Minister of Mines

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

For the Year ended 31st December

1946

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

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VICTORIA, B.C.:
Printed by DON McDIARMID, Printer to the King's Most Excellent Majesty.
1947.

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 1946 is herewith respectfully submitted.

R. C. MACDONALD,
Minister of Mines.

Minister of Mines' Office,
June, 1947.

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ANNUAL REPORT OF THE MINISTER OF MINES, 1946.

Review of the Mining Industry.

By Hartley Sargent, Chief Mining Engineer.

In 1946, the first calendar year following the end of the Second World War, the quantities of coal and of most of the metals produced in British Columbia were less than had been produced in 1945. The quantities of many items classified as non-metallics, clay products, and other structural materials increased compared with the 1945 figures. The reduction in output of coal was because of shortage of labour and the loss of productive time in a strike of short duration. A strike beginning on July 3rd caused the loss of most of the remaining part of the year to the copper producers, most of the lode-gold producers, and some of the silver-lead-zinc producers. Productive time was also lost in other strikes affecting some metal mines. Shipments of British Columbia copper- and gold-bearing concentrates to the Tacoma smelter were held up by a strike which affected the smelter for five months. As the Sullivan mine was not affected by strikes, the output of lead and zinc was not reduced as seriously as the output of lode gold and of copper. The output of silver was slightly higher than in 1945. The British Columbia strike was not directed against non-producing lode mines nor against placer mines. The output of placer gold was higher than for 1945, reflecting increased production in the Atlin, Cariboo, and Quesnel Mining Divisions. Drag-line dredges in the Cariboo and Quesnel Mining Divisions were responsible for about 10 per cent. of the total placer output.

The price for gold produced in Canada was reduced by about 10 per cent. on July 5th, when the Canadian Foreign Exchange Control Board raised the official exchange rate for the Canadian dollar from 10 per cent. below par to parity with United States dollar. The prices for all the other principal metals increased during the year, and the average prices for the year were well above 1945 prices. The increases were more than enough to offset decline in the quantities of gold, copper, lead, and zinc, and in the price of gold, resulting in an over-all increase of 12.9 per cent. in the value of metals produced as compared with 1945. The total value of mineral products, $71,807,951, was 13.3 per cent. higher than the 1945 figure. The 1946 total value of mineral production has been exceeded only in the years 1937, 1940, 1941, and 1942.

Dividends paid in 1946 amounted to $15,566,047. Major items of expenditure by the metal-mining industry were: Salaries, $4,014,266; wages, $13,427,006; process supplies, $5,018,341; fuel, $4,173,699. The average number employed in all branches of the industry, computed on a 12-month basis, was 11,933.

Activities in metal mining, including exploration and development, are reviewed on pages 58 to 60. Exploratory work was resumed at several former gold producers which had been shut down during the war, and production was resumed on a continuing basis at the Polaris-Taku and Privateer properties; production was also resumed at several other properties but was discontinued before the end of the year. Exploratory work was undertaken on numerous lode-gold properties. There was also exploratory activity at many silver-lead-zinc properties. The decision to bring the Toric silver property at Alice Arm into production was announced, and work to that end was started. A major programme of development undertaken at the Sullivan mine involves changes in the underground and surface haulage of ore, in the grinding department of the mill, and in the underground filling procedure.

Decreased production of barite, correlated with reduced demand for permanent ship ballast, and increased production of gypsum and gypsum products, reflecting the demand for building materials, were features of the non-metallics division of the mining industry. Substantiated increases in the production of almost all the clay products and of cement, lime and limestone, sand and gravel, rubble, crushed rock, etc., reflected the large requirements for the building industry and the construction of highways.

Although coal production was less than for 1945, exploratory work was undertaken at Tsable River on Vancouver Island, and preparations for strip mining were made in the Crowsnest Pass coal area. Some interest was indicated in the Peace River coal area.

The price of gold is now again at the 1939 level, while the rates paid for labour and the charges for supplies and equipment are substantially higher than in 1939. Accordingly, unless mining practices can be adjusted so that the output per man will be increased and the materials required per ton of ore decreased, ore which yielded a small profit under 1939 conditions will be unprofitable under present conditions. The recent prices for silver, copper, lead, and zinc have stimulated efforts to discover and mine these metals, and it may be expected that 1947 production will exceed the 1946 output of these metals. Production of materials for the building industry will undoubtedly be at a high level in 1947 unless unforeseen reductions occur. The production of coal from underground mines is expected to decrease, but strip mines being brought into production in the Crowsnest Pass field may more than offset the reduction in output from underground mines.

STATISTICS.

The collection and compilation of mining statistics and the preparation of statistical tables for this report is in charge of the Bureau of Economics and Statistics, Department of Trade and Industry.

Since 1939 several mining divisions have been amalgamated with others. These changes may be of interest to those studying the tables and therefore have been set forth under the heading "Amalgamation of Mining Divisions," page. 38.

METHOD OF COMPUTING PRODUCTION.

The total value of mine output of the Province, consisting of metalliferous minerals, coal, structural materials, and miscellaneous metals, minerals, and materials, is calculated at standard prices in Canadian funds.

In the Annual Report for 1925 some changes were made in the methods used in previous years in computing and valuing the products of the industry, but in order to facilitate comparisons with former years the same general style of tables was adhered to. The methods used in the 1925 Annual Report have been followed in subsequent Annual Reports, with the addition of new tables.

METALS.

The following notes explain the methods used:—

1. From the certified returns, made by the operators of lode mines, for ore and concentrate shipped during the full calendar year, the net recovered metal contents have been determined by deducting from the "assay value content" necessary corrections for smelting and refining losses. In making comparisons of production figures with previous years, it should be remembered that prior to 1925 in the Annual Reports the total metal production, with the exception of copper, was determined by taking the assay value content of all ores shipped; deductions for slag losses were made by taking varying percentages of the metal prices.

2. 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, 1947; the average price for the year was approximately $36.75; the equivalent average price per crude ounce was $30.22.

3. 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.

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 previously. A foot-note under Table II outlines the procedures which have been followed in recent years. The prices used formerly 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.

British Columbia lead and zinc were sold largely on the basis of the London prices. The New York, St. Louis, and Montreal lead- and zinc-market prices differed materially from the London prices and were not properly applicable in valuing British Columbia production.

Until 1932 the New York price for copper was used. British Columbia copper production was sold largely in the United States, and the New York export price for copper rather than the London price was the basis for settlement. Any difference between the two prices introduced a variation in the gross value of copper production as calculated. (*See* foot-note, Table II.)

FUEL.

4. In 1926 a change was made in computing coal and coke statistics. The practice in former years had been to list coal and coke production (in part) as primary mineral production. Only the coke made in bee-hive ovens was so credited; that 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 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.

From 1918 to 1930 coal production was valued at $5 per long ton. In 1931 the price used was $4.50, and from 1932 on the price used has been $4.25 per long ton. The different prices should be kept in mind when comparing the dollar value of production for different years.

TABLE I.—British Columbia Mine Production, 1945 and 1946.

	Quantity, 1945.	Quantity, 1946.	Value, 1945.†	Value, 1946.†	Per Cent. Increase (+) or Decrease (—).	
					Quantity.	Value.
Metallics.			$	$		
Antimony			292,635	96,322		—67.1
Bismuth			260,047	327,628		+25.9
Cadmium			505,328	771,698		+52.7
Copper* ... lb.	25,852,366	17,500,538	3,244,472	2,240,070	—32.4	—31.8
Gold, lode* ... fine, oz.	175,373	117,612	6,751,860	4,322,241	—33.0	—36.2
Gold, placer* ... crude, oz.	12,589	15,729	398,591	475,361	+24.9	+19.3
Lead* ... lb.	353,497,689	347,990,146	17,674,884	23,489,335	—1.6	+32.9
Mercury ... lb.						
Silver* ... oz.	6,157,307	6,365,761	2,893,934	5,324,959	+3.4	+84.0
Tin ... lb.			484,490	480,802		—0.7
Tungsten concentrates			331			
Zinc* ... lb.	301,737,902	270,718,128	19,431,921	21,143,086	—10.2	+8.8
Totals			51,938,493	58,671,502		+12.9
Fuel.						
Coal (2,240 lb.) ... tons	1,518,673	1,463,640	6,454,360	6,220,470	—3.7	—3.7
Non-metallics.						
Barites, diatomite, and mica			63,414	43,447		—31.5
Fluxes—limestone, quartz ... tons	45,221	55,732	70,266	71,531	+23.2	+1.8
Granules—slate and rock, talc ... tons	969	1,116	16,272	19,917	+15.2	+22.4
Gypsum products, gypsite			127,434	318,500		+149.9
Iron oxides			1,985	2,135		+7.5
Sodium carbonate ... tons	286	210	3,146	2,310	—26.6	—26.6
Sulphur‡ ... tons	127,653	126,622	1,267,350	1,258,576	—0.8	—0.7
Totals			1,549,867	1,716,416		+10.7
Clay and Clay Products.						
Brick—						
Common ... No.	3,092,000	3,300,000	80,556	94,000	+6.7	+16.7
Face, paving, sewer-brick ... No.	1,319,743	2,077,683	49,814	84,353	+57.4	+69.3
Fire-bricks, blocks			217,275	283,317		+30.4
Fire-clay ... tons	510	601	7,899	8,241	+17.8	+4.3
Structural tile—hollow blocks			70,376	105,194		+49.5
Drain-tile, sewer-pipe ... No.	1,603,969	2,068,424	205,883	263,864	+28.9	+28.1
Pottery—glazed or unglazed			3,245	2,811		—13.4
Other clay products: bentonite			2,632	3,611		+37.2
Totals			637,680	845,391		+32.6
Other Structural Materials.						
Cement			1,182,297	1,739,966		+47.2
Lime and limestone ... tons	162,334	159,493	522,692	642,912	—1.7	+23.0
Sand and gravel			865,557	1,713,138		+97.9
Stone ... tons	4,284	4,354	127,809	99,710	+1.6	—22.0
Rubble, riprap, crushed rock ... tons	71,949	154,164	65,194	158,446	+114.2	+143.0
Totals			2,763,549	4,354,172		+57.5
Total value			63,343,949	71,807,951		+13.3

* For information on evaluation of gold, silver, copper, lead, and zinc in 1946, refer to foot-note on Table II.

† Canadian funds.

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

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** ,,
Average, 1942–46 (inc.)	38.15	52.014 ,,	11.857 ,,	4.673 ,,	5.192 ,,

Prices are in Canadian funds.

* Until price control was initiated in the recent war, the average metal prices used in evaluating British Columbia metal production were those used by the Dominion Bureau of Statistics and by all Provinces co-operating with that Bureau. The average United States prices, as quoted in the Engineering and Mining Journal, converted to Canadian funds were used for the precious metals. London prices were used similarly for the principal base metals (*see also* note headed " Metals," page 9). The method of arriving at the price for gold continued unchanged, but while controls were in effect during the war (1940–45), the prices for the metals controlled were supplied by the Canadian Metals Controller. In 1945 the controls were largely removed from sales but not from prices, and the Dominion Bureau of Statistics again computed average prices, using information supplied by the principal Canadian refiners of silver and the base metals.

In recent years the prices received for silver, lead, and zinc used in Canada have been 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 are weighted averages, taking into consideration sales in Canada at the ceiling prices and sales abroad at New York prices converted into Canadian funds. In 1946 the price for gold in Canada was $38.50 per ounce until July 5th, and thereafter $35 per ounce; the price given above for the year, $36.75 per ounce, is the average of the two. In British Columbia most of the lode gold was produced before July 5th; the true gross value, therefore, was somewhat greater than the figure obtained by using the above average price.

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 were used instead of the Dominion Bureau of Statistics average price, additional amounts could be credited to the copper production values; namely, for 1946, $458,513; for 1945, $82,728; for 1944, $315,815; and for 1943, $473,845.

NOTE.—In making comparisons with average prices used prior to 1925, it should be remembered that deductions were made from the average prices as a means of adjustment between the " assay value content " of ores shipped instead of allowing percentage losses in smelting operations. The price of copper prior to 1925 was taken at " net "; silver, at 95 per cent.; lead, at 90 per cent.; and zinc, at 85 per cent. Subsequent to 1925 (inclusive) prices are true averages, and adjustments are made on the metal content of ores for loss in smelting and refining.

TABLE III.—TOTAL PRODUCTION FOR ALL YEARS UP TO AND INCLUDING 1946.

Gold, placer	$92,773,312
Gold, lode	337,230,379
Silver	165,672,667
Copper	340,485,431
Lead	381,526,992
Zinc	262,406,461
Coal and coke	435,979,365
Structural materials	101,962,441
Miscellaneous metals, minerals, and materials	51,235,547
Total	$2,169,272,595

TABLE IV.—PRODUCTION FOR EACH YEAR FROM 1852 TO 1946 (INCLUSIVE).

1852 to 1895 (inclusive)	$94,547,370	1922	$35,162,843
1896	7,507,956	1923	41,304,320
1897	10,455,268	1924	48,704,604
1898	10,906,861	1925	61,492,242
1899	12,393,131	1926	67,188,842
1900	16,344,751	1927	60,729,358
1901	19,671,572	1928	65,372,583
1902	17,486,550	1929	68,245,443
1903	17,495,954	1930	55,391,993
1904	18,977,359	1931	34,883,181
1905	22,461,325	1932	28,798,406
1906	24,980,546	1933	32,602,672
1907	25,882,560	1934	42,305,297
1908	23,851,277	1935	48,821,239
1909	24,443,025	1936	54,081,967
1910	26,377,066	1937	74,475,902
1911	23,499,072	1938	64,485,551
1912	32,440,800	1939	65,681,547
1913	30,296,398	1940	75,701,155
1914	26,388,825	1941	78,479,719
1915	29,447,508	1942	75,551,093
1916	42,290,462	1943	65,892,395
1917	37,010,392	1944	54,923,803
1918	41,782,474	1945	63,343,949
1919	33,296,313	1946	71,807,951
1920	35,543,084	Total	$2,169,272,595
1921	28,066,641		

TABLE V.—QUANTITIES AND VALUE OF MINE PRODUCTS FOR 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, AND 1946.

Description.	1937.		1938.		1939.		1940.		1941.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer........oz.	54,153	$1,558,245	57,759	$1,671,015	49,746	$1,478,492	39,067	$1,236,928	43,775	$1,385,962
Gold, lode........oz.	460,781	16,122,727	557,522	19,613,624	587,180	21,221,272	583,416	22,461,516	571,026	21,984,501
Silver........oz.	11,308,685	5,075,451	10,861,578	4,722,288	10,771,585	4,361,199	12,327,944	4,715,315	12,175,700	4,658,545
Copper........lb.	46,057,584	6,023,411	65,769,906	6,558,575	73,254,679	7,392,862	77,980,223	7,865,085	66,435,583	6,700,693
Lead........lb.	419,118,371	21,416,949	412,979,182	13,810,024	378,743,763	12,002,390	485,364,420	16,317,952	490,185,657	16,480,042
Zinc........lb.	291,192,278	14,274,245	298,497,295	9,172,822	278,409,102	8,544,375	310,767,251	10,600,271	363,302,195	12,392,238
Coal........tons, 2,240 lb.	1,444,687	6,139,920	1,309,428	5,565,069	1,477,872	6,280,956	1,667,827	7,088,265	1,802,353	7,660,000
Structural materials........	....	2,098,337	....	1,975,249	....	1,832,434	....	2,534,840	....	2,845,262
Miscellaneous metals, minerals, and materials........	....	1,766,617	....	1,396,385	....	2,567,567	....	2,880,983	....	4,372,476
Totals........	....	$74,475,902	....	$64,485,551	....	$65,681,547	....	$75,701,155	....	$78,479,719

Description.	1942.		1943.		1944.		1945.		1946.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer........oz.	32,904	$1,041,772	14,600	$462,270	11,433	$361,977	12,589	$398,591	15,729	$475,361
Gold, lode........oz.	444,518	17,113,943	224,403	8,639,516	186,632	7,185,332	175,373	6,751,860	117,612	4,322,241
Silver........oz.	9,677,881	4,080,775	8,526,310	3,858,496	5,705,334	2,453,293	6,157,307	2,893,934	6,365,761	5,324,959
Copper........lb.	50,097,716	5,052,856	42,307,510	4,971,132	36,300,589	4,356,070	25,852,366	3,244,472	17,500,538	2,240,070
Lead........lb.	463,269,005	15,575,104	405,285,476	15,214,417	294,797,469	13,265,886	353,497,689	17,674,884	347,990,146	23,489,335
Zinc........lb.	396,857,260	13,536,801	335,137,014	13,405,481	280,356,477	12,055,328	301,737,902	19,431,921	270,718,128	21,143,086
Coal........tons, 2,240 lb.	1,938,158	8,237,172	1,821,654	7,742,030	1,933,639	8,217,966	1,518,673	6,454,360	7,463,640	6,220,470
Structural materials........	....	3,143,382	....	3,039,148	....	3,025,445	....	3,401,229	....	5,199,563
Miscellaneous metals, minerals, and materials........	....	7,769,288	....	8,559,905	....	4,002,506	....	3,092,698	....	3,392,866
Totals........	....	$75,551,093	....	$65,892,395	....	$54,923,803	....	$63,343,949	....	$71,807,951

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*	...	...	*7,052,481*
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	6,121,319	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	19,281,857
1923	179,245	3,704,994	6,032,986	3,718,129	57,720,290	8,328,266	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.
	Oz.	Value.	Oz.	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	4,163,859	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	22,535,578
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	4,080,775	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
Totals	12,352,175	337,230,379	313,606,095	165,672,667	2,424,850,831	340,485,431	9,019,128,830	381,526,992	5,986,445,828	262,406,461	1,487,321,930

TABLE VII.—Value of Gold Production to Date.

Year.	Placer Gold. Crude (Ounces).	Placer Gold. Value.	Lode Gold. Fine (Ounces).	Lode Gold. Value.	Total.
1858–1862	580,650	$9,871,634	....	....	$9,871,634
1863–1867	954,920	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	148,560	2,525,426	....	....	2,525,426
1893	20,950	356,131	1,170	$23,404	379,535
1894	23,260	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	79,100	1,344,900	138,315	2,857,573	4,202,473
1900	75,210	1,278,724	167,153	3,453,381	4,732,105
1901	57,060	970,100	210,384	4,348,605	5,318,703
1902	63,120	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	65,600	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	48,700	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	33,230	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	13,030	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
Totals	5,115,898	$92,773,312	12,352,175	$337,280,379	$430,003,691

TABLE VIII.—Value of Mine Production by Divisions, 1942, 1943, 1944, 1945, and 1946.

Mining Division.	1942.	1943.	1944.	1945.	1946.
	$	$	$	$	$
Ainsworth	25,270	49,405	277,435	254,429	77,057
Alberni	1,647,140	527,401	9,725	6,194	112,613
Ashcroft	59,598	9,964	14,809	1,393	10,119
Atlin	1,401,357	314,005	255,539	321,227	459,965
Cariboo	2,465,418	1,161,053	979,399	1,033,181	988,815
Clinton	8,602	5,679	1,803	3,368	2,310
Fort Steele	38,256,908	36,305,963	31,668,064	42,910,466	54,256,000
Golden	528,800	438,726	324,525	825,803	290,143
Greenwood	511,553	361,396	275,571	191,767	484,670
Kamloops	183,406	161,820	124,130	135,791	300,758
Lardeau	1,031	95	1,288	....	....
Lillooet	5,093,991	3,312,574	3,072,599	2,412,843	1,394,343
Nanaimo	3,418,984	3,435,235	3,353,930	2,981,253	3,038,045
Nelson	2,682,612	892,159	544,663	516,283	372,005
New Westminster	654,719	607,133	597,569	677,220	1,028,101
Nicola	122,930	155,606	83,032	27,099	6,967
Omineca	3,273,590	5,357,775	1,409,984	142,315	70,216
Osoyoos	2,429,785	1,490,888	1,837,959	2,069,351	1,057,802
Peace River	13,910	59,354	58,251	32,342	14,586
Portland Canal	1,796,684	1,100,439	732,087	736,125	410,892
Quesnel	77,082	20,360	13,804	14,533	43,731
Revelstoke	30,997	29,031	19,664	35,904	39,658
Similkameen	4,111,591	3,497,570	3,242,076	2,205,091	1,634,831
Skeena	430,090	58,309	32,211	37,443	58,841
Slocan	884,623	1,089,433	1,193,092	954,479	628,445
Stikine	16,211	2,311	1,520	348	5,954
Trail Creek	1,325,301	1,374,132	1,111,591	1,247,960	1,274,603
Vancouver	2,596,739	2,607,391	2,233,911	2,124,478	1,668,492
Vernon	10,409	2,177	3,225	1,338	3,049
Victoria	1,491,767	1,465,011	1,450,347	1,443,925	2,074,940
Totals	75,551,093	65,892,395	54,923,803	63,343,949	71,807,951

TABLE IXa (1945 and 1946).—Production in Detail of Placer Gold, Lode Gold, Silver, Copper, Lead, and Zinc.

Divisions.	Year.	Tons.	Gold—Placer.		Gold—Lode.		Silver.		Copper.		Lead.		Zinc.	
			Ounces.	Value.	Ounces.	Value.	Ounces.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
				$		$		$		$		$		$
Ainsworth	1945	39,461			10	381	24,266	11,405			948,092	47,404	2,939,273	189,289
	1946	8,885					10,680	8,934			679,725	45,881	182,992	14,292
Alberni	1945		2	63										
	1946	6,319			2,673	98,233	1,505	1,259						
Ashcroft	1945		37	1,172										
	1946		18	544										
Atlin	1945		10,014	317,062	28	1,078	16	7						
	1946	25,824	11,055	334,104	3,356	123,333	197	165						
Cariboo	1945	57,291	1,344	42,554	23,547	906,560	2,507	1,178						
	1946	62,725	2,165	65,430	22,890	841,208	2,372	1,984						
Clinton	1945		7	222										
	1946													
Fort Steele	1945	2,435,877	11	348			5,400,400	2,538,188			346,743,000	17,337,150	276,094,000	17,780,454
	1946	2,307,532	24	725			5,690,700	4,760,270			344,393,000	23,246,528	260,872,000	20,374,103
Golden	1945	47,777					72,598	34,121			2,152,007	107,600	9,660,898	622,162
	1946	15,678					12,088	10,112			847,240	57,189	2,470,512	192,947
Greenwood	1945	1,817			299	11,512	248,248	116,677			113,300	5,665	134,082	8,635
	1946	2,939			597	21,940	416,251	348,194			196,581	13,269	247,904	19,361
Kamloops	1945		6	190										
	1946		4	121										
Lardeau	1945													
	1946													
Lillooet	1945	114,322	30	950	62,308	2,398,859	16,511	7,760						
	1946	76,709	72	2,176	37,328	1,371,804	9,579	8,013						
Nanaimo	1945													
	1946													
Nelson	1945	26,258	3	95	10,934	420,959	4,376	2,057			19,096	955	19,228	1,238
	1946	23,228	8	242	8,321	305,797	6,123	5,122			45,556	3,075	47,062	3,676
New Westminster	1945		10	317										
	1946		19	574										
Nicola	1945													
	1946	4			1	37	2	2			33	2	12	1
Omineca	1945		608	19,250										
	1946		683	20,642										
Osoyoos	1945	155,995	2	63	51,475	1,981,788	5,368	2,523	137,882	17,304				
	1946	78,988			27,543	1,012,205	3,281	2,745	69,989	8,959				
Peace River	1945		17	538										
	1946		9	272										
Portland Canal	1945	65,801			14,464	556,864	83,598	39,291	94,149	11,816	2,563,078	128,154		
	1946	34,804			8,163	299,990	38,066	31,842			1,171,261	79,060		
Quesnel	1945		416	13,171										
	1946		1,413	42,704										
Revelstoke	1945		26	823										
	1946		10	302										
Similkameen	1945	785,629	24	760	4,309	165,897	88,717	41,697	14,013,705	1,758,720				
	1946	577,671	2	60	1,679	61,703	72,310	60,487	10,427,972	1,334,781				
Skeena	1945		12	380										
	1946		11	332										
Slocan	1945	80,826			21	809	166,915	78,450			901,541	45,077	12,890,421	830,143
	1946	47,701			27	992	74,422	62,254			396,434	26,759	6,894,245	538,440
Stikine	1945		11	348										
	1946		197	5,954										
Trail Creek	1945	168			146	5,621	200	94						
	1946	372			234	8,599	1,054	882			7,104	480	3,247	254
Vancouver	1945	566,500			7,832	301,532	43,587	20,486	11,606,630	1,456,632	57,575	2,879		
	1946	435,982			4,800	176,400	27,104	22,672	7,002,577	896,330	252,975	17,076		
Vernon	1945		9	285										
	1946	14	39	1,179			27	22			237	16	154	12
Victoria	1945													
	1946													
Totals	1945	4,377,722	12,589	398,591	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
	1946	3,705,375	15,729	475,361	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

TABLE IXB.—PRODUCTION VALUE OF PLACER GOLD, LODE GOLD, SILVER, COPPER, LEAD, AND ZINC IN 1941, 1942, 1943, 1944, 1945, AND 1946.

