certificate of competency as such. Examinations are held regularly in the coal-mining districts, and no certificate is granted where the candidate has failed to satisfy the Board as to his fitness, experience in a coal mine, and a general working knowledge of the English language.

During 1948 there were 113 candidates for coal-miners' certificates; of these, 112 passed and 1 failed to qualify.

In addition to the certificates granted above, substitute certificates were issued to those who had lost their original certificates.

The Board of Examiners desires to thank the different coal-mining companies for the use of their premises for holding examinations where necessary.

The Inspector of Mines in each district has authority under the "Coal-mines Regulation Act" to grant, after a satisfactory examination, a provisional certificate as a coal-miner to an applicant, which entitles the holder to follow the occupation of a coal-miner for a period not exceeding sixty days or until the date of the next examination before the Board.

NOTES ON COAL MINES.

VANCOUVER ISLAND INSPECTION DISTRICT.

By John MacDonald.

Canadian Collieries (D.), Ltd.

F. Ronald Graham, chairman of the board, Vancouver; Norman R. Whittall, president, Vancouver; Harry R. Plommer, managing director, Nanaimo; S. V. Isaacson, secretary-treasurer, Nanaimo; R. K. Smart, general superintendent, Nanaimo; E. O. T. Simpson, assistant general superintendent, Cumberland; J. A. Quinn, district superintendent, Cumberland. During 1948 this company operated No. 10 mine at South Wellington and White Rapids mine at Extension, in the Nanaimo district; and in the Comox area, No. 8 mine of Comox Colliery and the new Tsable River mine. Descriptions of these operations and progress reports on them are given in the following pages according to district. As a result of a labour dispute at the termination of the old wage agreement, all operations on the Island were suspended from January 13th to April 8th.

NANAIMO (49° 123° S.W.).

No. 10 Mine, South Wellington.—W. Frew, manager; J. Wilson, overman; A. Hannah, T. Jordan, F. Bell, W. Roper, J. Frew, H. Kirkpatrick, J. McArthur, F. Johnson, and T. McCann, firebosses. This mine is in the Cranberry District, about half a mile south of the old No. 5 mine and approximately 7 miles south of Nanaimo. No additions were made to the surface plant during the year. A full description has appeared in previous Annual Reports.

This mine is in the Douglas seam and has maintained its position as the chief producing mine in the Vancouver Island Inspection District. In 1948 production amounted to 172,281 short tons over a working period of 190 days, with an average crew of 192 men employed underground and 35 on the surface. The major part of the output during the past two years has come principally from pillar-extraction; the production this year has been equally divided between the pillars and the new part of the seam developed in Nos. 1 and 1½ headings, which was described in the British Columbia Minister of Mines Annual Report for 1947. Principal development-work done during the year included the following drivage: 4,000 feet in No. 1 Right off the main slope, 5,000 feet in No. 1 heading off the main slope, 2,000 feet in No. 1½ heading off the main slope, 1,000 feet in No. 2 Left off No. 1 Diagonal slope, and 2,000 feet in No. 3 Right off No. 1 Diagonal slope. Practically all of the above development has been done in areas by-passed in the first working, and the amount of coal found in those so-called barren areas has added materially to the producing life of this mine. Three shifts a day are still worked, with the result that the available area of workable coal is decreasing rapidly as the pillars are drawn back to the main haulage-roadways. At the present rate of extraction, it is estimated, this mine should provide employment for the present crew for another eighteen months.

First-aid requirements have been kept at the usual high standard. In addition to the main first-aid station adjacent to the lamp-cabin, emergency stations are located at strategic points both underground and on the surface. Thirty-five employees are qualified to render first aid to the injured. Mine-rescue teams of six men each have kept up regular training at the mine-rescue station at Nanaimo. No blow-outs or other dangerous occurrences were reported. Despite the fact that extensive pillar-extraction has resulted in heavy crushing on many roadways, working conditions in general have been found fairly satisfactory during the course of inspection. Measurements taken at the last inspection in December showed a total quantity of 117,000 cubic feet of air a minute passing in the main returns for the use of 192 men employed during the

three-shift period of twenty-fours. Six samples of air were collected in the main return airways, none of which exceeded 0.2 per cent. methane. Ninety-nine samples of dust were gathered from the various roadways; all the samples contained a much higher incombustible content than the minimum standard set by the Coal-dust Regulations. One hundred and ten tons of limestone-dust was used to reduce the coal-dust hazard on the roadways, and approximately 20 tons for tamping explosives. Searches were made at regular intervals for matches and other prohibited articles, but none was found. Seventy-two accidents were reported and investigated. None of these was fatal—one was serious and the balance were classed as minor, although many of the latter resulted in the loss of a fairly high percentage of working time.

White Rapids Mine, Extension.—A. Newbury, manager; J. T. Brown, overman; A. Bennett, J. Marrs, T. McCourt, A. Kirkham, and M. Brodrick, firebosses. This mine is situated in Sections 3 and 4, Range 1, in the Cranberry District, approximately 9 miles by road south of Nanaimo. It is operated in the Wellington seam and produced 46,644 short tons over a working period of 190 days with an average crew of 102 employed underground and 10 on the surface. No additions were made to the surface plant, but a heavy inflow of water necessitated the installation of two additional electrical pumping units in the Diagonal Slope district. A description of the seam and general method of working has appeared in previous Annual Reports.

The main first-aid station is located near the lamp-cabin and is supervised by the lampman, who is a fully qualified first-aid attendant. Emergency kits are taken underground each shift to the loading-points on the levels and are readily available for the men engaged on the walls. Fifteen employees are qualified to render first aid to the injured. One mine-rescue team of six men has taken regular training at the mine-rescue station at Nanaimo. General working conditions have usually been found satisfactory during the course of inspection. At the last inspection in December, the quantity of air passing in the main return amounted to 25,000 cubic feet a minute for the use of fifty-two men. Two samples of air were taken in the main return airway; these showed a very slight trace of methane. Sixty samples of dust were gathered where necessary, all of which were well above the minimum standard of incombustible content as set by the Coal-dust Regulations. Forty accidents, one of which was fatal, were reported and investigated. The fatal accident was caused by a fall of rock, from a slip in the roof, that caught a miner as he was kneeling at the face, crushing him severely about the head and neck. The balance of the accidents were of a minor nature.

Twelve minor accidents were reported from the various surface departments of the company in the Nanaimo area during the year. All of these were investigated.

Chambers' No. 4 Mine, Extension.

R. H. Chambers and associates, operators; R. H. Chambers, fireboss. This mine is in the Extension district and operates in the barrier pillar which separated the former Extension No. 1 and Extension No. 3 mines. Production in 1948 amounted to 2,840 short tons over a working period of 162 days, with an average crew of seven men employed. General conditions have been found fairly satisfactory during the course of inspection. No accidents were reported during the year.

Deer Home No. 2 Mine, Extension.

R. Hamilton and associates, operators; R. Hamilton, overman. This mine, in the vicinity of the old Vancouver slope in the Extension district, is operating in a small section of outcrop pillars left in this area when the old Extension No. 3 mine was abandoned. Production in 1948 amounted to 608 short tons over a working period of ninety-seven days, with an average crew of three men employed. Working conditions have usually been found satisfactory in the course of inspection. No accidents were reported during the year.

Furnace Portal Mine, Harewood.

J. Biggs, operator and fireboss. This mine is on Harewood Ridge and is operating in a small area of outcrop coal left by former operators. Production in 1948 amounted to 993 short tons over a working period of 161 days, with an average crew of three men employed. General working conditions have always been found satisfactory in the course of inspection. No accidents were reported during the year.

No. 5 Mine, Cassidy.

J. McKellar and associates, operators; L. Dickie, fireboss. This mine is in the Cassidy district and operated in a small area of the Douglas seam lying to the south of the abandoned Granby No. 2 mine. Production in 1948 amounted to 1,040 short tons over a working period of 159 days, with a crew of four men employed. General working conditions were usually found satisfactory in the course of inspection. As all available coal that could be recovered with safety had been extracted, all material was brought out, and this mine permanently abandoned at the end of November. No accidents were reported during the year.

Old No. 8 Mine, Timberlands.

J. R. Wilson and G. Lewis, operators; J. R. Wilson, fireboss. This mine is operating in the Wellington seam, in a small area of outcrop coal that was left when the Wellington mine was abandoned by Canadian Collieries (Dunsmuir), Limited. Production in 1948 amounted to 665 short tons over a working period of 176 days, with a crew of two men employed. General working conditions have usually been found satisfactory in the course of inspection. No accidents were reported during the year.

NORTH WELLINGTON (49° 124° S.E.).

Loudon's No. 5 Mine.

W. Loudon and associates, operators; W. Loudon, fireboss. This mine is on the opposite side of the ridge from the old No. 9 mine in the Wellington district, and operates in the upper Wellington seam. Production in 1948 amounted to 896 short tons over a working period of 164 days, with a crew of four men employed. General working conditions have always been found satisfactory in the course of inspection. A second outlet and airway is maintained through to the old No. 9 mine. No accidents were reported during the year.

Carruthers & Wakelam No. 3 Mine.

R. B. Carruthers and W. Wakelam, operators; R. B. Carruthers, fireboss. This mine is in the immediate vicinity of the Loudon mine and also operates in the upper Wellington seam adjacent to the old No. 9 mine abandoned workings. Production in 1948 amounted to 621 short tons over a working period of 185 days, with a crew of two men engaged. General working conditions have usually been found satisfactory in the course of inspection. A second outlet is maintained through to old No. 9 mine as an emergency exit and airway. No accidents were reported during the year.

Stronach No. 2 Mine.

C. Stronach, operator; H. Gilmour, fireboss. This mine is operating in a section of the upper Wellington seam adjacent to old No. 9 mine. Pillar-extraction is in general progress, commencing at old No. 9 facelines and retreating in the general direction of the Stronach main slope. Production in 1948 amounted to 1,575 short tons over a working period of 167 days, with a crew of seven men employed. General working conditions have been found fairly satisfactory in the course of inspection. One minor accident was reported and investigated.

COMOX (49° 124° N.W.).

Canadian Collieries (D.), Ltd.

No. 8 Mine, Comox Colliery, Cumberland.—J. S. Williams, manager; A. W. Watson, overman; D. Morgan and W. Johnstone, shiftbosses; W. Bennie, T. Robertson, A. Dean, J. Weir, A. Maxwell, J. W. Smith, D. Waddington, T. Shields, A. Jones, L. Cooper, J. Vaughan, F. Coates, C. Williams, P. Queen, J. Queen, J. Clarkson, and T. Wynne, firebosses. This mine is close to the Lake Trail road and approximately 2 miles east of the mine camp at Bevan. The seams in this area are reached by two shafts, each 1,000 feet in depth, but practically the whole of the output has come from the upper, or No. 2, seam. The lower, or No. 4, seam was reached by a rock slope at the end of 1946, but results in this area have failed to come up to expectations, as the seam is interspersed with a number of rock-bands of varying thickness. While the main and counter levels in this section have been stopped for some time, exploratory work is being pushed ahead by means of two inclines in an effort to prove the seam to the rise of the main levels. Nine long-walls, each with an average length of 300 feet and a seam thickness varying from 36 to 48 inches, were being operated at the end of the year. Production in 1948 amounted to 170,152 short tons over a working period of 191 days, with an average crew of 330 men employed underground and 30 on the surface.

General working conditions have been found fairly satisfactory in the course of inspection, excepting where faulted conditions on the face-lines were responsible at times for an abnormal outflow of gas. Under such circumstances, blasting was prohibited, pending the effective removal of all visible gas-caps from the general body of the air. At the last inspection in December, air measurements showed a total quantity of 218,000 cubic feet a minute passing in the main returns for the use of 335 men engaged in the full three-shift period of twenty-four hours. Twenty-one samples of air were taken in the main returns, the methane content of these varying from 0.27 per cent. in the north side return to 0.82 in the No. 1 main south return. One hundred and eighty samples of dust were gathered from the various roadways. All of these samples were above the minimum standard of incombustible content as set by the Coal-dust Regulations. A total of 258,000 lb. of limestone-dust was used during the year, 178,000 lb. being used for treating roadways and the balance used in blasting operations. Frequent searches were made for matches and other prohibited articles, but none was found. One hundred and fifty-seven accidents were reported and investigated. One of these was serious, while the remainder were classed as minor. While no fatalities occurred during the year, a miner who was seriously injured on December 2nd, 1947, passed away in Cumberland hospital on January 1st, 1949. One dangerous occurrence was reported during the year. This was on the morning of December 20th when three of the surface employees were affected by noxious gases seeping back into the office, lamp-room, and warehouse. These gases were the result of a fire, in the filled ground in the mine yard, that gradually worked back underneath the frozen surface until it found a means of escape into the buildings mentioned above. These men were all taken to the hospital at Cumberland for a check on their condition, but blood tests showed they were not seriously affected. The burning material in the mine yard was removed as soon as possible, and the excavation will be filled in with gravel and clay.

Tsable River Mine.—S. Lawrence, manager; T. Eccleston, A. Somerville, M. Brown, M. Frobisher, A. Cullane, and L. Hutcheson, firebosses. This mine is in the Tsable River area, approximately 5 miles west of Buckley Bay on the Island Highway. Pending the construction of the permanent surface plant, power is supplied by two small Canadian Ingersoll-Rand compressors and one small Gardner-Denver compressor. These have a total capacity of 2,360 cubic feet of air a minute. A 75-horsepower electric hoist, situated behind the temporary coal-bunkers, is used to haul the trips of 1-ton

capacity side-dump cars up the prospect slope. A small Keith type of fan, 40 inches in diameter, with a capacity of 20,000 cubic feet of air a minute, is able to provide sufficient ventilation to take care of the development, pending the driving of the main return airways and erection of the main ventilating unit. Parts of the permanent plant are now under construction, and these include tipple with 500-ton storage-bunker, wash-house building containing lamp-room and first-aid room, office building to accommodate the official staff, car-repair shops, and blacksmith-shop. These are all in various stages of construction, but the building programme has been seriously delayed on account of adverse weather. It is estimated it will be late in the spring before many of these buildings are ready for occupancy.

Development-work done during the year included 900 feet of drivage in the seam in the main slope and 500 feet in each of No. 1 Right and No. 1 Left levels off the slope. Four hundred feet down the slope from No. 1 Right level, No. 2 Right and No. 2 Left levels have been turned off, and each roadway driven in a distance of 100 feet. Repairs to the new rock slope were completed. The upper 200 feet of soft ground near the surface was secured by steel arches and concreting. General working conditions have been found usually satisfactory during the course of inspection. At the last inspection in December, air measurements showed a quantity of 24,000 cubic feet a minute passing in the main return airway for the use of thirty men. Up to the time of writing, careful checks made with the safety-lamp have failed to detect any signs of methane in this mine. Production in 1948 amounted to 29,055 short tons over a working period of 191 days, with an average crew of eighty men employed. As the workings are naturally wet throughout, rock-dusting is not yet required on any of the roadways, but a considerable quantity of rock-dust is used in tamping explosives. First-aid requirements are well taken care of. An ambulance is kept standing in readiness at the mine at all times, while there is one industrial first-aid attendant on each shift. Twenty-six accidents, all minor, were reported and investigated. Searches have been made regularly for matches and other articles prohibited underground, but none was found.

At all the larger mines in the Nanaimo and Cumberland areas, regular inspections were made each month by the Inspection Committees appointed by the workmen, and copies of all their reports have been forwarded to the office of the Inspector through the courtesy of the various committees. All report-books required to be kept at the mines were examined frequently and usually found to be in order.

NICOLA-PRINCETON INSPECTION DISTRICT.

By E. R. Hughes.

Four collieries were operated in this district during 1948. They were Tulameen Collieries, Limited, at Princeton; Taylor-Burson Coal Company, Limited, at Princeton; the Black mine, operated by the Fred Mannix & Company, Limited, at Princeton; and Coldwater Coal Mines, at Merritt. The most prominent features of the year were the start of strip coal-mining at the Black mine and the preliminary testing of the overburden on the site of the old Princeton Colliery. A small amount of surface prospecting was done in the vicinity of Collins Gulch, near Coalmont, and efforts were made to discover a coal-seam on Lot 2258 (S.), 1 mile south-east of Princeton. Surface-prospecting was done on Lot 4222, Osoyoos Division of Yale District, in the vicinity of Shorts Creek. The Taylor-Burson Coal Company, Limited, discontinued operating their Taylor No. 1 mine on April 1st and reopened the adjoining Jackson No. 1 mine, which had been idle since January, 1945.

No fatal accidents occurred in the underground operations at any of the coal mines of this district during the year, but one fatality occurred at the Black mine stripping operation when a workman was run over by a heavy truck. Seven compensable accidents were reported, but none of these was classed as serious.

There were no prosecutions under the "Coal-mines Regulation Act" during the year, nor were there any dangerous occurrences to report.

The Similkameen Valley Mine Safety Association held its annual field-day competitions at the Athletic Park, Princeton, on Saturday, June 5th. The dislocation of railway and highway traffic owing to floods prevented the attendance of senior officials of the Department of Mines from Victoria and, to some extent, limited the number of entries in the first-aid events; the mine-rescue competition, however, was distinguished by the record number of six entries. The Princeton team, captained by James Fairley, won the mine-rescue event; Copper Mountain No. 2 team, captained by George Hallinan, was second; and Elk River No. 1 team, captained by Dan Chester, was third.

The Ryan trophy regional plaque was awarded to the Tulameen Colliery for having the lowest accident rating of any coal-mining operation in British Columbia during the year 1947. This company has now won the trophy for two consecutive years.

Princeton (49° 120° S.W.).

Tulameen Collieries, Ltd.—Head office, 716 Hall Building, Vancouver. Thomas M. Wilson, manager; David M. Francis, overman; Arthur Hilton, Thomas Bryden, Frank Bond, and William Forsyth, firebosses. The only mine operated by this company during the year was the Pleasant Valley No. 4 mine, situated about 2 miles west of Princeton.

Pleasant Valley No. 4 Mine.—Part of the main Princeton seam, lying between the abandoned Pleasant Valley No. 3 mine and the old Tulameen Nos. 2 and 3 mines, is being developed at this mine, which was opened in 1946. The seam is approximately 460 feet below that formerly mined in the now abandoned Pleasant Valley No. 1 mine. The seam was reached in a cross-measure rock slope driven 700 feet southward on a pitch of 25 degrees from the south end of the old Pleasant Valley Colliery tipple. After contact was made with the seam, this Main slope was continued in the same southerly direction for a distance of 1,050 feet from the portal where, because of the progressive thinning of the seam, it was turned eastward. At 1,300 feet from the portal, at which point it is under a cover of 850 feet, the seam thinned to 3 feet 5 inches, including 11 inches of impurities, so the slope-development was discontinued.

No. 2 slope was started at the junction of the Main slope and No. 1 North level. This slope was driven in a south-easterly direction for a distance of 490 feet, on a dip of 16 degrees, when the progressive thinning noted in the Main slope resulted in the seam thinning down to 4 feet, including 11 inches of impurities, so this slope-development was also stopped. No. 3 slope was started from No. 2 slope, between No. 1 and No. 2 North levels, and was driven a distance of 330 feet due east, where a connection was made with No. 5 North level. The coal from the development of Nos. 3, 4, and 5 North levels is hauled up No. 3 slope.