Divisions.	1941.	1942.	1943	1944.	1945.	1946.
	$	$	$	$	$	$
Ainsworth	34,308	3,870	45,455	272,678	248,479	69,107
Alberni	2,450,639	1,610,534	521,595	5,631	63	99,492
Ashcroft	1,362	7,535	855	1,203	1,172	544
Atlin	1,445,031	1,393,567	310,734	253,242	318,147	457,602
Cariboo	3,077,675	2,415,991	1,104,703	947,593	950,292	908,622
Clinton	11,420	6,554	982	1,330	222	....
Fort Steele	31,013,289	30,921,250	30,328,407	25,549,264	37,656,140	48,381,626
Golden	700,911	497,178	402,738	267,048	763,883	260,248
Greenwood	711,981	458,573	224,385	183,763	142,489	402,764
Kamloops	8,073	5,713	1,551	1,007	190	121
Lardeau	11,823	....	95	1,288	....	....
Lillooet	5,982,811	5,075,552	3,286,891	3,068,573	2,407,569	1,381,993
Nanaimo	1,379	1,102	....	190	....	....
Nelson	3,686,326	2,633,021	837,919	276,616	425,304	317,912
New Westminster	32,095	3,758	380	728	317	574
Nicola	9,436	....	....	760	....	42
Omineca	170,039	62,397	31,789	30,141	19,250	20,642
Osoyoos	2,173,069	2,122,417	1,414,337	1,793,878	2,001,678	1,023,909
Peace River	2,438	760	....	....	538	272
Portland Canal	2,253,299	1,796,684	1,089,525	732,087	736,125	410,892
Quesnel	167,297	74,625	20,232	13,614	13,171	42,704
Revelstoke	2,596	1,108	253	1,361	823	302
Similkameen	4,351,322	3,621,198	3,010,155	2,949,189	1,967,074	1,457,031
Skeena	547,908	354,257	982	601	380	332
Slocan	626,106	884,623	1,089,433	1,193,092	954,479	628,445
Stikine	32,991	16,211	2,311	1,520	348	5,954
Trail Creek	322,106	193,658	348,821	13,772	5,715	10,215
Vancouver	3,742,673	2,245,915	2,387,899	1,959,227	1,781,529	1,112,478
Vernon	30,122	7,473	831	398	285	1,229
Victoria	1,456	380	73,354	158,092	....	....
Totals	63,601,981	56,415,904	46,536,612	39,677,886	50,395,662	56,995,052

TABLE IXc.—Production and Value of Placer Gold, Lode Gold, Silver, Copper, Lead, and Zinc, 1900–1946.

Divisions.	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	3,875	113,210	6,567,549	3,954,826	10,175	1,201	124,501,150	6,135,475	42,322,381	1,444,055	11,654,457
Alberni	1,581	32,157	274,405	10,333,639	148,663	68,262	2,225,948	333,373	108,322	3,679			10,771,110
Ashcroft	11,035	254,539	8,476	289,680	16,804	9,513	633,775	155,721	99	4			709,457
Atlin*	641,006	15,200,083	110,629	3,855,933	57,152	34,234	83,161	11,949	109,945	7,036			19,109,235
Cariboo†	1,914,113	39,079,309	561,019	20,665,474	61,571	27,891			656	30	492	16	59,772,720
Clinton	9,984	237,744	23,388	827,260	31,564	14,214	57,548	5,905	193	7			1,085,130
Fort Steele	17,114	396,156	2,532	56,964	152,398,556	74,229,654	28,592	6,193	8,212,654,404	346,413,506	5,345,837,816	232,019,654	653,122,127
Golden	467	11,213	70	1,447	1,404,595	834,240	57,378	10,590	98,515,618	3,661,872	117,891,420	4,447,663	8,967,025
Greenwood	4,038	94,634	1,085,638	23,397,978	23,178,265	11,716,902	441,171,575	70,493,191	9,576,385	386,881	9,634,621	338,169	106,427,755
Kamloops	3,310	82,764	39,376	1,318,141	281,229	167,209	5,767,133	1,021,694	368,662	20,737	409,170	26,063	2,636,608
Lardeau	1,769	38,136	24,889	652,366	2,805,116	1,119,860	5,594	785	9,569,431	382,498	447,139	20,393	2,214,038
Lillooet‡	90,595	1,856,596	1,835,819	64,057,880	486,602	221,187	400	41	62,463	2,542			66,138,246
Nanaimo	596	13,711	67,890	1,426,275	518,645	298,523	20,223,405	3,201,703					4,940,212
Nelson	3,184	79,931	1,246,783	38,969,524	4,171,618	2,247,819	5,685,261	889,008	53,597,219	2,344,577	24,761,978	1,469,310	46,000,169
New Westminster	11,332	235,791	4,311	110,307	13,373	5,960	26,489	6,379	28,144	1,081	12,163	415	359,983
Nicola	230	4,652	8,521	234,774	266,828	126,123	536,304	103,443	2,223,318	88,853	320,002	10,512	568,357
Omineca	47,527	1,254,594	3,638	197,545	2,350,470	1,454,199	6,126,209	1,345,688	6,239,613	345,809	3,960,018	248,654	4,846,489
Osoyoos	190	4,142	1,178,116	33,677,311	517,023	328,289	2,170,274	244,753	252,418	7,475	5,209	163	34,262,133
Peace River	4,083	94,027											94,027
Portland Canal	201	4,260	1,918,854	48,113,904	49,106,680	27,305,187	649,677,707	96,796,399	33,652,824	1,461,363	1,867,664	110,254	173,791,367
Quesnel§	622,831	12,962,626	198	7,156	271	110							12,969,892
Revelstoke	4,076	88,645	12	335	50,097	31,309	683	124	939,741	55,882	8,093	469	176,764
Similkameen	7,075	160,297	101,978	3,432,490	2,475,333	1,155,782	346,377,488	41,124,902	238,577	9,006	64,377	2,616	45,885,093
Skeena	3,914	86,780	414,794	9,979,046	265,198	182,759	7,671,642	1,215,720	39,539	1,287	15,277	490	11,466,082
Slocan	150	3,596	6,409	157,535	40,567,076	24,497,643	219,318	42,287	298,696,735	14,285,071	260,557,798	15,307,898	54,294,030
Stikine	32,913	771,060	114	4,120	20	8							775,188
Trail Creek‖	848	24,176	2,604,634	55,583,811	3,307,379	1,844,594	116,845,719	17,374,402	16,987,413	690,003	157,920,611	5,292,655	80,809,641
Vancouver	182	5,306	309,842	9,432,157	3,682,772	1,983,031	741,294,051	100,277,972	8,194,627	295,127	17,981,772	563,988	112,557,581
Vernon	2,130	56,114	5,212	175,639	7,701	3,815	614	89	6,611	309	2,974	161	236,127
Victoria	612	15,223	36,574	777,845	765,054	412,656	21,034,675	3,112,698	129,288	5,481	2,424,853	102,853	4,426,756
Provincial totals	3,437,298	73,153,952	11,882,996	327,849,746	295,503,204	154,275,799	2,367,931,118	337,776,210	8,876,693,395	376,605,591	5,986,445,828	261,406,451	1,531,067,749

* 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, 1945 and 1946.

Divisions.	Year.	Cement.	Lime and Limestone.	Building-stone.	Rubble, Riprap, and Crushed Rock.	Sand and Gravel.	Brick (Common).	Face, Paving, and Sewer Brick.	Fire-brick, Blocks.	Fire-clay.	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	1945				310	2,770									3,080
	1946				90	2,273									2,363
Portland Canal and Skeena	1945		22,281		10,278	4,173									36,732
	1946		19,007		20,848	18,654									58,509
Cariboo and Quesnel	1945				554	66,063									66,617
	1946				675	56,098									56,773
Omineca and Peace River	1945					14,657									14,657
	1946					8,599									8,599
Nicola, Vernon, and Kamloops	1945			579		11,427									12,006
	1946			748	2,196	36,117									39,061
Greenwood, Osoyoos, and Similkameen	1945				19,383	86,427									105,810
	1946		946		6,698	54,866									62,510
Fort Steele and Golden	1945				775	28,892									29,667
	1946				6,300	481,176									487,476
Ainsworth, Slocan, and Nelson	1945			61,630	817	34,482									96,929
	1946			8,787	8,630	44,626									62,043
Trail Creek and Revelstoke	1945				4,632	42,064									46,696
	1946				30,522	45,222									75,744
Alberni, Nanaimo, and Victoria	1945	1,182,297	495,931		1,245	178,917	80,556				21,976	15,461	3,245		1,979,628
	1946	1,739,966	615,417		2,064	256,832	94,000				40,255	22,385	2,811		2,773,730
Ashcroft, Lillooet, and Clinton	1945				414	4,860									5,274
	1946				268	21,657									21,925
Vancouver and New Westminster	1945		4,480	65,600	26,786	390,825		49,814	217,275	7,899	48,400	190,422		2,632	1,004,133
	1946		7,542	90,175	80,155	687,018		84,353	283,317	8,241	64,939	241,479		3,611	1,550,830
Totals	1945	1,182,297	522,692	127,809	65,194	865,557	80,556	49,814	217,275	7,899	70,376	205,883	3,245	2,632	3,401,229
	1946	1,739,966	642,912	99,710	158,446	1,713,138	94,000	84,353	283,317	8,241	105,194	263,864	2,811	3,611	5,199,563

TABLE XI.—Production in Detail of Miscellaneous Metals, Minerals, and Materials, 1945 and 1946.

Division.	Year.	Antimony.	Barite.	Bismuth.	*Cadmium.*	Diatomite, Mica.	Flux (Limestone and Quartz).	Gypsum Products.	Iron Oxides.	Mercury.	Slate and Rock Granules.	Sodium Carbonate.	Sulphur.	Tin.	Tungsten Concentrates.	Division Total.
		$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Skeena	1945	......	......	......	......	......	......	......	......	......	......	......	......	......	331*	331
	1946	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Cariboo and Omineca	1945	......	......	......	......	17,136	......	......	......	......	......	......	......	......	......	17,136
	1946	......	......	......	......	23,420	......	......	......	......	......	......	......	......	......	23,420
Peace River and Quesnel	1945	......	......	......	......	498	......	......	......	......	......	......	......	......	......	498
	1946	......	......	......	......	1,027	......	......	......	......	......	......	......	......	......	1,027
Kamloops and Greenwood	1945	......	......	......	......	......	28,400	125,134	......	......	......	......	......	......	......	153,534
	1946	......	......	......	......	......	65,373	263,500	......	......	......	......	......	......	......	328,873
Osoyoos and Similkameen	1945	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	1946	......	......	......	......	......	438	......	......	......	......	......	......	......	......	438
Fort Steele, Golden, and Lardeau	1945	......	45,780	......	......	......	......	2,300	......	......	......	......	......	......	......	48,080
	1946	......	*19,000*	......	......	......	......	*55,000*	......	......	......	......	......	......	......	74,000
Ainsworth, Nelson, and Revelstoke	1945	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	1946	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Trail Creek	1945	292,635†	......	260,047†	505,328†	......	......	......	......	......	......	......	1,230,630†	484,490‡	......	2,773,130
	1946	*96,322*†	......	327,628†	771,698†	......	......	......	......	......	......	......	1,228,000†	480,802‡	......	2,904,450
Ashcroft and Clinton	1945	......	......	......	......	......	......	......	......	......	......	3,146	......	......	......	3,146
	1946	......	......	......	......	......	......	......	......	......	......	2,310	......	......	......	2,310
Lillooet and Nanaimo	1945	......	......	......	......	......	41,866	......	......	......	......	......	......	......	......	41,866
	1946	......	......	......	......	......	5,600	......	......	......	......	......	......	......	......	5,600
Vancouver and Victoria	1945	......	......	......	......	......	......	......	1,985	......	16,272	......	36,720	......	......	54,977
	1946	......	......	......	......	......	120	......	2,135	......	19,917	......	30,576	......	......	52,748
Totals	1945	292,635	45,780	260,047	505,328	17,634	70,266	127,434	1,985	......	16,272	3,146	1,267,350	484,490	331	3,092,698
	1946	96,322	19,000	327,628	771,698	24,447	71,531	318,500	2,135	......	19,917	2,310	1,258,576	480,802	......	3,392,866

* The item of $331 noted for 1945 represents the balance of British Columbia tungsten concentrates held in Ottawa, as originally shipped from the Department of Mines' sampling plant, Prince Rupert, and for ready reference has been assigned to the Skeena Mining Division owing to the difficulty of placing this amount to the correct point of origin.

† 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.

Log of No. 11 Hole, Diamond Vale Collieries—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
COAL	0	3		
Light sandy shale	38	9	568	0
Sandstone	11	0		
Light sandy shale	5	0		
Sandstone, dip 25°	18	0		
Light sandy shale, dip 18°	0	9	610	4
11B { COAL, 6' 5"; COAL—bony, 6"; COAL, 6' 3" }	13	2	638	3
Dark-brown shale	3	6		
COAL	3	8		
Dark-brown shale	7	0		
Light sandy shale	2	0		
Sandstone	1	0		
Light sandy shale	2	6		
COAL	0	10	658	9
Light sandy shale	8	4		
Dark sandy shale	2	0		
Sandstone	32	6		
Dark sandy shale	5	0		
11C { COAL, 1' 10"; COAL—bony, 2"; COAL, 9" }	2	9	709	4
Dark sandy shale	6	9		
Light sandy shale	9	0		
Sandstone	5	0		
Light sandy shale	2	0		
Sandstone	3	0		
Light sandy shale	11	6		
Sandstone	2	0		
Light sandy shale	3	0	750	7

Original log apparently signed by Alfred T. Wall, Benjamin Browitt, and N. L. Wimmler.

Note.—Discrepancies are apparent in the original copy of this log, which is reproduced without alteration.

Log of Drill-hole No. 1

Located on North-west Quarter of Section 14, Township 91, 378 feet north 35 degrees east from Diamond Vale Hole No. 11; elevation, 1,986 feet.

Location: 1. Source: Signed original on file at British Columbia Department of Mines.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Unconsolidated Material.				
Boulder clay	102	0	102	0
Bed-rock.				
Sandstone—grey, medium to coarse grain, with shaly streaks	14	0	116	0
Shale—dark, sandy	6	6	122	6
Sandstone—very coarse, poorly sorted, shaly streaks	5	0	127	6
Shale—grey, sandy	3	6	131	0
Sandstone—grey, coarse, coal marks	2	10	133	10
COAL—bony	0	10	134	8
Shale—dark, fissile, coal marks	1	6	136	2
Sandstone—grey, coarse, some fine sand and shaly streaks	11	0	147	2
Shale—black, leaf moulds, few sandy streaks	9	0	156	2
Sandstone—shaly, finely bedded	2	6	158	8
Shale—dark to black, coal marks	3	0	161	8
Shale—dark, sandy	1	0	162	8
Sandstone—medium grain, with few shaly streaks	4	8	167	4
Shale—sandy, grey	2	6	169	10
Sandstone—medium grain, shaly streaks, coal marks	3	2	173	0
Shale—black, coal marks, much fractured	7	0	180	0
Sandstone—light grey, coarse	3	8	183	8
Shale—grey, sandy	5	6	189	2
Sandstone—grey, coarse, poorly sorted	10	10	200	0
Shale—dark grey, slightly sandy, dip 25°	9	0	209	0
Sandstone—shaly, dip 15°	4	6	213	6
Shale—dark grey, sandy, fractured	6	6	220	0
Sandstone—medium to coarse, poorly sorted, few fine-sand and shaly streaks	19	0	239	0
Shale—black, compact, leaf moulds	13	6	252	6
COAL	0	8	253	2
Shale—black, much fractured	8	10	262	0
Sandstone—fine grain, shaly, dip 14°	4	0	266	0
Sandstone—very coarse, poorly sorted, with some irregular fine conglomerate bands; abrupt contact below	14	0	280	0
Shale—black, fractured	3	1½	283	1½
COAL	0	4½	283	6
Shale—black, fissile, leaf moulds	9	0	292	6
Sandstone—medium- to fine-grained, somewhat shaly	8	0	300	6
Shale—dark, fractured	4	0	304	6
Sandstone—grey, shaly, coal marks	3	0	307	6
Shale—grey to black, fractured, ¼" coal-seam	6	6	314	0
Sandstone—shaly, dark grey	4	6	318	6
Sandstone—light grey, coarse, poorly sorted, irregular conglomerate streaks	12	0	330	6
Conglomerate—fine	0	9	331	3
Sandstone—light grey, coarse, friable, poorly sorted	27	0	358	3
Shale—dark, sandy, with fine-sand streaks, dip 14°	5	9	364	0
Sandstone—grey, medium-grained, shaly streaks	4	6	368	6
Conglomerate—fine, with coarse-sand streaks and 2" streak of sandy shale	5	0	373	6
Sandstone—fine-grained	1	6	375	0
Conglomerate—fine	0	8	375	8
Sandstone—fine-grained	1	0	376	8

TABLE XIII.—BRITISH COLUMBIA LODE MINES PRODUCTION, 1913–1946.

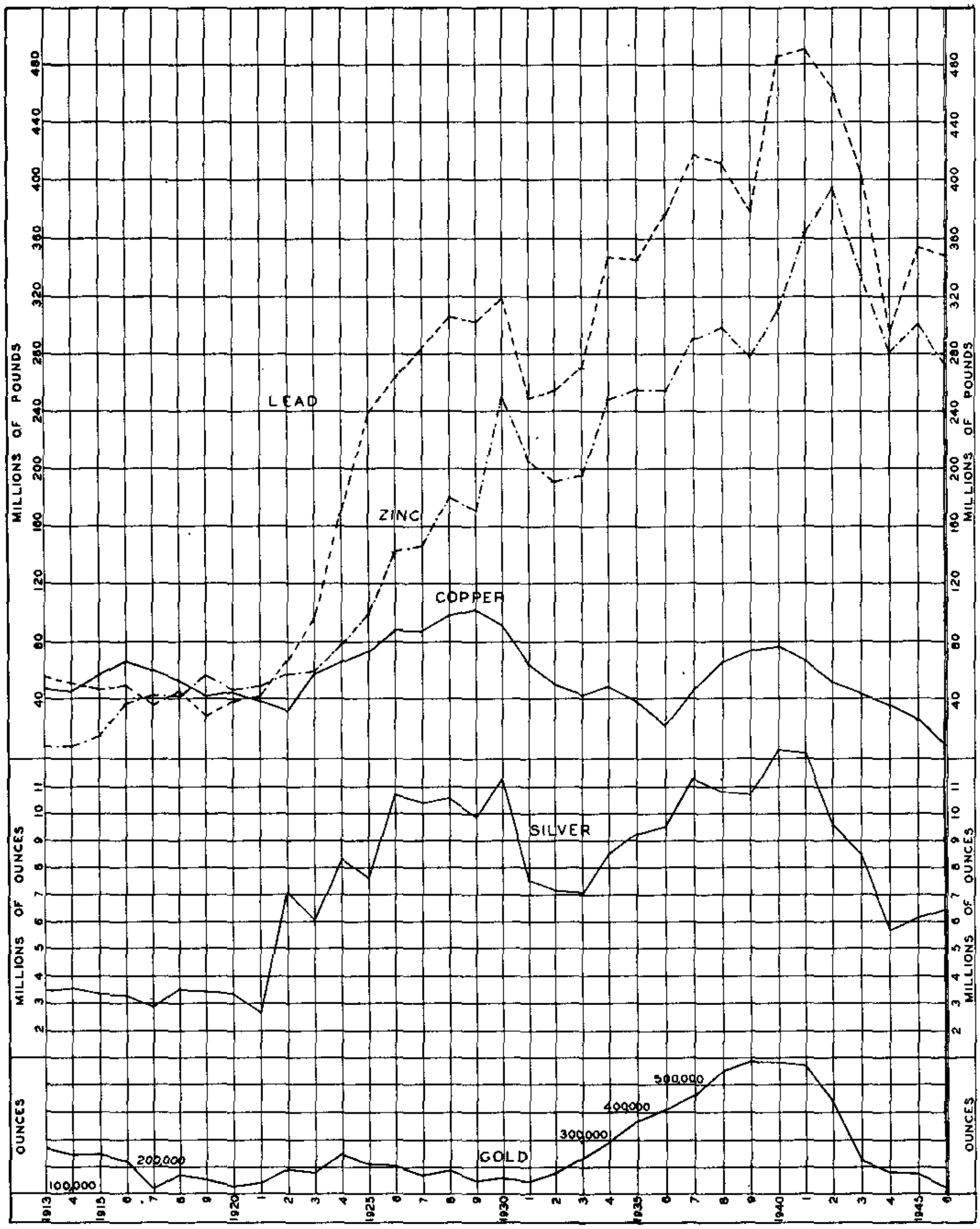


TABLE XIV.—COAL PRODUCTION PER YEAR TO DATE.*

	Tons. (2,240 lb.)	Value.		Tons. (2,240 lb.)	Value.
1836–1885	3,029,011	$9,468,557	1917	2,149,975	$7,524,913
1886	326,636	979,908	1918	2,302,245	11,511,225
1887	413,360	1,240,080	1919	2,267,541	11,337,705
1888	489,301	1,467,903	1920	2,595,125	12,975,625
1889	579,830	1,739,490	1921	2,483,995	12,419,975
1890	678,140	2,034,420	1922	2,511,843	12,559,215
1891	1,029,097	3,087,291	1923	2,453,223	12,266,115
1892	826,335	2,479,005	1924	1,939,526	9,697,630
1893	978,294	2,934,882	1925	2,328,522	11,642,610
1894	1,012,953	3,038,859	1926	2,330,036	11,650,180
1895	939,654	2,818,962	1927	2,453,827	12,269,135
1896	896,222	2,688,666	1928	2,526,702	12,633,510
1897	882,854	2,648,562	1929	2,251,252	11,256,260
1898	1,135,865	3,407,595	1930	1,887,130	9,435,650
1899	1,306,324	3,918,972	1931	1,707,590	7,684,155
1900	1,439,595	4,318,785	1932	1,534,975	6,523,644
1901	1,460,331	4,380,993	1933	1,264,746	5,375,171
1902	1,397,394	4,192,182	1934	1,347,090	5,725,133
1903	1,168,194	3,504,582	1935	1,187,968	5,048,864
1904	1,253,628	3,760,884	1936	1,346,471	5,722,502
1905	1,384,312	4,152,936	1937	1,444,687	6,139,920
1906	1,517,303	4,551,909	1938	1,309,428	5,565,069
1907	1,800,067	6,300,235	1939	1,477,872	6,280,956
1908	1,677,849	5,872,472	1940	1,667,827	7,088,265
1909	2,006,476	7,022,666	1941	1,802,353	7,660,000
1910	2,800,046	9,800,161	1942	1,938,158	8,237,172
1911	2,193,062	7,675,717	1943	1,821,654	7,742,030
1912	2,628,804	9,200,814	1944	1,933,639	8,217,966
1913	2,137,483	7,481,190	1945	1,518,673	6,454,360
1914	1,810,967	6,338,385	1946	1,463,640	6,220,470
1915	1,611,129	5,638,952			
1916	2,084,093	7,294,325	Totals	102,142,322	$410,305,765

* 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.

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, 1945 and 1946.

Description.	1945.		1946.	
	Quantity.	Value.	Quantity.	Value.
Coal used in making coke, long tons	206,132	$1,211,584	224,959	$1,441,415
Coke made in bee-hive ovens, long tons	12,021	$117,369	18,344	$178,556
Coke made in by-product ovens, long tons	52,766	434,876	44,780	416,267
Coke made in gas plants, long tons	81,859	577,479	73,132	619,266
Total coke made, long tons	146,646	$1,129,724	136,256	$1,214,089
Gas sold and used	....	2,721,690	....	3,079,009
Tar produced	....	83,828	....	88,947
Other by-products	....	20,756	....	88,886
Total production value of coke industry	....	$3,955,998	....	$4,470,931

TABLE XVII.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1946.

*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	14,704,350
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	†868,595
Goodenough (leasers)	Ymir	Gold	13,731
Hedley Mascot Gold Mines, Ltd.	Hedley	Gold	1,290,553
Island Mountain Mines, Ltd.	Wells	Gold	1,182,045
I.X.L.	Rossland	Gold	134,025
Jewel-Denero	Greenwood	Gold	11,751
Kelowna Exploration, Ltd. (Nickel Plate)	Hedley	Gold	1,560,000
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	2,765,625
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			$70,633,084

* 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, 1897–1946—*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	†148,567,638
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	646,415
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	136,000
Washington	Rambler Station	Silver-lead-zinc	20,000
Whitewater	Retallack	Silver-lead-zinc	592,515
Miscellaneous mines		Silver-lead-zinc	70,237
Total, silver-lead-zinc mines			$160,293,468

* " 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, 1897–1946—*Continued.*

Copper Mines.

Company or Mine.	Locality.	Class.	Amount paid.
Britannia M. & S. Co.*	Britannia Beach	Copper	$11,511,449
Canada Copper Corporation	Greenwood	Copper	615,399
Cornell	Texada Island	Copper	8,500
Granby Cons. M.S. & P. Co.†	Copper Mountain	Copper	26,643,227
Marble Bay	Texada Island	Copper	175,000
Hall Mines	Nelson	Copper	233,280
Miscellaneous mines		Copper	261,470
Total, copper mines			$39,448,325

* 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	13,613,434
Total	$29,613,434

Miscellaneous, Structural, and Placer Gold.

Various	$3,112,886

Aggregate of all Classes.

Lode-gold mining	$70,633,084
Silver-lead-zinc mining and smelting	160,293,468
Copper-mining	39,448,325
Coal-mining	29,613,434
Miscellaneous, structural, and placer gold	3,112,886
Total	$303,101,197

TABLE XVII.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1946—*Continued.*

Dividends paid Yearly, 1917–1946, inclusive.

Year.	Amount paid.	Year.	Amount paid.
1917	$3,269,494	1933	$2,471,735
1918	2,704,469	1934	4,745,905
1919	2,494,283	1935	7,386,070
1920	1,870,296	1936	10,513,705
1921	736,629	1937	15,085,293
1922	3,174,756	1938	12,068,875
1923	2,983,570	1939	11,865,698
1924	2,977,276	1940	14,595,530
1925	5,853,419	1941	16,598,110
1926	8,011,137	1942	13,627,104
1927	8,816,681	1943	11,860,159
1928	9,572,536	1944	11,367,732
1929	11,263,118	1945	10,487,395
1930	10,543,500	1946	15,566,047
1931	4,650,857		
1932	2,786,958	Total	$239,948,337

Dividends paid during 1945 and 1946.