The No. 1 North section is developed to the rise from the No. 1 North level. This level was started to the left of the Main slope at a point 840 feet down it from the portal. At a distance of 1,100 feet from the Main slope the No. 1 North level had reached the barrier pillar required between the new workings and the Tulameen River. Two inclines were driven up the pitch from No. 1 North level for a distance of 700 feet, and seven rooms were turned off in a north-easterly direction. These rooms have reached the barrier pillar, and the extraction of the developed pillars provides most of the coal-output from the mine. A connection from the fan-drift to Nos. 1 and 2 inclines passes under the Main slope and thus provides the necessary intake airway for these workings. The fan is used to force fresh air into the mine, and the Main slope is the return airway. The thickness of the seam being mined in the No. 1 North section ranges from 5 feet 10 inches to 6 feet and includes four bands of impurities totalling 4 to 5 inches in thickness. The coal at the faces of Nos. 3, 4, and 5 North levels ranges

from 5 feet 8 inches to 5 feet 10 inches in thickness and includes four bands of impurities totalling 4 to 6 inches in thickness.

All mining in development-places is done with post-type punching-machines, and in the pillar-drawing section the coal is blasted from the solid. Polar Monobel No. 4 is used to blast down the machine-cut coal as well as to break down the pillar coal. Marl, from a local deposit, is used to rock-dust the mine roadways to combat the dangers arising from the presence of coal-dust, and is also used to tamp loaded explosives. The broken coal is hand-loaded into mine-cars of 1.3 tons capacity, which are hand-trammed from the face to collecting sidings. No system of mechanical loading or mechanical conveying has yet been introduced, except that loaded cars are hauled up the Main slope by an electric hoist on the tipple.

The No. 1 South section developed an area lying between the Main slope and the water-filled workings of the abandoned Pleasant Valley No. 2 mine. Thin coal was found in the lower workings, and, because of this, advance in the No. 1 South level was stopped at a point 920 feet from the Main slope. Nos. 4, 5, and 6 Left rooms had been advanced to the barrier pillar required between the new workings and the inundated workings of the abandoned Pleasant Valley No. 2 mine. Pillar-drawing operations in this section were completed, and the section was sealed off during the month of April.

Most of the coal mined at this colliery is sold on the local domestic market. Some of the smaller-sized coal is used at the Granby Company's steam-electric plant near Princeton. The average daily output during December was approximately 150 tons. Forty-one men were employed underground and eight men on the surface.

Taylor-Burson Coal Co., Ltd.

Taylor No. 1 Mine.—James Fairley, fireboss, Princeton. This mine is on the North Half of Lot 88, 4 miles west of Princeton, and a half-mile north of the Jackson No. 1 mine. This half-section of coal land is held under the provisions of the "Coal Act." Near the outcrop the seam pitches 55 degrees south-eastward and is believed to be the larger of the two seams found at the Jackson mine. The Main slope has been driven 470 feet in a north-easterly direction on a pitch of 25 degrees. Three levels have been turned off the slope. No. 1 level was driven north-east 110 feet, and a ventilation-raise was driven to the surface. No. 2 level, which now forms a lower travelling-road into the mine, was driven north-east 220 feet, and a raise driven to the surface. No. 3 level was driven north-eastward for 200 feet to where surface gravel and a flow of water were encountered; a concrete stopping was built near the face of the level to prevent the seepage from entering the workings. No. 3 level was also driven in a south-westerly direction for a distance of 300 feet. At this point the face had reached the southern boundary of the Taylor-Burson Company's coal licence on the North Half of Lot 88. An agreement was made with the owner of the Jackson mine to continue work in this seam over the boundary into his property. As the seam appeared to improve as advance was made south-westerly, it was decided by the operators that the best approach to this area would be from the then abandoned workings of the Jackson No. 1 mine. Therefore, operations at the Taylor No. 1 mine were suspended on April 1st, all material was taken from the mine, and the workings were allowed to fill with water. The crew of four men moved to the Jackson No. 1 mine.

Jackson No. 1 Mine.—James Fairley, fireboss, Princeton. This mine is on the South Half of Lot 88, 4½ miles south-west of Princeton, and a half-mile south of the Taylor No. 1 mine. This half-section of coal land is owned by British Lands, Limited, whose agent is C. H. Jackson, Kelowna, B.C. The property has been leased to the Taylor-Burson Coal Company, Limited, who reopened the mine during April, following the closing of the Taylor No. 1 mine. The mine had been closed since January, 1945. However, the original workings were not extensive, and a few days' work sufficed to put the mine in condition to produce coal. The portal of the main adit is at an eleva-

tion of 3,047.3 feet and is situated at the south-west corner of the coal lease. The main adit, after being driven through 119 feet of surface gravel, sandstone, and shale, reached a 4½-foot seam of coal containing a 1½-inch shale-band and a 7½-inch bentonite-seam. After driving 30 feet along the strike of the seam to the north, a surface connection was made for ventilation. The cross-measure main adit was then extended for exploration. Forty-seven feet beyond the intersection of the first seam a thicker one was found. This was 86 inches thick, including a 1-inch clay parting, a 1-inch shale parting, a 2-inch shale parting, and a 14-inch mixture of coal and shale. A level was driven northward along the strike of the seam, and when the mine was closed in 1945, the face of the level was 110 feet in from the intersection of the main adit. Since resuming operations this year, the face of the Main level has been advanced 325 feet and a ventilation raise has been driven to the surface. In addition, a counter-level and the necessary crosscuts have been driven for ventilation. The Main level was also advanced southward 20 feet from the intersection of the main adit. At this point the face had reached the southern boundary of the South Half of Lot 88 and the northern boundary of Lot 385. Four men were employed underground and one on the surface.

Fred Mannix & Co., Ltd.

Head office, 332 Seventh Avenue West, Calgary, Alta. Project manager, coal operations, K. Collett, Calgary; superintendent at Princeton, B. Montgomery. This company is producing coal from a surface-stripping operation on Lot 87, situated in the Finlay Creek district, 6 miles south-west of Princeton and about one-half mile south of the Jackson mine; this is on the site of the former underground operation known as the Black mine. This company has also done some preliminary testing on the site of the old Princeton Colliery, No. 1 mine, on Lot 1822, adjoining the town of Princeton to the south.

The Black Mine.—This property was operated intermittently on a small scale for many years as an underground mine. The total production did not exceed 4,000 tons. During December, 1947, the Marwell Construction Company, Limited, of Vancouver, took over the property with the intention of operating it as a strip mine, removed an appreciable part of the overburden, and commenced coal production. The operation was taken over in May and continued by Fred Mannix & Company, Limited. The coal produced has been sold to the Granby Consolidated Mining, Smelting, and Power Company, Limited, for use at their steam-electric power plant near Princeton.

The measures at the Black mine dip easterly on a pitch of approximately 50 degrees. The strata outcropping near the entrance to the underground workings have a thickness of a little more than 80 feet. The lower 30 feet of the measures, containing several thin coal-seams separated by layers of clay and shale, have been left unmined. In the upper part of the measures, four layers of coal, with an aggregate thickness of 47 feet, are separated by layers of shale a foot or two thick. The upper part of the measures had been partly developed by the underground workings which extended about 500 feet southward from the portal. This area was overlain by gravel from a few feet to more than 60 feet thick. The gravel has been removed and a pit has been mined in three lifts, removing the full 47 feet of coal to the elevation of the floor of the former underground workings. A new lift has been started below this elevation. Stripping has not been extended beyond the southern extremity of the underground workings, where the continuity of the seam is broken by a washout.

Carry-alls, bulldozers, and trucks were used in removing the overburden. At the end of the year a 2½-yard capacity Northwest shovel was being used to excavate the coal from the face, and the coal was hauled in Euclid trucks to a tipple erected on the property. At the tipple the coal is passed through a breaker and is then hand-cleaned on a shaker screen. The sized coal is transported in trucks to the Granby Company's bunker near Princeton. Twenty-five men were employed; living accommodation is provided for these workmen at a camp, erected during the month of May on Lot 406, 1 mile south-east from the Black mine.

Princeton Colliery, No. 1 Mine.—This mine was worked underground from 1909 to 1924. During that time approximately 333,000 tons of coal was produced. In a diamond-drill hole, put down near the Similkameen River bridge at Princeton about forty years ago, 29 feet 7 inches of coal was found within 67 feet 4½ inches of the surface. The underground operations were conducted almost entirely in a 10-foot section.

During September the Fred Mannix Company commenced to test the possibilities of strip-mining the outcrop area left unmined by the underground operation. The testing consisted of diamond-drilling and the excavation of three trenches. Work was suspended in December for the winter.

Lot 2258 (S.).—This is a coal claim of 121 acres 1 mile south-east of Princeton. A licence to mine coal has been granted to M. J. Mullin & Sons, Princeton, under the provisions of the "Coal Act." The licensees believe that the main Princeton seam, and possibly other seams, will be found on the claim. In their search for an outcrop, several trenches were dug and a bulldozer was used for one week. No coal-outcropping was found.

COALMONT (49° 120° S.W.).

Hayes and Vittoni Prospect.

This prospect, between Blakeburn and Coalmont, is near the No. 7 tower of the abandoned aerial tramway formerly operated by the Coalmont Collieries, Limited. Six seams have been discovered, three of which have been partly developed by underground work, and the the other three uncovered by surface-trenching and open-cut work. The seams range in thickness from 3 feet to 5 feet 6 inches, including bands of clay and shale. Most development has been done in the No. 1 tunnel, which has been advanced to a point 90 feet from the portal. Underground work was suspended at the end of June, 1947, and was not resumed during 1948. A bulldozer was used in an unsuccessful effort to uncover a thicker seam believed to be in this area.

Lot 294.

This is a coal claim, 1 mile square, on Collins Gulch, 2 miles west of Coalmont and 2 miles south of Tulameen. A licence to mine coal has been granted to F. Glover and J. S. Ney, Vancouver. Collins Gulch is a small stream flowing northward that enters the Tulameen River about 1 mile south-east of the village of Tulameen. Coal is exposed on both sides of the gulch at a point approximately 1½ miles from the Tulameen River, and at an elevation of approximately 800 feet above the river. The gulch cuts through the strike of the coal-measures, and at the point of exposure the coal-seam dips toward the south.

Coal was discovered on Collins Gulch over fifty years ago. The early work done in this area included an adit driven into the hillside on the east side of the gulch. The entrance to this adit has been caved, so that the extent of the workings could not be ascertained. During this year Messrs. Glover and Ney did some prospecting on the west side of the gulch and built a road from near the Hayes and Vittoni prospect into the new showing. Insufficient work has been done to determine the full thickness of the seam or the extent of included impurities. However, the seam is believed to be the principal seam worked at the Coalmont Colliery. The outcrop is approximately 1 mile northerly from the nearest underground workings of the abandoned Coalmont Colliery No. 5 mine. Prospecting was suspended for the winter.

MERRITT (50° 120° S.W.).

Coldwater Coal Mines.

C. E. Thomas, operator; Robert Murray, fireboss. This property, formerly operated by the Middlesboro Collieries, Limited, is about 1 mile south of the city of Merritt. Present activity is confined to Coldwater Hill, about half a mile east of the old Middlesboro Colliery office. In December five men were employed.

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No. 1 East Mine.—Carmichael McNay, overman; Thomas Reid and Leonard Brett, firebosses. The operation at this mine consists entirely of extracting pillars formed in the earliest working of the mine. As the coal is fairly soft, and is crushed by the pillar-extraction, blasting is not required, and pneumatic picks are used to advantage. The coal is hand-loaded into cars which are then hauled by horses to three main sidings, where the trips are made up. From the sidings the trips are hauled by a compressed-air hoist to the head of the endless-rope system, about 450 feet from the mine portal. They are then lowered on the surface incline to the level of the old Coal Creek tipple. From there the coal is hauled to the Elk River preparation plant, about 4,000 feet away, by a steam locomotive.

Although the production of coal from this mine has been kept remarkably steady, the life of the mine is rapidly approaching the economic limit, owing to the frequent repairing and regrading of roadways made necessary by the squeezing induced by large caved areas behind the line of working-faces.

The mine was free from major bumps, but experienced several very minor ones which did little or no material damage.

Very little methane is given off by the pillars during their extraction, which is typical of mines in other areas. In general, the ventilation during the year was good, but because of the low velocity of the ventilating current and the numerous old roadways encountered, considerable coal-dust held in suspension at and near the working-faces was evident at times, especially in the Nos. 5 and 6 East sections. The total volume of air passed by the fan is about 92,000 cubic feet per minute, of which 68,000 cubic feet is supplied to the active workings for a total working force of seventy men and nineteen horses, while 24,000 cubic feet circulates through the abandoned east-side workings.

No. 4 Mine.—James Bushell, shiftboss. This mine is on the retreat; all production of the single shift employed comes from splitting and slabbing the high-side main-entry pillars, extraction being limited to about 50 per cent. The coal is soft, and pneumatic picks can be used to advantage; hence only an occasional shot is required. The broken coal is conveyed by Meco shaker-conveyers to loading-points on the Main level, where the trips are made up. Horses haul the trips to the mine portal, which is a very short distance from the tipple rotary dump.

Early in the year an incline was started off the main entry, inby old No. 3 incline, with the object of recovering the pillars to the left off No. 3 incline. It is estimated that the extraction of these pillars, together with the entry pillars inside the new incline, will extend the life of the mine another two years.

The ventilation, supplied by a double-inlet Sirocco fan 5 feet in diameter, was found adequate throughout the year. To maintain efficient ventilation, and also as a safety precaution, the area inby the present workings has been sealed off.

No. 9 Mine.—Daniel Chester, overman; William Waller, Ralph Larner, Albert Littler, James Corrigan, and John Sweeney, firebosses. On account of the continuous faults and the reduced thickness of the coal on the high side of the Main level, work to the rise was stopped early in the year. The output was maintained in the Nos. 5 and 6 Slope sections.

The coal is mined by radial-punching machines, blasted, and then loaded into cars in the rooms and into Meco shaker-conveyers in the crosscuts. The trips are hauled up the slopes by compressed-air hoists to the main haulage-level, where they are gathered into larger trips to be hauled to the mine portal by horses.

As mentioned in the Annual Report of the Minister of Mines for 1947, work at the face of the Main level was stopped at a fault. No. 6 slope and counter were started close to the fault, and were driven about parallel to it to obtain information necessary for driving a rock tunnel to the seam.

When No. 6 slope was driven a distance of about 700 feet, it reached the faulted ground separating No. 9 mine from the No. 2 mine old workings. Rooms driven to the right off the slope also met with faulted ground. Four raises were driven, on the full pitch of the seam, to the right off and close to the face of the slope. These raises eventually gained elevations higher than the Main level before meeting with faulted ground. Near the faces of the raises, bore-holes were put up which intersected the seam. The information derived from the bore-holes permitted the planning of a rock tunnel, about 500 feet in length, to reach the seam. This tunnel was started late in December.

The ventilation is maintained by an 8-foot reversible Jeffrey fan and, in general, was found to be adequate throughout the year. The friable coal and the method of mining have necessitated the use of large amounts of limestone-dust to efficiently combat the coal-dust hazard.

No. 3 Mine.—James Anderson, overman; Kenneth Kniert, David Brown, Roger Girou, William Verkerk, and Brindley Morris, firebosses. The development of this mine has progressed to the extent that its output is now the largest of any mine at the colliery.

The four inclines driven to the rise off the main haulage-level have reached their boundaries, and levels are being driven near the top of these inclines to open up a district toward the outcrop. The development of these inclines was considerably retarded by a series of small down-throw faults and by changes of gradient, as encountered in 1947.

In November the face of the main haulage-level entered faulted ground and, at the end of the year, was still advancing slowly. This area has every indication of being an upward extension of the faulted ground met with at the face of the No. 4 mine main haulage-level before the inside part of that level was abandoned.

Two slopes are being developed on the low side of the Main level with the intention of opening a producing district as soon as possible.

The drainage-level, or Main level counter, was connected to the surface late in the year by driving a tunnel from the surface through the gravel.

A considerable length of the main haulage-level, from the portal inby, has been relaid with heavy rails in preparation for the new battery locomotive which, it is expected, will be used shortly.

The coal, which averages about 15 feet in thickness, is very friable and contorted and is mined by pneumatic picks, although radial-punching machines are used in the harder parts. Very little blasting is required. Both Meco shaker-conveyers and flight conveyers are used to advantage for conveying the coal to the main belt-conveyer and loading-points.

The mine, ventilated by an airodyne fan with a rated capacity of 100,000 cubic feet per minute against a water-gauge of 2 inches, was found, in general, to be fairly well ventilated throughout the year, except for the low-side section. This section, including the Main level face, is exceedingly gaseous and is also subjected to considerable heaving of the floor and sloughing of the high-side rib coal. No blasting is permitted in this section.

During the year 367 lb. of Polar CXL-ite, 11,574 lb. of Polar Monobel No. 4, 2,404 lb. of Polar Monobel No. 14, and 12,391 electric detonators were used at the colliery in coal and rock blasting. No misfired shots were reported.

To overcome the coal-dust hazard, 210 tons of limestone-dust was applied to the underground workings and to the tamping of shots. As a check on the efficacy of the above applications of inert dust, monthly samples of mine dust were collected throughout the year and analysed; all the samples were above the minimum requirements of incombustible content as set by the Coal-dust Regulations.

Monthly inspections were made by the miners' Inspection Committees, and a copy of each inspection report was sent to the office of the District Inspector through the courtesy of the committee members. All report-books kept at the various mines in accordance with the "Coal-mines Regulation Act" were examined regularly and were found to be in order.

Michel Colliery.—(49° 114° N.W.) William Chapman, manager; Irving Morgan, senior overman; Walter McKay, afternoon overman; John Whittaker, night shiftboss. Underground operations are under the daily supervision of five overmen, nine shiftbosses, and sixteen firebosses. Eight shotlighters are also employed.

During the year five mines, not including the strip mine, were active at the colliery, of which "A" East, "A" West, and "A" South operated in "A" seam, and "B" East, and "B" South operated in "B" seam.

"A" East Mine.—William Gregory, overman; Harry Sanders and Frank McVeigh, shiftbosses; Henry Beard, Robert Barass, Sr., and Stephen Lazaruk, firebosses. This mine operates on the east side of the syncline, most of the production coming from the No. 5 Slope section and from the extraction of the main pillars above the main haulage-level inby No. 5 Slope.

Wherever possible, duck-bill loaders and short-wall cutters are used to drive the rooms and splits. The pillars are subsequently extracted by Meco shaker-conveyers equipped with a swivel pan. This device allows the top part of the conveyer to be angled into the pillar, thus making a longer face-line possible on which the working force may be concentrated. In the pillar-drawing sections, pneumatic picks are usually sufficient to break down the coal, only an occasional shot being required. The bad roof that exists in most parts of this mine has proved a handicap to mechanization and requires the closest attention of all concerned to mine the coal with efficiency and safety.

The coal is naturally dusty, and as crushing in the areas of pillar-extraction produces much dust, liberal and frequent applications of inert dust have been necessary to mitigate the coal-dust hazard. In general, the ventilation during the year was found to be adequate. Only a few times was blasting temporarily prohibited.

"A" South Mine.—Harry Corrigan, overman; Harry Batchelor and Roger Pasiaud, firebosses. This mine is operating on the Sparwood or western limb of the syncline, where inclinations of 30 degrees and more are usual. The No. 4 Raise section, the only section active during the year, is rapidly being depleted. To offset the loss of production when this raise is exhausted of coal, No. 1 raise, outby No. 4 raise, was started early in the year to recover pillars of coal lying to the left of No. 10 incline.

Rooms are driven on the strike of the coal to the left and right off the raise, usually with duckbill-equipped conveyers. The intervening pillars between rooms are extracted on the retreat.

In general, the ventilation during the year was good. Gas found a few times during inspections was due to local disarrangements of the brattice.

"A" West Mine.—Harry Corrigan, overman; John McInnis and Frederick Simister, shiftbosses; Reginald Taylor, Thomas Taylor, and James Walsh, Jr., firebosses. In this mine the development-rooms are driven in pairs to the left and right off No. 2 belt-road on the approximate strike of the seam. When a pair of rooms have reached the predetermined boundary, splits are driven from them to the next pair of rooms above, thus forming pillars that are subsequently extracted by Meco shaker-conveyers equipped with swivel pans. The coal from these conveyers is delivered onto a cross-belt in one of the rooms for transportation to the main belt system on No. 2 belt-road, which in turn delivers it to a series of belts on No. 4 incline. These transport the coal to the main loading-point on the main haulage-level.

The development-work in the rooms and splits is done with short-wall cutters and duckbill-equipped conveyers. Although blasting is necessary in this narrow work, the

extraction of the pillars is successfully done with pneumatic picks, only occasional shots being required.

Raises have been started off No. 4 incline, above the junction of No. 2 belt-road. These will intersect No. 10 incline, "A" South mine, with the object of opening and developing the virgin area above No. 8 Left room off No. 10 incline. These raises are progressing rapidly. In general, the ventilation during the year was found satisfactory.

"B" South Mine (No. 3 Incline District).—Abel Hampton, overman; Henry Eberts, Sidney Hughes, Thomas Slee, and Frederick Nash, shiftbosses; Thomas Krall, Mario Pettoello, Daniel Bobchuk, David Thewlis, and Benjamin Volpatti, firebosses. This mine is on the western or Sparwood limb of the syncline, where inclinations of 30 degrees and more exist. The seam averages about 5 feet in thickness, is of excellent quality, and has a fairly strong shale roof in most sections, which allows machinery to be used to advantage.

No. 3 Raise section was depleted of coal reserves late in the year, and all machinery and material subsequently withdrawn. Nos. 200 and 300 Raise sections were developed rapidly during the year to the point where their production offset that lost when No. 3 raise was abandoned. The method of work adopted in these raises is substantially the same as that reported in the Annual Report of the Minister of Mines for 1947 for the No. 3 Raise section.

Very little methane is given off by the coal, probably because of its proximity to the outcrop. The ventilation was generally good during 1948 and is maintained by a 4-foot single-inlet Sirocco fan, assisted materially during the winter by natural ventilation through the several openings driven to the outcrop.

Owing to the complete mechanization of coal cutting and haulage, as well as to the numerous chutes in use, the coal-dust hazard is ever present. Liberal and frequent applications of inert dust are required to keep this potential danger at a minimum.

"B" South Mine (Slope District).—William Gregory, overman; Thomas Owen, James Robson, and William Davey, firebosses. The workings of this slope, reopened in March, are confined to the extraction of pillars lying between the slope and "B" East mine. The method of mining is that of driving splits off the rooms and extracting the resulting pillars by Meco shaker-conveyers equipped with swivel pans. In general, owing to the squeezing of the pillar coal, pneumatic picks are sufficient to break it down; only an occasional shot is required.

At about 8.30 a.m. on July 11th a rather severe bump occurred in No. 1 split off No. 10 Left room, which caused considerable heaving that resulted in numerous broken and swung posts, together with partial disarrangement of the ventilation.

In general, the ventilation during the year was adequate, although a few times blasting was prohibited on account of the influx of gas from the surrounding gob area.

"B" East Mine.—Because of the depletion of coal reserves, all production in this mine was suspended in April, and subsequently all equipment was withdrawn.

During 1948, 420 lb. of Polar CXL-ite, 15,980 lb. of Polar Monobel No. 14, 31,970 lb. of Polar Monobel No. 4, and 70,540 electric detonators were used at the colliery in coal and rock blasting. Two misfired shots were reported.

Monthly examinations were made by the miners' Inspection Committees. All report-books kept at the various mines in accordance with the "Coal-mines Regulation Act" were examined regularly and were found to be in order.

To mitigate the coal-dust hazard, 588 tons of limestone-dust was applied to the underground workings and to the tamping of shots. As a check on the efficacy of the above applications, monthly samples of mine dust were collected in each mine and analysed. All the samples were above the minimum requirements of incombustible content as set by the Coal-dust Regulations.

On the west flank of Baldy Mountain, about 2½ miles north-west of Michel, the company, in 1948, did considerable drilling and trenching to explore a coal-stripping prospect. Considerable tonnage of fair-quality coal is indicated.

In May, 1948, construction-work was started on a new battery of sixteen Curran-Knowles by-product ovens. Rapid progress was made on this project, and it is estimated that the new battery will be producing coke in the spring of 1949.

Michel Strip Mine.—Ivon Donkin, fireman; Edward Halverson, John Hope, and Stephen Ozubko, shiftbosses. This mine was worked throughout the year, except for time lost on account of a labour dispute from January 14th to February 18th, and for time lost during floods. The floods, in late May and early June, destroyed the company's bridge across Michel Creek. This bridge connected the main highway to the mine road east of Michel. A new road was built on the north side of the valley from near Michel Station to join the mine road which is also on the north side of the valley, thus making it unnecessary to replace the bridge.

The coal deposit, which reaches a thickness of 90 feet in places, as reported in the 1947 Report, is of variable quality and rather friable. The overburden of shale and sandstone is thicker toward the west and requires extensive blasting. Wagon-drills are used to drill the 15-foot holes in the overburden. The coal is hauled to the Michel preparation plant by six trucks, each of 15-ton capacity.

During 1948, 39,100 lb. of 40 per cent. Forcite, 7,650 lb. of 60 per cent. Forcite, 52,400 lb. of 40 per cent. Dynamex, 100 lb. of 60 per cent. Dynamex, and 10,596 electric detonators were used at the mine in rock-blasting.

Corbin Colliery, Corbin.

(49° 114° N.W.) Henry Miller, manager; Walter Almond, overman. On June 28th the Hillcrest Mohawk Collieries, Limited, with office at Bellevue, Alta., commenced mining at the Big Showing strip mine. The coal was loaded by two diesel shovels into trucks and transported to the old Corbin Colliery tipple for weighing, screening, and crushing. It was hauled by trucks to the Canadian Pacific Railway spur at McGillivray, where it was either loaded into railway-cars or added to the stock-piles. About sixty trucks were used.

Operations were suspended on September 25th, when it became necessary to remove overburden before production could be continued. The total output for 1948 amounted to 135,524 long tons.

NORTHERN INSPECTION DISTRICT.

By E. R. Hughes.

TELKWA (54° 127° N.E.).

Bulkley Valley Collieries, Ltd.

F. M. Dockrill, managing director; A. H. Dockrill, overman; William Dinsdale and Robert Gourlay, firebosses. This property is on Goat Creek, about 7 miles from Telkwa. The market is confined to the district between Prince George and Prince Rupert. At present mining is being done only at the No. 2 mine, although some prospecting has been done in the area adjacent to the abandoned No. 1 mine. Most of the coal is being produced from the splitting of pillars formed on the south side of the Main slope. The only development at the end of the year consisted of advancing the Main Slope left counter, which is being driven through a washout to contact the seam on the west side of the barren area. The No. 2 diamond-drill hole has proved the existence of the seam westward beyond the present workings.

A diesel-driven Gardner-Denver compressor, of 360 cubic feet capacity, provides the underground power requirements. The solid coal is cut by post-type punching-machines, and in the pillar-drawing operations the coal is blasted from the solid. Polar

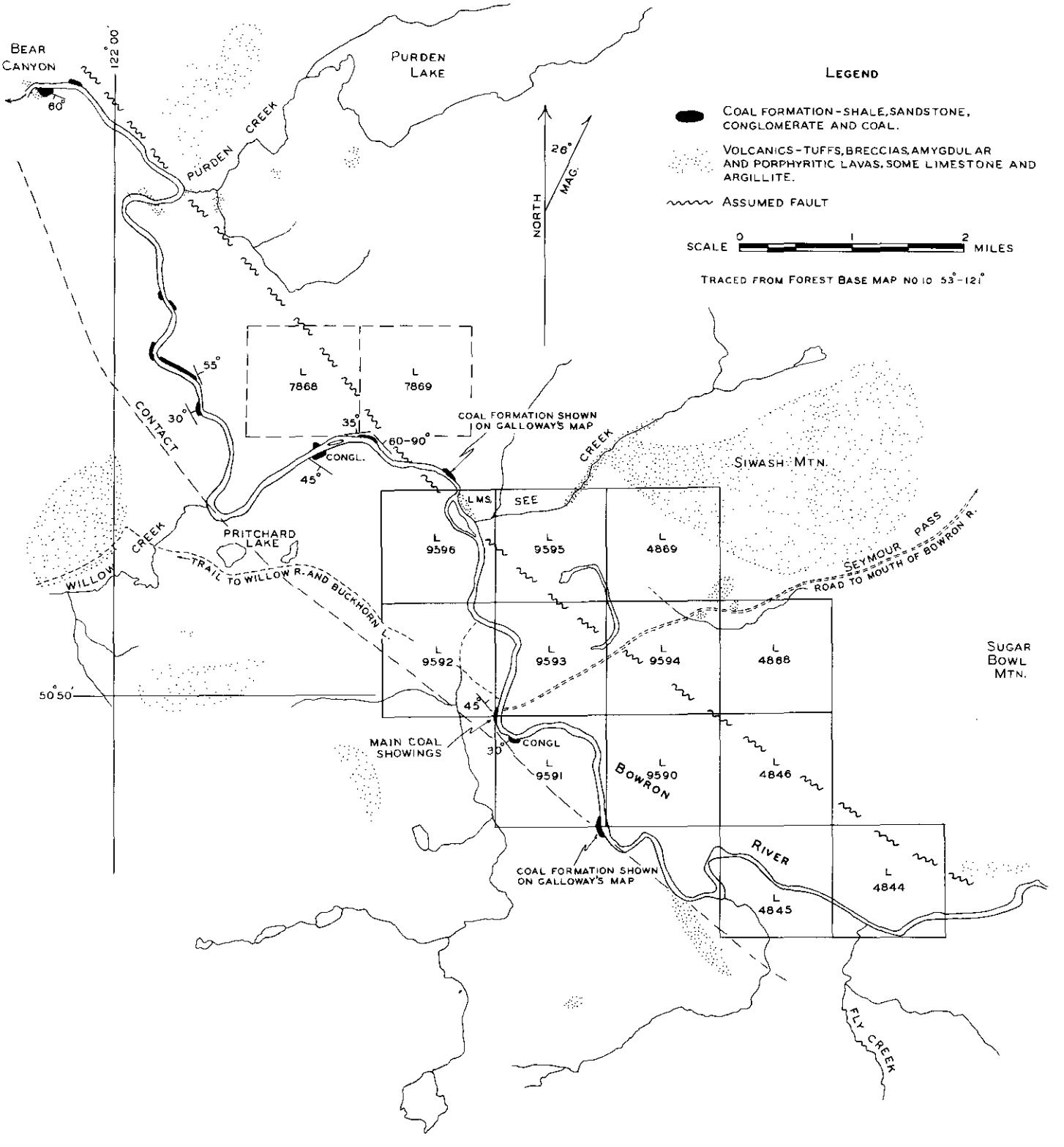


FIG.18. SKETCH MAP OF BOWRON RIVER SHOWING DISTRIBUTION OF COAL FORMATION AND OLDER ROCKS.

Monobel No. 4 is used to blast down the machine-cut coal as well as to break down the pillar coal. The broken coal is hand-loaded into mine-cars which are hand-trammed from the face to sidings off the Main slope. The loaded cars are hauled to the surface by a small Canadian Ingersoll-Rand compressed-air hoist. The seam, which dips north-westerly on a pitch of 7 degrees, is 13 feet thick and contains two bands of rock, 2½ inches and 1½ inches thick. The top 2 feet of coal is left to form the roof.

On the surface the coal is dumped over stationary bar-screens and is separated into four sizes—lump, egg, stoker, and slack. Coal is hauled to the railroad by truck. Bath-house facilities are provided at the mine, and the workmen reside in Telkwa. A bus is used to transport employees to and from their work daily. At the end of the year twenty-seven men were employed underground and five on the surface.

CARIBOO.*

Bowron River.

Bowron Coal Co., Ltd.

(53° 121° N.W.) The Bowron Coal Company, Limited, Box 255, Prince George, of which D. Wells is president, holds a coal lease on Lot 9596 on the Bowron River about 30 miles due east of Prince George. The company established a camp on the east side of Bowron River in the south-west corner of Lot 9593 and during 1947 and 1948 explored coal-seams exposed in outcrops on the west bank of the river on Lot 9593.

Location and Accessibility.—The camp is accessible by about 28 miles of tractor-road built in 1947 from the mouth of the Bowron River, 3 miles from Hansard on the Prince Rupert branch of the Canadian National Railways. The road was used to service the camp during the summer of 1948. An alternative route is from Prince George to Buckhorn Lake, about 20 miles by motor-road, thence to the Willow River crossing, about 13 miles by jeep-road, and thence to the camp on Bowron River, about 22 miles by pack-horse trail. The Hansard tractor-road was abandoned in 1948, and a start was made toward locating and building a truck-road from Buckhorn Lake to the camp. A locating engineer was at work in late September, and a start had been made on the bridge across the Willow River.

History.—The existence of coal on the lower Bowron River has been known for many years. It is noted by Dawson† that coal about 18 inches thick was seen in 1871 by Dewdney on Bear River (now named Bowron), near latitude 54, close to the crossing of the Canadian Pacific Railway survey-line. The coal-occurrences were brought to the attention of A. E. Hepburn, of Vancouver, in 1909 by J. Wendle, of Barkerville, who had seen them first in 1898. By 1911 Hepburn held leases covering fourteen sections and totalling 8,960 acres.

In 1911 the lots were surveyed and the property was examined by C. F. J. Galloway, excerpts of whose report appear in the Annual Report of the British Columbia Minister of Mines for 1914 on pages 67 to 71. A camp consisting of four cabins and two stables, long since fallen in, was built at that time on the west side of the Bowron River downstream from the showings. No work was done on the property in the intervening years, until it was acquired by the present company in 1946. Since then the tractor-road from Hansard has been built and two new camp buildings have been constructed on the east side of the river, some diamond-drilling has been done around the main coal-showing, and construction of a new road from Buckhorn Lake has begun.

General Description.—Bowron River rises in Bowron Lake, about 15 miles north of Barkerville, and flows north-westward to join the Fraser River 3 miles east of Hansard. In the vicinity of the coal-showings, about 18 miles due south of Hansard,

* By Stuart S. Holland.

† *Geol. Surv. Canada*, Report of Progress, 1876–77, p. 145.

the Bowron River valley is wide and flat-bottomed. The valley-floor, at an elevation of about 2,400 feet, is about 1½ to 2 miles wide between the valley-sides which rise to summits of about 5,000 feet altitude.

The Bowron River follows a meandering course and has cut down through the valley-fill, leaving benches at various heights. These extend back from the river and are covered with a thick growth of spruce and pine. Noticeable features of the valley, especially well seen in aerial photographs, are several oxbow lakes and cut-off meanders just north of the camp.

There are very few outcrops in the valley-bottom, and those seen are confined to the banks of the river. The extensive gravel benches and depth of fill make it extremely unlikely that any outcrops, and particularly of soft coal formation, will be found in the flat ground between the river-banks and the valley-sides. Outcrops are to be found on some of the tributary creeks and on rising ground.

There is no topographic map of the coal area. The general position with reference to Prince George and other points is shown on Map No. 3A of the Department of Lands and Forests. The accompanying sketch-map, Fig. 18, is taken from Department of Lands and Forests, Forest Base Map No. 10, 53°–121°. This map also shows the location of vertical aerial photographs.*

Description of Formations.—The rising ground on the valley-sides and a few points along the river itself are underlain by a group largely comprising volcanic rocks (*see* Fig. 18). The volcanics are generally green-coloured and include fine tuffs, breccias, and amygdular and porphyritic lavas. In two places on the west side of the river the volcanics appear to have interbeds of dark cherty argillaceous rocks. Grey limestone outcrops for about 500 feet on the east side of Bowron River in the north-east corner of Lot 9596.

The volcanic rocks for the most part show no bedding, though in places they may be crossed by two sets of almost vertical joints, one striking north and the other west.

The only intrusives seen are several small dykes which intrude dark argillite near the mouth of Purden Creek.

Coal has been found in a series of sandstones, shales, and conglomerates that outcrop along Bowron River for a distance of 7 miles. Outcrops of these rocks have been found at various places between Bear Canyon and the north-west corner of Lot 9591. It is possible that the coal-bearing series may outcrop farther to the north-west and south-east, but the formation has not been traced farther in those directions. Outcrops of the coal series were not seen at any place other than on the river-bank, and there are no reports of coal formation being found in the mountains or at elevations above river-level.

The coal formation comprises grey and buff sandstones interbedded with light to dark soft shales and sandy shales, some of which are carbonaceous, and several beds of conglomerate. Conglomerate containing cobbles of green volcanic rocks up to 10 inches across outcrops about 200 yards south-east of the south-west corner of Lot 9593. This conglomerate proves that the volcanic rocks are the older. The high proportion of volcanic cobbles suggests that the rock is either a basal conglomerate, lying on volcanics that do not outcrop, or at least that it is close to the base of the sedimentary succession. Several beds, up to 15 feet thick, of grey conglomerate outcrop along the river near the south-west corner of Lot 7869, and a thick conglomerate-bed underlain by coal outcrops on both sides of the river down-stream from the island west of the south-west corner of Lot 7869.

The distribution of coal-formation outcrops suggests that the formation underlies the bottom of Bowron River valley, forming a belt 1½ to 2 miles wide and about 7 miles long (*see* Fig. 18).

* Prints of air photographs may be obtained from Air Surveys Engineer, Department of Lands and Forests, Victoria.