	1945.	1946.
Base Metals Mining Corp., Ltd.		*$466,143
Bralorne Mines, Ltd.	$1,247,000	498,800
Britannia Mining and Smelting Co., Ltd.		
The Consolidated Mining and Smelting Co. of Canada, Ltd.	8,189,653	13,922,502
The Crow's Nest Pass Coal Co., Ltd.	186,354	186,354
Granby Consolidated Mining, Smelting and Power Co., Ltd.	74,966	
Highland Bell, Ltd.	13,159	
Island Mountain Mines, Ltd.	73,550	73,550
Kelowna Exploration, Ltd. (Nickel Plate)	210,000	
Providence	†10,504	
Relief Arlington Mines, Ltd.	*18,000	
Sheep Creek Gold Mines, Ltd.	225,000	178,125
Silbak Premier Mines, Ltd.	‡100,000	25,000
Others	139,209	215,573
Totals	$10,487,395	$15,566,047

* Distribution of capital. † Omitted from 1944. ‡ Includes $50,000 omitted from 1944.

TABLE XVIII.—SALARIES AND WAGES, FUEL AND ELECTRICITY, AND PROCESS SUPPLIES, 1946.

Class.	Salaries and Wages.	Fuel and Electricity.	Process Supplies.
Lode-mining	$17,441,272	$4,173,699	$5,018,341
Placer-mining	232,259	18,774	35,093
Coal-mining	5,262,996	294,414	1,034,173
Miscellaneous metals, minerals, and materials	1,269,126	162,110	2,023,937
Structural materials industry	1,984,547	778,461	256,161
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, 1935–46	275,462,919	*55,278,217	77,012,143

* 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, 1901–1946.

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	7,211,223	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	34,154,917	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**

* 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, 1901–1946.

Year.	Placer-mining.	Lode-mining.			In Concentrators.	In Smelters.	Coal-mining.			Structural Materials.		Miscellaneous.	Total.*
		Under.	Above.	Total.			Under.	Above.	Total.	Quarries and Pits.	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	581	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	3,555	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**

* 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.—METALLIFEROUS MINES SHIPPING IN 1946.*

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.
Krao	Ainsworth	Ainsworth	V. Esposito, Salmo		Silver, lead, zinc.
Silver Coin	Woodbury Creek	Ainsworth	J. Burns *et al.*, Ainsworth		Silver, lead, zinc.
Central Zeballos	Zeballos	Alberni	Controlled by Reno Gold Mines, Ltd., Vancouver	Amalgamation, flotation	Gold, silver.
Privateer	Zeballos	Alberni	Privateer Mine, Ltd., Vancouver	Amalgamation, cyanidation	Gold, silver.
Engineer	Tagish Lake	Atlin	Kirkwood, Forbes, and Sweet, Atlin		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.
Sullivan	Kimberley	Fort Steele	Cons. Mining & Smelting Co. of Canada, Ltd., Trail	Flotation	Silver, lead, zinc.
Monarch and Kicking Horse	Field	Golden	Base Metals Mining Corp., Ltd., Toronto	Table concentration, flotation	Silver, lead, zinc.
Cariboo Amelia	Camp McKinney	Greenwood	E. A. Wanke and O. Johnson, Greenwood		Gold, silver, lead, zinc.
Highland Bell	Greenwood	Greenwood	Highland Bell, Ltd., Vancouver		Silver, gold, lead, zinc.
Providence	Greenwood	Greenwood	W. E. McArthur, Jr., Greenwood		Silver, gold, 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	Amalgamation, flotation	Gold, silver.
Alpine	Sitkum Creek	Nelson	Alpine Gold, Ltd., Nelson	Flotation	Gold, silver, lead, zinc.
Arizona	Ymir	Nelson	B. Sterna, Nelson		Gold, silver.
Arlington	Erie Creek	Nelson	F. Lipsack *et al.*, Salmo		Gold, silver.
Bayonne	Tye	Nelson	Bayonne Consolidated Mines, Ltd., Vancouver	Cyanidation	Gold, silver, lead, zinc.
Centre Star (Wesko)	Ymir	Nelson	C. Anderson *et al.*, Ymir		Gold, silver, lead, zinc.
Daylight	Nelson	Nelson	Peter Rolich, Nelson		Gold, silver.
Kenville (Granite-Poorman)	Taghum	Nelson	Kenville Gold Mines, Ltd., Toronto		Gold, silver.
Kootenay Belle	Sheep Creek	Nelson	J. R. Thompson, Sheep Creek		Gold, silver.
Nugget	Salmo	Nelson	A. Endersby, Sr. and Jr., Fruitvale		Gold, silver.
Perrier	Nelson	Nelson	W. E. Anderson, Nelson		Gold, silver.
Porto Rico	Porto Rico	Nelson	W. E. Anderson, Nelson		Gold, silver.
Protection	Ymir	Nelson	J. Turk, Ymir		Gold, silver, lead, zinc.
Reno	Sheep Creek	Nelson	Clean-up; C. Anderson *et al.*, Ymir		Gold, silver.
Second Relief	Erie	Nelson	A. Burgess *et al.*, Salmo		Gold, silver.
Sheep Creek (Queen)	Sheep Creek	Nelson	Sheep Creek Gold Mines, Ltd., Vancouver	Cyanidation	Gold, silver.
Yankee Girl	Ymir	Nelson	C. Anderson *et al.*, Ymir		Gold, silver, lead, zinc.
Sonny Boy	Merritt	Nicola	Sonny Boy Gold Mining Syndicate, Vancouver		Gold, silver, lead, zinc.
Hedley Mascot	Hedley	Osoyoos	Hedley Mascot Mines, Ltd., Vancouver	Flotation, cyanidation	Gold, silver.
Nickel Plate	Hedley	Osoyoos	Kelowna Exploration Co., Hedley	Cyanidation, flotation	Gold, silver.
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.
Bosun	New Denver	Slocan	Santiago Mines, Ltd., Vancouver		Silver, lead, zinc.
Morning Star	Springer Creek	Slocan	George A. McMillan, Slocan City		Gold, silver, lead, zinc.
Number One	Sandon	Slocan	W. E. Lane, Ainsworth		Silver, lead, zinc.
Ottawa	Springer Creek	Slocan	Ottawa Silver Mining and Milling Co., Slocan City		Silver.
Surprise	Sandon	Slocan	Joe Gallo, Nelson		Silver, lead, zinc.
Victor	Sandon	Slocan	E. Doney, Sandon		Silver, lead, zinc.
Standard, Mammoth, and Enterprise	Silverton	Slocan	Western Exploration Co., Ltd., Silverton	Flotation	Silver, lead, zinc.
Zincton (Lucky Jim)	Zincton	Slocan	Zincton Mines, Ltd., Vancouver	Flotation	Silver, zinc, lead.
I.X.L.	Rossland	Trail Creek	M. J. Doran, Rossland		Gold, silver.
Midnight	Rossland	Trail Creek	B. A. Lins, Rossland	Amalgamation, jig, flotation	Gold, silver.
Union	Rossland	Trail Creek	M. Gach *et al.*, Rossland		Gold, silver, lead, zinc.
Britannia	Britannia Beach	Vancouver	Britannia Mining & Smelting Co., Ltd., Britannia Beach	Flotation	Copper, gold, silver.
Admiral	Vernon	Vernon	George Caryk, Vernon		Silver, lead, zinc.

* Includes producers of lode gold, silver, copper, lead, and zinc, but not producers of miscellaneous metals and minerals.

TABLE XXII.—MINING COMPANIES EMPLOYING AN AVERAGE OF TEN OR MORE MEN DURING 1946.*

Shipping Mines.

Name of Mine or Company.	Days Operating.		Tons.		Average Number Employed.	
	Mine.	Mill.	Mined.	Milled.	Mine.	Mill.
Ainsmore Consolidated Mines, Ltd.	360	360	8,873	8,873	13	2
Central Zeballos (Reno Gold Mines, Ltd.)	265	120	3,843	2,658	22	3
Privateer Mine, Ltd.	204	122	7,045	3,661	58	4
Polaris-Taku Mining Co., Ltd.	228	165	25,724	25,724	62	8
Cariboo Gold Quartz Mining Co., Ltd.	220	205	45,224	45,224	199	9
Island Mountain Mines Co., Ltd.	212	212	20,807	20,807	68	5
Sullivan (Cons. M. & S. Co. of Canada, Ltd.)	360	360	2,307,532	2,307,532	1,280	300
Base Metals Mining Corp., Ltd.	153	153	15,678	15,678	33	5
Highland Bell, Ltd.	300	......	2,655	......	48	......
Bralorne Mines, Ltd.	219	219	69,526	64,534	227	10
Pioneer Gold Mines of B.C., Ltd.	182	181	13,706	12,175	94	9
Alpine Gold, Ltd.	150	......	160	......	13	......
Bayonne Consolidated Mines, Ltd.	185	65	2,196	2,196	38	1
Kenville Gold Mines, Ltd. (Granite-Poorman)	†	†	245	......	12	......
Sheep Creek Gold Mines, Ltd. (Queen)	177	131	18,208	18,208	56	3
Hedley Mascot Gold Mines, Ltd.	153	178	32,448	32,448	75	21
Kelowna Exploration Co., Ltd.	168	184	46,494	46,494	79	40
Silbak Premier Mines, Ltd.	176	155	34,804	34,804	132	9
Copper Mountain (Granby Cons. M.S. & P. Co., Ltd.)	201	154	597,678	577,671	280	117
Santiago Mines, Ltd. (Bosun)	360	......	59	......	18	......
Western Exploration Co., Ltd. (Standard, Mammoth, Enterprise)	202	11	2,462	2,462	29	13
Zincton Mines, Ltd. (Sheep Creek Gold Mines, Ltd.)	312	135	45,064	45,064	40	7
Britannia Mining & Smelting Co., Ltd.	209	196	435,982	435,982	335	100

Non-shipping Mines.

Name of Mine or Company.	Days Operating. Mine.	Days Operating. Mill.	Tons Mined.	Tons Milled.	Average Number Employed. Mine.	Average Number Employed. Mill.
Cangold Mining & Exploration Co., Ltd.	......	......	......	......	19	......
Canusa Cariboo Gold Mines, Ltd.	......	......	......	......	10	......
Barkerville Mining Co., Ltd.	......	......	......	......	15	......
Cariboo Hudson Gold Mines (1946), Ltd.	......	......	......	......	10	......
Pellaire Mines, Ltd.	......	......	......	......	10	......
Dentonia Mines, Ltd.	......	......	......	......	22	......
Bridge River Consolidated Mines, Ltd.	......	......	......	......	12	......
B.R.X. Consolidated Mines, Ltd.	......	......	......	......	17	......
Pinebrayle Gold Mines, Ltd.	......	......	......	......	11	......
Congress Gold Mines, Ltd.	......	......	......	......	‡	......
Pacific (Eastern) Gold Mines, Ltd.	......	......	......	......	42	......
Vananda Mining Co.	......	......	......	......	27	......
Gold Belt Mining Co., Ltd.	......	......	......	......	39	......
Hedley Monarch Gold Mines, Ltd.	......	......	......	......	13	......
Big Four Silver Mines, Ltd.	......	......	......	......	14	......
Morris Summit Mines, Ltd.	......	......	......	......	24	......
Torbrit Silver Mines, Ltd.	......	......	......	......	11	......
Silver Ridge Mining Co., Ltd.	......	......	......	......	13	......
Kelowna Exploration Co., Ltd. (Ruth-Hope, Sandon)	......	......	......	......	12	......

* 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.

† No information.

‡ Information incomplete.

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 which are held 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 39 and 40.

Copies of the various Acts, upon payment of the prices listed on page 316, 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.

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.
1936	1,470	$50,000	$28.00
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*
Totals	10,374	$300,159	....

* 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	W. M. H. Dunn	
Sub-office	Poplar			A. Robb.
Alberni	Alberni	T. H. Harding	T. H. Harding	
Sub-office	Nanaimo			W. H. Cochrane.
Sub-office	Quatsino			Axel Hansen.
Sub-office	Tofino			Mrs. E. M. Burchett.
Sub-office	Zeballos			G. Nicholson.
Ashcroft	Ashcroft	D. Dalgleish (Kamloops)	W. F. Knowlton	
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			M. S. Morrell.
Sub-office	Squaw Creek			Mrs. F. Muncaster.
Sub-office	Telegraph Creek			R. F. Johnston.
Sub-office	Tulsequah			H. K. Richardson.
Cariboo	Barkerville	W. E. McLean	W. E. McLean	Mrs. T. B. McLean.
Sub-office	Fort McLeod			J. E. McIntyre.
Sub-office	McBride			J. Blezard.
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	A. W. Anderson	A. W. Anderson	C. J. Dainard.
Sub-office	Windermere			A. M. Chisholm.
Greenwood	Greenwood	W. L. Draper	W. L. Draper	
Sub-office	Beaverdell			L. F. Crump.
Sub-office	Grand Forks			E. Harrison.
Sub-office	Oliver			W. L. Cousins.
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			W. H. Davidson.
Sub-office	Cumberland			A. G. Freeze.
Sub-office	Granite Bay			H. J. Bull.
Sub-office	Quatsino			Axel Hansen.
Sub-office	Stuart Island			J. B. Willcock.
Sub-office	Tofino			Mrs. E. M. Burchett.
Sub-office	Vananda			Henry Carter.
Sub-office	Zeballos			G. Nicholson.
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			A. J. Sutherland.
Sub-office	Lytton			J. Blakiston-Gray.
Nicola	Merritt	D. Dalgleish (Kamloops)	R. G. Couper	
Omineca	Smithers	K. D. McRae	K. D. McRae	D. H. Bruce.
Sub-office	Bella Coola			E. Bradley.
Sub-office	Burns Lake			John Brown.
Sub-office	Copper River			L. G. Skinner.

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	Doreen			W. E. Horwill.
Sub-office	Fort Fraser			A. Fisher.
Sub-office	Fort St. James			Norman Henry.
Sub-office	Fort St. John			H. O. Callahan.
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	Terrace			T. D. Brunton.
Sub-office	Usk			V. H. Dodd.
Sub-office	Vanderhoof			George Ogsdon.
Osoyoos	Penticton	T. S. Dalby	T. S. Dalby	
Sub-office	Hedley			A. J. Dillabough.
Sub-office	Keremeos			L. S. Coleman.
Sub-office	Oliver			W. L. Cousins.
Peace River	Pouce Coupe	M. S. Morrell	S. M. Carling (Deputy)	
Sub-office	Fort St. John			H. O. Callahan.
Sub-office	Prince George			G. H. Hallett.
Portland Canal	Stewart	G. Forbes (Prince Rupert)	W. S. Orr	
Sub-office	Alice Arm			Mrs. M. V. Leake.
Quesnel	Williams Lake	Miss J. Foster	Miss J. Foster	
Sub-office	Barkerville			W. E. McLean.
Sub-office	Horsefly			A. B. Campbell.
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			A. J. Dillabough.
Skeena	Prince Rupert	G. Forbes	G. Forbes	
Sub-office	Bella Coola			E. Bradley.
Sub-office	Burns Lake			John Brown.
Sub-office	Copper River			L. G. Skinner.
Sub-office	Queen Charlotte			F. J. Walker.
Sub-office	Stewart			W. S. Orr.
Sub-office	Terrace			T. D. Brunton.
Slocan	New Denver	C. MacDonald (Kaslo)	F. Broughton	
Sub-office	Slocan			W. E. Graham.
Stikine	Telegraph Creek	R. F. Johnston	R. F. Johnston	
Sub-office	Burns Lake			John Brown.
Sub-office	Dease Lake			R. A. Farrell.
Sub-office	Fort St. John			H. O. Callahan.
Sub-office	Lower Post			J. W. Stewart.
Sub-office	Pouce Coupe			M. S. Morrell.
Trail Creek	Rossland	E. B. Offin	E. B. Offin	
Vancouver	Vancouver	J. Egdell	Mrs. D. White (Deputy)	Miss F. Schachter.
Sub-office	Alert Bay			W. H. Davidson.
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 L. Davey.

Gold Commissioners' and Mining Recorders' Office Statistics, 1946.

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	135	3	2	2	389	92	14	......	117	1	......	......	......	$874.00	$4,524.75	$5,398.75
Alberni	191	5	2	......	210	369	82	23	29	......	3	1	......	1,283.50	5,716.00	6,999.50
Ashcroft	56	......	......	1	70	75	13	......	......	4	2	12	11	313.25	1,793.25	2,106.50
Atlin	180	4	2	......	44	70	10	16	4	15	23	62	27	1,425.00	5,280.60	6,705.60
Cariboo	477	13	5	......	359	538	61	4	......	11	146	227	138	3,270.25	34,297.50	37,567.75
Clinton	41	1	......	5	133	171	15	......	2	3	4	4	8	286.00	2,069.00	2,355.00
Fort Steele	181	......	......	8	155	84	18	2	9	5	13	8	3	752.00	2,503.35	3,255.35
Golden	53	3	2	......	80	36	7	5	1	......	1	1	1	483.25	822.00	1,305.25
Greenwood	131	4	......	......	183	74	18	......	17	1	7	5	......	912.50	2,343.75	3,256.25
Kamloops	206	......	2	28	235	65	6	......	22	6	6	2	......	989.50	1,788.50	2,778.00
Lardeau	38	1	1	1	138	88	27	......	......	......	......	......	......	222.50	1,195.00	1,417.50
Lillooet	348	11	7	6	599	938	188	11	9	5	24	21	15	2,681.00	7,857.40	10,538.40
Nanaimo	132	1	......	......	217	480	23	......	16	......	1	......	......	686.75	2,678.68	3,365.43
Nelson	328	11	9	9	496	392	23	5	17	17	6	3	......	2,579.75	7,111.25	9,691.00
New Westminster	221	2	3	30	232	219	56	9	12	4	5	14	6	1,210.50	4,628.00	5,838.50
Nicola	36	1	......	1	56	106	5	......	......	......	......	......	......	242.75	503.75	746.50
Omineca	332	4	1	1	535	551	30	......	6	2	8	47	5	1,773.75	9,101.50	10,875.25
Osoyoos	134	1	1	1	301	178	38	......	8	......	......	......	......	595.25	2,087.50	2,682.75
Peace River	228	......	1	......	86	21	25	......	......	......	7	......	5	917.00	591.00	1,508.00
Portland Canal	92	6	......	......	241	176	32	......	......	......	......	......	......	1,171.25	1,489.25	2,660.50
Quesnel	476	8	5	44	275	116	17	......	......	17	83	116	72	2,875.25	11,284.75	14,160.00
Revelstoke	69	......	3	......	154	91	157	......	42	......	6	1	1	318.50	2,318.50	2,637.00
Similkameen	229	4	......	6	155	90	64	......	3	3	68	19	101	1,582.75	3,855.50	5,438.25
Skeena	142	......	......	......	62	60	1	6	91	......	......	......	......	608.25	3,040.75	3,649.00
Slocan	119	1	......	......	362	80	8	......	......	......	......	......	......	633.50	1,099.50	1,733.00
Stikine	75	......	1	......	51	42	40	......	......	......	10	20	24	376.75	2,069.25	2,446.00
Trail Creek	114	1	2	1	101	32	2	......	26	2	......	......	......	657.00	1,040.50	1,697.50
Vancouver	1,481	87	23	44	176	111	18	......	14	......	......	2	1	14,648.75	2,697.01	17,345.76
Vernon	119	1	......	13	80	24	4	......	......	......	......	6	1	558.00	762.75	1,320.75
Victoria	246	9	4	14	54	46	2	......	7	2	3	......	4	2,097.50	1,958.00	4,055.50
Totals, 1946	6,610	182	76	215	6,229	5,405	1,004	81	452	98	426	571	423	$47,026.00	$128,508.54	$175,534.54
Totals, 1945	6,213	165	47	133	4,534	3,250	815	101	212	94	316	328	316	35,901.25	78,226.18	114,127.43

CHEMICAL LABORATORIES.

During 1946 the chemical laboratory in Victoria issued reports on 2,290 samples and specimens. A laboratory examination of a 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. The laboratory reports were distributed in the following manner amongst *bona fide* prospectors, *bona fide* prospectors who were grantees under the " Prospectors' Grubstake Act," and Departmental engineers.

	Samples and Specimens.	Mineralogical Determinations.	Spectrographic Analysis.	Assays.
Bona fide prospectors	871	859	798	1,374
Bona fide prospectors (grantees)	419	382	372	757
Departmental engineers	1,000	7	277	1,757
Totals	2,290	1,248	1,447	3,888

Serially numbered sample or specimen tags stapled together in booklets of ten continued to be supplied free of charge to *bona fide* prospectors during 1946. About 75 per cent. of those who submitted samples used these tags, and their availability was drawn to the attention of those who did not. In addition, shipping-tags and sample sacks were loaned free of charge to those prospectors who requested them for use when submitting samples or specimens to this laboratory.

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

Twenty-one analyses of agricultural materials were performed for the Department of Agriculture. Eleven samples of water were analysed for mineral contents; five of these were for the Provincial Board of Health, three were for the Department of Public Works, two were for the Department of Trade and Industry, and one was for the Petroleum and Natural Gas Commissioner. Twelve other analyses of a miscellaneous nature were made for various Departments.

For the Attorney-General's Department, fifty-two cases of a chemico-legal nature were undertaken, involving a study of 239 exhibits of a very varied nature. These cases included twenty-four toxicological analyses, which figure is much above the average.

A total of 115 lots of placer gold, amounting to 136.5447 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 at Victoria in May and in December, and at Trail in August and in December. In all, fourteen candidates sat for the entire examination, and, of these, five passed, five were granted supplementals in wet assaying and two in fire assaying, while two failed. In addition, four candidates sat for supplemental examinations, and, of these, one passed and three failed. Two applications for licences to practise assaying under section 11, subsection (2), of the " Department of Mines Act " were received; one was granted, and the other rejected.

INSPECTION BRANCH.

Organization and Staff.

Inspectors of Mines, May 1st, 1947.

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

The Inspectors are now stationed at the points listed, and inspect coal mines, metalliferous mines, and quarries in their respective districts.

Board of Examiners for Coal-mine Officials, May 1st, 1947.

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

Messrs. Bonar and 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.

James Dickson retired as Chief Inspector of Mines on April 30th, 1947, and was succeeded by James Strang; at the same time Hamilton C. Hughes was appointed Senior Inspector of Metalliferous Mines.

On the retirement of James Dickson, James Strang succeeded him as Chairman of the Board of Examiners for Coal-mine Officials, and John MacDonald was appointed a member of the Board.

Alfred Gould, instructor, mine-rescue station at Princeton, retired in December, 1945, and James L. Brown, instructor, mine-rescue station at Cumberland, retired on December 31st, 1946. Thomas H. Cunliffe was appointed instructor at the Princeton Station and Arthur Williams as instructor at the Cumberland Station. Both of the new appointees are veterans of World War II.

James Dickson.

James Dickson, Chief Inspector of Mines and Chairman of the Board of Examiners for Coal-mine Officials, retired at Victoria at the end of April, 1947.

He was born in Scotland and studied mining engineering at the Royal Technical College, Glasgow. Before coming to British Columbia, he served as a mine official in several Old Country collieries.

He came to British Columbia in 1912 and, after holding official positions in several Vancouver Island coal mines, became manager of the Reserve mine of the Western Fuel Company. In 1919 he left this position to join the staff of the Department of Mines as Inspector of Mines and member of the Board of Examiners for Coal-mine Officials. He became Chief Inspector in 1926.

During his long tenure of office as Chief Inspector he was instrumental in introducing many sound safety provisions in both the Coal and the Metalliferous Mines Regulation Acts. He was especially active in promoting mine-rescue work, in the training of mine personnel for this very important and necessary phase of safety-work, and is directly responsible for the high standard of efficiency of the mine-rescue stations maintained at the important coal-mining centres throughout the Province.

His enthusiasm for his work, coupled with a genial manner and a thorough appreciation of the other fellow's problems, have created a host of friends among the mining fraternity in the Province. The same manner and a deep personal consideration have won him the esteem of the staff of the Department, who join in wishing him many years of continued activity and happiness.

Reports.

Reports on the inspection of metalliferous mines and quarries will be found on pages 210 to 214. On pages 281 to 301 will be found the first report of the Electrical Inspector, dealing with the inspection of electrical installations and equipment at metal mines, coal mines, and quarries. The section of the Annual Report entitled "Coal-mining" is contributed by the Inspection Branch, as is also much of the material under the headings "Metal-mining," "Placer-mining," and "Structural Materials and Industrial Minerals."

MINERALOGICAL BRANCH.

In 1946 the Mineralogical Branch completed fifty years of service, which began in 1896 with the appointment of W. A. Carlyle as the first Provincial Mineralogist.

Field-work by officers of the Mineralogical Branch is devoted principally to geological mapping and the examination of mineral deposits, the results of which are published partly in the Annual Report of the Minister of Mines and partly in a series of bulletins. The Annual Report is compiled and edited by the Mineralogical Branch. Other 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.

In 1946 the manuscripts of Bulletin 22, "Geology of the Whitewater-Lucky Jim Mine Areas"; Bulletin 23, "Calcareous Deposits of the Georgia Strait Area"; and Bulletin 24, "Geology and Coal Resources of the Carbon Creek-Mount Bickford Map-area," were written. Other activities are noted in the following references to members of the staff and to the field-work done by the several engineers, also in the notes on the training course for veterans and grub-staking prospectors.

B. T. O'Grady supervised the road and trail and the grub-stake programmes of the Department, and assisted the Securities Commissioner in administration of the "Securities Act."

J. T. Mandy, who had been the Department's engineer at Prince Rupert from 1928 till 1943, and from 1943 at Vancouver, retired from the service of the Department early in 1946.

John S. Stevenson, with two assistants, spent most of the field season on detailed examinations of mining properties in the Bridge River area, and spent the latter part of the season completing examinations of properties in the Zeballos area.

John M. Cummings, who had been on loan to the British Columbia Research Council, returned to the service of the Department at the first of September as the Department's engineer in Vancouver.

M. S. Hedley, with one assistant, made property examinations in the Slocan area, and began mapping in detail an area extending westerly and south-westerly from Sandon. During the latter part of the season J. M. Black, with one assistant, collaborated in the detailed mapping.

Stuart S. Holland, with one assistant, completed the detailed mapping of a part of the Cariboo gold belt.

W. H. Mathews went on leave of absence at the beginning of the summer to undertake postgraduate study.

K. DeP. Watson, with two assistants, completed field-work in the Squaw Creek-Rainy Hollow area. At the end of the field season Dr. Watson left the service of the Mineralogical Branch to join the staff of the Department of Geology of the University of British Columbia.

W. J. Lynott, with two assistants, began mapping an area between Tofino Inlet and Warn Bay. Early in September he was granted leave of absence to permit him to continue his postgraduate studies.

W. H. White, after obtaining his discharge from the R.C.A.F., joined the staff of the Mineralogical Branch at the end of January, 1946. After spending some time supervising drilling at Merritt and supervising the preliminary training of veterans in prospecting (*see* page 47) he made property examinations at Olalla, Portland Canal, and on the Canadian National Railway. He had one assistant in the field.

C. B. Newmarch joined the staff of the Mineralogical Branch in April. After some time supervising drilling at Merritt, he began detailed mapping in part of the Crowsnest Pass coal area. He had one assistant in the field.

J. M. Black joined the staff of the Mineralogical Branch in June, having just obtained his discharge from the Canadian Army. After supervising drilling at Merritt, he collaborated with M. S. Hedley in detailed mapping of a part of the Slocan area. He had a student assistant during the latter work.

A. Fraser Shepherd, who had obtained his discharge from the Canadian Army in June, 1945, and had spent the intervening months in postgraduate study in the Department of Geology at the University of British Columbia, joined the staff of the Mineralogical Branch as technical assistant in June, 1946, and also serves as custodian of the technical library and the mineral museum.

H. T. Nation, who since 1910 had been a member of the staff of the Mineralogical Branch and who had served as a field assistant much of the time between 1906 and 1910, retired at the end of September, 1946. He served in the Canadian Expeditionary Force from November, 1914, to October, 1917, being discharged with the rank of major. Before enlisting he had served as a field and general technical assistant to the Provincial Mineralogist. Following his discharge from the Army, Major Nation served as a general technical assistant to the Provincial Mineralogist and as librarian. His familiarity with the geography of the Province and with mining activities fitted him uniquely for the task of indexing the Department's publications as they were issued and for preparing Index to Annual Reports of the Minister of Mines, 1874 to 1936, published in 1938, and Index to Annual Reports of the Minister of Mines, 1937 to 1943, and Bulletins Nos. 1 to 17, published in 1944. At his retirement Major Nation had served thirty-six years on the permanent staff of the Department and had been associated with the Department for a period of forty years. The warm good wishes of the staff of the Department and of other associates in the Government service go with Major and Mrs. Nation.

Kenneth Sutherland Crabtree, following his discharge from the Canadian Army, joined the staff of the Mineralogical Branch as draughtsman in May, 1946.

D. H. Rae and N. G. Freshwater were employed for the summer months to assist Mr. O'Grady on the grub-stake programme.

J. W. McCammon was employed for a short period mapping a small area on Blue Creek.

Ralph Toombs was employed for the summer months at first as an instructor at the Emory Creek training camp and later supervising the work of the prospector trainees in the field. Ten field assistants were employed on the various field projects mentioned.

Grub-staking Prospectors.

The "War-time Prospectors' Grub-stake Act," passed at the 1943 session of the Legislature, authorized the provision of grub-stakes as a means of assisting prospectors in the search for strategic minerals required in the prosecution of the war. Amendments made to the 1943 Act by the Legislature in March, 1944, included striking out the term "war-time" and the definition of "war minerals." Grub-stakes were limited under the 1943 Act to $300 per man; the amended Act provided for an additional allowance of up to $200 per man for travelling expenses if required. For the 1943 season (fiscal year 1943–44) $25,000 was appropriated by the Legislature, and for each subsequent season an appropriation of $50,000 has been made.

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

Many of the men grub-staked are veterans of one or both World Wars. In addition to the ninety-five regular grub-stakes granted in 1946, eight grub-stakes were granted to veterans who completed a training course mentioned later. The expenditure for 1946 includes this item and expenditures made in connection with the veterans' prospecting training programme carried out under the auspices of Canadian Vocational Training (D.V.A.) with the co-operation of the British Columbia Department of Mines.

Samples and specimens submitted by grub-staked prospectors are examined by an engineer, following which most of them are given further study involving one or more of: mineralogical determination, spectrographic analysis, assaying.

Search for strategic minerals was stressed in the 1943 season, but the prospectors were urged also to be on the lookout for deposits of ores of precious and base metals. Deposits of scheelite and other strategic minerals were found, but by the end of the season it was apparent that the war demand for such minerals would be met from properties already in production or fully developed. In subsequent seasons attention has been given principally to the search for deposits of metallic minerals. Several properties located by holders of grub-stakes have been taken up and have been explored by mining companies and syndicates. A moderate quantity of gold ore has already been shipped from the Good Hope property at Hedley, located in 1943 and taken up by

Hedley Mascot Gold Mines, Limited. The Harrison property in Tweedsmuir Park has been explored by Pioneer Gold Mines of B.C., Limited. The Paymuck on Marshall Creek, and the Truax (Ranger) on Mount Truax in the Bridge River District, and the Warrior on Carpenter Creek, near Pacific, have been explored by companies or syndicates. Discoveries near Goldway Peak (McConnell Creek) made by two holders of grub-stakes in 1946 have also aroused interest.

The grub-stake programme has been organized and supervised by B. T. O'Grady. In 1946 he was assisted by D. H. Rae and N. G. Freshwater.

Prospectors' Training Course for Veterans.

In 1946 a course in prospecting was offered to ex-service men under provisions of the rehabilitation programme of the Department of Veterans' Affairs. The course was given under the supervision of Canadian Vocational Training. Organizing the course was the responsibility of the Mineralogical Branch. W. H. White, of the Mineralogical Branch, was in charge of instruction in geology, mineralogy, and prospecting methods. Preliminary training was given at Emory Creek, where a training camp had been operated before the war. The preliminary training was followed by a period of prospecting under supervision. The cost of rehabilitating the camp was met by the Department of Mines. The trainees were maintained from D.V.A. grants while the course was in progress. The costs for instructors and supervisors employed for this course were shared by Canadian Vocational Training and the Department of Mines.

Rehabilitation of the camp at Emory Creek was started on April 10th, and by May 20th preparations had been completed to train thirty men. More could have been accommodated with little difficulty, but unfortunately only fourteen ex-service men took advantage of the opportunity. Eight men completed the course.

The course at Emory Creek was of eight weeks' duration. Lectures and practical study were given in geology and mineralogy, the emphasis being on mineral and rock identification and the field occurrence of ore deposits. The men were shown how to prospect intelligently and efficiently, how to use a compass and read a map, and how to stake and record mineral and placer claims. They learned, by doing, how to sharpen and use hand-steel, handle powder, drive and timber a tunnel, and sink a shaft in overburden. They learned to use the gold-pan, and built and operated rockers and a sluice-box. Tests from time to time checked their progress, and extra instruction was given as necessary.

From July 20th to September 20th the trainees prospected under supervision in the Bridge River District. The men worked in parties of two or three, and were visited and advised frequently by an instructor. Since the conclusion of the training programme, several of the men have visited the office of the Department of Mines in Victoria and have expressed satisfaction with the course, and are actively making plans to continue prospecting next season.

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 303.

PUBLICATIONS.

Annual Reports of the Minister of Mines, bulletins, and other publications of the Department, with prices charged for them, are listed on pages 301 to 303.

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; in the offices of the Inspectors of Mines in Nelson and Prince Rupert, as well as in public libraries listed on pages 304 and 305.

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 were to be carried on by the Geological Survey of Canada; this agreement has been fully adhered to by the Dominion of Canada and has proved of great benefit to the mining industry of the Province. Each year several geological parties are kept in the field, and in the many excellent reports and maps covering British Columbia, issued by the Geological Survey of Canada, a vast amount of information has been made available to prospectors and mining engineers.

For some years a branch office of the Geological Survey has been maintained in Vancouver, where copies of maps and reports on British Columbia can be obtained. The officer in charge of the British Columbia office is W. E. Cockfield, and the address is 305 Federal Building, Vancouver, B. C.

In 1936 a reorganization of several departments in the Federal Government was effected, and the Department of Mines and Resources created. One of the main branches of this Department is that of Mines and Geology, with sub-branches known as the Bureau of Geology and Topography and the Bureau of Mines. The Geological Survey of Canada and the Topographical Survey are now a part of the Bureau of Geology and Topography. During the 1946 season the Bureau of Geology and Topography had no topographic parties working in British Columbia, the following officers being employed on geological field-work in British Columbia:—

Geological Parties.

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

J. E. Armstrong and J. W. Hoadley commenced and completed the geological mapping of the Carp Lake area; longitude 123°–124°, latitude 54°–55°.

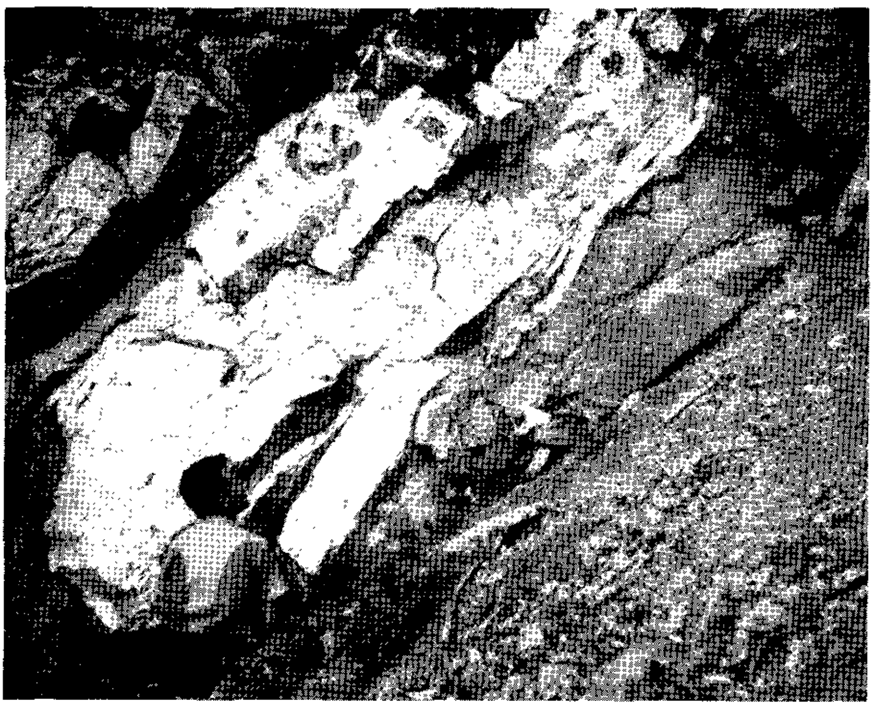
A. F. Buckham continued a study of the coal-bearing rocks in the Nanaimo and Cumberland areas, Vancouver Island.

S. Duffell and K. C. McTaggart completed geological mapping of the Ashcroft area; longitude 121°–122°, latitude 50°–51°.

H. M. A. Rice continued geological examination of the Salmon Arm area; longitude 119°–120°, latitude 50°–51°.

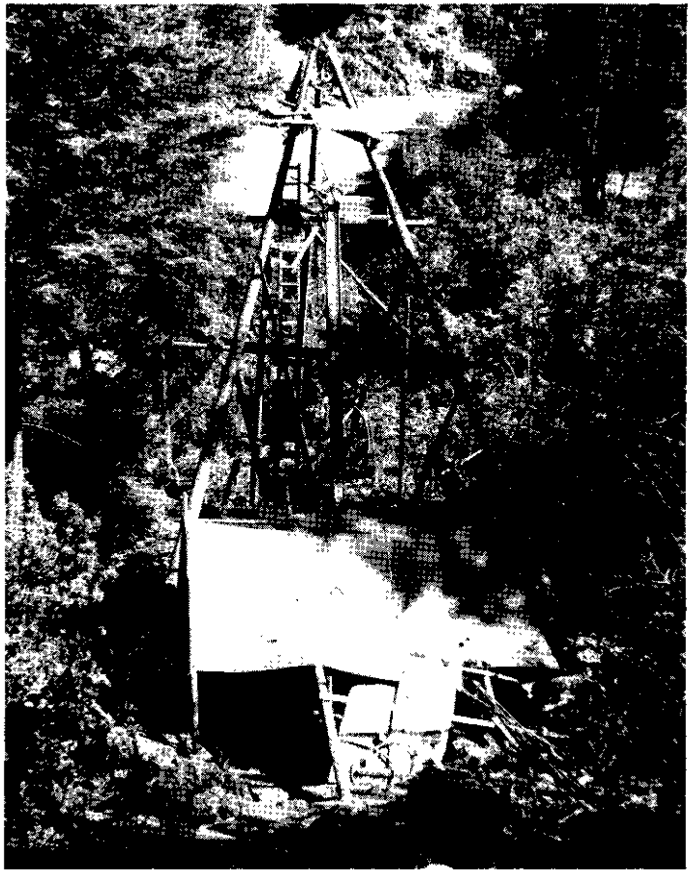
PLATE I.

A. Camp at Hi-do, Pellaire Mines, Limited, elevation 7,880 feet, Taseko Lake area.



B. Outcrop of Forty Thieves vein, Bridge River.

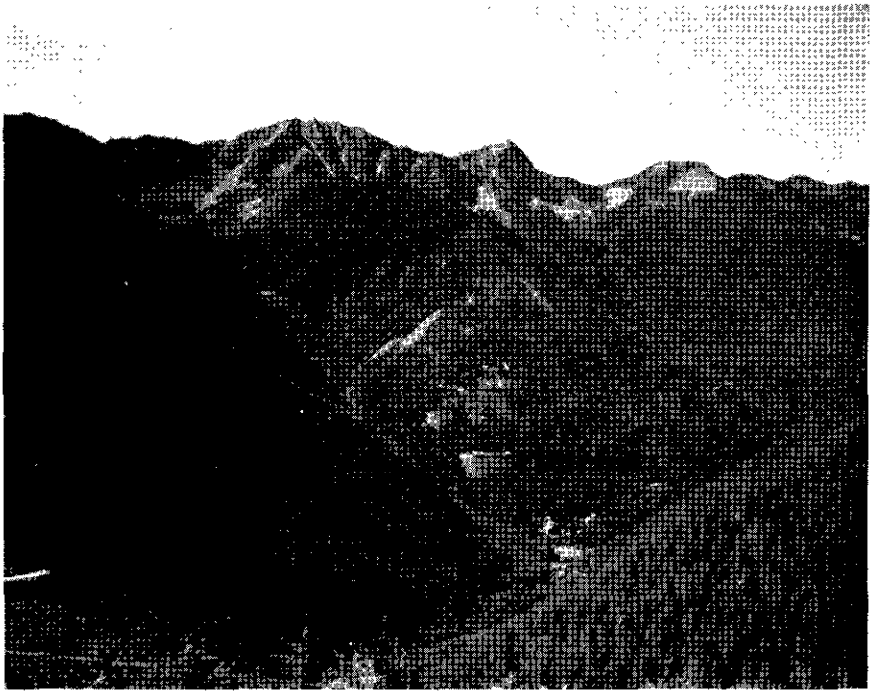
PLATE II.



A. Diamond-drilling on the Alma claim, Bridge River.

B. Six-ton ore skip on surface tramway, Nickel Plate mine, Hedley.

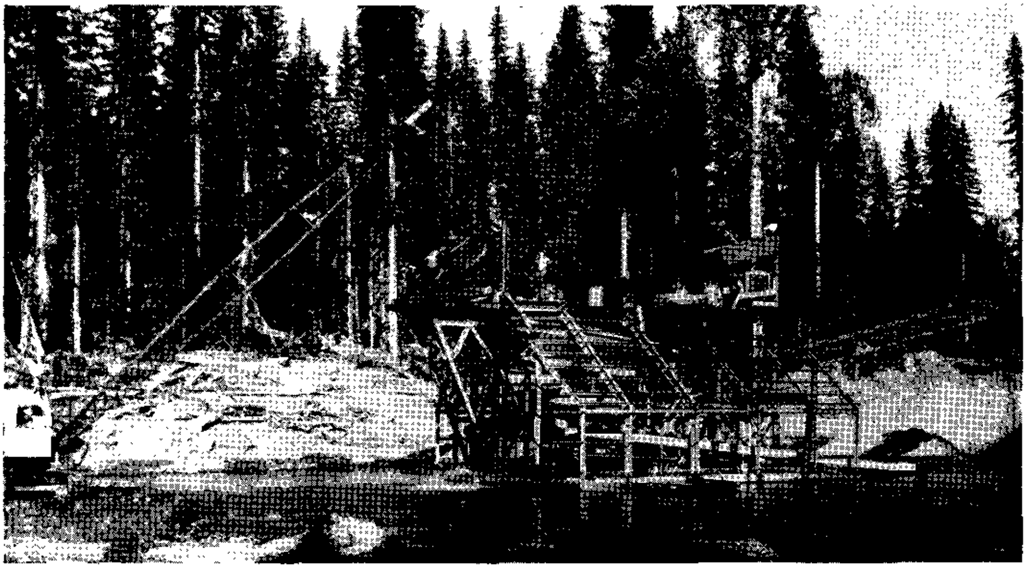
PLATE III.



A. Valley of Carpenter Creek from Noble Five mine; Sandon in valley-bottom; Ruth-Hope dumps, centre.

B. Concentrator of Western Exploration Company, on shore of Slocan Lake, Silverton.

PLATE IV.



A. Drag-line shovel and floating washing plant, Swift River Dredging Company, Cariboo.

B. Looking down Lowhee placer pit, Barkerville.

METAL-MINING (LODE).

CONTENTS.

DRAWINGS.

GENERAL REVIEW.*

The total quantity of ore mined from lode mines in British Columbia in 1946 was 3,705,375 tons, compared with 4,377,722 tons mined in 1945. The quantities of all the principal metals except silver were less than quantities produced in 1945, and ranged from 1.6 per cent (lead) to 33 per cent (gold) less than the 1945 figures. The prices for silver, copper, lead, and zinc increased, and the increases were more than enough to offset the reductions in quantities of these metals and the reductions in both the quantity and price of gold. The quantities of metals recovered were reduced because the copper mines, most of the producing gold mines, and several silver-lead-zinc mines were affected by a strike which began July 3rd. The major silver-lead-zinc producer, the Sullivan, was not affected. The strike was directed against producing mines, and workers at properties not in production were not called out. Although arrangements to settle the strike affecting copper mines were made in October and November, production had not reached full scale at Britannia and had not been resumed at the Copper Mountain mine at the end of 1946. The strike affecting gold mines was settled in November and December, but production at several mines had not been resumed at the end of 1946. A strike of short duration had affected the Sheep Creek mine in the first half of the year, and the Polaris-Taku mine was affected by a strike in November.

The exchange ratio for United States and Canadian dollars, authorized by the Canadian Foreign Exchange Control Board, was changed on July 5th. The Canadian dollar, which had been 10 per cent. below par, was raised to parity with the United States dollar; thus for Canadian producers the settlement price for gold was reduced by 10 per cent. The prices for silver, copper, lead, and zinc improved materially during the year and were higher than average.

Shipments of British Columbia copper- and gold-bearing concentrates to the Tacoma smelter were held up by a strike which affected the smelter for five months. In addition to the inconvenience caused by the delay, shippers also suffered loss of the premium on the gold content of concentrates produced before July 5th and held up because of the strike at the smelter.

Programmes of exploration and development had been arranged for numerous properties in gold camps before the British Columbia strike, and the change in the exchange rate affected adversely the earnings of gold mines. Exploration and development at many non-producing properties were continued while the strike was in progress.

After having been shut down since April, 1942, the Polaris-Taku property was reopened, and production was resumed in the latter part of the year. Production at the Privateer mine, which had been resumed in February, was interrupted by a fire which destroyed the power plant; production was resumed in November, 1946, after the replacement of the power plant.

Mining on a modest scale was undertaken at the Engineer mine on Tagish Lake and at McDame Lake.

Exploration and development were undertaken in many gold camps. In Portland Canal work was done on several properties, and a substantial exploration programme was undertaken by Morris Summit Gold Mines, Limited, on the Salmon Gold property. At Princess Royal Island, exploration was undertaken by Surf Inlet Consolidated Gold Mines, Limited, the property having been shut down in 1942.

In the Cariboo District exploratory work was undertaken on several properties, including underground work on the Cariboo Hudson, extensive surface exploration on Proserpine, Antler, and Island Mountains by Barkerville Mining Company, and diamond-drilling on the Westport group by Williams Creek Gold Quartz Mining Com-

* By Hartley Sargent, Chief Mining Engineer.

pany. Canusa Cariboo Gold Mines, Limited, began sinking a shaft as an exploration venture.

In the Taseko Lake area Pellaire Mines, Limited, undertook road construction and continued underground exploration on the Hi Do property.

In the Bridge River area, in addition to exploratory work done on the Bralorne and Pioneer properties, diamond-drilling from the surface or underground was done on seven properties and underground development or exploratory work was done on seventeen, including the B.R.X., on which the California shaft was reopened and deepened ; the Pacific Eastern, on which the shaft and lateral workings were reopened and the lateral workings were extended; and the Congress, on which shaft-sinking and drifting were done. The lowest adit of the Wayside was reopened and the surface plant was reconditioned or rebuilt.

In the Hedley Camp exploratory work and development were undertaken on the Nickel Plate and Hedley Mascot properties, while surface or underground exploratory work, including diamond-drilling, was undertaken at six other properties. Exploratory work was undertaken by Guichon Mine, Limited, in the Nicola area and by Hedley Monarch Gold Mines, Limited, at Olalla.

Exploratory work, preparations for exploratory work, and leasing-type operations were carried on at seventeen properties in gold or copper-gold areas in the Boundary country from Fairview to Rossland.

In the Nelson-Ymir-Sheep Creek area work was done on nineteen properties in gold belts; of these, ten were leasing-type operations, from which gold-bearing ore was recovered. Production and development by Sheep Creek Gold Mines, Limited, were reduced materially because of strikes and the shortage of mine labour. Exploratory work was continued on the property of Kenville Gold Mines, Limited, and the Gold Belt property was reopened and exploratory work was undertaken. Work was also undertaken at the Bayonne and Alpine properties, some gold being recovered from each, but work was suspended at both properties before the end of the year.

On Texada Island underground work and substantial programmes of diamond-drilling, both from the surface and underground, were done on the Marble Bay and Vananda (Little Billie) properties.

On the west coast of Vancouver Island, from Deep Inlet to Tranquil Inlet, prospecting or exploratory work or leasing were undertaken at fifteen properties; of these, the Privateer, Spud Valley, and Central Zeballos were in production for part of the year. Work was also undertaken by Cangold Mining and Exploration Company at the Sherwood property and by Twin J Mines, Limited, at the Lenora-Tyee property north of Duncan.

Good prices for silver, lead, and zinc encouraged work in several areas. At Portland Canal, Big Four Silver Mines, Limited, consolidating the Silverado, Porter Idaho, and Prosperity properties, began an exploration programme on the Silverado. At Alice Arm, Torbrit Silver Mines Company, Limited, controlled by Mining Corporation of Canada, began preparing the Toric property for production. The surface plant and underground workings of the Duthie property at Smithers were reconditioned. At Beaverdell control of the Highland Bell property was acquired by Leitch Gold Mines, Limited, and exploration was undertaken in the district by other companies. South of Nelson, in the Ymir-Salmo and Nelway areas, exploratory work was done on several zinc or lead-zinc properties. In the Slocan and Ainsworth Mining Division production was hampered by the strike, but interest in the area was keen, and substantial programmes of exploratory work were undertaken on several properties. At the Sullivan mine a major development programme was undertaken, involving changes in the underground and surface haulage, placing the primary crushing units underground, and installing the sink-and-float process at the mill. Production at the Monarch and

Kicking Horse properties was interrupted by the strike and had not been resumed at the end of the year.

A revival of interest in tungsten was indicated by the purchase of the Emerald property (Nelson Mining Division) by Canadian Exploration Company, which company also prospected the Sapples tungsten property on Sheep Creek.

NOTES ON METAL MINES.

The following section includes short notes on mines and prospects and more detailed reports on some properties and areas. In the main the material in the short notes was supplied by Inspectors of Mines, and the more detailed notes are the work of Engineers of the Department's Mineralogical Branch, but may include the contributions of an Inspector. Authorship is indicated by foot-notes. Statistics regarding development and production have been obtained from the Bureau of Economics and Statistics through the courtesy of the property-owners. Information has also been obtained from the office of the Registrar of Companies.

The notes are arranged in a geographical order under headings which are place-names suggesting the area in which the properties are found. As a further aid in placing the properties, the approximate geographic positions are indicated by numbers and letters in parentheses following the place-name or the name of the property. The numbers refer to the latitude and longitude of the south-eastern corner of the 1-degree quadrilateral, and the letters refer to the quarter of the quadrilateral in which the property is situated.

ATLIN (59° 134° S.E.).*

Gold.