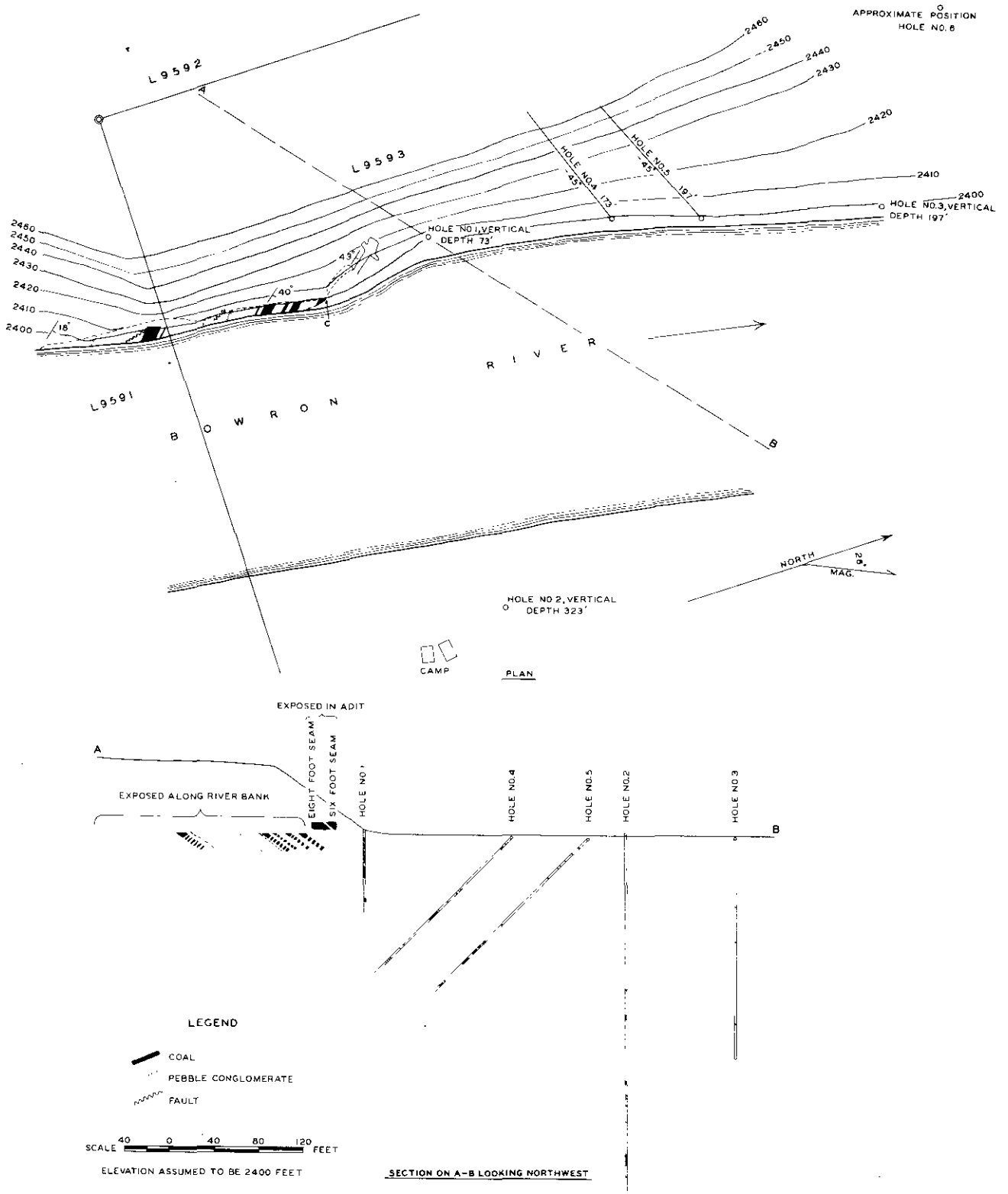


FIG. 19. PLAN AND SECTION OF WORKINGS ON LOT 9593 BOWRON RIVER.

Sandstone-beds underlying the main coal-seams near the south-west corner of Lot 9593 contain fragmentary fossilized plant remains. A collection made from this locality was sent to W. A. Bell, of the Geological Survey of Canada, for identification. Dr. Bell reports as follows:—

"The fossil plants from the Bowron River area are indeed poor and consist only of the following:—

"*Sequoiites langsdorfii* (Brongniart).
"*Thuites* sp.
"*Pinus* sp.
"3 fragments of dicotyledenous leaves.
"I consider the age to be Tertiary. . . ."

Structure.—Two small normal faults striking north 10 to 20 degrees west appear 50 and 100 feet south of the main coal-showing on Lot 9593. In both instances the east side has moved down a few inches to a few feet with respect to the west. The coal formation at two places in the exposure east of the south-west corner of Lot 7869 is cut by small normal faults striking about west. No other actual faults were seen. However, because of the slickensiding, small drag-folds, and the attitude and position of the beds relative to the volcanics, it is inferred that the north-east contact between the band of coal formation and the older volcanics, particularly near the south-west corner of Lot 7869, is along a fault.

The coal formation generally strikes about north 40 degrees west, and for the most part the beds dip north-east at from 20 to 60 degrees. The conglomerate west of the south-west corner of Lot 7869 and the outcrop at the head of Bear Canyon are the only beds dipping to the south-west.

The south-west dips of the coal formation may be the result of folding or, alternatively, may be due to faulting parallel to the assumed fault along the north-east contact. The general structure of the basin remains in doubt, since outcrops are far too few to permit any correlation of beds or any determination of the stratigraphic succession.

Description of Coal-showings.—The main coal-showings are on the west side of Bowron River in the south-west corner of Lot 9593. Other undeveloped coal-seams of unknown thickness and extent are indicated at the following localities (*see* Fig. 18): By coal float on the west bank at the large conglomerate-outcrop in the north-west corner of Lot 9591, by outcrops and coal float on the east bank in the south-west corner of Lot 7869, by 15 inches of coal outcropping beneath conglomerate on the west bank west of the south-west corner of Lot 7869, and by coal float on the west bank at the head of Bear Canyon 1½ miles north-west of the mouth of Purden Creek.

The coal-exposures in the south-west corner of Lot 9593 were first developed in the autumn of 1910 by J. Wendle, of Barkerville, who drove a short adit for A. E. Hepburn, the owner of the leases. The adit (*see* Fig. 19) is at the northern end of natural exposures of coal formation outcropping continuously along the river for about 260 feet. At the adit the beds strike north 40 degrees west and dip about 45 degrees north-eastward, while at the southern end of the outcrop they dip about 20 degrees north-eastward. The adit is about 8 feet above high-water level and was driven in a north-westerly direction for 33 feet; at 22 feet a crosscut was driven 9 feet left and another 13 feet right. The left-hand crosscut exposes the Eight Foot seam and the right-hand the Six Foot seam. The adit is now caved.

It is reported that at extreme low water a trench was dug along the edge of the river just north of the adit and that a third seam, lying above the Six Foot seam, was exposed in it across a width of 10 feet.

In 1947 the present company exposed the formation in a rock-cut extending 30 feet south-east of the adit-portal and late in the autumn put down a 73-foot vertical drill-hole near the adit (*see* Fig. 19).

In 1948 four other drill-holes, totalling 885 feet, were completed by September, and an additional hole was drilled later in the autumn. Some surface-stripping and blasting in the bank just south of the adit caved the portal and covered the rock-cut.

The drill-holes, shown on Fig. 19, are all in the south-west corner of Lot 9593 and were put down in order to obtain further information on the extent of the coal. Hole Nos. 1, 2, and 6 were put down by a machine making 1¼-inch diameter core. The coal-seams cored reasonably well, and the core recovery in rock was good. The core of Hole No. 1 was not seen by the writer, and the log is by the driller, O. R. Christofferson. Hole No. 6 was drilled after the examination was made, and its approximate position is shown on Fig. 19. It is reported that 6 feet of coal was cut at a depth of 204 feet. Hole Nos. 3, 4, and 5 were drilled with an X-ray drill whose core is $1^{3}/_{16}$ inch in diameter. No core was recovered by it from the coal-seams, and coal in the logs of those holes is noted by the driller from the appearance of the cuttings. His record was accepted for the thickness and depth of the coal-seams.

The six drill-holes cross a stratigraphic thickness of about 300 feet of measures which contain numerous coal-seams, both thick and thin, as well as a number of sand, grit, and conglomerate beds. Despite the close spacing of the holes it is not possible to correlate an individual seam from one drill-hole to another or with those exposed on surface. Neither is it possible to correlate individual sandstone and grit beds even between Hole Nos. 4 and 5, which are but 80 feet apart. One possible correlation is between the conglomerate near the bottom of Hole No. 4 and the conglomerate exposed about 130 feet south of the adit-portal. In general, there appears to be a localization of coal in about 50 feet of measures, but individual seams do not seem to persist nor to maintain a constant thickness.

Character of the Coal.—The coal is clean and bright, contains numerous small masses of yellow resin, and is fractured along closely spaced planes perpendicular to the bedding. Clay and bone layers up to 8 inches thick are fairly numerous. They thicken and thin along their length so that in sections measured at different places across the same seam not only does the proportion of coal to bone vary, but a bone-layer found in one section may not be present elsewhere. The presence of bony material is reflected in the ash content of the samples in the following tabulation:—

Sample No.	H_2O at 105° C.	Ash.	Vol. Comb. Matter.	Fixed Carbon.	Sulphur.	B.T.U.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
1	6.1	4.7	33.9	55.3	0.6	12,160
2	5.8	9.7	35.5	49.0	0.9	11,340
3	5.8	13.6	33.7	46.9	1.0	10,760
4	5.0	14.3	34.0	46.7	1.6	10,989
5	6.0	18.0	31.0	45.0	1.0	10,120

Sample No. 1 is of specially selected clean coal taken from the 1-foot 9-inch layer of clean coal exposed in the open-cut by the adit (*see* Section II). Analyses of coal of this quality or even slightly better have been obtained before.* Such samples must represent selected material, for nowhere was a face seen that would provide a channel sample across several feet of coal of similar quality. No. 2 is a channel sample across the foot-wall 4 feet of the Eight Foot seam; in taking the sample, bony layers amounting to 7½ inches were excluded (*see* Section III). No. 3 is a channel sample across

* *Minister of Mines, B.C.*, Ann. Rept., 1914, p. 70.

3 feet 3 inches, excluding partings totalling 8 inches, on the hanging wall of the Eight Foot seam exposed in the face of the adit (*see* Section III). No. 4 is a channel sample taken by Graham* across the upper 7 feet of the Eight Foot seam in the face of the adit. It includes the two thicknesses of coal represented in Sample Nos. 2 and 3. No. 5 is a channel sample across 4 feet of coal, excluding five partings totalling 10 inches, on the foot-wall side of the Six Foot seam exposed in the right-hand crosscut in the adit (*see* Section IV).

No samples of coal from drill-holes were analysed. Details of measured sections and logs of drill-holes follow in the Appendix.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1914, pp. 67–71; 1946, pp. 247, 248.]

Appendix.

The following section is measured southward from the point marked "C" on Fig. 19 and downward stratigraphically across measures which are dipping about 40 degrees north-eastward.

Section I.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Brown-weathering sandstone	1	6	0	0
Coal	2	2	3	8
Black shale	0	3	3	11
Coal	1	0	4	11
Shale	0	7	5	6
Coal	0	10	6	4
Shale	0	6	6	10
Coal	0	4	7	2
Brownish-black sandy shale	3	0	10	2
Coal with shale partings	3	0	13	2
Brown-weathering grey sandstone	2	0	15	2
Coal with shale partings	2	0	17	2
Hard sandstone with plant remains	2	0	19	2
Coal with black-shale partings	4	0	23	2
Black shale	0	10	24	0
Coal	0	4	24	4
Brown sandstone	1	0	25	4
Black shale	7	0	32	4
Pebble conglomerate	2	6	34	10
Grey shale and sandy shale	6	0	40	10
Grey sandstone	1	2	42	0
Grey sandstone and grit	2	0	44	0
Pebble conglomerate	2	0	46	0
Grey sandy shale	2	0	48	0
Brown shaly sandstone	3	0	51	0
Brown shale	1	6	52	6
Coal with shale partings	2	0	54	6
Sandstone and coarse grit	1	2	55	8
Coal with shale partings	5	0	60	8
Grey sandy shale	Base not exposed.			

The rock-cut at the portal of the adit exposes measures immediately overlying the section tabulated above; the rocks strike north 40 degrees west and dip 45 degrees north-east. The shale at the top of the section marks the top of the Eight Foot seam and the base of the Six Foot seam. Section II is measured across the Eight Foot seam, as it is exposed in the rock-cut south of the adit.

Section II.

Section of Eight Foot seam measured down from centre of portal of adit along the side of the open cut.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Firm dark shale	0	8	0	0
Mostly shale with thin coaly layers	1	6	2	2
Coal with thin shale partings	1	6	3	8
Clay and shale	0	3	3	11
Coal	0	9	4	8
Grey shale with thin coal-layers	0	6	5	2
Clean bright coal (Sample No. 1)	1	9	6	11
Alternate coal and shale in 1- to 2-inch layers	0	10	7	9
Coal	0	7	8	4
Brown shale	0	3	8	7
Coal	0	11	9	6
Shale	0	2	9	8
Dirty coal	1	0	10	8
Grey shale	0	6	11	2
Dirty coal	0	4	11	6
Grey sandstone (this is the brown-weathering sandstone at the top of Section I).				

The adit was driven north-westward for 33 feet along the strike of the beds, and at 22 feet a crosscut was driven 9 feet left and another 13 feet right. The left-hand crosscut exposes the Eight Foot seam and the right-hand the Six Foot seam. Sections III and IV are measured across the Eight Foot and Six Foot seams where exposed in the adit and in the two short crosscuts.

* *Minister of Mines, B.C.*, Ann. Rept., 1946, p. 248.

Section III.

Section of the Eight Foot seam measured in face of adit, beds dipping 45 degrees north-east.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.	Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Brown shale	1	4	0	0	Shale†‡	0	3	7	2½
Shale with thin coaly seams‡	0	10	2	2	Coal†‡	0	8½	7	11
Coal*‡	1	10	4	0	Shale†‡	0	4	8	3
Dirty coal*‡	0	7	4	7	Coal†‡	0	7½	8	10½
Shale*‡	0	3	4	10	Shale†‡	0	2	9	½
Coal*‡	0	7	5	5	Coal†‡	0	9	9	9½
Shale‡	0	3½	5	8½	Sandstone	0	5	10	2½
Coal†‡	0	6	6	2½	Coal	0	8	10	10½
Shale†‡	0	3	6	5½	Grey shale	0	7	11	5½
Coal†‡	0	5	6	11½	Dirty coal	1	6	12	11½

* Sample No. 3. † Sample No. 2. ‡ Sample No. 4.

The 2 feet 2 inches of shale at the top of this section corresponds to the 2 feet 2 inches of shale at the top of Section II.

Section IV.

Section of Six Foot seam exposed in right crosscut.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.	Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Gravel in face of crosscut	0	0	0	0	Coal*	0	6	2	8½
Coal	0	8	0	0	Shale*	0	1½	2	10
Shale parting	0	2	0	10	Coal*	0	6	3	4
Coal	0	10	1	8	Shale*	0	3	3	7
Shale	0	2	1	10	Coal with four half-inch shale partings*	2	3	5	10
Coal*	0	4	2	2	Brown shale	1	4	7	2
Shale*	0	½	2	2½					

* Sample No. 5.

Log of Hole No. 1.

Elevation of collar, 2,402.5 feet. Hole, vertical. Depth, 73 feet. Core logged by O. R. Christofferson.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.	Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Surface soil	6	6	6	6	Coal	0	3	42	5
Gravel	0	6	7	0	Slate	0	3	42	8
Coal with gravel	3	1	10	1	Slate with streaks of coal	1	8	44	4
Slate	0	7	10	8	Sandstone with streaks of coal	1	8	46	0
Coal	0	6	11	2	Coal and slate	3	0	49	0
Slate	0	5	11	7	Grey shale	0	5	49	5
Coal	4	5	16	0	Slate	0	3	49	8
Slate	0	6	16	6	Slate and coal	0	4	50	0
Coal	3	0	19	6	Grey shale	1	0	51	0
Slate	0	6	20	0	Slate with streaks of coal	2	6	53	6
Coal	6	6	26	6	Grey shale	0	8	54	2
Slate	0	5	26	11	Coal and slate	0	10	55	0
Coal	1	0	27	11	Slate	3	0	58	0
Slate	1	6	29	5	Sandstone	2	0	60	0
Sandstone	1	0	30	5	Coal	2	0	62	0
Slate	1	1	31	6	Slate and coal	3	0	65	0
Coal	9	5	40	11	Grey and dark shale with coal-streaks	8	0	73	0
Slate	1	3	42	2					

Log of Hole No. 2.

Elevation of collar, 2,402.8 feet. Hole, vertical. Depth, 323 feet.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Sand and gravel	27	0	27	0
Dark shale with sandy layers	8	4	35	4
Coal	0	8	36	0
Shale	0	3	36	3
Coal	0	11	37	2
Shale	8	2	45	4
Coal	0	8	46	0
Dark shale	9	0	55	0
Dark shale with sandy layers	12	0	67	0
Grit	1	0	68	0
Grey shale	12	0	80	0
Coal	0	1	80	1
Shale	2	2	82	3
Coal	0	3	82	6
Black shale	1	5	83	11
Coal	0	9	84	8
Shale	0	6	85	2
Coal	0	3	85	5
Dark shale	6	1	91	6
Coal	0	7	92	1
Shale	0	2	92	3
Dirty coal	0	5	92	8
Shale	0	10	93	6
Coarse sandstone	1	6	95	0
Dark carbonaceous shale with coaly streaks	6	0	101	0
Carbonaceous sandstone	0	10	101	10
Impure coal	0	6	102	4
Shale	0	3	102	7
Coal	0	6	103	1
Shale with coal partings	0	9	103	10
Coal	0	4	104	2
Dark-brown shale	0	3	104	5
Coal	0	3	104	8
Dark shale with coaly streaks	5	4	110	0
Coal	0	9	110	9
Shale with coaly streaks and sandy layers	8	3	119	0
Interbedded shale and shaly sandstone	6	0	125	0
Shale sandstone	4	0	129	0
Grey fine-grained sandstone	2	0	131	0
Soft shale	7	0	138	0
Fine-grained sandstone	1	0	139	0
Sandy shale with 2 inches of coal at 140 feet	4	0	143	0
Fine to gritty sandstone	12	0	155	0
Soft grey shale	2	0	157	0
Interbedded sandstone and shale	5	6	162	6
Pebble conglomerate	4	6	167	0
Grit and fine-grained sandstone	3	0	170	0
Sandy shale	2	0	172	0
Brown sandstone and grit with 2 inches of coal at 176 feet	4	0	176	0
Grey and black shale	2	0	178	0
Interbedded sandstone at shale	26	0	204	0
Brown thinly bedded sandstone with current bedding	2	0	206	0
Grey shale	2	0	208	0
Broken and sheared rock	2	0	210	0
Grey and brown sandstone with 2 inches of coal at 222 feet	20	0	230	0
Sandy shale and shaly sandstone with 2 inches of coal at 235 and 236 feet	13	0	243	0
Brown sandy shale	8	0	251	0
Grey shale	12	0	263	0
Shaly sandstone with 2 inches of coal at 258 feet	3	0	266	0
Grey shale	2	0	268	0
Grey and brown sandstone and shaly sandstone	9	0	277	0
Brown soft shale	3	0	280	0
Fine-grained sandstone	4	0	284	0
Coal and carbonaceous shale—poor core recovery, 284 to 294 feet	10	0	294	0
Buff fine-grained sandstone	2	0	296	0
Coal	0	6	296	6
Grey and black shale with coal-streaks	5	6	302	0
Grey and black shale with 6 inches of coal at 306 feet—poor core recovery	5	0	307	0
Grey gritty sandstone	1	0	308	0
Grey sandy shale	3	0	311	0
Grey shale with coal-streaks—1 inch of coal at 312 feet	3	0	314	0
Fine-grained sandstone	4	0	318	0
Shale	5	0	323	0

Log of Hole No. 3.

Elevation of collar, 2,398.2 feet. Hole, vertical. Depth, 197 feet. Drilled by X-ray machine.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Sand and gravel	7	0	7	0
Interbedded sandstone and dark shale with 6 inches of grit at 27 feet	32	0	39	0
Dark shale	7	0	46	0
Grey medium to coarse sandstone	9	0	55	0
Interbedded sandstone and shale	6	0	61	0
Coal	0	9	61	9
Sandstone and shale	24	3	86	0
Grey coarse grit	2	0	88	0
Sandstone and shale	4	0	92	0
Coal	0	10	92	10
Black shale	2	2	95	0
Sandstone	5	0	100	0
Dark shale with thin coaly streaks	21	0	121	0
Sandstone with shale and sandy shale interbeds	7	0	128	0
Grey coarse grit	3	0	131	0
Sandstone and sandy shale	5	0	136	0
Mostly sandstone with interbeds of dark shale containing coaly streaks	29	0	165	0
Coal	0	8	165	8
Sandstone with interbeds of dark shale and shaly sandstone (poor core recovery)	31	4	197	0

Coal reported by driller from appearance of cuttings; no coal core recovered.