Engineer. Neil Forbes, T. J. Kirkwood, and Walter Sweet own and operate the Engineer mine on the north shore of Tagish Lake. The mine has been idle for many years. In order to work below the main level, it was necessary to partly unwater the shaft. After some experimenting a workable arrangement was developed. A water-line under a pressure of 65 lb. per square inch was connected to a nozzle, reducing from 2 inches to 3/8 inch, fitted into the lower end of a 2-inch tee, with the tip of the nozzle at the top of the side opening of the tee. The suction-pipe was connected to this opening. The upper end of the tee was connected by a close nipple and a 2-inch by 3-inch reducer to a 3-inch discharge-pipe. In the discharge-pipe a throat—made from two pieces of oak, semi-circular in cross-section and held in place by set screws—narrows in 5 inches of length to 1 1/8 inches diameter then expands in 8 inches to the full diameter of the pipe. This device was lowered into the shaft to a depth of slightly over 30 feet. When the water was turned on, it cleared the shaft to a depth of 30 feet and holds the water there.

Two small shafts were sunk on an ore-shoot to a depth of 30 feet and are connected with a crosscut. The vein varies from 6 to 9 inches in width and is high grade. About 5,400 cubic feet has been mined, and over $10,000 in gold has been recovered. All work is done by hand-steel.

The old assay crushing and grinding plant, driven by a small gasoline-engine, is used to grind the ore, which is treated in a small barrel amalgamator, 24 inches in diameter, capable of handling 32 lb. of ore per batch. The amalgamator is run by a small overshot water-wheel at 28 to 30 revolutions per minute. Each batch of ore takes about six hours. All tailings from the barrel are saved. A sample of these tailings

* By Charles Graham.

assayed: Gold, 3.72 oz., and silver, 3.84 oz. per ton. When sufficient tailings have accumulated, a shipment will be made to a smelter.

Only the owners, who are all miners, are employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1933, p. 73.]

TAKU RIVER (58° 133° N.W.).*

Gold.

Polaris-Taku Mine, Taku River Gold Mines, Ltd. Company office, 1500 Royal Bank Building, Vancouver. President, W. B. Milner; Manager, Frank H. MacPherson; Mine Superintendent, D. Sykes. Capital: 3,000,000 shares, no par value. The mine resumed operations on April 19th, 1946, after having been idle since March 31st, 1942. Operations were continuous, except for fifteen days' time lost owing to a strike.

The shaft was deepened an additional 300 feet. Other development consisted of 883 feet of drifting and 45 feet of crosscutting. No diamond-drilling was done during the year. A new stope was opened on C level.

An extension to the crusher building to house a new Symons cone-crusher, including conveyer-belts and screens, was about two-thirds completed. Changes were made in the power distribution system, so that the mine, mill, and camp circuits now go out of the power-house separately.

A safety committee of employees was formed and is now functioning regularly.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1936, pp. B 21–B 28.]

Tulsequah Chief and Big Bull. Work was done on these two groups by Consolidated Mining and Smelting Co., Ltd. J. C. McLean was the engineer in charge. The road up Tulsequah River to the Tulsequah Chief property was put into shape. Five diamond-drill holes were put in, having a total footage of 2,874 feet. Geological work and sampling were done on this group and also on the Big Bull group on Taku River. Several men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1929, pp. 136–139.]

McDAME CREEK (59° 129° S.W.).*

Gold.

Cornucopia Group, Benroy Gold Mines, Ltd. T. E. Davey, Engineer. The Cornucopia group of seven claims is on the north side of McDame Lake and about 3 miles distant from it. The company obtained the property from J. C. Simpson and carried out a programme of diamond-drilling during the summer months. A development programme proposed for 1947 includes the sinking of a shaft about 300 feet deep.

PORTLAND CANAL.†

SALMON RIVER (56° 130° S.E.).

Gold.

Silbak Premier Mines, Ltd.* D. L. Coulter, General Manager; J. G. Pearcey, Superintendent. Capital: 3,000,000 shares, $1 par value. The mine worked 176 days and produced 34,804 tons (dry). A strike accounted for 133 days' lost time. Work was resumed on December 9th. Shortage of labour also hampered the operations during the working period. Development-work consisted of 1,972 feet of drifting, 145 feet of crosscutting, 227 feet of raising, and 5,019 feet of diamond-drilling. As miners become available, development of indicated ore-shoots will be carried on.

* By Charles Graham.
† By W. H. White, except as noted.

At the end of 1946 milling had not been resumed; the mill machinery was being overhauled and a new jaw-crusher was being installed.

Ore milled amounted to 34,804 tons. Net contents: gold, 8,163 oz.; silver, 38,066 oz.; lead, 1,171,261 lb.

Silver.

Silver Tip Gold Mines, Ltd.

Company office, 415 Scollard Building, Victoria. G. E. Winkler, Managing Director. Capital: 3,000,000 shares, 50 cents par value. The property consists of five Crown-granted claims—Bella Coola, Silver Leaf, Ladybird, Good Hope, and May P.J.—on the rolling southward slope of Mount Dillsworth, and is reached by 1½ miles of pack-trail from the end of the motor-road from Stewart at the Big Missouri camp-site.

The property is in the southern margin of the " belt of dykes " which traverses the Portland Canal area in a north-westerly direction. Numerous branching and intersecting acidic dykes, separated by bands of argillite, conglomerate, and tuffaceous rocks, characterize the geology. Mineralized zones have been found between and in the margins of several dykes.

Former development includes two long adits and several short adits, totalling about 1,400 feet of underground workings, and numerous open-cuts, most of which are now caved.

In 1946 three men were engaged in driving a crosscut northerly from the long adit on Ladybird No. 2 claim in an attempt to locate the continuation of a mineralized zone exposed in an open-cut some 200 feet above. This exposure, on the hanging wall of a feldspar porphyry dyke, strike north 65 degrees west and dip 55 degrees south-westward, is of soft black sheared rock, brecciated and filled with drusy quartz and calcite stringers, and mineralized with disseminated, fine-grained pyrite and occasional grains of sphalerite and galena. A 40-inch channel sample across the footwall-side of the zone assayed: Gold, trace per ton; silver, 4.3 oz. per ton; lead, 0.5 per cent.; and zinc, 1.03 per cent.

Some 200 feet south-easterly from this exposure another mineralized zone is indicated by a line of sloughed open-cuts. This zone apparently occurs along the foot-wall side of a branching dyke of feldspar porphyry which strikes southerly and dips variably westward. The mineralization, seen in place at only one point, consists of the brecciated foot-wall of the dyke filled with quartz containing irregular grains of galena and sphalerite. A 10-inch channel sample across this material assayed: Gold, *nil;* silver, 79.5 oz. per ton; lead, 1.4 per cent.; and zinc, 1.3 per cent.

The present exposures on this part of the property are insufficient to give any idea of continuity or of average value.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1920, p. 64; 1925, p. 103; 1927, pp. 101–103; 1928, p. 115; 1936, p. A 99.]

Summit Lake (56° 130° S.E.).

Gold.

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

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 includes the Salmon Gold and other groups, totalling twenty claims, and one fraction held by location on the west side of Summit Lake about 1 mile from the north end. The lake, which is 3 miles long, is about 25 miles north of Stewart. A poor pack-trail which extends north from the Big Missouri camp-site skirts the east side of the lake, which must be crossed to reach the Morris Summit property. During 1946 much heavy equipment was taken over the Salmon Glacier by tractor, and other supplies were flown in by aircraft which land on the lake.

The topography is steep and rugged. From the lake-shore, at an elevation of 2,700 feet, the ground rises in a series of bluffs and rough benches for more than 2,500 feet to the crest of the ridge west of Summit Lake. The ridge is covered with an ice-cap, from which a large hanging glacier extends down a precipitous canyon nearly to lake-level. Several small creeks cascading down the mountain from the ice-cap have cut deep canyons. The Morris Summit camp, which has accommodation for twenty-five men, is on the lake-shore about 800 feet north-easterly from the toe of the glacier. The delta of a creek which enters the lake from a north-westerly direction near the camp, one of the few level spots on this property, is used as a landing and storage area.

The nearest timber suitable for mining purposes grows north and east of the lake. Although there is a drop of about 500 feet between Summit Lake and the Tide Lake valley, 2 miles north, the drainage-basin of Summit Lake may be too small to provide hydro-electric power sufficient for the mine.

Ten days were spent during the summer of 1946 examining the Morris Summit property and the adjoining Scottie group. Fig. 1 is a map of the area made from a transit and plane table survey. The most abundant rocks are fragmental volcanics of the lower Hazelton group. They vary from coarse breccias to fine-grained tuffs, the fragmental nature of which can be seen only under the microscope. The original attitude of these rocks is unknown.

A large body of coarse-grained granodiorite, evidently a spur of the Coast Range batholith, intrudes the volcanics north and west of the Morris Summit camp. The undulating contact is bordered by a zone of very hard siliceous hornfels which varies in width from 50 to 200 feet. Similar rock covers a large area immediately west of the granodiorite-body. Several partly-assimilated roof-pendants are found within the intrusive mass.

An irregular and, in places, dyke-like body of feldspar porphyry occurs in the volcanics near the camp and on either side of the toe of the glacier. Under the microscope the rock appears somewhat brecciated. The larger masses are surrounded by zones of siliceous hornfels similar to those associated with the granodiorite-body. It is probable that this rock represents an intrusive member of the Hazelton group rather than a separate and later intrusive.

Two types of post-granodiorite and post-mineral dykes occur. The older, referred to as green dykes, are fine-grained and light green in colour due to abundant epidote. These vary from a few inches to 20 feet in width. With few exceptions, they strike north 20 degrees west and dip 70 degrees westward. The younger dykes are fine-grained, dark-coloured rock containing occasional small phenocrysts of hypersthene. These basic dykes vary from ½ inch to 3 feet in width and, like the green dykes, have a fairly constant attitude, striking south 70 degrees west and standing vertically.

A major fault which strikes north 35 degrees west and dips variably from 40 to 57 degrees south-westward can be traced for nearly a mile. The fault-scarp is well exposed on the north edge of the hanging glacier at an elevation of 3,500 feet. This fault is of economic importance because it cuts off mineralized zones of current interest lying to the west, the continuations of which, east of the fault, have not been found. It is thought that the fault-displacement is very large, possibly measurable in miles. Another fault of lesser importance, having a horizontal displacement of 400 feet, follows the creek-canyon which extends north-westerly from the lake-shore near the camp a distance of 3,500 feet.

Eight hundred feet north of the glacier and immediately east of the major fault is a prominent outcrop 600 feet long in a north-westerly direction and 450 feet wide. This

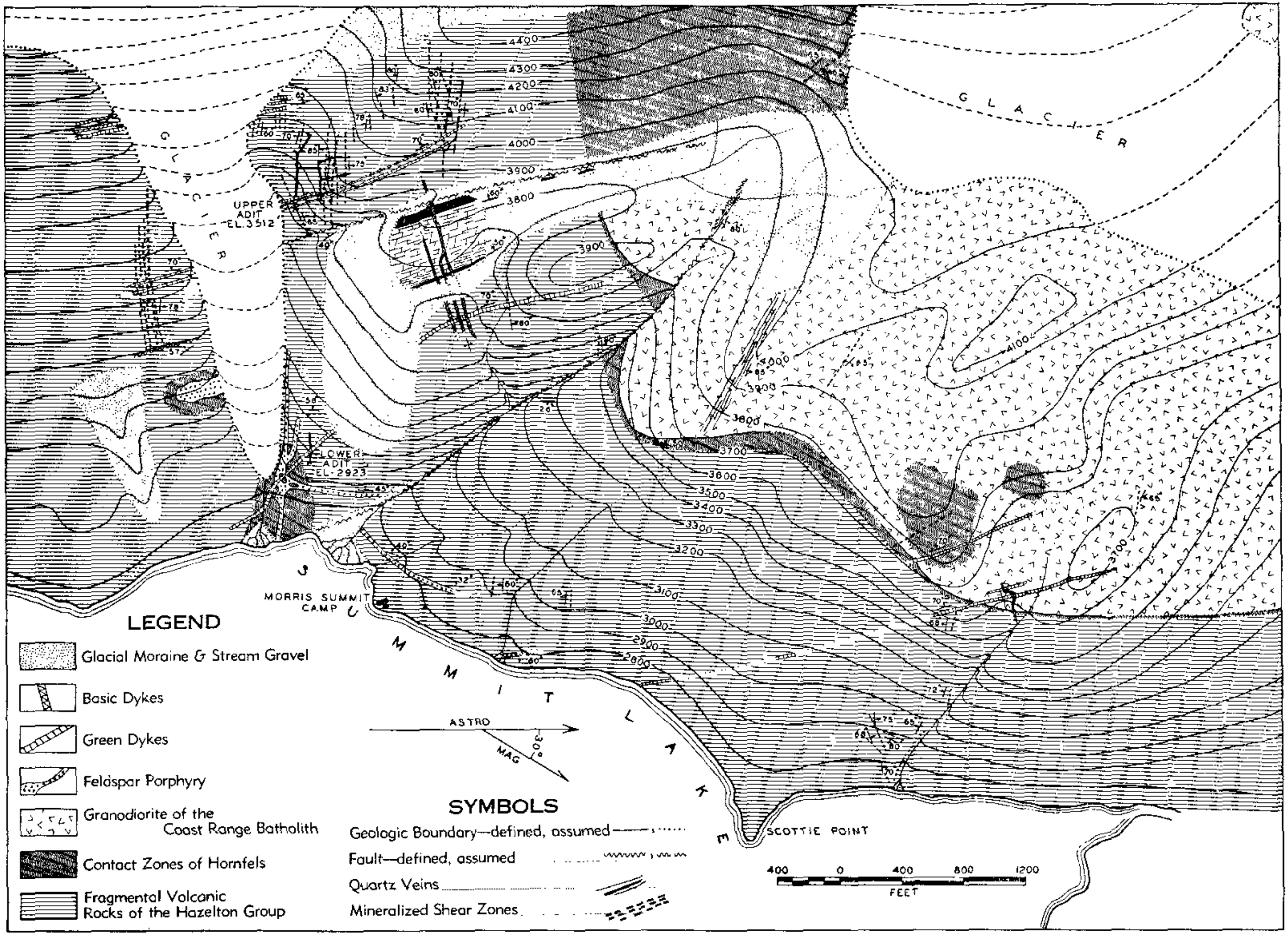


Fig. 1. Geology of the north-western side of Summit Lake.

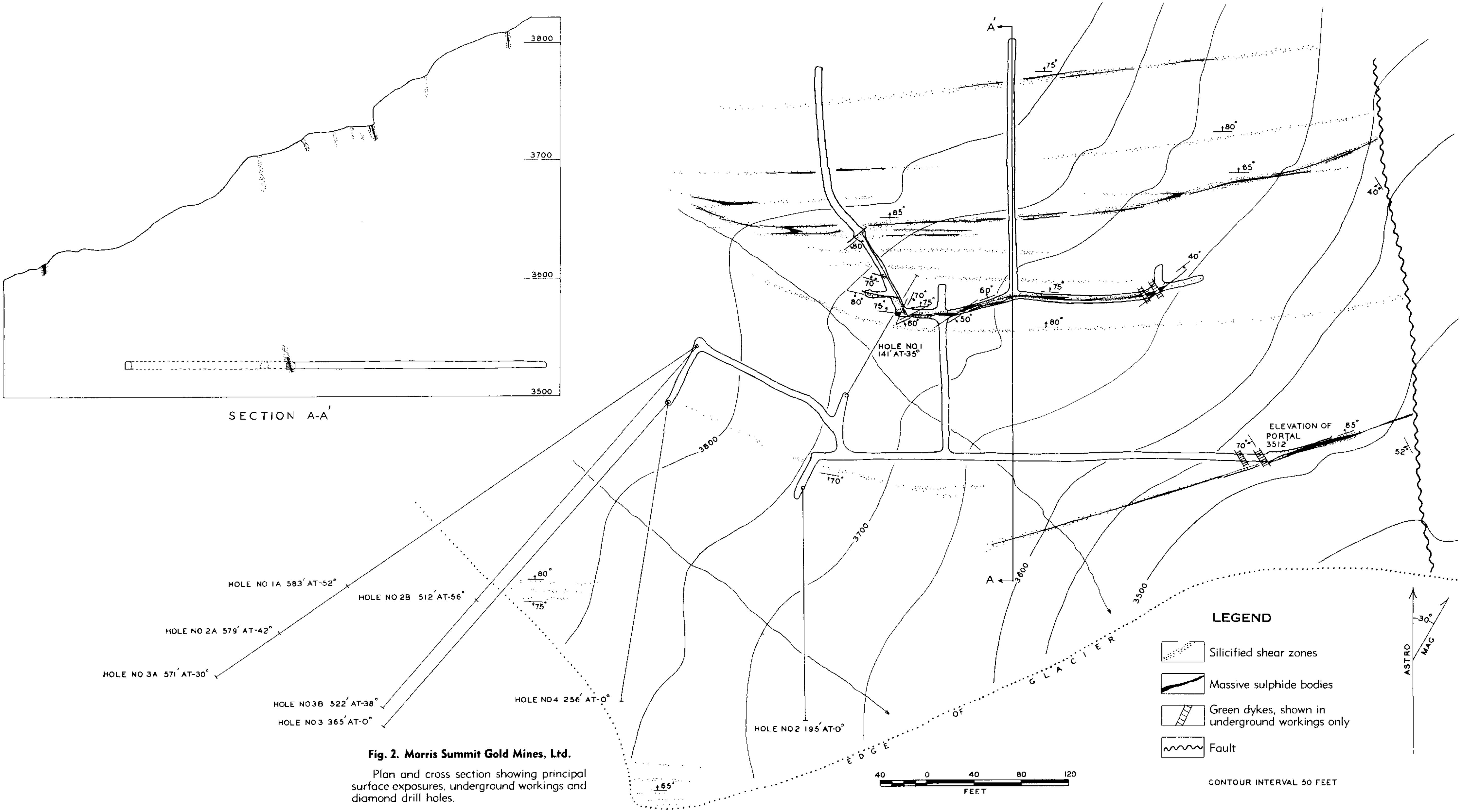


Fig. 2. Morris Summit Gold Mines, Ltd.

Plan and cross section showing principal surface exposures, underground workings and diamond drill holes.

is a huge quartz lode, which strikes north 20 degrees west and dips 60 degrees westward. It is made up of a 50-foot vein of quartz on the west side, a 3-foot vein on the east side, and a central part which is a maze of drusy quartz stringers and irregular zones of quartz-filled breccia. The quartz is only slightly stained and is apparently barren of metallic minerals, except in the central part of the lode where one 2-inch stringer contains massive galena, and some pyrite and tetrahedrite. A sample of this stringer assayed: Gold, trace; silver, 12.4 oz. per ton. The lode has not been traced beyond its outcrop.

Numerous parallel veins from 1 to 8 inches wide, containing quartz, feldspar, calcite, and disseminated pyrite, form a zone in quartz-diorite. The zone is about 100 feet wide, strikes north 60 degrees west and dips 65 degrees north-eastward, and can be traced for 1,000 feet.

Elsewhere on the Morris Summit property east of the major fault several discontinuous rusty shear-zones, weakly silicified and containing disseminated pyrite and pyrrhotite, appear to have little economic significance. However, three more important showings occur west of the fault. The outcrops are deeply weathered; consequently, no surface samples were taken. As these showings are similar in structure and mineralogy, only the one of current interest, located near the north edge of the hanging glacier, will be described.

As shown in Fig. 2, this showing consists of several shear-zones in fragmental volcanic rocks arranged in sub-parallel, branching, and *en échelon* fashion across a width of about 350 feet. The shear-zones strike approximately west and, for the most part, dip steeply northward. From the major fault at which they terminate, the shear-zones can be traced about 500 feet westward, where they curve slightly northward and merge in an area of disseminated mineralization. The vertical distance between terminal outcrops is about 250 feet.

These shear-zone deposits are siliceous replacements with no defined walls and contain discontinuous lenses of massive sulphides. Pyrrhotite is the principal metallic mineral. Pyrite, arsenopyrite, and chalcopyrite occur in small quantity intimately associated with the pyrrhotite, and occasional grains of galena and sphalerite can be found. Individual sulphide lenses are nowhere more than 24 inches wide and rarely exceed 50 feet in length, but several narrow sulphide stringers may be distributed in *en échelon* arrangement across widths up to 60 inches. Some sulphide lenses are split longitudinally by one or more veins of drusy quartz and calcite, barren of sulphides. A somewhat different type of mineralization is found in several narrow veins recently exposed by recession of the glacier. These contain pyrite, pyrrhotite, sphalerite, and galena in a quartz-carbonate gangue. They strike west and dip steeply either north or south. An unoxidized sample across one 5-inch vein assayed: Gold, trace; silver, *nil*.

In 1931, following the discovery of spectacular gold samples, the Premier Gold Mining Company did some open-cutting and diamond-drilling which disclosed several mineralized zones carrying erratic gold values (see *Minister of Mines, B.C.*, Ann. Rept., 1930, p. 115, and 1933, p. 60). In 1934 the Consolidated Mining and Smelting Company drilled several deep holes, one of which intersected mineralization with good gold values (see *Minister of Mines, B.C.*, Ann. Rept., 1934, p. B 29). An adit was started in 1936 at a point near the north edge of the hanging glacier, 812 feet above and 2,100 feet west of the lake-shore, and during the next three seasons some 1,500 feet of underground work was done. Morris Summit Gold Mines, Limited, acquired the property in 1945 and did 3,724 feet of diamond-drilling in 1945 and 2,137 feet in 1946. In August, 1946, an 8- by 8-foot adit was started 222 feet above and 430 feet west of the lake-shore and by the end of the year had advanced 798 feet in a westerly direction. During the summer of 1946 the camp was expanded to provide winter accommodation for a crew of twenty-six men, additional mining equipment, including a 145-horsepower

D-13000 Diesel power unit, a 531-foot X.V.H. Ingersoll-Rand air-compressor, a 70-kilowatt UD-9 International lighting plant, and a mucking-machine, were brought to the property.

Underground exploration by the Consolidated Mining and Smelting Company disclosed a single mineralized zone in a drift 120 feet north of the main adit and parallel to it. Fig. 2 shows this exposure in relation to the surface outcrops in both plan and vertical section. It will be seen that the long crosscuts driven northward beneath the better-looking surface exposures failed to intersect their downward continuations. The zone exposed in the drift is about 240 feet long and averages 30 inches in width. Like the surface exposures, this is a silicified shear-zone containing discontinuous streaks and lenses of massive sulphides. Mineralization occurs in the west face of the drift but pinches out near the east face along an oblique slip. Five channel samples and one specimen were taken in this mineralized zone with the following results. Distances are measured from the crosscut leading to the main adit.

Location of Sample.	Description.	Width.	Assay.	
			Gold.	Silver.
		Inches.	Oz. per Ton.	Oz. per Ton.
West face	Channel sample—silicified rock with quartz stringers and irregular masses of pyrrhotite	24	0.06	0.2
West face	Specimen of massive pyrrhotite with minor amounts of pyrite, arsenopyrite and chalcopyrite	....	0.36	1.0
Crosscut + 15 feet east, S. side	Massive sulphides, mainly pyrrhotite	14	0.03	0.4
Crosscut + 15 feet east, N. side	Siliceous rock with stringers of quartz, pyrrhotite, and pyrite	18	0.03	0.1
Crosscut + 115 feet east	Siliceous rock with several sulphide seams aggregating 12 inches	30	0.03	0.2
Crosscut + 175 feet east	Siliceous rock with abundant masses of pyrrhotite, some pyrite and chalcopyrite	30	0.09	0.4

Current development by Morris Summit Gold Mines, Limited, is directed towards an area south and west of the upper workings and some 400 feet below them. It was in this area that one hole drilled by the Consolidated Mining and Smelting Company in 1934 encountered mineralization carrying interesting gold values. Holes drilled in 1945, the results of which have been made public by the company, are shown on Fig. 2. The immediate objective of the low-level adit now being driven is a point approximately 200 feet below the intersections in some of these drill-holes. From this point possible ore-bodies indicated by the drilling will be further explored.

Scottie. This group of four claims was staked in 1944 by E. G. Langille, of Stewart, and H. Melville, of Premier. The claims lie in a line along the west shore of Summit Lake north of the Morris Summit holdings and extend one claim-length west of the shore. In 1945 the group was optioned to Leta Explorations, Limited, and this company did 1,250 feet of stripping and open-cutting and 2,730 feet of diamond-drilling before dropping the option in the autumn of 1946.

The showings are very irregular siliceous replacement bodies containing disconnected streaks and large masses of sulphides. The deposits appear unrelated to any definite structural features, but several unmineralized north-westerly and westerly striking shear-zones, having a composite and branching structure into which some of the mineralized zones tend to merge and die out, may have some significance. The sulphide mineralization, similar to that on the Morris Summit property, is characterized

CHANNEL SAMPLES

Sample Location	Width inches	Ounces per ton Gold	Ounces per ton Silver
1	4	1.00	1.5
2	23	0.14	1.7
3	60	0.26	0.6
4	32	Tr.	1.3
5A	40 (S. side)	0.98	1.7
5B	37 (N. side)	0.44	0.4
6A	37 (W. side)	1.49	1.7
6B	60 (E. side)	0.24	1.0
7	8	0.09	5.8
8A	20 (W. side)	1.20	1.4
8B	34 (E. side)	0.54	1.2
9A	11 (S.W. side)	3.37	1.7
9B	28 (N.E. side)	0.22	Nil
10	17	Tr.	1.8
11	20	Nil	Tr.
12	28	Nil	Nil
13A	54 (W. side)	Nil	1.3
13B	54 (E. side)	Tr.	0.6
14	62	Nil	0.1
15	35	0.47	0.3
16	8	0.06	0.7
17	24	1.19	3.1
18	28	Tr.	0.5

Note: All widths given are normal to the attitude of the deposit.
The direction of the arrows pointing to the sample locations are parallel to the directions in which the samples were cut.

SPECIMEN SAMPLES

Sample Location	Description	Ounces per ton Gold	Ounces per ton Silver
8A	Mixed sulphides in calcite	0.06	1.8
8B	Massive Pyrrhotite, some Chalcopyrite	0.11	Nil
14	Massive Pyrrhotite	Tr.	0.3
16	Massive Pyrite	3.59	2.2
16	Massive Pyrrhotite, some Chalcopyrite	3.52	3.4

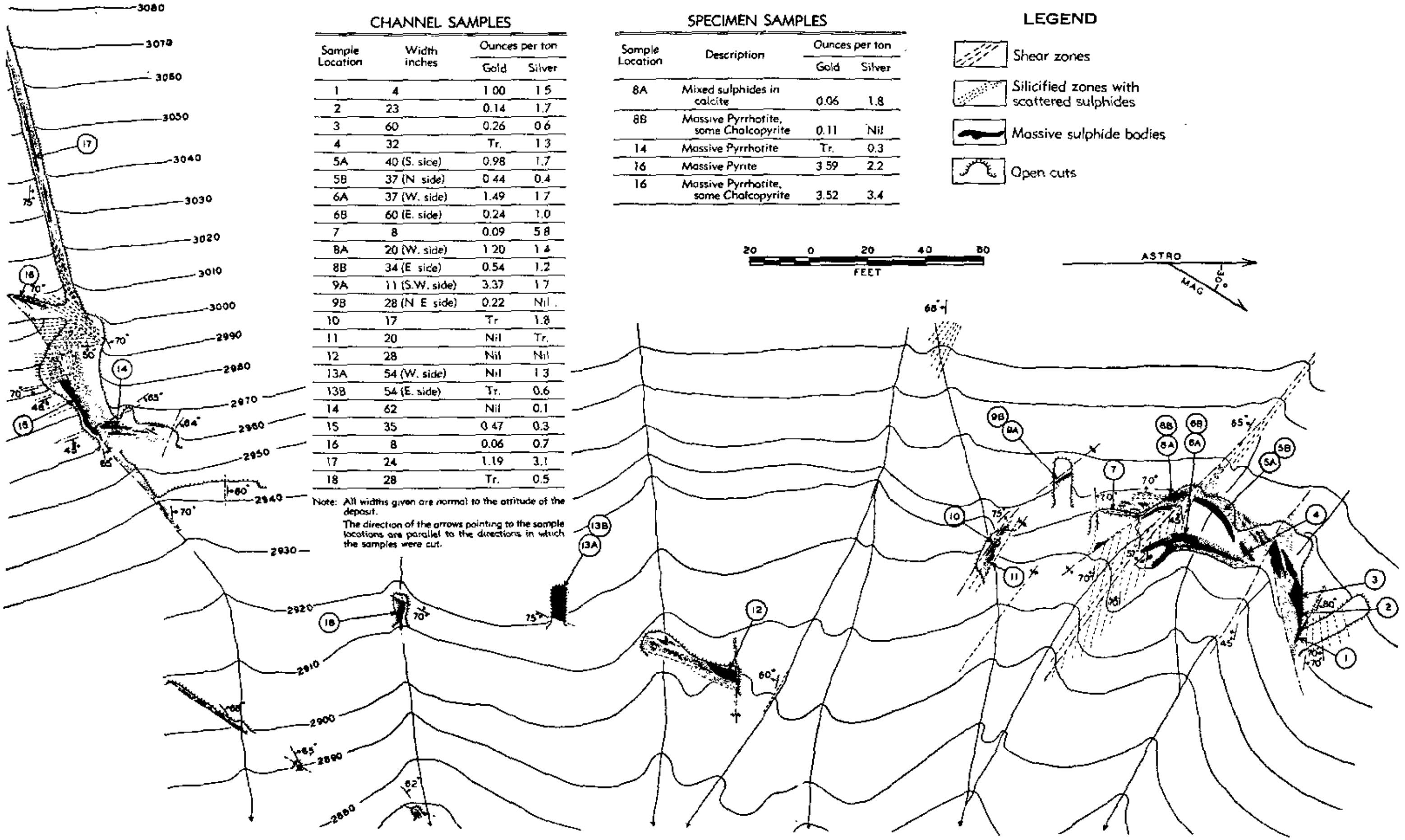


Fig. 3. Scottie group—plan showing open-cuts, mineralization, and assays.

by abundant fine-grained pyrrhotite, with smaller amounts of pyrite, arsenopyrite, and chalcopyrite, and occasional grains of sphalerite and galena.

Fig. 3 is a plan of the property showing the distribution and shapes of the mineralized zones, the diverse nature of shear-planes within the composite shear-zones, and the distribution of massive sulphide and siliceous bodies. The results of nineteen channel samples and five samples of selected mineralization taken from the deposits are given in tabular form in Fig. 3. It will be noted that the gold content is very erratic and apparently is not proportional to the total amount of sulphides. Assays of specimens of fairly pure pyrite and of pyrrhotite do not indicate a preference of gold for either mineral. More study will be necessary to determine the mineral associations of the gold.

TIDE LAKE (56° 130° S.E.).

Gold-Silver.

East.

This group of eight claims is held by location by A. Phillips and Julia K. Phillips, of Hyder, Alaska. It is on the west side of the Tide Lake valley, approximately 3½ miles north of Summit Lake, and is reached by the pack-trail from Big Missouri, which continues past Summit Lake, crosses several rather treacherous glacial streams at the head of Tide Lake, and continues northward along the west edge of the flat valley-floor. The East group is about 1 mile north of Tide Lake. Two boats are provided at Tide Lake for the use of foot-travellers.

The general geology of the west side of the Tide Lake valley is mentioned briefly as it has some bearing on the geological environment of the East group. For a distance of 4,000 feet northward from Tide Lake the rocks are thin-bedded slate and greywacke. The strata are contorted and sheared for the first 3,000 feet owing to the proximity of a granitic intrusive which is probably the northerly continuation of the intrusive body of Morris Summit property. However, for 1,000 feet beyond this point, at which the intrusive contact swings rather abruptly from a northerly to a westerly strike, the strata are undisturbed, striking evenly north and dipping 70 degrees westward. Here the regular attitude is abruptly disrupted at a rough and precipitous draw which reaches the valley-floor from a north-westerly direction. Immediately north of this draw the rocks are variegated light- and dark-coloured beds of fine-grained tuffaceous sediments impregnated with pyrite, which strike north 70 degrees east and dip 70 degrees southward. This is the typical rock on the East group. Some 2,000 feet farther north and about 1,000 feet beyond the main showing on the East group the pyritized strata end abruptly at another prominent draw, and another abrupt change in attitude occurs. From this it is inferred that the East group is located in an isolated fault-block which has been affected as a whole by hydrothermal alteration.

The main showings and workings are on several conspicuous hummocks and rough benches of bare rock stained yellow and reddish colours owing to the oxidation of pyrite. The bluffs rise in abrupt steps to an elevation of about 500 feet above the valley-floor. A small creek enters the valley from a westerly direction by a steep ravine which cuts the bluffs. An adit is driven on the north side of this ravine 260 feet above the floor of the valley. From this adit, 168 feet in length, a 30-foot winze-stope is sunk, and a stope is raised to the crest of a prominent rock hump 60 feet above. Several open-cuts have been made in the outcrops. A comfortable double log cabin is located on a timbered bench about a quarter of a mile northwest of the workings.

Fig. 4 is a map, based on a chain and compass survey, of that part of the property on which development-work has been concentrated. Although no horizon in the thin-bedded tuffaceous sediments could be recognized whereby their structure could be completely solved, marked variations in attitude and critically located zones of drag-folding indicate that the strata are warped into two or more small fold structures, the axes of which trend south-easterly and plunge rather steeply in that direction. Superimposed

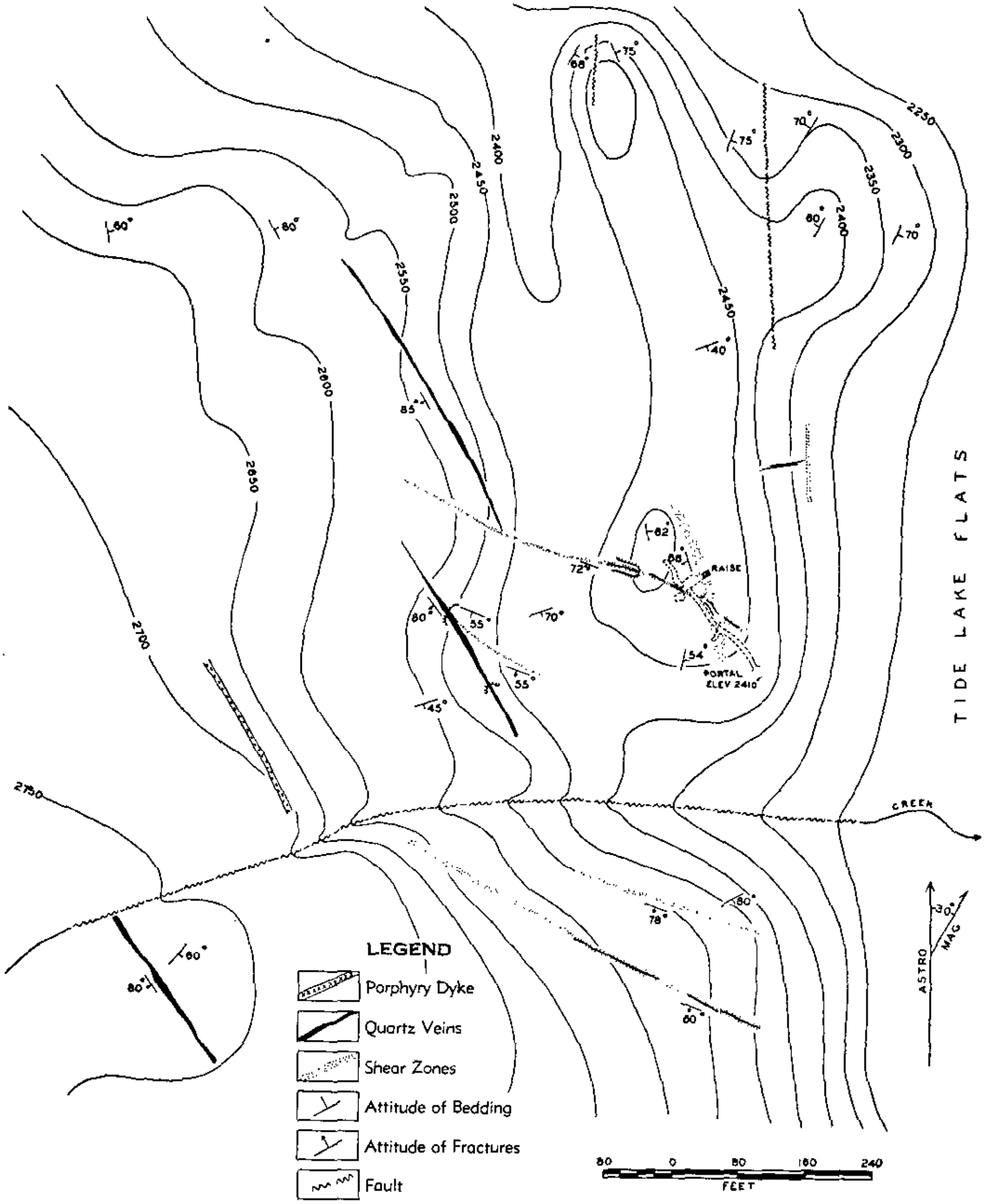


Fig. 4. East group—plan showing principal veins and workings.

on this fold structure is a fracture pattern, consisting of a direction of fracturing and a direction of shearing. The fractures strike north 35 degrees west and dip about 80 degrees south-westward, and the shear-zones strike north 70 degrees west and dip from 60 to 78 degrees southward. Another structural element is a westerly trending fault which is assumed to follow the small creek. The presence of this fault is inferred from the severe crumpling of strata along the creek and from the fact that a vertical 6-foot dyke of feldspar porphyry can be traced southerly to the creek, but its continuation could not be found on the exposed south side of the ravine. Moreover, several mineralized zones, traced to the creek from either side, do not continue across it.

Three quartz veins occupy the north-westerly trending fractures. The first, about 300 feet west of the mine-workings, can be traced by open-cuts for 380 feet. South-eastward it terminates against a westerly trending shear-zone. The vein, from 2 to 5 feet wide, consists of fractured white quartz with stringers and irregular concentrations of massive pyrite and small discontinuous lenses of friable brown sphalerite and a little galena. A channel sample of this vein across 50 inches, excluding a 10-inch stringer of massive sulphides, assayed: Gold, 0.06 oz. per ton; silver, 6.8 oz. per ton. The stringer assayed: Gold, 0.08 oz. per ton; silver, 25.4 oz. per ton.

The second vein, which is in *en échelon* relation to the first and 100 feet farther west, can be traced for 240 feet. North-westward it dies out in a zone of small stringers, and south-eastward it can be traced nearly to the creek, but not across it. The vein is 40 inches wide in the most southerly exposure, increases to 68 inches in a large open-cut 160 feet north-westward, and then narrows again. The vein was sampled in the large open-cut, with the following results:—

Description.	Width.	Assay.	
		Gold.	Silver.
	Inches.	Oz. per Ton.	Oz. per Ton.
Banded quartz and silicified rock with disseminated pyrite on the hanging-wall side of vein	34	*Nil*	*Nil*
Central part of vein, similar to above but with more abundant pyrite	23	Trace	0.4
Quartz with stringers of coarse and fine-grained pyrite and several seams of sphalerite and galena on foot-wall side of vein	11	Trace	11.0
Stringer of brown sphalerite with some galena	2	0.07	43.7
Stringer of fine-grained pyrite	1	0.08	36.5
Stringer of quartz and coarse-grained pyrite	1	0.12	19.8

The third quartz vein outcrops for 200 feet on a bluff about 500 feet farther south-west. It is on the south side of the creek, and its bold outcrop ends abruptly in a cliff forming the south bank of the creek-ravine. The vein is a composite structure, about 8 feet wide, of quartz stringers, quartz-filled breccia, and areas of silicified rock. The whole is well mineralized with disseminated pyrite. A chip sample across 60 inches of the best mineralized section assayed: Gold, 0.03 oz. per ton; silver, 1.3 oz. per ton.

Westerly striking shear-zones are silicified and mineralized with disseminated pyrite and in places contain narrow streaks of massive pyrite; however, no base-metal sulphides could be seen. Two broad shear-zones are exposed in open-cuts near a bend of the pack-trail about 200 feet south of the creek. The more southerly zone is the more persistent and can be traced 500 feet westerly to the creek. A channel sample 70 inches wide across this zone in the open-cut on the pack-trail assayed: Gold, *nil*; silver, 0.2 oz. per ton. A third shear-zone is exposed in an open-cut 80 feet west of the collar of the raise. It can be traced 300 feet westerly from the open-cut, where it appears to die out in diffused shear-planes. One hundred feet easterly from the open-cut it seems to merge at an acute angle into a broad diffused zone of shear-planes which extend north-

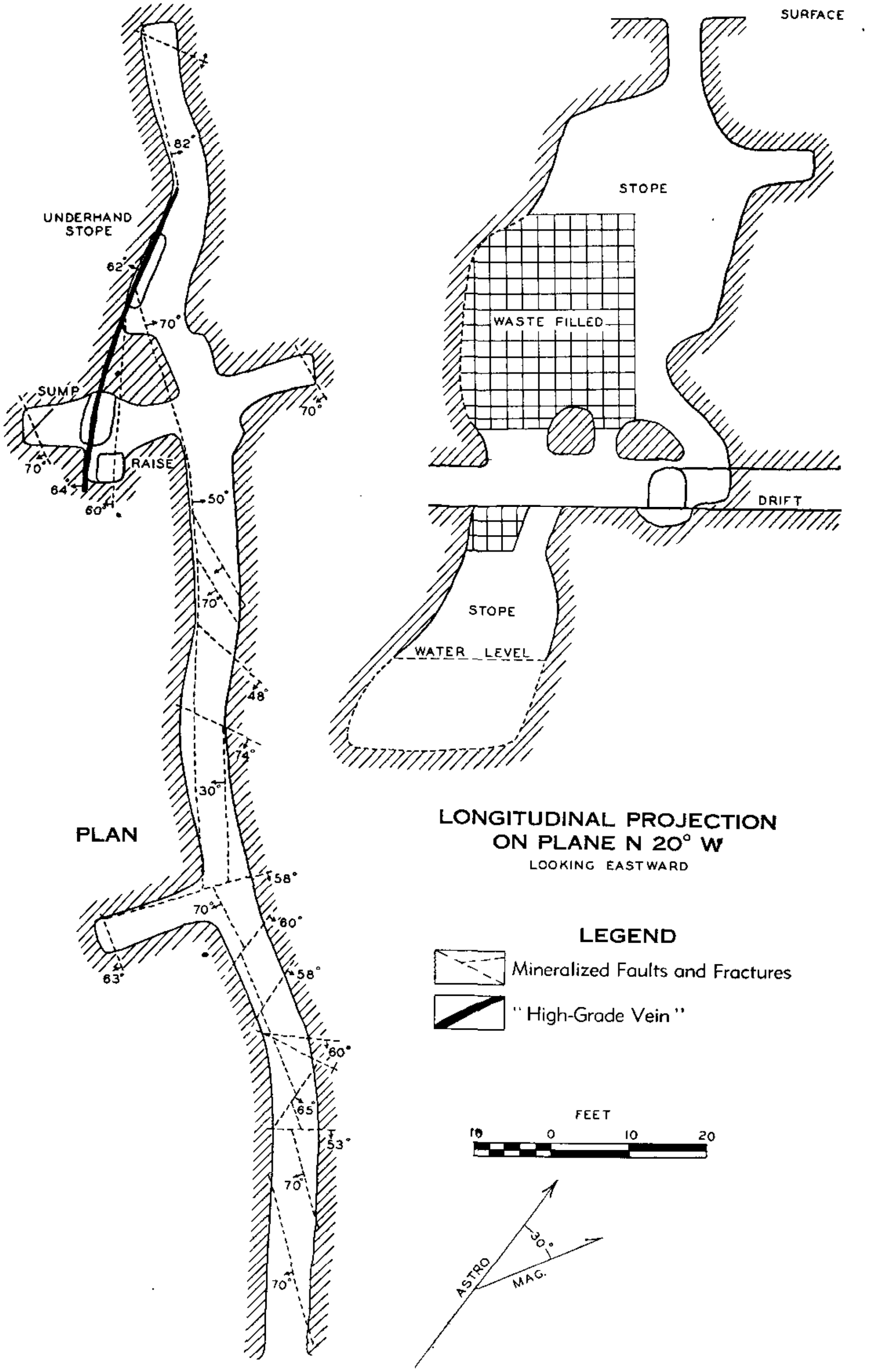


Fig. 5. East group—plan and longitudinal section of underground workings.

westerly past the collar of the raise. A 10-inch channel sample from the open-cut 110 feet west of the raise assayed: Gold, 0.01 oz. per ton; silver, 4.5 oz. per ton.

Fig. 5 shows the underground workings. The drift follows a zone of sub-parallel and intersecting fractures, on some of which movement has occurred. The more persistent fractures trend north-westerly and dip either way. The fractures and intervening sheared rock contain irregular stringers of quartz and calcite with films of fine-grained pyrite, smaller amounts of sphalerite, and occasional grains of galena. Seventy-five feet from the portal one such stringer 4 inches wide assayed: Gold, 0.01 oz. per ton; silver, 1.2 oz. per ton.

The "high grade" vein is a narrow zone of sheared and silicified rock containing stringers of quartz and calcite, much pyrite, and discontinuous lenses from ½ inch to 2 inches wide of friable brown sphalerite and some galena. The zone has no defined foot-wall but is sharply bounded on the hanging-wall side by a fault, the plane of which is vertically striated and slightly undulating. The strike varies from north 20 degrees west to north, and the dip varies between 62 degrees and 71 degrees westward, averaging 68 degrees for the vein as a whole. The vein extends from the foot of the raise 40 feet northward to a bend of the drift, where it appears to merge with another mineralized zone which strikes north-westward and dips steeply north-eastward. The drift follows this zone for 22 feet to the face. As the surface is approached in the stope, the "high grade" vein becomes less well defined and merges into the diffused shear-zone which strikes north-westerly through the collar of the raise.

No rich ore was seen underground. A 12-inch sample across the "high grade" vein at the foot of the raise assayed: Gold, trace; silver, 0.2 oz. per ton. Another sample on this vein, 32 inches wide, from the north face of the stope on top of the fill, assayed: Gold, trace, and silver, trace. A 12-inch sample across the zone in the face of the drift, excluding a 1-inch stringer of sphalerite and galena on the west side, assayed: Gold, trace; silver, 0.7 oz. per ton. A 2½-inch sample, including the stringer and 1½ inches of silicified rock, assayed: Gold, 0.06 oz. per ton; silver, 13.9 oz. per ton.

The "high grade" vein has yielded small quantities of very rich ore. From 1939 to 1945, inclusive, fourteen shipments of sorted ore to the Department of Mines sampling plant at Prince Rupert, having an aggregate weight of about 16¼ tons, contained approximately 646 oz. of gold and 1,424 oz. of silver. It is understood from Mr. Phillips that the rich pockets were found in narrow lenses near the hanging wall of the "high grade" vein, associated usually, but not always, with abundant brown sphalerite. Assays of the ore show no significant relationship between the content of precious metals and the percentages of lead or zinc. A. P. Fawley,* who did graduate research on the ore at Queen's University, found the following minerals, in order of abundance: quartz, sphalerite, galena, calcite, pyrite, ruby silver, electrum, arsenopyrite, tetrahedrite, chalcopyrite, and native silver.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1927, pp. 106, 107, under the name "Pioneer group"; 1930, p. 117; 1939, p. 66; 1944, p. 53.]

Gold.

Portland. Alphonse Thomas, of Stewart, is the owner of this group of four claims located 2 miles north-westerly of the East group on the north side of a glacier-filled valley tributary to the Tide Lake valley. The pack-trail to the East group continues to this property. The claims range in elevation from 3,000 to about 4,200 feet, the lower slopes being steep and rough but becoming more gentle at higher elevations. Two small cabins are built on a narrow timbered bench some 200 feet above the glacier. A small creek cascades into the valley near the cabins from a westerly direction, cutting an abrupt canyon in the lower part of its course.

* Unpublished thesis.

Development consists of an adit 162 feet long, driven by the Premier Gold Mining Company in 1940; a 10-foot adit; and ten open-cuts, some of which are caved. The country rock is banded slate and greywacke in contact to the south with volcanic breccia. The slate bedding strikes north 45 degrees west and dips 66 degrees north-eastward. Near the cabins a dyke of feldspar porphyry 100 feet wide strikes northerly. The showings are along the small creek in sediments not far from their contact with volcanic breccia.

The lowest showing, elevation 3,220 feet, is in the 10-foot adit driven into the south wall of the creek-canyon. This is a vein, about 5 feet wide, of quartz and silicified rock containing numerous streaks and irregular masses of pyrite, arsenopyrite, sphalerite, and galena. The vein strikes north 70 degrees west and dips 83 degrees north-eastward. At the contact of the feldspar porphyry dyke, a few feet east of the adit, the vein pinches to about 6 inches but continues into the dyke.

Similar mineralization is exposed in a large cut at the base of the canyon-wall 120 feet westerly from this adit and 100 feet higher. The zone is 40 inches wide, and its outcrop can be traced up the vertical 100-foot wall of the canyon, beyond which, however, the outcrop is drift-covered. The vein strikes south 80 degrees west and dips steeply southward. A channel sample of this vein, 40 inches wide, consisting of quartz and silicified rock liberally mineralized with pyrite and arsenopyrite and with minor amounts of sphalerite, galena, and chalcopyrite, assayed: Gold, 0.12 oz. per ton; silver, 0.6 oz. per ton. A specimen of the best mineralized material assayed: Gold, 0.28 oz. per ton; silver, 1.4 oz. per ton.

Above the canyon, about 100 feet farther westerly, at an elevation of about 3,500 feet, is a large cut, in the north end of which the main adit is collared. In the south end of this cut, 20 feet from the adit-portal, a vein is exposed, well mineralized with pyrite, sphalerite, galena, and arsenopyrite. This vein strikes north 25 degrees west—a considerable variation from that of the showings below the cliffs—and it dips 82 degrees north-eastward. The vein is not cut by the main adit, as it would be had the vein continued on this strike for 50 feet. A channel sample across an 8-inch zone of well-mineralized quartz on the foot-wall of this vein assayed: Gold, 0.50 oz. per ton; silver, 0.6 oz. per ton. A channel sample of the remainder of the vein, 24 inches wide, more sparsely mineralized, assayed: Gold, 0.12 oz. per ton; silver, 0.3 oz. per ton.

The main adit is driven north 80 degrees west, following a poorly defined shear-zone, irregularly silicified and sparsely mineralized, which dips about 85 degrees southward. A well-mineralized quartz vein 14 inches wide, on which the adit was started, pinches out 35 feet from the portal. The shear-zone explored by this adit follows approximately a somewhat irregular contact, with fragmental rocks on the south side and slate and greywacke on the north. No samples were taken underground.

Two open-cuts about 40 feet apart have been made on a mineralized zone about 300 feet westerly from the portal of the main adit and 200 feet higher. This zone strikes north 60 degrees west and dips variably from 77 degrees to 85 degrees south-westward. It is in slate, but fragmental volcanic rocks are found a few feet to the south. The zone is about 24 inches wide with gradational walls. The mineralization is somewhat different to that described above. The material is silicified rock with stringers of quartz and abundant fine-grained pyrite and arsenopyrite both in veinlets and as disseminations. A channel sample across a fresh exposure in the lower cut, 26 inches wide, assayed: Gold, 0.98 oz. per ton; silver, 0.7 oz. per ton. It might be pointed out that if this zone were to continue with the attitude shown at the surface to the level of the adit, it would lie a few feet south of the face of the adit.