Log of Hole No. 4.

Elevation of collar, 2,398.2 feet. Bearing of hole, south 70 degrees west, minus 45 degrees. Depth, 173 feet. Drilled by X-ray machine.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Clay and sand	7	0	7	0
Grey fine-grained sandstone	1	0	8	0
Coal	0	6	8	6
Shale with coaly streaks	3	6	12	0
Coal	1	5	13	5
Grey sandy shale and shaly sandstone	3	7	17	0
Grey fine-grained sandstone	3	0	20	0
Grey sandy shale	3	0	23	0
Grey sandstone grading to grit	21	0	27	0
Grey to black shale	6	0	33	0
Grey sandstone with 2 feet of grit at base	4	0	37	0
Shaly sandstone and grit	5	0	42	0
Shaly sandstone	5	0	47	0
Grit	1	0	48	0
Sandstone	2	0	50	0
Grey sandstone with 6-inch grit bed at 52 feet	5	0	55	0
Sandstone with thin shaly beds and carbonaceous streaks	10	0	65	0
Coal	0	5	65	5
Sandstone	1	7	67	0
Coal	0	3	67	3
No core	2	9	70	0
Coal	0	4	70	4
Dark sandy shale	1	8	73	0
Dark-brown shale with carbonaceous streaks	5	0	78	0
No core	3	0	81	0
Coal	0	3	81	3
Brown shale	2	9	84	0
Shale and sandstone	5	0	89	0
Shale	3	0	92	0
Coal	0	7	92	7
Brown shale	1	5	94	0
Coal	6	9	100	9
Shale	0	8	101	5
Coal	2	4	103	9
Brown and grey sandy shale	12	3	116	0
Brown sandy shale	8	0	124	0
Shale	4	0	128	0
Carbonaceous gritty sandstone	1	0	129	0
Brown to black shale	5	0	134	0
Grey grit	0	6	134	6
Grey and brown sandstone	10	0	144	6
Pebble conglomerate	0	6	145	0
Brown and black shale	9	0	154	0
Coarse grit and pea-pebble conglomerate	6	0	160	0
Grey sandstone	13	0	173	0
Coal reported by driller from appearance of cuttings; no coal core recovered.				

Log of Hole No. 5.

Elevation of collar, 2,497.2 feet. Bearing, south 67 degrees west, minus 45 degrees. Depth, 192 feet. Drilled by X-ray machine.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Grey fine-grained sandstone	6	0	6	0
Brown shale with carbonaceous streaks	4	6	10	6
Coal	1	3	11	9
Grey shaly sandstone	7	3	19	0
Coal	0	3	19	3
Brown shale	1	9	21	0
Brown shale and sandy shale	5	0	26	0
Dark-brown to black shale	2	0	28	0
Coal	0	6	28	6
Shaly sandstone	1	6	30	0
Grey coarse sandstone and grit	1	6	31	6
Dark shale	2	6	34	0
Coal	0	8	34	8
Shaly sandstone	2	4	37	0
Coal	0	2	37	2
Fine grey sandstone and shaly sandstone	8	10	46	0
Sandy shale	3	0	49	0
Coal	0	2	49	2
Grey sandstone and shaly sandstone	10	10	60	0
Coarse sandstone and grit	1	0	61	0
Sandstone	1	6	62	6
Coarse grit and sandstone with carbonized-wood fragments	1	6	64	0
Grey sandstone and shaly sandstone	24	0	88	0
Grey grit	1	0	89	0
Shale and sandy shale	3	0	92	0
Grey sandstone with shale-beds and thin coaly layers	16	0	108	0
Coal	0	3	108	3
Sandstone (poor core recovery)	2	9	111	0
Grey sandstone with shaly sandstone	18	6	129	6
Coal	3	7	133	1
Shale	1	11	135	0
Coal	2	7	137	7
Shale	1	6	139	1
Coal	0	9	139	10
Shale	0	5	140	3
Coal	4	11	145	2
Sandstone and shale	4	10	150	0
Coal	7	0	157	0
Shaly sandstone	8	0	165	0
Coal	0	8	165	8
Interbedded sandstone and brown shale	13	4	179	0
Coal	1	2	180	2
Sandstone and brown shale	11	10	192	0
Coal reported by driller from cuttings; no coal core recovered.				

*Fraser River.**

Donnelly Coal Syndicate.

(53° 122° S.W.) J. Donnelly, manager. The property of this syndicate is located on and in the vicinity of Lot 702, Quesnel Land District, on the west bank of the Fraser River, 6 miles north of Quesnel. The deposit is lignite coal. Test-drilling indicates at least 19 feet of coal with a 4-inch sand parting 4 feet below the top of the seam.

In 1948, 3 miles of road was reconstructed, and a 400-ton storage-bunker and housing accommodation for four men were constructed. A small amount of coal has been mined by stripping with a bulldozer.

PEACE RIVER (56° 122°).†

Peace River Coal Mines, Ltd.

Lloyd Gething, managing director; A. D. Chapple, fireboss. The property is on Larry Creek, on the west slope of Portage Mountain, at the upper end of Peace River canyon, about 18 miles by road from Hudson Hope. Operations are confined to the development of the Canyon No. 1 mine. The main development consists of a slope driven south 9 degrees west for 178 feet and a crosscut driven west 125 feet from the lower end of the slope to the wall of the Peace River canyon. This crosscut provides drainage and good natural ventilation for the present mine-workings. Two levels were driven to the south-east a sufficient distance to form a panel of five rooms to the rise as well as a new main incline. No further advance was made in the levels during the year. Room Nos. 3, 4, and 5 were advanced, and the necessary crosscuts were made to provide ventilation to the faces. The present slope location, at the extreme west end of the workings, is unsatisfactory, and a new mine portal at a more central point is desirable. To this end, it is intended to advance the No. 6 incline through to the surface and erect a new tipple at the new portal. The distance from the Main level to the outcrop is approximately 600 feet, and at the end of the year the No. 6 incline had advanced 500 feet. Gas was not detected and general conditions were satisfactory.

The seam dips about 3½ degrees south-westward. It is 7 feet 2½ inches thick and contains a 6-inch and a 4½-inch band of clay ironstone. The coal is blasted from the solid and is hand-loaded into mine-cars. The loaded cars are hauled up the Main slope by a gasoline-driven hoist on the surface. Additions to the plant during the year included a gasoline-engine and generator for the lamp-charging unit. At the end of the year six men were employed underground and three on the surface.

King Gething No. 2 Mine.

Quentin F. (King) Gething, operator and fireboss. This mine is on the east slope of Portage Mountain, about 12 miles by road from Hudson Hope and 72 miles from Fort St. John. The seam worked at this mine, and formerly worked in the now abandoned King Gething No. 1 mine, is known as the King seam, so named after its discoverer, Quentin F. (King) Gething. The seam is in the lower part of the Gething formation.

The opening of No. 2 mine was commenced during 1947, when a slope was started on the south-west bank of Lorrette (King) Creek, approximately 100 feet south-east of the portal of No. 1 mine. At a distance of 100 feet down the slope a connection was made with a drainage-level which had been driven from the surface at the elevation of the tipple-floor. From the intersection of the slope and drainage-level a level was extended in a southerly direction for approximately 150 feet, and three raises were started.

A peculiar feature of this seam is the occasional presence of an ironstone band, or concretionary zone, in its upper part. The existence of the zone, in varying thickness from a thin parting to as much as 2 feet, does not affect the thickness of the coal in the

* By J. E. Merrett.

† By E. R. Hughes.

seam, which is fairly constant at about 4 feet 8 inches. A shale parting ranging from 1 to 3 inches in thickness intersects the seam 2 feet 6 inches from the floor. This lower 2½ feet is good coal. However, at the face of the level the concretionary zone had attained a thickness of 2 feet, and although the level-face is in a distance of only 250 feet from the portal, the management decided that the seam did not warrant further development. The coal claim on which the mine is situated is held under the provisions of the "Coal Act," and in December application was made to the Chief Inspector of Mines to permit the withdrawal of pillars already formed. This application was granted. Gas was not detected and general conditions of safety were satisfactory. Four men were employed underground.

Reschke Coal, Ltd.

J. Reschke, operator; Sam Protti, fireboss (under permit). This property is on the southern spur of Butler Ridge, about 23 miles by road from Hudson Hope and 83 miles from Fort St. John. The property was formerly operated by George A. Packwood and was known as the Packwood mines. At present mining is done only at the No. 2 mine. The face of the Main level is approaching the boundary between Lot 1002 and Lot 1002A, and in November, a licence under the provisions of the "Coal Act" was issued to Reschke Coal, Limited, to develop and produce coal on the North Half of Lot 1002 and Lot 1002A.

The seam is about 5 feet thick and contains two thin rock-bands in the top 6 inches. It pitches about 43 degrees, and the main level had, at the end of the year, been advanced 510 feet northerly along the strike from the portal. Eight raises, with connecting crosscuts, have been driven up the full pitch of the seam from the Main level, and two of these raises have been driven out to the surface to afford natural ventilation. An air-compressor, driven by a 100-horsepower diesel engine, provides the power for a puncher coal-cutter and for drilling the rock floor in the Main level for height. Coal from the raises is loaded from chutes on the Main level, and the mine-cars are hand-trammed along the level to the portal.

The mine was free from gas and in satisfactory condition. Five men were employed underground.

Inspection of Electrical Equipment and Installations at Mines and Quarries.

By L. Wardman.

CONTENTS.

CANADIAN ELECTRICAL CODE, PART V.

The "Metalliferous Mines Regulation Act" and the "Coal-mines Regulation Act," which were enacted in 1948, both contain a ruling which requires that the standards prescribed by the fifth draft of the Canadian Electrical Code, Part V, in conjunction with Parts I, II, and III of that code shall be observed in the installation and maintenance of mine electrical equipment, except where those standards do not conform with the provisions of these Acts.

Because the above-mentioned fifth draft is not completely acceptable to all the Provinces, a sixth draft has been written. In this draft the code is divided into two parts:—

C22.5, No. 1: Use of Electricity in Metalliferous Mines, Industrial Mineral Mines, and Quarries.

C22.5, No. 2: Use of Electricity in Coal Mines.

The committee appointed to revise the Canadian Electrical Code, Part V, decided that this division was necessary to give each of the two branches of the mining industry only those rules applicable to that branch. It is expected that these two sections of the sixth draft will be printed in 1949. Until further notice the fifth draft will be in force in British Columbia.

The adoption of a special electrical code for guidance in the installation of mine electrical equipment has already had a beneficial effect in the last year. In this code, regulations governing electrical installations in and about mines have been segregated from those governing other types of installation. To this is attributed the recognition by operators of many faults in existing installations. Hence new installations are now generally made in an approved manner.

Nevertheless, further changes are necessary to many of the existing installations before they fully comply with the requirements of the code. Regulations often violated and faults noted in the course of inspection are discussed in the following Summary of Reports on Inspections.

SUMMARY OF REPORTS ON INSPECTIONS AND INVESTIGATIONS.

During 1948 the electrical installations at twenty-eight metal mines, eighteen mills, seven coal mines, two clay mines, and seven quarries were inspected. Six coal-mine installations were inspected twice, making a total of sixty-nine inspections for the year. Four properties at which new mills were to be built were visited.

One dangerous occurrence was investigated, which involved the production of static electricity by a compressed-air limestone-rock dusting machine.

Supply-stations and Equipment.

The general condition of supply-stations has been greatly improved, but a few stations were not up to requirements, as follows: The passage-ways of several stations were used as storage-space for equipment, which prevented free access to the switch gear, transformers, etc. Several stations were not kept locked, and several lacked basins for retention of the oil that might leak from a transformer.

Switch Gear.

The marking of switch gear to indicate circuits or equipment controlled is often neglected, or the markings are allowed to become illegible. Switch gears shall be legibly marked so that there is no possibility of the wrong switch being operated.

Several installations were equipped with switches of inadequate capacity. Furthermore, a number of switches were installed where they were exposed to moisture.

It was also noted that magnetic switches and manually operated switches were frequently blocked in the closed position to prevent opening on overload; interlocks were often broken so as to allow the switch cover to be opened while the switch was in the closed position; and unused knockout holes were seldom covered.

Cables and Wiring.

The power-cable installations were generally satisfactory. In four installations, however, overcurrent protection was omitted or was inadequate to protect the cable. Automatic overcurrent devices are required at the supply end of all feeders, sub-feeders, and branch circuits which are reduced in section.

Several installations of temporary wiring were made to prevent a shut-down or to test equipment. Although temporary wiring may be used for such reasons, it must

be installed so as to present no hazard and must be replaced as soon as possible or as soon as it is decided to put the equipment into permanent use.

Several temporary splices on trailing cables were noted. One of these cables was a 2,300-volt shovel cable. Temporary splices should not be used, except to allow the shift to be finished, after which the cable shall be taken into the shop and a permanent splice made. This includes vulcanizing the cable-sheath as well as proper splicing.

Lighting-circuits.

The most common faults noted in the lighting-circuits were overfused branch circuits, fused neutrals on single-phase three-wire circuits, standard switches used where a water-proof switch was required, and temporary wiring.

Blasting-circuits.

Several serious faults have been found in the construction of blasting-circuit switch gear and blasting-circuit installations. These have caused one premature ignition and some misfired shots.

Blasting-circuits may be energized from ungrounded sources of electrical energy up to, but not exceeding, a potential of 550 volts. A grounded source of electrical energy must not be used because a path is formed for leakage of current through the ground from bare cap leads which may be making good contact with the ground. This leakage may be great enough to deprive some of the caps of sufficient current to fire them, thus causing misfired holes.

The switch gear for potentials up to 300 volts may be manually operated and must consist of (1) a fused isolating-switch and (2) a blasting-switch opened by gravity.

For over 300 volts potential the blasting-switch should be closed magnetically by a control-circuit, but must open by gravity. The blasting-switch must also automatically shortcircuit the supply ends of the blasting-circuit leads when in the open position.

The blasting-circuit leads must be completely and effectively insulated from ground and should run to a position as close to the blasting-place as is practicable. They should be kept well away from power, light, and trolley conductors or anything such as water-pipes and air-pipes which may act as a conductor.

Several blasting-circuits were so constructed that the blasting-leads were grounded at the supply ends when the blasting-switch was open. This is dangerous, as stray current may be picked up by the grounding conductor, carried along to the caps, and returned to ground through the cap leads, causing a premature ignition. At least one premature ignition in British Columbia has been caused by grounded blasting-leads.

Hoists.

There has been a decided improvement in the adjustment of hoist safety devices and brakes, and most hoist safety devices were found to be in satisfactory operating condition.

Locomotives and Trolley-wires.

The most common defects of locomotives were lack of head-lights and gongs, both of which are required.

On some trolley-wires, guard-boards were not in place as required.

Dangerous Occurrences.

The dangerous occurrence previously mentioned was actually a potential danger resulting from the use of a compressed-air limestone-rock dusting machine. While dusting in one of the mines of the Elk River Colliery, the operator of a rock-dusting machine received an electric shock from the rubber discharge-hose. The management

of the Crow's Nest Pass Coal Company immediately prohibited the use of these machines until the matter could be properly investigated.

On March 16th, 1948, a series of tests was made to determine if electrostatic charges were produced by these machines and to measure, if possible, the approximate potential of such charges. It was found that the rubber hose used as a discharge-hose for the machine did accumulate an electrostatic charge estimated at 20,000 volts.

The production of a charge requires favourable atmospheric conditions, particularly of relative humidity. The lower the relative humidity the greater the electrostatic charge produced and, inversely, the greater the relative humidity the smaller the electrostatic charge produced. There is, therefore, a greater tendency for an electrostatic charge to be produced in winter than in summer. Moisture in the limestone-dust decreases the tendency to produce an electrostatic charge.

To prevent the production of electrostatic charges, the company was advised to use flexible metallic tubing for a discharge-hose.

ELECTRICAL POWER.

Metalliferous Mines.

Electrical power was used on the surface at thirty-seven metalliferous mines and underground at twenty-four of these mines during 1948.

The average amount of power consumed amounted to 47,400 horse-power; approximately 37 per cent. of this was purchased, and the remainder was produced by company-owned plants.

Quarries.

Electrical power is used at ten quarries. Power is produced for two of these by company-owned plants and is purchased for the others.

Coal Mines.

Electrical power is used for surface operations at seven coal mines and for underground operations at four. A total of 16,251 horse-power used in combined surface and underground operations at these mines is distributed as follows:—

Above Ground.	Average Horse-power.
Compressed air	7,810
Ventilation	1,220
Hoisting	1,466
Haulage	992
Coal washing and screening	2,237
Pumping	448
Coke production	432
Miscellaneous	369
Total	14,974
Underground.	
Haulage	657
Pumping	600
Miscellaneous	20
Total	1,277

ELECTRICAL INSTALLATIONS.

The following paragraphs give a brief general description of new electrical installations and also details of additions and changes to existing installations.

LODE MINES.

TAKU RIVER (58° 133° N.W.).

Polaris-Taku (Taku River Gold Mines, Ltd.). Further work was done toward completing the improvements to the electrical installations planned in 1946. Temporary wiring in the crusher distribution centre was replaced with permanent wiring. This distribution centre, consisting of Cemco safety-switches and Canadian General Electric magnetic switches, is now fed by three 500,000-c.m. rubber-covered double-braid cables in 3-inch conduit. The new 87-horsepower addition, as well as the old 89.5-horsepower crusher plant, is fed from this centre.

A distribution centre was installed in the hydro-electric plant to serve a 25-horsepower motor driving a fan that ventilates the 317 stope, a 3-horsepower oil-pump motor, and a 1-horsepower diesel starting motor.

A 20-horsepower Higgs motor controlled by a 100-ampere Cemco safety-switch and a Canadian General Electric magnetic switch was installed to drive the mine cut-off saw.

A distribution centre consisting of Cemco switches has been installed underground to serve the pumps on the lower levels. A 40-horsepower sump-pump motor and a 25-horsepower emergency motor will be served from this distribution centre.

Two new CR 7051 automatic compensators have been installed for the 100- and 75-horsepower pump motors on the 450 level. All wiring for this centre is in conduit.

Tulsequah Chief (Consolidated Mining and Smelting Co. of Canada, Ltd.).—Development-work was commenced on this property in 1948. A 15-horsepower direct-current plant was installed to provide lighting for the camp and power for the shops. A Mancha Little Trammer is used for tramming.

Big Bull (Consolidated Mining and Smelting Co. of Canada, Ltd.).—A 20-horsepower direct-current plant was installed on the property to provide lighting for the camp.

PORTLAND CANAL (56° 130° S.E.).

Silbak Premier Mines, Ltd.—Operations were suspended in the spring of 1948. A report on the electrical installations may be found in the Minister of Mines Annual Report for 1946.

ALICE ARM (55° 129° N.E.).

Torbrit Silver Mines, Ltd. The construction of a 300-ton mill and crushing plant and a 1,600-horsepower hydro-electric plant was commenced in 1948. It is expected that the major part of the construction-work will be completed about the middle of January, 1949. The power plant, which was completed by the end of the year, is on Clearwater Creek, not far from its outlet into the Kitsault River. The level of Clearwater Lake, which is used as a storage-pond, was raised 7 feet by building a dam 74 feet long across its outlet. It is estimated that this will give ample storage for low-water periods.