Some 200 feet north-westerly from these exposures and about 100 feet higher a cut has been made in deeply weathered material, which apparently is a mineralized shear-zone about 6 feet wide having an attitude similar to that of the zone mentioned above.

A washed specimen of relatively fresh material, picked out of the weathered zone, well silicified and mineralized with pyrite and arsenopyrite, with some sphalerite and galena, assayed: Gold, 1.15 oz. per ton ; silver, 3.2 oz. per ton.

Altogether, the showings on this property are considered sufficiently attractive to warrant further exploration.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1934, p. B 29.]

Bear River (55° 129° N.W.).

Silver-Lead-Zinc.

Big Four Silver Mines, Ltd.

Head office, Royal Bank Building, Vancouver. W. B. Milner, President; E. G. Langille, Resident Manager. Capital: 4,000,000 shares, 50 cents par value. This company owns or controls thirty Crown-granted claims and fractions, including the Silverado, Prosperity, and Porter-Idaho groups. The holdings are on Mount Rainey, east of the Portland Canal, about 2½ miles south-easterly from Stewart. They extend from an elevation of 600 feet up the west side of the mountain to an ice-capped saddle nearly 6,000 feet above sea-level and down the opposite slope towards the north fork of the Marmot River to an elevation of about 3,500 feet. The Silverado group is on the west side of the mountain nearest Stewart, whereas the Prosperity and Porter-Idaho groups are on the Marmot River slope.

Work was done in 1946 on the Silverado, but nothing was done on the Prosperity or Porter-Idaho sections. Several sub-parallel and branching shear-zones on the Silverado group trend south-easterly up the mountain-side and disappear beneath a glacier which completely covers the saddle of Mount Rainey. Consequently it is not known whether these shear-zones join or intersect at an acute angle similar shear-zones on the Prosperity group some 6,000 feet farther south-easterly.

The Silverado group was staked in 1920 and was prospected intermittently until 1928, when the Premier Gold Mining Company undertook a programme of underground work designed to develop at depth showings of high-grade silver ore found under the toe of the glacier. The result of about 4,000 feet of crosscutting, drifting, and raising was disappointing, and development ceased in 1930. Subsequently a drift beneath the surface showings, known as Zero level, was extended by leasers, and from this and surface workings small shipments of hand-sorted silver ore were made. Differential recession of the glacier of 600 to 1,000 feet from its position in 1928, by revealing continuations of structures in which the high-grade silver ore was found, has renewed interest in the property.

During the summer of 1946 a crew of variable size, averaging about twenty, was employed, mainly in surface construction. Two men were engaged in sampling surface and underground exposures and two others advanced Zero level 55 feet. Raises from the lower levels are being retimbered so that men can reach Zero level. A temporary tractor-road about 2½ miles in length leaves the Bear River road just north of the bridge, follows down the gravel flats on the east bank of the Bear River, and switchbacks up the steep hill-side to a point about 800 feet above sea-level. A Pioneer-drive tram-line 4,400 feet long was erected, connecting this point with the portal of the lowest mine-workings, elevation of 2,955 feet.

A new bunk-house for sixteen men was built near the lowest mine-workings and a gasoline-engine installed to drive the old compressor. A new 360-cubic-foot Diesel-driven compressor is at the property awaiting installation.

Seven days were spent examining the main surface showings and underground workings on the Silverado group, and a reconnaissance was made over the saddle of Mount Rainey. The topography and geology of Silverado No. 4 Fraction and part of Glacier Fraction are shown in Fig. 6.

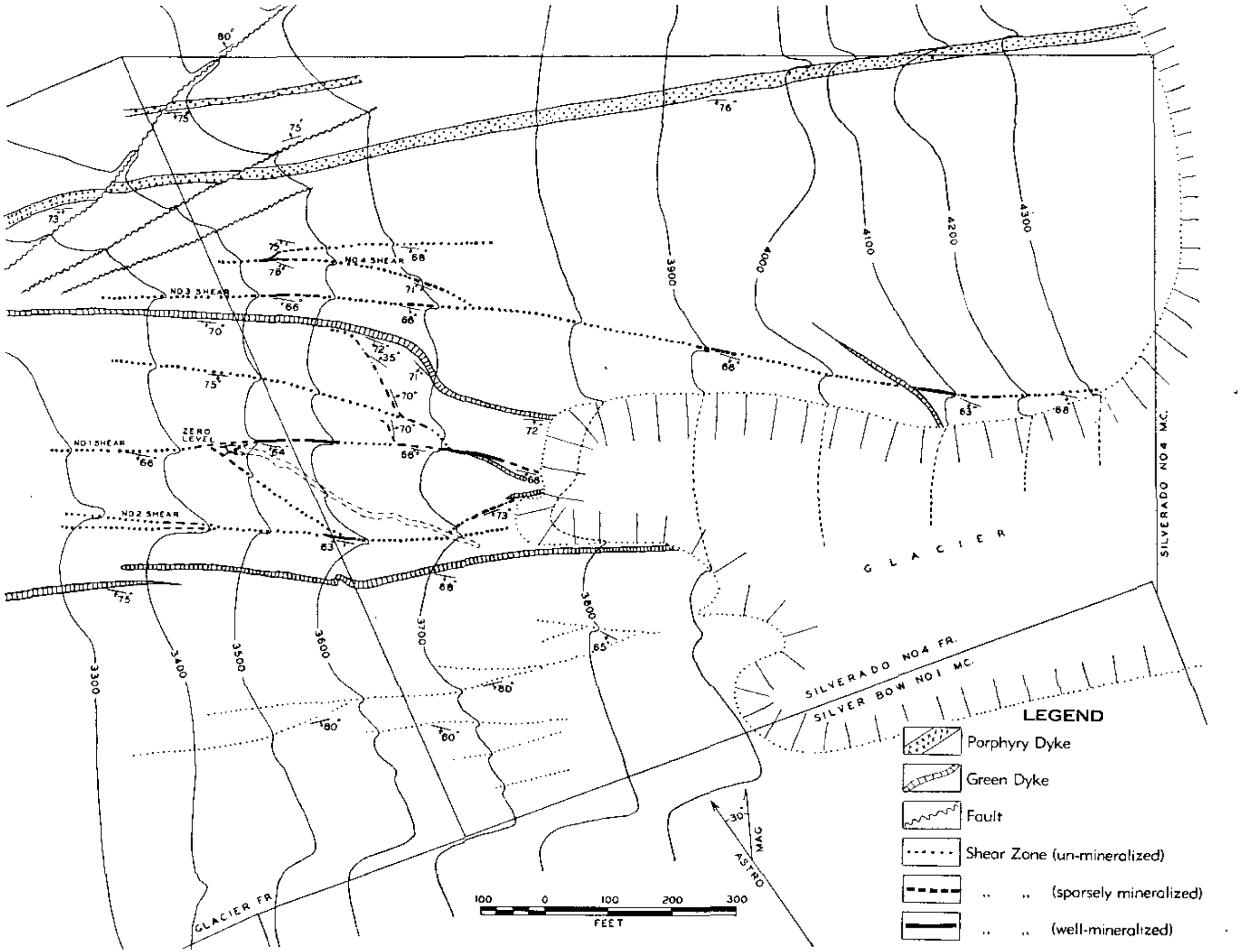


Fig. 6. Big Four Silver Mines, Limited—plan showing principal Silverado shear-zones.

The principal rocks are fragmental volcanics of the Bear River formation. Some are clearly breccias, the fragments being from ½ inch to several feet in size; others are fine-grained, without visible structure in hand specimens, and microscopic examination is necessary to observe their original fragmental character. Granitic rocks in local areas have gradational and indistinct contacts with the enclosing breccias. Under the microscope the texture is not that of an intrusive rock, but rather of an original clastic type which has been partly replaced by feldspar and quartz. Development of these rocks is believed to represent local granitization resulting from metasomatic action. Other evidence of such action is found in the widespread occurrence of epidote, which gives all rocks a greenish colour.

North of the mineralized zones two parallel dykes of feldspar porphyry, 16 feet and 8 feet wide and 100 feet apart, occur near the north-eastern boundary of Silverado No. 4 Fraction. These strike regularly south 60 degrees east and dip from 68 degrees to 75 degrees south-westward. They are cut and offset 5 feet to the left by two unmineralized sub-parallel faults which strike easterly and dip steeply northward.

A number of green dykes occur in the general area of mineralization. These are fine-grained, light green in colour due to abundant disseminated epidote and hornblende. Two of these dykes, from 3 to 9 feet in width, can be traced for more than 1,000 feet; other narrower dykes are less continuous. Although not as regular as the feldspar porphyry dykes, the green dykes have a similar attitude. They strike south 35 to 50 degrees east and dip 68 to 75 degrees south-westward.

The rather important question of the age relationship between the green dykes and the mineralization could not be answered because the dykes are parallel to and, in places, within the mineralized zones. At one point only, near the north edge of the glacier at an elevation of 4,050 feet, a green dyke was found crossing a mineralized zone at an acute angle; but here, unfortunately, the actual intersection was obscured by glacial moraine. Probably stripping at this place would provide the answer.

Swarms of short, lenticular quartz-calcite-epidote veinlets cut the volcanic rocks within the general area of mineralization. They are cut, but not greatly displaced, by the feldspar porphyry dykes, green dykes, and mineralized shear-zones. These veinlets conform to a common attitude, striking north 25 degrees west and dipping gently north-eastward, and are believed to represent tension cracks filled during an early phase of metasomatic activity.

The main showings, on the Glacier Fraction and Silverado No. 4 Fraction, are four sub-parallel and branching shear-zones which strike about south 45 degrees east. The dip averages 66 degrees south-westward, but may vary in the same or different zones from 63 to 76 degrees. The zones are easily traced up the steep bluffs because they occupy erosion troughs which have abrupt walls on the hanging-wall side (south-west side) and more gentle slopes on the foot-wall side. Fig. 6 shows the shear-zones and indicates the distribution and intensity of mineralization within them. They are essentially zones of sheared rock, somewhat silicified, sparsely pyritized, along which, recurring at intervals, are lenses containing variable amounts of galena and sphalerite, occasional grains of chalcopyrite and tetrahedrite, and, rarely, ruby silver and native silver. The zones are referred to, from north to south, respectively, as No. 4, No. 3, No. 1, and No. 2 shears.

From a short adit at 3,556 feet elevation No. 4 shear can be traced 350 feet south-easterly to its junction with No. 3 shear. A well-mineralized lens in and above the adit is 75 feet long and varies from 3 inches to a maximum of 18 inches in width. A short foot-wall branch contains 8 inches of massive sulphides near the junction. Much of the better ore from these lenses has been mined. A channel sample across 14 inches of No. 4 shear, in the adit, containing several stringers of massive galena and sphalerite, assayed: Gold, *nil;* silver, 29.3 oz. per ton; lead, 0.56 per cent.; zinc, 0.2 per cent. A sample across 12 inches at the face of the adit assayed: Gold, 0.02 oz. per ton; silver, 32.6 oz. per ton; lead, 1.8 per cent.; zinc, 5 per cent.; and cadmium, 0.06 per cent. Another narrow sparsely mineralized zone occurs in No. 4 shear near its junction with No. 3 shear.

No. 3 shear is exposed for 1,600 feet through a vertical range of nearly 1,000 feet. To the south-east it disappears beneath the glacier, and to the north-west below the bluffs it is obscured by overburden. In this distance it contains four mineralized lenses, three of which are 75 feet or less in length and from 6 to 30 inches wide. A channel sample 24 inches wide taken across one lens at an elevation of 3,900 feet assayed: Gold, 0.02 oz. per ton; silver, 44.2 oz. per ton; lead, 1.7 per cent.; zinc, 2.8 per cent. A specimen of massive sulphides from a 3-inch stringer at this place assayed: Gold, 0.01 oz. per ton; silver, 38.9 oz. per ton. The fourth mineralized section of No. 3 shear is some 300 feet farther south-east. Although partly obscured by moraine, this appears to be from 3 to 6 feet wide and 200 feet long, 50 feet of which is well mineralized with galena and sphalerite.

From the portal of Zero level, elevation 3,450 feet, No. 1 shear is exposed for 500 feet south-easterly, where it disappears under the glacier. The difference in altitude in this distance is 300 feet. The zone continues narrow and unmineralized for about 250 feet down the bluffs north-westerly from the portal. Several sparsely mineralized zones, one of which contains much magnetite, join No. 1 shear from the hanging-wall side near the portal, and a foot-wall branch joins it about 360 feet south-easterly from the portal. One section of No. 1 shear which begins above the portal of Zero level and extends 200 feet south-easterly contains galena and sphalerite mineralization across widths varying from 6 inches to 20 inches. Much of the surface ore has been mined. A second section begins 70 feet farther south-easterly and continues about 200 feet to the glacier. The central 100 feet of this section is well mineralized with base-metal sulphides across widths of from 24 to 40 inches. A channel sample 36 inches wide across the foot-wall side of No. 1 shear, 370 feet south-easterly from the portal, assayed: Gold, *nil;* silver, 3 oz. per ton; lead, 1 per cent.; and zinc, 1.9 per cent.

The foot-wall branch of No. 1 shear is sparsely mineralized near its junction with the main shear. A southerly striking stringer-zone which dips 35 to 70 degrees eastward joins this branch shear from the foot-wall side. This contains base-metal sulphides in stringers from ¼ inch to 2 inches in width. A 5-inch sample containing several closely spaced sulphide stringers assayed: Gold, 0.07 oz. per ton; silver, 109 oz. per ton; lead, 3 per cent.; and zinc, 2.4 per cent.

No. 2 shear lies about 115 feet south of No. 1 and is traceable for about 700 feet. It could not be examined closely because of the volume of water rushing down the canyon in which it lies, but apparently, like the other shear-zones, it contains short well-mineralized lenses. A sample taken across 4 inches on the foot-wall side of No. 2 shear at a point 250 feet southerly from the portal of Zero level assayed: Gold, 0.01 oz. per ton; silver, 90.3 oz. per ton; and lead, 1.4 per cent. The zone at this point is over 6 feet wide, but most of it is eroded or obscured by water.

No. 1 shear is explored rather thoroughly underground. The workings include the 301 crosscut, 1,250 feet long, at an elevation of 2,955 feet; the 201 drift, 450 feet long, about 200 feet above the crosscut; and Zero level, elevation 3,450 feet, which at the time the workings were examined had been advanced 430 feet south-easterly from the portal. A vertical raise connects 301 crosscut with 201 drift, and from this drift, 201 raise follows No. 1 shear to Zero level.

The lowest point at which mineralization is exposed in these workings is in a small drift from 201 raise, 70 feet below Zero level. Two stringers of massive galena and sphalerite, 3 inches and 7 inches wide, separated by 3 feet of sheared rock, are exposed in this drift for 50 feet north-westerly from the raise. This is the bottom of the ore-shoot exposed on the surface above the portal of Zero level. It is seen again in two small stopes on either side of 201 raise about 30 feet below Zero level. Here it is 50 feet long with a maximum width of 15 inches, and contains, in addition to abundant base-metal sulphides, several large grains of ruby silver. On Zero level the well-mineralized section is about 80 feet long and 16 inches wide, but an additional 60 feet of the zone contains disseminated mineralization. A small raise above the Zero level follows the ore-shoot to the surface. It should be noted that Zero level has not encountered the downward continuation of the second mineralized section of No. 1 shear exposed on the surface 300 feet up the dip from the present face.

The following table summarizes the results of twelve channel samples taken underground:—

Location of Sample.	Description.	Width.	Assay.					
			Au.	Ag.	Pb.	Zn.	Cu.	Cd.
		Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
No. 2 shear, 301 crosscut, portal + 885′ N.E.	Sheared rock slightly pyritized	60	0.01	0.4	......	......	......	......
No. 1 shear, 301 crosscut, portal + 935′ N.E.	Sheared rock with veinlets of pyrite	12	0.01	1.1	......	......	......	......
No. 1 shear, 301 crosscut, portal + 935′ N.E.	Pyritic seam	2	0.01	0.4	......	......	......	......
201 drift at 201 raise	Sheared rock slightly pyritized	14	*Nil*	0.2	......	......	......	......
51 sub-drift N. of 201 raise, F.W. side	Silicified, with seams of galena and sphalerite	7	0.01	6.1	2.0	2.4	......	......
51 sub-drift N. of 201 raise, H.W. side	Massive galena and sphalerite	3	0.03	115.3	29.1	18.4	......	0.22
Stope 30′ below Zero level, 15′ S.E. of 201 raise	Silicified, with abundant pyrite, galena, sphalerite, and with some ruby silver	15	0.02	83.6	8.9	6.3	0.20	0.09
Stope 20′ below Zero level, 8′ N.W. of 201 raise	Silicified, with abundant mixed sulphides	11	0.01	68.4	4.6	8.8	0.25	0.08
Zero level portal + 75′ S.E., H.W. side	Massive sulphides	4	Trace	229.6	29.8	12.8	0.47	0.14
Portal + 100′ S.E.	Silicified, with disseminations and stringers of sulphides	16	Trace	36.7	5.8	1.0	......	......
Portal + 130′ S.E.	Sheared, silicified, with disseminated sulphides	33	0.02	6.1	0.8	0.8	......	......
Portal + 250′ S.E.	Sheared, oxidized, with gouge seams	16	Trace	18.5	2.6	1.8	......	......

Some mineralization was seen at greater elevations north of the glacier. About 200 feet north of the north-east boundary of Silverado No. 4 claim, on what was then open ground, since staked as the D.B.R. claim, a silicified shear-zone containing disseminated pyrite strikes south 50 degrees east and dips 70 degrees south-westward. This intersects or joins a brecciated quartz-calcite vein containing irregular stringers and bunches of tetrahedrite, which strikes south and dips 24 degrees eastward. The vein is from 1 foot to 2 feet wide and can be traced 300 feet northerly from the edge of the glacier. A specimen of the best mineralization assayed: Gold, trace; silver, 308.6 oz. per ton. About 1,000 feet farther east irregular quartz lenses, up to 2½ feet in width and 50 feet long, mineralized with disseminated pyrite, chalcopyrite, galena, and sphalerite are found in a poorly defined shear-zone. This strikes south-westerly and dips steeply north-eastward. A specimen of the best mineralization assayed: Gold, trace; silver, 25.8 oz. per ton.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1921, p. 63; 1927, p. 86; 1929, p. 94. *Geol. Surv., Canada,* Mem. 175; pp. 146, 147.]

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, consisting of eight claims and a fraction held by location and the Molly B Crown-granted claim, is east of the Bear River about half a mile from Stewart. From a tractor-road along the Bear River flats a pack-trail extends a quarter of a mile up the steep side-hill to the portal of an adit at an elevation of 500 feet. When the property was visited in July, 1946, work in this adit had been suspended, pending repairs to the portable air-compressor. A 360-foot Diesel-driven compressor is to be installed in the old mill building on the east bank of the Bear River.

The adit extends 192 feet in an average direction south 50 degrees east along a poorly defined mineralized zone in sheared volcanic rocks. Lenses of silicified rock and irregular masses and stringers of quartz along this zone are sparsely mineralized with pyrite, pyrrhotite, and chalcopyrite. The mineralization has no defined limits but fades irregularly into the walls. A 14-inch channel sample across the zone in the face of the adit assayed: Gold, 0.08 oz. per ton; silver, 1.7 oz. per ton.

The mineralized zone in the adit is cut but not offset by cross-fractures which strike south 30 degrees west and dip at angles varying from 50 degrees to 85 degrees north-westward. These contain quartz stringers sparsely mineralized with pyrite, chalcopyrite, and pyrrhotite. At 136 feet from the portal several closely spaced cross-fractures form a transverse mineralized zone 22 inches wide. A channel sample across this zone assayed: Gold, 0.14 oz. per ton; silver, 3.7 oz. per ton.

Red Cliff. (56° 129° S.W.) The Yale Mining Company held an examining option on this old property, located west of American Creek near its junction with the Bear River. Two and one-half miles of trail was brushed out and a tent-camp established for four men. The object was to sample mineralized showings on the canyon of Lydden Creek on the Montrose claim, from which shipments of gold ore were made in 1939 and 1940.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1939, p. 66; 1940, p. 52.]

Gold-Silver-Copper.

George Enterprise Mining Co., Ltd. (56° 129° S.W.) Company office, Pemberton Building, Victoria. W. B. George, Manager. Capital: 2,500,000 shares, 50 cents par value. The holdings include the Enterprise group of thirteen Crown-granted claims and fractions on the north side of the Bear River about 20 miles from Stewart. This group is reached by motor-road 12 miles to American Creek, pack-trail 7 miles up the Bear River, and foot-path 1¼ miles up the steep hill-side to the camp-site on a rough bench at an elevation of about 3,440 feet. This is near the base of a conspicuous cliff over 200 feet in height which extends westerly for a short distance, then turns abruptly up the slope in a direction north 30 degrees west. West of the cliff is a broad area of unstable slide-rock which continues up the 40-degree slope to the base of a line of bluffs at about 3,900 feet elevation.

The property was under development from 1928 to 1930, but little has been done since. During the 1946 season two men were engaged in clearing the trail and in surface prospecting.

A persistent fault-zone which strikes north 16 degrees east and dips 30 degrees eastward marks the base of the cliff. It contains from 3 to 12 inches of gouge, and on the foot-wall side the rock is somewhat silicified and mineralized with disseminated pyrite and occasional grains of chalcopyrite, galena, and sphalerite. The zone was sampled in a short adit at 3,750 feet elevation, known as Tunnel 15. A 7-inch sample of gouge assayed: Gold, 0.01 oz. per ton; silver, 20.8 oz. per ton; copper, 0.9 per cent.; and lead, 0.8 per cent. A channel sample 44 inches wide across the silicified zone below the gouge assayed: Gold, trace; silver, 0.4 oz. per ton; copper, 0.2 per cent.; and lead, 0.7 per cent.

From time to time high-grade silver float has been found on the slide west of the cliff. One small piece found south-westerly from Tunnel 15, consisting of weathered drusy quartz with interstitial masses of tetrahedrite assayed: Gold, 0.30 oz. per ton; silver, 149.8 oz. per ton. The source of this float has not been found.

About 200 feet north-westerly from Tunnel 15 at 3,900 feet elevation several mineralized fractures occur in a small rock hummock 50 feet west of the base of the cliff. These strike north 20 degrees east and dip 45 degrees eastward and apparently approach the main fault-zone at a small angle from the foot-wall side. The mineralization in these fractures consists of silicified rock and quartz stringers with disseminated pyrite and chalcopyrite, and occasional grains of tetrahedrite, galena, and sphalerite.

A channel sample 11 inches wide from an open-cut on one of these fractures near the lower end of the rock hummock assayed: Gold, 0.03 oz. per ton; silver, 4.3 oz. per ton; and copper, 1.8 per cent. Another cut, being put in about 20 feet from the cliff, exposed similar mineralization. A specimen of the best mineralized material from this cut assayed: Gold, *nil;* silver, 1.1 oz. per ton; copper, 1.7 per cent.; and lead, 0.2 per cent. A specimen of the best mineralization from another fracture incompletely exposed in an old cut about 60 feet farther to the north-west assayed: Gold, 0.01 oz. per ton; silver, 15.2 oz. per ton; and copper, 2.5 per cent.

An old cut and short adit, at 3,750 feet elevation in the base of the line of bluffs some 200 feet south-westerly from these showings, shows dark-green volcanic rock sparsely mineralized with pyrite and chalcopyrite. No defined structure is visible; the sulphides are disseminated in irregular stringers. A sample 7 inches wide representing the best mineralization assayed: Gold, trace; silver, 1.1 oz. per ton; and copper, 7.6 per cent.

A silicified zone 6 feet wide containing abundant coarse-grained pyrite is exposed in a cut on top of the ridge at 4,600 feet elevation. A 60-inch channel sample across the zone assayed: Gold, *nil;* silver, *nil.*

[References: *Minister of Mines, B.C.,* Ann. Rept., 1928, p. 110; 1929, pp. 100, 101; 1930, p. 108.]

BITTER CREEK (56° 129° S.W.).

Silver-Lead-Zinc.

Lead Mountain. This group of eight claims, on the north side of the north fork of Bitter Creek near its head in a glacier cirque, is in part a restaking in June, 1945, of ground formerly covered by the Lucky Date group. The owners are O. McFadden, of Stewart, and J. Bunn, of Prince Rupert. It is reached by a densely overgrown trail 4 miles in length which leaves the Bitter Creek trunk trail at the north fork bridge, about 5 miles from the Bear River Road. From the glacier-filled bottom of the narrow valley, at about 3,200 feet elevation, the ground rises in a series of steep bluffs cut by deep ravines to smoother slopes at elevations above 4,500 feet.

The claims straddle the complex contact-zone of the Bitter Creek formation of argillite, greywacke, and conglomerate, and the overlying Bear River formation, composed mainly of massive and fragmental volcanic rocks. In places the massive volcanics are porphyritic and appear to bear an intrusive relationship to the sediments. The general trend of the contact-zone is north-westerly. The showing includes several rather persistent shear-zones and quartz veins erratically mineralized with galena, sphalerite, tetrahedrite, and some pyrite. In former years these were explored by open-cuts, and several adits are said to have been driven, although only one could be found. No exploratory work is being done at present.

A lenticular quartz vein, known as the I.X.L. vein, containing irregular bunches and disseminations of galena, sphalerite, and tetrahedrite, is exposed in an old cut at an elevation of 4,550 feet on the westerly part of the property. The vein exposed for a length of 50 feet in this cut has a width of 30 inches. It strikes north and dips 40 degrees west. The hanging wall is porphyritic andesite and the foot-wall is slate. Beyond the cut in either direction, where the hanging-wall rock changes to conglomerate, the strike changes to north 20 degrees west, and the vein pinches abruptly to a zone of narrow stringers which cannot be traced more than a few feet.