The diversion-dam and spillway on Clearwater Creek is 1½ miles down-stream from the storage-dam. Three thousand feet of wood-stave and 2,100 feet of steel penstock carry the water to the power plant, giving a head of over 800 feet.

The power plant consists of two 800-horsepower Gilkes Pelton wheels driving two 625-kva. 480-volt 3-phase 60-cycle 720-r.p.m. direct-connected English Electric generators. Three 400-kva. single-phase 480/13,200-volt transformers step up the potential for transmission to the mine, a distance of 5 miles.

The transmission-line is No. 4 B. & S. gauge bare copper wire supported on wooden poles and cross-arms. The transformer sub-station at the mine consists of three single-phase 400-kva. 13,200/480-volt step-down transformers.

The crushing plant will use about 160 horse-power, distributed as follows: Symons cone-crusher, 100 horse-power; jaw-crusher, 40 horse-power; dust fan, 5 horse-power; screen, 5 horse-power; Symons oil-pump, 1 horse-power; three conveyers, 8 horse-power; vibrator feeder, 1 horse-power.

The cyanide-mill will use about 420 horse-power, distributed as follows: Two feeders, 2 horse-power; two ball-mills, 300 horse-power; two classifiers, 6 horse-power; seven tank agitators, 14 horse-power; one compressor, 25 horse-power; pumps, 66½ horse-power; one filter, 6 horse-power; one repulper, 2 horse-power.

The two air-compressors installed will be driven by a 200-horsepower and a 150-horsepower motor respectively.

The surplus power over that required for the above-mentioned units, lighting, shops, assay office, refinery, etc., will be used for heating water-boilers.

HAZELTON (55° 127° S.W.).

Silver Standard Mines, Ltd.

A flotation plant and a power plant built during the year were put into operation on September 16th, 1948. The power plant consists of two diesel-driven generators capable of supplying a total of 167 horse-power. One unit is a U.D. 18-A Palmer diesel driving a direct-connected 50-kw. 440-volt 3-phase generator, and the other is a D-13000 Caterpillar diesel driving a 75-kw. 440-volt 3-phase direct-connected generator. The connected load consists of the following units:—

Crushing plant: Coarse-ore feeder, 2-horsepower motor (Master); picking-belt, 1-horsepower motor (Westinghouse); washing classifier, 1-horsepower motor; jaw-crusher, 15-horsepower motor (Canadian General Electric); exhaust-fan, 1-horsepower motor (Canadian General Electric); conveyer, 2-horsepower motor (Westinghouse).

Concentrator: Fine-ore feeder, 1½-horsepower motor (Canadian General Electric); ball-mill, 50-horsepower motor (Westinghouse); classifier, 1½-horsepower motor (English Electric); Pb flotation M/C, three 3-horsepower motors (Canadian General Electric); Zn conditioner, three 3-horsepower motors (Canadian General Electric); Zn flotation M/C, three 3-horsepower motors (Canadian General Electric); Pb conc pump, 3-horsepower motor (Canadian General Electric); Zn conc pump, 3-horsepower motor (Canadian General Electric); filter, 2-horsepower motor; vacuum pump, 7½-horsepower motor; blower, 1-horsepower motor; dry feeder, ¼-horsepower motor (Canadian General Electric); wet feeders, ¼-horsepower motor (Canadian General Electric); pilot table, ¼-horsepower motor (Canadian General Electric).

Pump-house at River: Water-pump, 15-horsepower motor (Canadian General Electric).

All the above motors, with the exception of the three ¼-horsepower 110-volt motors, are 440-volt 3-phase.

The pump-house is heated with three 1,000-watt electric heaters. One thousand six hundred feet of power-line from the mill to the pump-house at the river supplies the pump motor and heaters.

In addition to the above, 6 horse-power is used in the workshop. The average power consumption is approximately 109 horse-power. Two Ferranti Electric 7½-kva. 440/110-volt transformers in the concentrator supply the lighting-circuits.

CARIBOO (53° 121° S.W.).

Cariboo Gold Quartz Mining Co., Ltd.

During the year the No. 1 shaft was extended through to the surface and the No. 3 hoist was moved from its position underground to a position on the surface adjacent to the No. 1 shaft collar. The original 50-horsepower 580-r.p.m. 440-volt 3-phase 60-cycle motor was replaced with a 75-horsepower 860-r.p.m. 440-volt 3-phase 60-cycle General Electric motor. No other major changes were made to the electrical installations.

Canusa Cariboo Gold Mines, Ltd.—Operations were suspended at this mine in 1948.

Island Mountain Mines Co., Ltd.—A new pole-line was erected from the power plant to the mine portal. A 1½-ton type J, Atlas locomotive was added to the haulage equipment and a charging-station was set up on the 2850 level.

BLUE CREEK (51° 122° S.E.).

Elizabeth (Bralorne Mines, Ltd.).

Operations were resumed by Bralorne Mines, Limited, late in 1947 and continued until June, 1948, when they were suspended. A temporary power and lighting system was installed to carry on development-work. Power was produced by a Caterpillar diesel-electric generating unit. The utilization equipment consisted of an air-compressor motor, a ventilating-fan motor, and a locomotive-battery charging unit. All the buildings were wired for lighting. A 1½-ton battery locomotive was used for tramming.

BRIDGE RIVER (50° 122° N.W.).

Bralorne Mines, Ltd.—One new locomotive was added to the haulage equipment.

L.A.P. Mining Co., Ltd.—A new shaft pump driven by a 15-horsepower motor and a new sump-pump driven by a 25-horsepower motor were installed during the year. Preparations were made to install a new 4-stage Gardner-Denver shaft pump driven by a 7½-horsepower 440-volt motor.

B.R.X. (1935) Consolidated Mines, Ltd.—A new Ingersoll-Rand single-stage 410-c.f.m. air-compressor driven by a 60-horsepower motor was installed during the year.

COPPER MOUNTAIN (49° 120° S.W.).

Granby Consolidated Mining, Smelting, and Power Co., Ltd.

During 1948 extensive alterations were made to the electrical installations entailed by moving some equipment to new locations and installation of new equipment. Underground, eighteen 50-horsepower slusher-hoists were installed in the following locations in the order listed: Four units—7-20 block, 7 level; five units—32-34 block, 6 level; one unit—22-26 block, 6 level; one unit—26-163 block, 6 level; two units—A-14 block, 4 level; five units—7-10 block, 7 level.

Also five 40-horsepower ventilation-fans were installed in these locations in the order listed: One unit—150 drift, 4 level; one unit—70 drift, 7 level; one unit—240 drift, 6 level; one unit—130 drift, 6 level; one unit—70 drift, 6 level.

One 15-horsepower complete ventilating-fan unit was installed in 8 level main drift.

Three 20-kva. transformers were installed on 8 level for alternating-current power for lighting, track, and trolley signals, pumps, and for servicing 8 level car and locomotive repair shop.

An 85-kw. motor generator set was installed on 6 level at No. 2 shaft for 8 level direct-current power.

Two 10-ton General Electric locomotives were added to the 6 level transportation system.

On the surface, 3,000 feet of the 13,000-volt transmission-line was rerouted because of surface subsidence, and the 250-horsepower surface tram-hoist was moved to a new location clear of the caving area.

HEDLEY (49° 120° S.E.).

Hedley Mascot Gold Mines, Ltd.—The installation of 2,300 feet of 3-conductor No. 6 B. & S. gauge varnished cambric-insulated lead-sheathed double-steel-tape-armoured cable was commenced on the 3700 level but not completed.

Nickel Plate (Kelowna Exploration Co., Ltd.).—One new Mancha 1-ton battery locomotive and two 3-drum Ingersoll-Rand scraper-hoists driven by 20-horsepower electric motors were added to the mining equipment.

SITKUM CREEK (49° 117° N.E.).

Alpine Gold, Ltd.—Operations at this mine were suspended, except for a small crew on development-work. The electric-lighting plant was removed from the mine camp, but the mill electrical equipment was left intact.

SALMO (49° 117° S.E.).

Sheep Creek Gold Mines, Ltd.—Milling operations at this mine were suspended in 1948, but a small crew is carrying on development-work. Electrical power is used only for underground development operations and lighting at present.

Emerald (Canadian Exploration, Ltd.). A temporary 20-horsepower scraper-hoist unit was installed underground and a 220/110-volt line was run to the first-aid and lunch room to supply current for lights and power for a fan. New installations on the surface consist of 3,600 feet of 3-phase 440-volt power-line, a 5-horsepower Hertner Electric battery-charging station, two 25-kva. 2,200/440-volt transformers, and one 25-kva. 2,200/220-110-volt transformer.

NELWAY (49° 117°•S.E.).

Reeves MacDonald Mines, Ltd. The building of a 1,200-ton lead-zinc mill was commenced during the year. Power for this mill will be obtained from the West Kootenay Power and Light Company. It will be transmitted over a 9-mile line, now under construction, at 69,000 volts from the West Kootenay Power Company's sub-station at the Emerald mine to the West Kootenay sub-station located 100 yards from the Reeves mill. Here the potential will be stepped down to 2,300 volts for transmission to the Reeves sub-station, near the office building. From this sub-station the power is distributed to the upper tunnel, crusher-house, compressor-house, and mill. At the end of the year the poles for the sub-station had been erected and the three 200-kva. transformers were in place but not connected.

In the mill, crusher-house, and compressor-house the installation of ceiling-lights was almost completed. The 500-horsepower compressor motor for driving the 2,600-c.f.m. compressor is in place and the conduit installed. The pole-line has been built from the distribution sub-station to the upper tunnel.

The total connected crushing and milling load will be approximately 1,125 horsepower, distributed as follows:—

Crushing plant: Two 50-horsepower motors for two crushers; one 10-horsepower motor for screen; one 5-horsepower motor for conveyer; one 2-horsepower motor for conveyer; two 1-horsepower motors for two conveyers; one 1-horsepower motor for pump.

Mill: Two 350-horsepower motors for two 6- by 10-foot ball-mills; two 10-horsepower motors for two classifiers; sixteen 10-horsepower motors for flotation cells; nine 1½-horsepower motors for flotation units; one 20-horsepower motor for vacuum pump; two 2-horsepower motors for thickeners; two 10-horsepower motors for slurry pumps; two 3-horsepower motors for filters; two 3-horsepower motors for pumps; one 2-horsepower motor for pump; three 2-horsepower motors for conveyers; one 25-

horsepower motor for conveyer; one 25-horsepower motor for outside conveyer between crushing plant and mill.

With the exception of the ball-mill and air-compressor motors, which will operate at 2,300 volts potential, all motors will operate at 440 volts potential.

AINSWORTH (49° 116° N.W.).

Ainsmore Consolidated Mines, Ltd.—A 5-horsepower blower was installed in the mill to provide air for the flotation cells and so improve recovery.

RIONDEL (49° 116° N.W.).

Bluebell (Consolidated Mining and Smelting Co. of Canada, Ltd.).

Unwatering of this mine was commenced this year. Two 75-kva. 550-volt 3-phase 60-cycle 900-r.p.m. generators driven with Texrope drives by two 120-horsepower Vivian diesels were installed to supply power for surface and underground operations. Three centrifugal pumps driven by 40-horsepower 550-volt 3,600-r.p.m. direct-connected motors will be used for pumping. Two of these units had been installed by the end of the year for unwatering. A pumping unit driven by a 10-horsepower 550-volt 1,800-r.p.m. motor will be used as a stand-by unit.

Ventilation is augmented by a fan driven by a 5-horsepower motor.

A Canadian Ingersoll-Rand double-drum hoist driven by a 30-horsepower 550-volt 3-phase 60-cycle 900-r.p.m. wound-rotor motor was installed at the top of the shaft.

Three thousand feet of transmission-line for 550- and 110-volt circuits was built on the surface. One thousand and fifty feet of 600-volt 3-conductor No. 1/0 B. & S. gauge varnished cambric cable was installed along the adit-level and down the shaft for supplying the pumps. A Mancha Little Trammer will be used for haulage.

The connected load at the present time is as follows: Hoist, 30 horse-power; pumps, 80 horse-power; fan, 5 horse-power; lighting, 27 horse-power; miscellaneous, 15 horse-power.

KASLO-THREE FORKS (50° 117° S.E.).

Whitewater (Kootenay Belle Gold Mines, Ltd.).

Two 6-cylinder 1,200-r.p.m. Murphy M.E. 66 diesel engines rated at 180 horse-power for intermittent duty, or 150 horse-power for continuous duty, were installed in the power plant. One drives a reconditioned 135 kva. 480-volt General Electric generator through a twin-disk clutch power take-off, and the other is belt-connected to the 240-kva. hydro-electric generator to furnish additional power during low-water periods.

A new structural steel panel was added to the switchboard to take care of the 135-kva. generator.

A Murphy M.E. 46 4-cylinder 100-horsepower continuous rating diesel engine was installed to drive an air-compressor.

SLOCAN LAKE (49° 117° N.E.).

Western Exploration Co., Ltd.—New electrical installations include a transformer-station at the 7 level portal and a Hertner type K battery-charger.

KIMBERLEY (49° 115° N.W.).

Sullivan (Consolidated Mining and Smelting Co. of Canada, Ltd.).

Three 100-kva. 2,200/550-volt oil-filled transformers were installed on the 3500 level near No. 1 shaft. This is a temporary installation which will be replaced with a permanent installation of either non-inflammable oil-filled or dry-type transformers in the near future. Two 50-kva. 2,200/440-volt oil-filled transformers were installed in a transformer-station, with a concrete floor and oil-retaining curb, cut

out to the north-east of 3610 drift. Approximately 2,000 feet of 3-conductor No. 4 B. & S. gauge paper-insulated lead-sheathed steel-wire-armoured cable suspended on a messenger cable was installed in 3610 drift to supply the above transformers.

A 1,000,000 circular mil direct-current trolley feeder cable was installed down No. 1 shaft from the 3900 level to the 3500 level. It will eventually be continued down to the 2850 level.

Two 125-horsepower 2,300-volt ventilation-fan motors with automatic reduced-voltage starters were installed on the surface at No. 23 shaft.

The No. 1 hoist high-tension sub-station was enlarged, including the steel-work, high-tension buses, and high-tension switches and fuses, to accommodate the installation of three 1,000-kva. 66,000/6,900/2,300-volt transformers and a Bepco 6,900-volt metering kiosk which will supply the new underground crushing plant for the sink-float project. Provision was also made in these extensions to allow for the addition of a second 1,500-kva. 66,000/2,300-volt Westinghouse unit sub-station similar to that already installed. This extra capacity will be required to supply two 600-horsepower synchronous compressor motors which are to be installed in No. 1 hoist-room.

A high-tension sub-station was erected and electrical installations were almost completed for the three 300-kva. 66,000/6,900-volt transformers which are located at the 3700 portal, and which will supply the mercury-arc-rectifier sub-station for traction power for the new 3700 haulage system. Two buildings have been completed and will house No. 1 and No. 2 mercury-arc-rectifier sub-stations. These are near the concentrator and at the 3700 portal respectively. Electrical installation-work on these sub-stations is expected to be completed by the summer of 1949, and the haulage system is expected to be in operation shortly afterwards.

Sullivan Mill.—A 1,000-horsepower 550-volt 720-r.p.m. synchronous motor with automatic reduced-voltage starting equipment was installed to drive a new rod-mill. This motor is fed through two 3-conductor 1,000,000 circular mil paper-insulated lead-sheathed cables. A temporary 2,000-ampere 7,500-volt oil circuit-breaker feeder panel was installed in the main sub-station to feed this motor. This oil circuit-breaker will be replaced by an air circuit-breaker which will be incorporated in the new switchboard.

Considerable progress was made in the installation of the equipment in the main switch-rooms and of the conduits for motor installations in the new sink-float plant. The estimated total connected load for this plant will be approximately 850 horse-power.

Howe Sound (49° 123° N.E.).

Britannia Mining and Smelting Co., Ltd.—New electrical installations consisted of four double-drum scrapers, two driven by 50-horsepower motors and the other two driven by 20-horsepower motors. This makes a total of seventeen scrapers in use. Several of the old scraper installations were moved to new locations. One new Mancha locomotive was purchased during the year.

Texada Island (49° 124° N.W.).

Little Billie (Vananda Mines (1948), Ltd.).

A new 150-ton flotation-mill was built on the property and put into operation on November 9th, 1948. The principal units are as follows: Crushing plant—Jaw-crusher, 30-horsepower motor; cone-crusher, 30-horsepower motor; screen, 1-horsepower motor; magnet, 1½-horsepower motor; two conveyers, 3- and 2-horsepower motors. Mill—Ball-mill, 150-horsepower motor; feeder, 1½-horsepower motor; classifier, 5-horsepower motor; jig, 1-horsepower motor; concentrate-pump, 2-horsepower motor; sump-pump, 3-horsepower motor; flotation cells, four 5-horsepower motors; blower, 5-horsepower motor; filter, 1-horsepower motor; thickener, 2-horsepower motor; vacuum pump, 10-horsepower motor.

The installation of a hoist driven by an 80-horsepower 440-volt motor was completed in 1948. The remainder of the load is composed of an air-compressor (100 horse-power), mine-pumps (70 horse-power), workshops (25 horse-power), lighting (40 horse-power), and miscellaneous (20 horse-power). This makes a total connected load of approximately 600 horse-power, and the average power consumption is 400 horse-power.

To carry the extra load imposed by the new additions, a Fairbanks-Morse unit consisting of a 312-kva. 2,300-volt 3-phase 60-cycle generator direct-connected to a 375-horsepower diesel was installed.

ZEBALLOS (50° 126° S.W.).

Privateer Mine, Ltd.—Operations at this mine were suspended in October, 1948.

CLAY MINES.

KILGARD (49° 122° S.W.).

Clayburn Co., Ltd. A new electrical power distribution system was installed in the mine early in the year. Three 50-kva. 2,200/440-volt single-phase transformers were installed a short distance from the Fire-clay mine portal and adjacent to the new compressor-house to supply power for a new air-compressor and two slusher-hoists. The air-compressor is driven by a 75-horsepower 440-volt motor, and the two slushers are driven by 10-horsepower 440-volt motors. Power is carried underground through a 3-conductor No. 4 B. & S. gauge rubber-insulated lead-sheathed double-steel-tape-armoured cable. Three water-proof switches and plugs are installed in the Fire-clay mine and one is installed in the No. 4B mine in strategic locations. The slusher motors are fed from the nearest switch through a 4-conductor rubber-sheathed cable. The fourth conductor is used as a grounding conductor for grounding the non-current-carrying metal parts of the motor to the metal armouring of the armoured cable, which in turn is grounded at the surface.

COAL MINES.

CUMBERLAND (49° 125° N.E.).

No. 8 Mine (Canadian Collieries (D.), Ltd.).—Construction of the locomotive-battery charging station for the main North level started in 1947 was completed during the year. It houses a 10-horsepower charging unit and three 20-kva. 2,200/440-volt single-phase 25-cycle transformers. A 75-horsepower 440-volt motor was added to the underground hoist, thereby increasing its power to 150 horse-power for haulage.

TSABLE RIVER (49° 124° N.W.).

Tsable River Prospect Mine (Canadian Collieries (D.), Ltd.). Two temporary 25-horsepower pumping units were installed underground to handle an increased inflow of water. Only one of these units is used at a time. One 1,500-kva. 13,200/2,200-volt 3-phase 25-cycle transformer was added to the main sub-station and three 20-kva. 2,200/440-volt single-phase transformers have been added to the temporary installation at the tipple. Three air-compressors are now in use, making a total compressor load of 450 horse-power.

NANAIMO (49° 123° S.W.).

White Rapids Mine (Canadian Collieries (D.), Ltd.).—A pump driven by a 50-horsepower 440-volt motor was installed underground to increase the pumping capacity.

East Kootenay.

Elk River Colliery (Crow's Nest Pass Coal Co., Ltd.).—(49° 114° S.W.) An Atlas 11-ton battery locomotive was put in service in No. 3 mine during the latter part of the year. The battery-charging station will be a short distance from the portal outside the mine for the next year or two, after which an underground charging-station may be built.

Michel Colliery (Crow's Nest Pass Coal Co., Ltd.). (49° 114° N.W.) A complete new switch-room for all incoming and outgoing power was constructed. A new overhead power-line on steel towers was built from the switch-room to the tipple and by-product plant. A new 1,200-ampere magnetically controlled breaker was installed in the switch-room to control all incoming power. A new copper bus was installed through the switch-room and to the station. A new 600-ampere breaker was installed on the tipple circuit.

BRITISH COLUMBIA DEPARTMENT OF MINES
LIST OF PUBLICATIONS.

The publications listed are available for distribution except as noted. Recent publications for which no charge is made may be obtained from the Department's offices at Victoria, Vancouver, and Nelson.

PRICES.

A small reserve stock of each Annual Report or Bulletin is set aside; the greater part of each issue is distributed free of charge. When the free stock has been exhausted, copies may be obtained from the reserve stock on payment of the price set. The price for a cloth-bound copy of an Annual Report is $1. The Provincial sales tax of 3 per cent. must be collected on all sales of publications within the Province. If a charge is made, application for the Annual Report or Bulletin should be made to the Department of Mines, Victoria, B.C., and should be accompanied by the proper sum, including the tax.

INDEXES.

Index to Annual Reports of the Minister of Mines of British Columbia for the years 1874 to 1936, inclusive. (By H. T. Nation.) Paper bound, $1; cloth bound, $2.

Index to Annual Reports of the Minister of Mines, 1937–43, and Bulletins Nos. 1–17. (By H. T. Nation.) Paper-bound copies, 50 cents each. Cloth-bound copies, $1 each.

Corrigenda, Index to Annual Reports of the Minister of Mines, 1874–1936.

ANNUAL REPORTS.

For each year the entry " free " or the price charged appears in the following table if the report is available. If neither " free " nor a price is entered, the report for that year is not available for distribution.

Year.	Paper Bound.	Cloth Bound.	Year.	Paper Bound.	Cloth Bound.
1874–1896	.....	.....	1925	50c.	.....
1897	50c.	.....	1926	50c.	.....
1898–1900	.....	.....	1927	Free	.....
1901	50c.	.....	1928	Free	$1.00
1902–1906	.....	.....	1929	Free	.....
1907	50c.	.....	1930	Free	.....
1908	50c.	.....	1931	50c.	.....
1909	50c.	.....	1932	.....	.....
1910	50c.	.....	1933	Free	1.00
1911	.....	.....	1934	Free	1.00
1912	.....	.....	1935	50c.	1.00
1913	50c.	.....	1936	*	1.00
1914	.....	.....	1937	*	1.00
1915	Free	.....	1938	*	1.00
1916	Free	.....	1939	Free	1.00
1917	Free	.....	1940	Free	1.00
1918	Free	.....	1941	Free	1.00
1919	Free	$1.00	1942	Free	1.00
1920	Free	.....	1943	Free	1.00
1921	Free	.....	1944	Free	1.00
1922	Free	.....	1945	Free	1.00
1923	Free	.....	1946	Free	1.00
1924	50c.	.....	1947	Free	1.00
			1948	Free	1.00

* Parts A to F, bound separately in paper, are available (free) for the years 1936, 1937, and 1938. Part G, " Inspection of Mines," is not available for these years.

BULLETINS, OLD SERIES.

Bulletin No. 2, 1918: Bumps and outbursts of gas. (By George S. Rice.)
Bulletin No. 2, 1919: The commercial feasibility of electric smelting of iron ores in British Columbia. (By Alfred Stansfield.)
Bulletin No. 2, 1932: Report on McConnell Creek placer area. (By Douglas Lay.)

MISCELLANEOUS.

Special Reports on Coal-mine Explosions. (By George Wilkinson, Thomas Graham, and James Ashworth.) 1918.
Report on Snowflake and Waverley-Tangier Mineral Properties. (By J. D. Galloway.) 1928.
Report on Mineral Properties of the Goldside Mining Company. (By B. T. O'Grady.) 1935.
Elementary Geology applied to Prospecting. (By John F. Walker.) Revised, 1946. 50 cents.
Possibilities for Manufacture of Mineral Wool in British Columbia. (By J. M. Cummings.) 1937.
Lode-gold Deposits of the Zeballos Area. (By J. S. Stevenson.) 1938. Out of print.
Preliminary Investigations into Possibilities for Producing Silica Sand from British Columbia Sand Deposits. (By J. M. Cummings.) 1941.
Iron Ores of Canada: Vol. I, British Columbia and Yukon. (By G. A. Young and W. L. Uglow, Geological Survey, Canada, Department of Mines.) 1926.

BULLETINS, NEW SERIES, STARTING IN 1940.

(Free, except as noted.)

Bulletin No. 1: Aiken Lake Area, North-Central B.C. (By Douglas Lay.)
Bulletin No. 2: Placer-gold Deposits, Wheaton (Boulder) Creek, Cassiar District. (By Stuart S. Holland.)
Bulletin No. 3: Fraser River Tertiary Drainage-history in relation to Placer-gold Deposits. I. (By Douglas Lay.)
Bulletin No. 4: Saline and Hydromagnesite Deposits of British Columbia. (By J. M. Cummings.)
Bulletin No. 5: Mercury Deposits of British Columbia. (By John S. Stevenson.) Out of print.
Bulletin No. 6: Geology of Camp McKinney and the Cariboo Amelia Mine. (By M. S. Hedley.) 50 cents.
Bulletin No. 7: Lode-gold Deposits of the Upper Lemon Creek Area and Lyle Creek-Whitewater Creek Area, Kootenay District. (By R. J. Maconachie.) Out of print.
Bulletin No. 8: Preliminary Report on the Bedwell River Area. (By H. Sargent.)
Bulletin No. 9: Molybdenite in British Columbia. (By John S. Stevenson.) Out of print.
Bulletin No. 10: Tungsten Deposits of British Columbia. (By John S. Stevenson and staff of the Department of Mines.) Revised.
Bulletin No. 11: Fraser River Tertiary Drainage-history in relation to Placer-gold Deposits. II. (By Douglas Lay.)
Bulletin No. 12: Reconnaissance in the Area of Turnagain and Upper Kechika Rivers. (By M. S. Hedley and Stuart S. Holland.)
Bulletin No. 13: Supplementary Report on Bedwell River Area. (By H. Sargent.)
Bulletin No. 14: Coal Analyses of British Columbia. (By James Dickson.)
Bulletin No. 15: Hydraulic Mining Methods. (By Stuart S. Holland.)
Bulletin No. 16: Dragline Dredging Methods. (By Stuart S. Holland.)

Bulletin No. 17: An Introduction to Metal-mining in British Columbia. (By Officers of the Department.)

Bulletin No. 18: Specimens and Samples—Their Treatment and Use. (By Officers of the Department.)

Bulletin No. 19: The Tuya-Teslin Area, Northern British Columbia. (By K. DeP. Watson and W. H. Mathews.)

Bulletin No. 20: Lode-gold Deposits—

Part II: South-eastern British Columbia. (By W. H. Mathews.) Revised, 1948.

Part III: Central Southern British Columbia. (By M. S. Hedley and K. DeP. Watson.)

Part IV: South-western British Columbia—exclusive of Vancouver Island. (By J. S. Stevenson.) Revised, 1946.

Part V: Vancouver Island. (By J. S. Stevenson.) Revised, 1946.

Part VI.: North-eastern British Columbia and Cariboo and Hobson Creek Areas. (By S. S. Holland.) Revised, 1946.

Bulletin No. 21: Notes on Placer-mining in British Columbia. (By Officers of the Department.)

Bulletin No. 22: Geology of the Whitewater and Lucky Jim Mine Areas. (By M. S. Hedley.)

Bulletin No. 23: Calcareous Deposits of the Georgia Strait Area. (By W. H. Mathews.)

Bulletin No. 24: *Geology and Coal Resources of the Carbon Creek-Mount Bickford* Map-area. (By W. H. Mathews.)

Bulletin No. 25: The Squaw Creek-Rainy Hollow Area. (By K. DeP. Watson.)

Bulletin No. 26: Report on the Stanley Area, Cariboo Mining Division. (By Stuart S. Holland.)

SPECIAL REPORTS.

Special reports on certain properties were advertised in the Annual Reports 1936 to 1941, inclusive, as available on application. A list of those still available will be supplied on request. The text of a report is either in mimeographed or typewritten form, and ozalid prints can be made of maps or other drawings. Copies of reports still available will be supplied at 10 cents per page of typewritten or mimeographed copy, excepting that the charge for any mimeographed report shall not exceed 25 cents. Additional charges will be made for prints of maps. Requests for these Special Reports, accompanied by the proper sum, should be addressed to the Chief Mining Engineer.

NOTICES *RE* PUBLICATIONS.

Applications are invited from those who wish to receive notices when new publications become available.

MAPS SHOWING MINERAL CLAIMS AND PLACER LEASES.

Prints of maps showing the approximate positions of placer-mining leases and mineral claims held by record are available on request to the Chief Gold Commissioner at Victoria, B.C. These maps conform to the reference and mineral-reference maps issued by the Lands Department in size and geographical detail and correspond as to numbers. Full sheet, $1; half-sheet, 50 cents; quarter-sheet, 25 cents.

PROSPECTORS' SETS.

On request, collections, each consisting of about fifty specimens, including rocks and minerals, are supplied to prospectors and to schools teaching subjects relating to mining or prospecting. Because it is difficult to obtain the material for these sets, only requests from those actively prospecting in the Province and from schools in British Columbia can be considered. A charge of 50 cents plus 2 cents sales tax is made for each set; the price should be remitted with a request addressed to the Chief Mining Engineer.

LIST OF LIBRARIES.

All Department publications are being sent to the following Government departments and Legislative, University, and Public Libraries:—

CANADA.

Government Departments—
- Department of Secretary of State, Ottawa—Library.
- Department of Mines and Resources, Ottawa—Library of the Bureau of Geology and Topography.
- Department of Mines, Halifax, Nova Scotia.
- Department of Lands and Mines, Fredericton, New Brunswick.
- Department of Mines, Quebec, Quebec.
- Department of Mines, Toronto, Ontario.
- Department of Mines and Natural Resources, Winnipeg, Manitoba.
- Department of Natural Resources, Regina, Saskatchewan.
- Department of Lands and Mines, Edmonton, Alberta.

Legislative Libraries—
- Library of Parliament, Ottawa.
- Legislative Library, Halifax, Nova Scotia.
- Legislative Library, Fredericton, New Brunswick.
- Legislative Library, Quebec, Quebec.
- Legislative Library, Toronto, Ontario.
- Legislative Library, Winnipeg, Manitoba.
- Legislative Library, Regina, Saskatchewan.
- Legislative Library, Edmonton, Alberta.

University Libraries—
- Dalhousie University, Halifax, Nova Scotia.
- Acadia University, Wolfville, Nova Scotia.
- Laval University, Quebec, Quebec.
- McGill University, Montreal, Quebec.
- Queen's University, Kingston, Ontario.
- University of Toronto, Toronto, Ontario.
- University of Manitoba, Winnipeg, Manitoba.
- University of Saskatchewan, Saskatoon, Saskatchewan.
- University of Alberta, Edmonton, Alberta.
- University of British Columbia, Vancouver, B.C.

Public Libraries—
- Public Library, Halifax, Nova Scotia.
- Public Library, Montreal, Quebec.
- Public Library, Toronto, Ontario.
- Public Library, Edmonton, Alberta.
- Public Library, Calgary, Alberta.
- Public Library, New Westminster, B.C.
- Public Library, Nelson, B.C.
- Public Library, Prince Rupert, B.C.
- Public Library, Prince George, B.C.
- Public Library, Vancouver, B.C.
- Public Library, Victoria, B.C.

ENGLAND.

British Columbia House, Regent Street, London, England.
Canada House, London, England.

SOUTH AFRICA.

Public Library, Johannesburg, South Africa.

AUSTRALIA.

Public Library, Sydney, Australia.

UNITED STATES.

Government Departments and Legislative Libraries—
- Library of Congress, Washington, D.C.
- Bureau of Mines, Washington, D.C.
- United States Geological Survey, Washington, D.C.
- California State Division of Mines, Ferry Building, San Francisco, California.
- Oregon State Bureau of Mines, Salem, Oregon.
- Washington State Division of Mines and Geology, Olympia, Washington.
- Idaho State Bureau of Mines, Boise, Idaho.

University Libraries—
- Columbia University, New York, N.Y.
- University of California, Berkeley, California.
- State University of Iowa, Iowa City, Iowa.
- Oregon State College, Corvallis, Oregon.
- University of Washington, Seattle, Washington (College of Mines).
- University of Nevada (Mackay School of Mines), Reno, Nevada.

Public Libraries—
- New York Public Library, New York, N.Y.
- Free Library, Philadelphia, Pa.
- Public Library, Boston, Mass.
- Public Library, Los Angeles, California.
- Public Library, San Francisco, California.
- Library Association of Portland, Portland, Oregon.
- Public Library, Seattle, Washington.
- Public Library, Spokane, Washington.

SYNOPSES OF MINING LAWS AND LAWS RELATING TO MINING.

(The complete Acts may be obtained from the King's Printer, Victoria, B.C.)

"DEPARTMENT OF MINES ACT."

The "Department of Mines Act" empowers the Minister of Mines to organize the Department or to reorganize it from time to time to meet changing conditions in the mining industry. It provides for examination and certification of assayers; for the conducting of short courses of lectures in practical geology and mineralogy; and for the purchase of ore from the Provincial sampling plants. The Act also provides for the expenditure of public moneys for the construction, reconstruction, or repair of trails, roads, and bridges to facilitate the exploration of the mineral resources of any mining district, or the operation and development of any mining property.

"MINERAL ACT" AND "PLACER-MINING ACT."

FREE MINERS' CERTIFICATES.

Free miners' certificates must be obtained before any person can prospect for mineral and locate and record mineral claims in British Columbia.

Any person over the age of 18, and any joint-stock company incorporated or registered in British Columbia, may obtain a free miner's certificate on payment of the required fee.

The fee to an individual for a free miner's certificate is $5 for one year. To a joint-stock company having a capital of $100,000, or less, the fee for a year is $50; if capitalized beyond this, the fee is $100. If the company has no stated capitalization, the fee is $100.

The free miners' certificates run from date of issue and expire on the 31st day of May next after its date, or some subsequent 31st day of May (that is to say, a certificate may be taken out a year or more in advance if desired). Certificates may be obtained for any part of a year, terminating on May 31st, for a proportionately less fee. The possession of this certificate entitles the holder to enter upon all lands of the Crown, and upon any other lands on which the right to so enter is not specially reserved, for the purpose of prospecting for minerals, locating claims, and mining.

In the event of a free miner allowing his certificate to lapse, his mining property (if not Crown-granted) reverts to the Crown (subject to the conditions set out in the next succeeding paragraph), but where other free miners are interested as partners or co-owners the interest of the defaulter becomes vested in the continuing co-owners or partners *pro rata*, according to their interests.

Six months' extension of time within which to revive title in mining property which has been forfeited through the lapse of a free miner's certificate is allowed. This privilege is given only if the holder of the property obtains a special free miner's certificate within six months after the 31st of May on which his ordinary certificate lapsed. The fee for this special certificate in the case of a person is $15 and in that of a company $300.

It is not necessary for a shareholder, as such, in an incorporated mining company to be the holder of a free miner's certificate.

"MINERAL ACT."

All minerals occurring in place are acquired under the "Mineral Act," but limestone, marble, clay, sand, gravel, earth, building or construction stone, coal, petroleum, and natural gas are not considered as mineral.*

* Limestone, marble, etc., are disposed of by lease under the provisions of the "Land Act." Coal is disposed of under the provisions of the "Coal Act" and petroleum and natural gas under the "Petroleum and Natural Gas Act." These Acts are under the administration of the Department of Lands and Forests, Victoria, B.C.

A mineral claim is a piece of land not exceeding 1,500 feet square and fifty-one and sixty-five one-hundredths acres in area. The angles must be right angles unless the boundaries, or one of them, are the same as those of a previously recorded claim.

No special privileges are allowed for the discovery of new mineral claims or districts.

A mineral claim is located by erecting two "legal posts," which are stakes having a height of not less than 4 feet above ground and squared 4 inches at least on each face for not less than a foot from the top. A tree-stump so cut and squared also constitutes a legal post. A cairn of stones not less than 4 feet in height and not less than 1 foot in diameter 4 feet above the ground may also be used as a legal post. Upon each of these posts must be written the name of the claim, the name of the locator, and the date of location. On No. 1 post, in addition, the following must be written: "Initial post. Direction of Post No. 2 [*giving approximate compass-bearing*]. feet of this claim lie on the right and feet on the left of the line from No. 1 to No. 2 posts." Numbered metal identification tags must be attached to both posts at the time of staking.

The location-line between Nos. 1 and 2 posts must be distinctly marked—in a timbered locality by blazing trees and cutting underbrush, and in bare country by monuments of earth or rock not less than 2 feet in diameter at the base, and at least 2 feet high—so that the line can be distinctly seen.

Mineral claims must be recorded in the Mining Recorder's office for the mining division in which they are situate within fifteen days from the date of location, one day extra being allowed for each 10 miles of distance from the recording office after the first 10 miles. If a claim is not recorded in time it is deemed abandoned and open for relocation, but if the original locator wishes to relocate he can only do so by permission of the Gold Commissioner of the district and upon the payment of a fee of $10. This applies also to a claim abandoned for any reason whatever. A free miner can hold, by location, during any period of twelve months, eight mineral claims within a radius of 10 miles, and may acquire others by purchase.

Mineral claims are, until the Crown grant is issued, held practically on a yearly lease, a condition of which is that during such year assessment-work be performed on the same to the value of at least $100, or a payment of such sum be made to the Mining Recorder. Such assessments must be recorded before the expiration of the year, or the claim is deemed abandoned. If, however, the required assessment-work has been performed within the year, but not recorded within that time, a free miner may, within thirty days thereafter, record such assessment-work upon payment of an additional fee of $10. The actual cost of the survey of a mineral claim, to an amount not exceeding $100, may also be recorded as assessment-work. If, during any year, work is done to a greater extent than the required $100, any further sum of $100—but not less—may be recorded and counted as further assessments; such excess work must be recorded during the year in which it is performed. All work done on a mineral claim between the time of its location and recording may be counted as work done during the first period of one year from the recording. As soon as assessment-work to the extent of $500 is recorded and a survey made of the claim, the owner of a mineral claim is entitled to a Crown grant on payment of a fee of $25, and giving the necessary notices required by the Act. Liberal provisions are also made in the Act for obtaining mill-sites and other facilities in the way of workings and drains for the better working of claims.

"Placer-mining Act."

In the "Placer-mining Act" "mineral" is defined as in the "Mineral Act," but includes only mineral occurring in any natural unconsolidated material, excluding mineral in place.

Under the "Placer-mining Act" a free miner may locate, in any period of twelve consecutive months, one placer claim or leasehold in his own name and one placer claim or leasehold for each of three free miners for whom he acts as agent on any separate creek, river-bed, bar or dry diggings. Other placer claims or leaseholds may be acquired by purchase.

Placer Claims.

Placer claims are of three classes, as follows:—

"Creek diggings": any mine in the bed of any stream or ravine:

"Bar diggings": any mine between high- and low-water marks on a river, lake, or other large body of water:

"Dry diggings": any mine over which water never extends.

Every placer claim shall be as nearly as possible rectangular in form, and marked by four legal posts at the corners.

A placer claim must be recorded in the office of the Mining Recorder for the mining division within which the same is situate, within fifteen days after the location thereof, if located within 10 miles of the office of the Mining Recorder by the most direct means of travel. One additional day shall be allowed for every 10 miles additional or fraction thereof. The number of days shall be counted inclusive of the days upon which such location was made, but exclusive of the day of application for record.

Placer-mining Leases.

Leases of unoccupied Crown lands approximately 80 acres in extent may be granted by the Gold Commissioner of the district after location has been made by staking along a "location-line" not more than one-half a mile (2,640 feet) in length. In this line one bend, or change of direction, is permitted. Where a straight line is followed two posts only are necessary—namely, an "initial post" and a "final post." Where there is a change of direction a legal post must be placed to mark the point of the said change. The leasehold is allowed a width not in excess of one-quarter mile (1,320 feet), and the locator, both on his "initial post" and in his notice of intention to apply, which is posted at the office of the Mining Recorder, is required to state how many feet are included in the location to the right and how many feet to the left of the location-line.

That section of the Act dealing with the staking of placer-mining leases follows:—

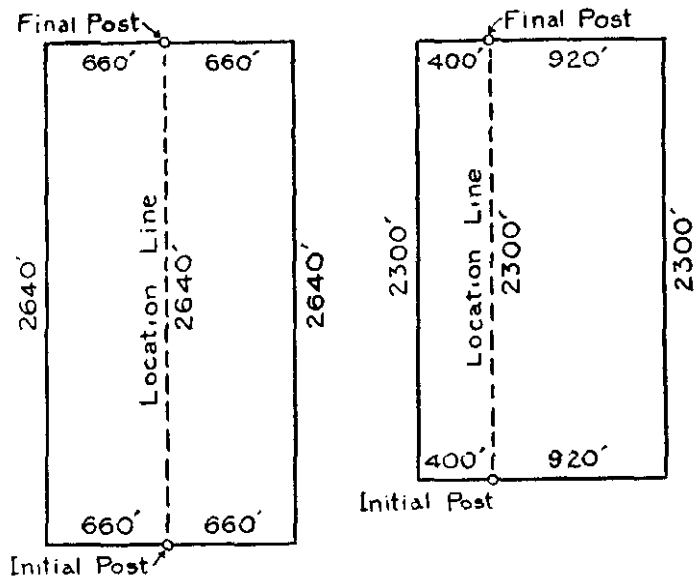
"105. (1) For the purpose of locating a placer leasehold, a line to be known as the 'location-line' shall be marked on the ground by placing a legal post at each end, one post to be known as the 'Initial Post' and the other as the 'Final Post.' The direction of the location-line may change at not more than one point throughout its length, and an intermediate legal post shall be placed at the point at which the direction changes. The total length of the location-line, following its change of direction (if any), shall not exceed two thousand six hundred and forty feet.

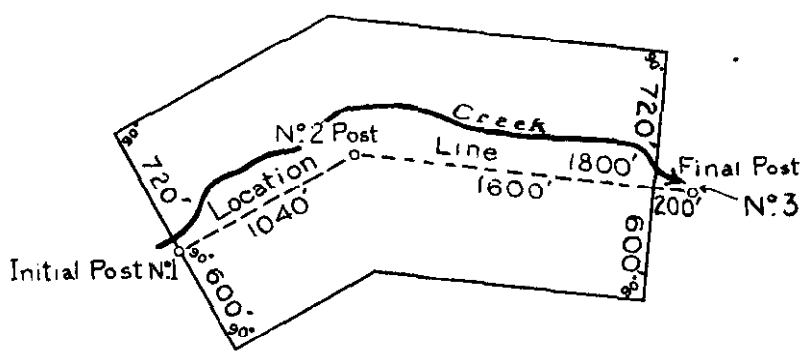
"(2) Upon the initial post and the final post shall be written the words 'Initial Post' and 'Final Post' respectively, together with the name of the locator and the date of the location. On the initial post shall also be written the approximate compass-bearing of the final post, and a statement of the number of feet of the leasehold lying on the right and on the left of the location-line, as viewed from the initial post, not exceeding in the aggregate a width of thirteen hundred and twenty feet, thus: 'Direction of Final Post, . feet of this claim lie on the right and feet on the left of the location-line.' In addition to the foregoing, where there is a change of direction in the location-line as marked on the ground, the number '1' shall be written on the initial post; the number '2' shall be written on the intermediate post; and the number '3' shall be written on the final post. There also shall be affixed to the initial post a notice to the following effect, namely: 'Application will be made under the "Placer-mining Act" for a lease of the ground within this location.'

"(3) The location-line shall at the time of location be marked between the legal posts throughout its length so that it can be distinctly seen; in a timbered locality, by blazing trees and cutting underbrush, and in a locality where there is neither timber nor underbrush, by placing legal posts or monuments of earth or stones not less than two feet high and not less than two feet in diameter at the base, so that the location-line can be distinctly seen.

"EXAMPLES OF VARIOUS METHODS OF LAYING OUT PLACER LEASEHOLDS.

"*Showing Areas secured with Location-lines of Various Lengths.*





"(4) Where, from the nature or shape of the surface of the ground, it is impracticable to mark the location-line of a leasehold as provided by this section, the leasehold may be located by placing legal posts as witness-posts, as near as possible to the location-line, and writing on each witness-post the distance and compass-bearing of some designated point on the location-line from the witness-post; and the distances and compass-bearing so written on the witness-posts shall be set out in the application for the lease and in any lease granted thereon.

"(5) The locator shall, within thirty days after the date of the location, post a notice in Form I in the office of the Mining Recorder, which notice shall set out:—

"(*a*) The name of the intending applicant or each applicant if more than one, and the numbers of their free miners' certificates:
"(*b*) The date of the location:
"(*c*) The number of feet lying to the right and left of the location-line, and the approximate area or size of the ground.

The words written on the initial post and final post shall be set out in full in the notice; and as accurate a description as possible of the ground to be acquired shall be given, having special reference to any prior locations it may join, and the general locality of the ground to be acquired."

Another provision is that there must be affixed to the "initial post" and to the "final post" a numbered metal identification tag furnished by the Mining Recorder with each free miner's certificate issued. These tags must be attached to the posts or placed in a container within a cairn, at the time of location.

The annual rental on a placer-mining lease is $30, and the amount to be expended annually on development-work is $250.

Authority also has been given for the granting of special placer-mining leases in locations other than has been defined. Copies of regulations governing the granting of special placer-mining leaseholds may be obtained upon application to the office of the Chief Gold Commissioner, Department of Mines, Victoria, B.C.

For more detailed information the reader is referred to the complete "Placer-mining Act," which may be obtained from the King's Printer, Victoria, B.C.

TABLE OF FEES, "MINERAL ACT" AND "PLACER-MINING ACT."

Individual free miner's certificate, annual fee	$5.00
Company free miner's certificate (capital $100,000 or less), annual fee	50.00
Company free miner's certificate (capital over $100,000), annual fee	100.00
Recording mineral claim	2.50
Recording certificate of work, mineral claim	2.50
Recording abandonment, mineral claim	10.00
Recording abandonment, placer claim	2.50
Recording any affidavit	2.50
Records in "Records of Conveyances" (for each claim or lease)	2.00
For each additional claim or lease in the same document	.50
Filing documents, "Mineral Act"	.25
Filing documents, "Placer-mining Act"	1.00
Recording certificate of work, placer-mining lease	2.50
For Crown grant of mineral rights under "Mineral Act"	25.00
For Crown grant of surface rights of mineral claim under "Mineral Act"	10.00
For every lease under "Placer-mining Act"	5.00

COAL, PETROLEUM, AND NATURAL GAS.

Limestone, marble, etc., are disposed of by lease under the provisions of the "Land Act," coal is disposed of under the provisions of the "Coal Act," and petroleum and natural gas under the "Petroleum and Natural Gas Act." These Acts are under the administration of the Department of Lands and Forests, Victoria, B.C.

"METALLIFEROUS MINES REGULATION ACT."

This Act is designed to provide for the safe working of metalliferous mines, metallurgical works, and quarries. It contains practical regulations which govern the main phases of mining, such as surface arrangements, fire-protection, use and storage of explosives, hoisting, haulage, ventilation, mine-rescue work, etc.

In preparing the present Act, passed in 1948, the former Act was entirely rewritten and rearranged to make it conform to modern mining practice.

In the new Act, provision regarding explosive gases in metal mines has been made. A new rule allows the use of internal-combustion engines of the diesel type underground under conditions which make this form of power unobjectionable.

Provisions have been made for training and maintaining mine-rescue teams at the larger metal-mining centres. The new Act also provides for the appointment of electrical, mechanical, and metallurgical inspectors; for protection of public and private property from damage resulting from mining operations; and for appointing workmen's safety committees.

The Inspectors of Mines are empowered to enter and inspect any part of any mine, metallurgical works, or quarry, and to inspect any plant or equipment, or anything relating to the safety of persons employed in or about quarries, metalliferous mines, or metallurgical works. They are also empowered to require the remedy of conditions affecting the safety of employees, to make provisions safeguarding those employed, and, if need be, to order the closing of a mine or part of a mine, or the stopping of all work connected with it.

"COAL-MINES REGULATION ACT."

This Act, like the "Metalliferous Mines Regulation Act," is designed to provide for the safe working conditions by practical regulations.

The Act was completely revised and rewritten in 1948, and several additions and changes were made to bring it into conformity with modern practice. The additions and changes include: Rules providing for precautions against coal-dust underground and in cleaning plants; a new section governing surface coal-stripping operations; revised rules governing electrical installations; and provisions for the use of internal-combustion engines of the diesel type underground, where the equipment and the conditions maintained render this form of power unobjectionable.

The powers of Inspectors under this Act are similar to those provided under the "Metalliferous Mines Regulation Act."

EXPLOSIVES.

Dominion Order in Council No. 2903, requiring a permit to maintain a magazine or purchase explosives on the authority of a Provincial Mines Inspector, has been repealed.

"MINES RIGHT-OF-WAY ACT."

This Act provides for access to mining property. It provides for the obtaining of a right-of-way for any road, railway, aerial, electric, or other tramway, surface or elevated cable, electric or telephone pole-line, chute, flume, pipe-line, drain, or any right or easement of a like nature.

"IRON AND STEEL BOUNTIES ACT."

The Lieutenant-Governor in Council may enter into an agreement with any person whereby the Crown will pay to that person, out of the Consolidated Revenue Fund, bounties on pig-iron and steel shapes when manufactured within the Province, as follows:—

(*a*) In respect of pig-iron manufactured from ore, on the proportion produced from ore mined in the Province, a bounty not to exceed three dollars per ton of two thousand pounds:

(*b*) In respect of pig-iron manufactured from ore, on the proportion produced from ore mined outside the Province, a bounty not to exceed one dollar and fifty cents per ton of two thousand pounds:

(*c*) In respect of steel shapes of commercial utility manufactured in the Province, a bounty not to exceed one dollar per ton of two thousand pounds.

Bounty, as on pig-iron under this Act, may be paid upon the molten iron from ore which in the electric furnace, Bessemer or other furnace, enters into the manufacture of steel by the process employed in such furnace; the weight of such iron to be ascertained from the weight of the steel so manufactured.

Bounty on steel shapes under this Act shall be paid only upon such steel shapes as are manufactured in a rolling-mill having a rated productive capacity per annum of at least twenty thousand tons of two thousand pounds per ton. The total amount of bounties paid under clauses (*a*) and (*b*) is limited to $200,000 in any one year or $2,000,000 in the aggregate; and the total amount of bounties paid under clause (*c*) is limited to $20,000 in any one year or $200,000 in the aggregate.

"INDIAN RESERVES MINERAL RESOURCES ACT."

This Act validates an agreement between the Dominion and the Province whereby mineral rights on Indian reserves, upon surrender by the Indians, shall be administered by the Province, subject to the laws of the Province. A free miner wishing to prospect on Indian reserves must obtain the approval of the Gold Commissioner for the mining division in which the reserve is situated and also of the Indian Agent for such reserve.

"PROSPECTORS' GRUB-STAKE ACT."

In this Act "grub-stake" means money, food supplies, clothing, powder, tools, or any other thing necessary to the business of prospecting. "Prospector" means any person who is a British subject and who is the holder of a valid free miner's certificate; who has been honourably discharged from any of His Majesty's Services or has been resident in the Province during the year preceding any application for a grub-stake.

Information regarding grub-stakes may be obtained from the Department of Mines, Victoria, B.C., or from any Mining Recorder, Mining Engineer, or Inspector of Mines of the Department.

No grub-stake granted to one applicant shall exceed $300 in value in any one year, but the grub-stake may be increased, if an applicant is required to travel to or from the area in which he is to prospect, by an amount sufficient to cover such travelling expenses. The total in no case shall exceed $500 in any year. Applicants are required to identify some of the commoner rocks and minerals.

Provision has been made for the establishment and operation of one or more mining training camps at suitable locations within the Province.

"TAXATION ACT."

(Procedure in applying to lease a Reverted Crown-granted Mineral Claim.)

"147. (1) Where property which consists of a mineral claim has been forfeited to and vested in the Crown under the provisions of this Part, it shall be lawful for the Gold Commissioner for the mining division in which the mineral claim is situate to grant a lease thereof to any person for the term of one year upon payment of the sum of twenty-five dollars, and, upon payment of a further sum of twenty-five dollars, to grant a renewal of the lease for a further term of one year commencing on the expiration of the former lease, but for no longer period.

"(2) No person shall be entitled to hold as lessee under this section more than eight claims in the same mining division at the same time.

"(3) No lease granted under this section shall be transferable.

"(4) Subject to the rights of any person to the surface or a portion of the surface of the mineral claim, the lessee shall, during the continuance of his lease, but no longer,

have the right to enter, prospect, and mine upon the claim for all minerals, precious and base, save coal and petroleum, and for that purpose shall have all the rights of a free miner under the 'Mineral Act.'

"(5) Where the Gold Commissioner has granted a lease to any person under this section, he shall forthwith notify the Surveyor of Taxes, giving the name of the mineral claim, the name of the lessee, and the date of the lease, and the Surveyor of Taxes shall enter the particulars furnished him by the Gold Commissioner in a proper book to be kept by him for that purpose.

"(6) The lessee may at any time before the expiration of his lease apply for and obtain a Crown grant of the mineral claim upon payment of all taxes, costs, expenses, and interest which remained due and unpaid on the mineral claim on the date of its forfeiture to the Crown, together with a sum equal to all taxes and interest which would have accrued due in respect thereof from the date of the lease to the date of the application for a Crown grant had the claim been regularly assessed in like manner as it appeared upon the assessment roll for the year last preceding the date of the forfeiture, and also with a fee of twenty-five dollars for the Crown grant: Provided that if the lessee establishes to the satisfaction of the Gold Commissioner that he has expended upon the claim in mining-development work a sum of not less than two hundred dollars a year during the continuance of the lease, then the payment of the sum in respect of taxes and interest from the date of the lease to the date of application for a Crown grant shall not be required: Provided further that if the lessee is the holder of a number of adjoining mineral claims not exceeding eight, and establishes to the satisfaction of the Gold Commissioner that a sum equal to two hundred dollars a claim of the full number of adjoining mineral claims has been expended upon one or more of the adjoining mineral claims in mining-development work for each year during the continuance of the leases, then the payment of the sum in respect of taxes and interest from the date of the lease to the date of the application for a Crown grant shall not be required.

"(7) The lessee shall be entitled to a Crown grant according to the acreage and description of the claim specified in the original Crown grant thereof under which the claim was held prior to the date of forfeiture, but subject to the prior rights of any other person.

"(8) Where the lessees under this section of a number of adjoining mineral claims, not exceeding eight, file with the Gold Commissioner a notice of their intention to perform on any one or more of the claims all the mining-development work that otherwise might be required in respect of all the claims, and where the lessees thereafter establish to the satisfaction of the Gold Commissioner that a sum equal to two hundred dollars a claim of the full number of the adjoining claims has been expended upon one or more of the adjoining claims in mining-development work for each year during the continuance of the leases, then the payment of the sum in respect of taxes and penalties from the date of each of the leases to the date of the application for a Crown grant shall not be required."

TAXATION OF MINES.

Crown-granted mineral claims are subject to a tax of 25 cents per acre. The tax becomes due on July 2nd in each year, and if unpaid on the following October 31st is deemed to be delinquent.

Mines are subject to a tax at the rate of 4 per cent. on income derived from mining operations.

For further particulars *see* the "Mining Tax Act," also the "Public Schools Act," which are obtainable from the King's Printer, Victoria, B.C.

The Federal Government now collects the income tax for the Provincial Government.

ROYALTIES.

All minerals mined from lands covered by records of mineral claims and placer claims and by placer-mining leases issued after the 1st day of May, 1948, are subject to payment of such royalties as may be fixed by regulation made by the Lieutenant-Governor in Council from time to time. The amounts of royalties to be paid have not yet been set. Properties subject to the payment of royalties are exempt from payment of the 4-per-cent. tax under the " Mining Tax Act."

" FOREST ACT."

In 1939 the " Provincial Parks Act " was repealed and the administration of Provincial parks brought under the " Forest Act." Under this Act the Lieutenant-Governor in Council may constitute any portion of the Province a Provincial park and may also extend, reduce, or cancel any park created before or after the amendment to this Act.

The Act provides for three classes of parks to be known as " A," " B," and " C " Class parks.

Lands included in Class "A" and Class " C " parks are reserved from pre-emption, sale, lease, or licence under the " Land Act " and with respect to mining are so reserved unless the consent of the Lieutenant-Governor in Council is obtained, and then only subject to further provisions of the Act.

No holder of any mineral claim in a Class "A" or Class " C " park may obtain a Crown grant of the surface rights of a mineral claim.

All mineral claims in any Class "A" or Class " C " park shall be subject to such terms and conditions and restrictions, including cutting and use of timber, as the Lieutenant-Governor in Council may from time to time prescribe.

The restrictions on prospecting and mining in Class "A" and Class " C " parks do not apply in the case of Class " B " parks.

Where, in the opinion of the Minister of Lands, the safety of life and property is endangered through the hazardous condition of the forest-cover or the occurrence or spread of forest fire, the Minister may declare a district closed for travel and prospecting so long as the hazard exists.

LIST OF PRICES CHARGED FOR ACTS.

(Sales, within the Province, amounting to 15 cents or more, are subject to the British Columbia sales tax.)

	Price.
Department of Mines Act	$0.15
Mineral Act	.25
Placer-mining Act	.25
Metalliferous Mines Regulation Act	.50
Coal-mines Regulation Act	.70
Mines Right-of-way Act	.15
Iron and Steel Bounties Act	.15
Indian Reserves Mineral Resources Act	.15
Prospectors' Grub-stake Act	.15
Taxation Act	.75
Forest Act	.80
Garibaldi Park Act	*
Strathcona Park Act	.15
Greater Vancouver Water District Act	.40
Security Frauds Prevention Act	.30
Coal Sales Act	.15

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