A channel sample 28 inches wide across this vein in the cut assayed: Gold, 0.01 oz. per ton; silver, 5.4 oz. per ton; copper, 0.15 per cent.; lead, 1.6 per cent.; zinc, 6.9 per cent.; and cadmium, 0.13 per cent. A second channel sample taken across the vein in the south end of the cut, where it narrows to 7 inches, assayed: Gold, trace; silver, 153.1 oz. per ton; copper, 1.78 per cent.; lead, 3.9 per cent.; zinc, 25.7 per cent.; and cadmium, 0.35 per cent.

From a point 300 feet north of the showing on the I.X.L. vein a shear-zone in massive and fragmental volcanic rocks can be traced up a glacial stream for about 1,000 feet, where it disappears beneath a glacier. The vertical relief on this exposure is about 350 feet. The zone could not be examined closely nor sampled because of the rush of water, but oxidized, sheared rock and, in places, remnants of mineralized quartz could be seen. It strikes north 30 degrees west and dips 50 degrees south-westward. It may represent the continuation of the I.X.L. vein in volcanic rocks.

Some 1,500 feet easterly from these showings, at an elevation of about 4,700 feet, a brecciated zone filled with quartz and carbonate and sparsely mineralized with galena and sphalerite occurs along the contact of fragmental volcanics and contorted argillite. The contact strikes north 75 degrees east and dips 45 degrees northward. The zone varies from 3 to 12 feet in width and can be traced for about 300 feet. Eastward it is obscured by overburden; westward it terminates abruptly at a precipitous ravine which evidently represents a fault of major dimensions trending north-westerly.

A persistent quartz stringer lode, known as the Goat vein, which varies irregularly in width from 4 inches to 30 inches, is exposed at a number of places in precipitous bluffs between elevations of about 3,500 feet and 3,900 feet and for a horizontal distance in excess of 800 feet. The quartz contains disseminated pyrite, galena, and sphalerite and, in places, short lenses of massive base-metal sulphides. A short adit is driven on the lowest exposure of the vein, about 200 feet above the bottom of the valley.

The assays of channel samples taken across the Goat vein in the adit and at two points on the surface are as follows:—

Location of Sample.	Width.	Gold.	Silver.	Copper.	Lead.	Zinc.	Cadmium.
	Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Adit, back; elevation 3,500 feet	28	*Nil*	2.2	0.07	2.90	3.9	0.05
Adit, floor; west side	8	0.01	5.3	0.15	35.30	0.2	....
300 feet north-west of adit, elevation 3,700 feet	9	0.01	5.0	0.21	10.10	14.4	0.33
600 feet north-west of adit, elevation 3,900 feet	22	*Nil*	0.5	0.05	0.26	0.6	....

[References: *Minister of Mines, B.C.*, Ann. Rept., 1931, p. 43, under the name Lucky Date group.]

Montreal. This group, on a mountain spur north-east of the head of Bitter Creek, adjoining the Bon Accord (formerly L.L. and H.) group staked in October, 1944, was visited in company with J. O. LeFrancois, of Stewart. The property covers the contact of the Bitter Creek formation and the Bear River formation. Excepting several deeply weathered narrow veinlets containing galena and sphalerite, no mineralization was seen. Open-cuts made the previous year could not be found.

MARMOT RIVER (55° 129° N.W.).

Gold.

Gold Drop Mines, Ltd. Company office, Stewart. M. L. Doyle, President; J. O. LeFrancois, Manager. Capital: 3,000,000 shares, $1 par value. This company holds sixteen claims located for the most part on the south side of the Marmot River, about 2 miles from tide-water. The property includes ground formerly covered by the Stimulator, Gold Knife, and Gold Boulder groups. Work was done on this ground in 1929 by the Bi-Metallic Syndicate and in 1938 by Crusader Mines, Limited. From time to time small shipments of hand-sorted ore have been made. Gold Drop Mines, Limited, acquired the property in 1944, and additional claims were staked. Development-work to date by this company includes some stripping and 556 feet of crosscutting and drifting. No work was in progress when examined in July, 1946.

The property is on a steep and rough slope characterized by precipitous bluffs and deep canyons. The elevation ranges from 200 feet at the Marmot River to about 4,500 feet on top of the ridge south of the river. Those parts of the property above 1,000 feet elevation are so steep and rough as to be almost inaccessible except to foot traffic.

The camp on the south side of the Marmot River, at an elevation of 400 feet, is reached from the wharf at Marmot Bay by 2½ miles of good tractor-road. It includes two substantial log cabins and two frame buildings with accommodation for a crew of ten. The tractor-road continues a quarter of a mile south-easterly to the main adit, at an elevation of 980 feet. Mining equipment at this adit includes a 210-foot Sullivan portable air-compressor, driven by a Buda engine; a 12-inch ventilating-fan, driven by a Petters engine; and a small blacksmith-shop.

The property lies within the Coast Range batholith, about 1½ miles from its eastern contact. The rock is medium- to coarse-grained granodiorite, in places grading into irregular areas of quartz-diorite and diorite. It is cut by several dykes of fine-grained dark-grey rock, resembling andesite. The showings are quartz veins which occupy narrow fault-zones traversing the granitic rocks and dykes.

The part of the property examined in 1946, to which recent development-work was confined, is shown in Fig. 7. Undeveloped veins reported at greater elevations south of this area were not seen, nor were some old workings north of the Marmot River on the former Gold Knife group. The four veins examined in surface exposures are referred to as the East-West, Four-inch, Midas, and Mystery veins.

The East-West vein outcrops in the sides of a narrow canyon known as Camp Gulch, about 400 feet southerly from the main adit and some 200 feet higher. The vein varies in width from 12 to 17 inches, strikes south 65 degrees west, and dips 75 degrees north-westward. The vein-filling is hard glassy quartz and silicified granodiorite, containing no metallic minerals other than scattered pyrite. A channel sample across 12 inches assayed: Gold, *nil;* silver, *nil.* A piece of float about 3 feet in diameter, consisting of quartz and large irregular masses of coarse-grained pyrite, was seen lower down Camp Gulch, near the main adit. A sample of this, containing about 15 per cent. pyrite, assayed: Gold, *nil;* silver, 0.4 oz. per ton.

The Four-inch vein is exposed in a single open-cut at an elevation of 1,430 feet in the west bank of a shallow draw about 950 feet south-westerly from the main adit. The vein varies in width from 2 inches at the top of the open-cut to 6 inches at the lowest exposure, 15 feet below. It strikes south 65 degrees west and dips 72 degrees north-westward. An 8-foot dyke parallels the vein 50 feet distant on the foot-wall side. The vein-filling is rather dark-coloured quartz containing numerous narrow stringers

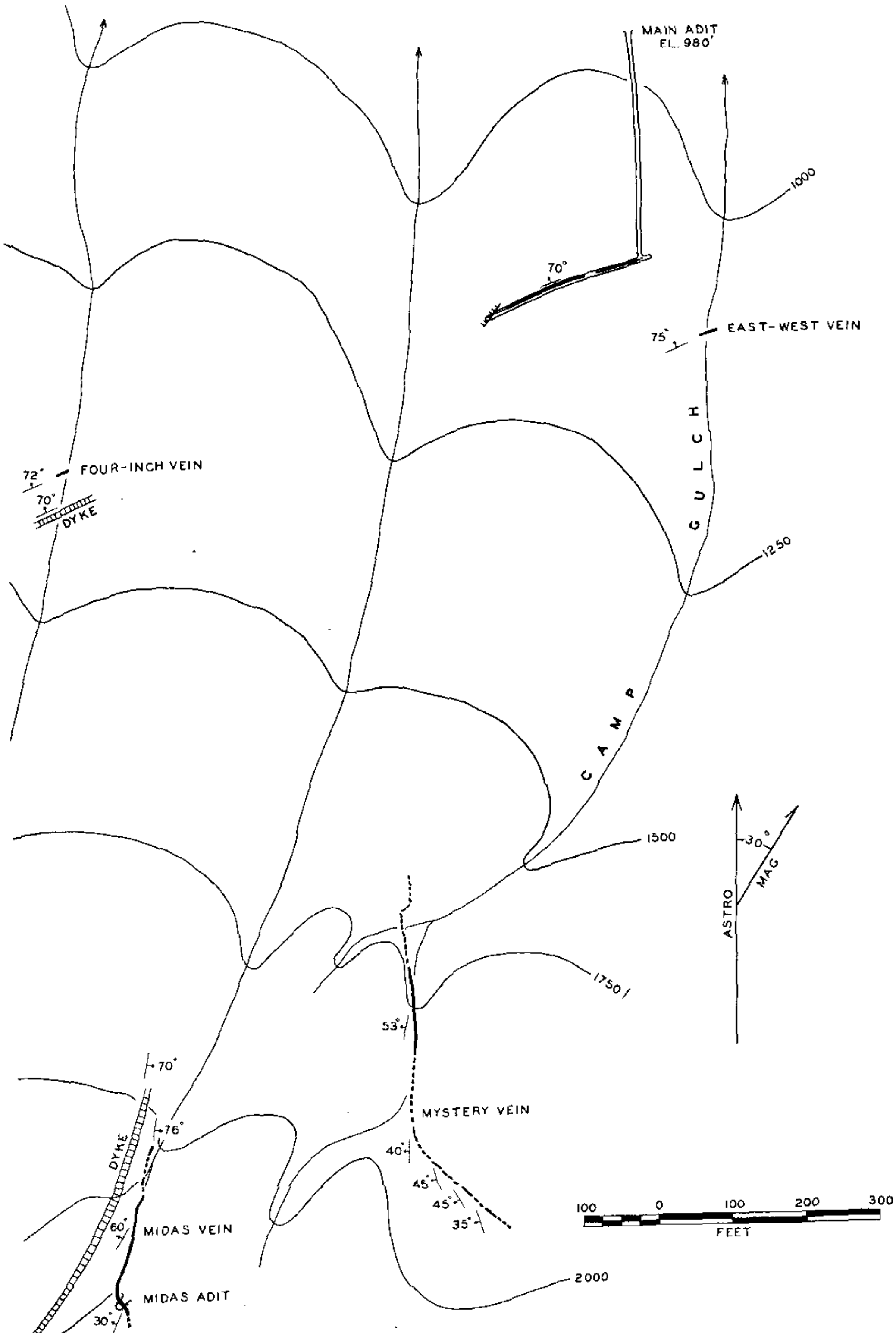


Fig. 7. Gold Drop Mines, Limited—plan showing principal veins.

of friable pyrite with minor amounts of sphalerite and galena and occasional specks of chalcopyrite. Parallel sheeting involves both vein and wall-rock across a total width of about 2 feet. The granodiorite contiguous to sheeting planes is bleached and altered, and contains scattered pyrite. A channel sample across 4 inches, including ½ inch of wall-rock on either side of the vein, assayed: Gold, 3.02 oz. per ton; silver, 7.6 oz. per ton.

About 1,000 feet south of the Four-inch vein the Midas vein is exposed in natural outcrops and by shallow trenching along the steep course of a small stream for a distance of 300 feet, through a vertical range of nearly 100 feet. These showings are at about 2,000 feet elevation. The Midas vein is a lode composed of discontinuous stringers and lenticular masses of quartz containing erratic concentrations of sulphides in a fault-zone containing much gouge, and brecciated and altered granodiorite. The width of the fault-zone varies from 18 inches to 32 inches, but in many places the width of mineralization is much less. The zone varies somewhat unevenly in strike between north 8 degrees east and north 30 degrees east. The dip is quite irregular. At the northernmost exposure the dip is 76 degrees eastward. A few feet south the dip reverses to 60 degrees westward and continues to flatten farther south to less than 30 degrees.

At the most northerly exposure a channel sample across 24 inches on the west side of the fault-zone, consisting of crushed quartz, gouge, and brecciated rock, assayed: Gold, 0.02 oz. per ton; silver, 0.6 oz. per ton. A sample across 8 inches of the east side of the zone, heavily oxidized, copper-stained, and containing much crushed quartz and some stringers of pyrite and chalcopyrite, assayed: Gold, 0.16 oz. per ton; silver, 6.9 oz. per ton; and copper, 12.8 per cent.

Near the southern end of the exposures of the Midas vein an adit has been driven 10 feet on a flat-lying lens of quartz well mineralized with pyrite, and containing some galena and lesser amounts of sphalerite and chalcopyrite. The area of this lens is little over 100 square feet and the maximum thickness about 30 inches. A shipment of 4.866 tons of sorted ore from this adit to the Department of Mines Sampling Plant at Prince Rupert in 1939 assayed: Gold, 2.34 oz. per ton; silver, 4.30 oz. per ton; lead, 2 per cent.; zinc, 0.2 per cent.; and copper, 0.2 per cent. A channel sample across the vein in the east wall of the adit, where it is 18 inches wide, assayed; Gold, 0.16 oz. per ton; silver, 0.6 oz. per ton. A selected specimen containing abundant pyrite and some galena and sphalerite assayed: Gold, 0.93 oz. per ton; silver, 7.1 oz. per ton. The Midas vein appears to pinch out a short distance beyond the adit.

The highest outcrop seen on the Mystery vein is about 500 feet easterly from the Midas adit, at an elevation of 1,920 feet. From this point the vein can be traced by intermittent outcrops and open-cuts for 450 feet northerly, where it crosses the deep canyon on Camp Gulch and disappears over an inaccessible ridge. In this distance the change in altitude is about 300 feet. The vein has not been located at lower elevations.

The vein is divisible into two sections. The upper section, about 150 feet long, is a fault-zone containing crushed quartz lenses, masses of pyrite, brecciated and altered granodiorite, and one or more thin layers of gouge. To the north-west along the outcrop the strike changes progressively from north 35 degrees west, to north, and the dip from 55 degrees south-westward to 40 degrees westward. The fault-zone is up to 5 feet wide, but mineralization is confined to narrower widths. A channel sample taken from the most southerly exposure across 13 inches of crushed quartz and silicified granodiorite well mineralized with pyrite assayed: Gold, 0.15 oz. per ton; silver, 0.3 oz. per ton. Another channel sample, across 7 inches, from a cut 100 feet farther north-westerly along the outcrop, contained abundant friable pyrite, gouge, and crushed granodiorite. This assayed: Gold, 0.02 oz. per ton; silver, 0.3 oz. per ton.

The lower section of the Mystery vein, outcropping in the canyon of Camp Gulch, is a solid quartz vein in granodiorite, sheeted parallel to its plane, and containing veinlets of fine-grained pyrite. It strikes north 10 degrees east and dips 53 degrees westward. A channel sample across 16 inches assayed: Gold, *nil;* silver, 0.2 oz. per ton. A specimen of massive fine-grained pyrite assayed: Gold, 0.08 oz. per ton; silver, 0.4 oz. per ton. It should be mentioned that a sample taken previously from the same place by a reputable engineer assayed several ounces of gold per ton.

The main underground workings consist of a crosscut 306 feet long, driven due south, and a drift from this crosscut which follows a fault-zone for 235 feet in an average direction south 70 degrees west. The zone contains several narrow stringers and one quartz-lens having a length of 150 feet and a maximum width of 24 inches. Of six channel samples taken in the drift over widths of from 2 to 24 inches, one assayed: Gold, 0.01 oz. per ton, and the remainder, *nil.* The drift ends in a dyke of uncertain attitude into which the vein-fracture continues.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1929, p. 93, under the name Bi-Metallic Syndicate. *Geol. Surv., Canada,* Mem. 175, pp. 108, 109.]

UNUK RIVER (56° 130° N.W.).*

Gold.

Unuk Gold Mines, Ltd. T. B. MacKay, Manager. The property is under option to Canadian Exploration, Limited. A crosscut 5 by 7 feet was being driven, and a raise was put through to the surface at 152 feet. All mining is by hand. A small Fairbanks-Morse blower-fan driven by a 1½-horsepower gasoline-engine furnishes the ventilation. Work is expected to continue throughout the winter with a crew of five men, the objective being to drive the crosscut a distance of 560 feet.

PRINCESS ROYAL ISLAND (53° 128° S.W.).*

Gold.

Surf Inlet Consolidated Gold Mines, Ltd. Company office, 402 Bank of Nova Scotia Building, Vancouver. W. H. Hax, President; W. S. Ellis, Mine Manager; A. J. Ingraham, Engineer. Capital: 3,000,000 shares, 50 cents par. Operations were resumed in April, 1946, and the power plant, transmission-lines, and the camps at the beach and mine reconditioned. The Pugsley shaft was unwatered to the 1300 level. Development consisted of 7,612 feet of diamond-drilling from the surface, 225 feet of drifting, 188 feet of crosscutting, and 116 feet of raising.

At the beginning of December, operations on the Pugsley were suspended. Several men were left at the mine for maintenance. It is proposed to drive a prospect drift by hand at an elevation of about 1,000 feet.

TERRACE (54° 128° N.W.).†

Gold.

Ida (formerly Black Bull). This group of nine claims, owned by William Hagan and associates, of Terrace, is located on the south-westward slope of Kleanza Mountain, south of the Skeena River and about 7 miles east of Terrace. From the Provincial highway near the Copper River Bridge it is reached by 3¼ miles of tractor-road. The gentle slope is heavily timbered and, except in occasional bluffs, rock-exposures are scarce.

The property is in the southern contact-zone of an irregular spur of the Coast Range batholith intrusive into volcanic rocks of the Hazelton group. The rocks include quartz-diorite and diorite, basic dykes, and various hybrid types of granitized volcanics.

* By Charles Graham.

† By W. H. White.

Development-work includes three adits, totalling 317 feet, and a number of open-cuts. No. 3 adit, elevation 2,200 feet, is 27 feet long; No. 2 adit, elevation 2,290 feet, is 152 feet long; and No. 1 adit, elevation 2,397 feet, is 138 feet long. From time to time small shipments of hand-sorted ore from No. 1 adit have been made to the Department of Mines sampling plant at Prince Rupert.

A quartz vein is exposed intermittently by these workings for a distance of 750 feet, and through a vertical range of about 400 feet. The vein undulates slightly, strikes north 10 to 26 degrees east, and dips 60 to 72 degrees eastward. Southward the vein is drift-covered; northward it narrows and splits into crooked stringers which soon pinch out. The vein pinches and swells, averaging about 14 inches in width. Locally it splits into two or more stringers, and irregular tapering veinlets extend outward into the wall-rocks. The walls are free, and some movement is indicated by striations and thin gouge-seams. The various rocks which the vein traverses do not appear to affect its structure or mineralogy.

In Nos. 2 and 3 adits and in open-cuts below No. 2 adit the vein-quartz is compact and glassy, and contains only occasional veinlets and disseminated crystals of pyrite. A channel sample 15 inches wide across the vein in the face of No. 2 adit assayed: Gold, trace; silver, 0.1 oz. per ton.

The vein in No. 1 adit and in open-cuts from 50 to 100 feet above is closely banded, and contains from 5 to 25 per cent. coarse friable pyrite and minor amounts of chalcopyrite. This well-mineralized ore-shoot is about 130 feet long and averages 15 inches wide. It is apparently continuous above No. 1 adit to the surface, but its downward continuity is unknown because No. 2 adit has not been driven far enough to test it.

The results of four samples taken from the vein in No. 1 adit are summarized below:—

Description.	Width.	Gold.	Silver.
	Inches.	Oz. per Ton.	Oz. per Ton.
30 feet from portal—banded quartz, about 5 per cent. sulphides	16	0.43	0.7
100 feet from portal—banded quartz, about 10 per cent. sulphides	14	1.15	1.9
125 feet from portal—banded quartz, about 25 per cent. sulphides	14	1.55	2.8
110 feet from portal—selected material, about 85 per cent. sulphides	....	6.58	4.8

It will be noted that the values are approximately proportional to the sulphide content. Moreover, as spectrographic analysis of these samples gave a strong indication of tellurium, the gold and silver may be present as tellurides.

SMITHERS (54° 127° N.E.).*

Silver-Lead-Zinc.

Duthie Mines (1946), Ltd. Company office, 615 Pender Street West, Vancouver. J. G. Turgeon, President; C. B. North, Mine Manager; J. B. McConnell, Superintendent. The company acquired the Duthie mine, formerly held by Smithers Mines, Limited. Operations began in June, 1946, and 151 days were worked. The surface buildings were reconditioned and a telephone-line was built from Smithers. The portals of 500, 245, and 65 levels were retimbered and a flame-proof fire-door put in 500 level. New ladders were put into four old stopes on 500 level and into two old stopes on 65 level. The main ore-pass from 245 to 65 levels was retimbered. The 500 level was cleaned up to No. 1 shaft and 245 level cleaned up to the main ore-pass. No mining was done.

* By Charles Graham.

Some difficulty developed in reconditioning the steam power plant. New fire-boxes had to be built to change over from wood to coal burning, and there was considerable delay in obtaining parts for the steam-turbine generator unit.

Gold-Silver.

La Marr Gold Mines, Ltd.* This private company, of which B. F. Messner, of Smithers, is President, controls a group of twenty-two located claims and a fraction, part of which was known formerly as the Silver King group. The property is in a small basin near the head of Driftwood Creek about 19 miles north-easterly from Smithers. The floor of the basin has an elevation of 4,900 feet, and on three sides the Babine Mountains rise steeply to over 6,000 feet. The camp includes a two-story frame bunk-house and a log cook-house. It is reached from Smithers by road, the last 5 miles of which, built this year, is suitable only for horse and tractor traffic. No work was in progress when the property was visited in September, 1946.

Small, irregular quartz-lenses, mineralized with pyrite, tetrahedrite, galena, and sphalerite, are found intermittently along one or more crooked and branching shear-zones which traverse volcanic breccias, light-coloured flow-rocks, and rhyolite dykes of the Hazelton group. In places the shear-zones occur along the contacts of the rhyolite dykes. Where the quartz-lenses are well mineralized, they constitute medium- to high-grade silver ore. From time to time small shipments of hand-cobbed ore have been made.

The property has been explored intermittently since 1919. Development-work includes four adits, totalling about 1,300 feet. The portal of the main adit is on the floor of the basin about 250 feet easterly from the mouth of a small canyon by which Driftwood Creek enters the basin. This adit starts as a crosscut 260 feet long, driven north 20 degrees east beneath a low talus-covered bench. From the end of the crosscut, crooked drifts extend south-easterly for about 160 feet and westerly about 115 feet. Other workings from the adit-level include two shallow winzes, a small open-stope, several short drifts and crosscuts, and a raise to an old drift 25 feet above.

These workings explore a zone of bleached and sheared rock with numerous gouge-seams. The zone is poorly defined and very irregular in attitude. It strikes from south 45 degrees east to south 80 degrees east and dips variably north-eastward and northward between 10 and 70 degrees. The zone contains discontinuous stringers and lenticular masses of shattered quartz with variable amounts of pyrite, tetrahedrite, galena, and sphalerite in irregular veinlets and bunches. The largest lens, found in 1926 where the main crosscut reached the shear-zone, was 35 feet long and about 12 inches wide. Drifting on this yielded about 3½ tons of hand-cobbed ore containing 0.4 oz. of gold per ton and 84 oz. of silver per ton (see *Minister of Mines, B.C.*, Ann. Rept., 1926, p. 133). As these workings are no more than 40 feet below the surface, the shear-zone is very much oxidized. In places the shattered quartz is cemented with soft clayey material coloured red and green by the oxidation products of pyrite and tetrahedrite. A short lens of mineralized quartz in the east drift, 90 feet from the main crosscut, was relatively fresh looking in part and the remainder very much oxidized. A sample taken across 51 inches of the relatively fresh-looking material on the foot-wall side assayed: Gold, *nil;* silver, 0.9 oz. per ton; and copper, 0.04 per cent. A sample across 14 inches of oxidized material on the hanging-wall side assayed: Gold, 0.34 oz. per ton; silver, 40.8 oz. per ton; copper, 4.7 per cent.; lead, 0.47 per cent.; and zinc, 0.4 per cent.

Small quartz-lenses containing variable amounts of pyrite and base-metal sulphides are found in two prospect adits about 1,200 feet south-easterly from the main workings,

* By W. H. White.

and similar mineralization is seen in two surface cuts in the same area. These have diverse attitudes and are not associated with any persistent well-defined structure. Their relation to the shear-zone in the main workings is not apparent.

Silver-Lead-Zinc.

Lorraine.* (54° 127° N.E.) This group of eight claims and fractions is at the head of a small timbered valley on the north-eastward slope of the Babine Mountains. It is about 4 miles south-easterly from the La Marr Gold Mines camp, from which place it is reached by a poor trail above timber-line. The owners are B. F. Messner, of Smithers, and associates. The claims range in elevation from about 4,500 feet in the valley to over 6,000 feet. Outcrops are not plentiful on the talus-covered slopes above timber-line.

Sedimentary rocks, mainly argillite, with contorted bedding-planes which strike north-easterly and dip variably south-eastward, extend eastward from their contact with massive light-coloured lava-flows, which here form the core of the Babine Mountains. The argillite is traversed by several southerly striking rhyolite dykes which dip steeply westward.

The two showings found on the property are referred to as the Main vein and West vein. Most of the development-work, including a caved adit, a water-filled shaft said to be 40 feet deep, and several open-cuts, is confined to the north-eastern end of the Main vein exposures. The Main vein is seen intermittently in widely spaced open-cuts for a distance of 3,000 feet, the difference in attitude in this distance being about 1,500 feet. It is a bedded quartz stringer lode in contorted argillite. The lode pinches and swells irregularly, but probably averages not more than 18 inches in width. As a general rule it is sparsely mineralized with disseminated pyrite, galena, sphalerite, chalcopyrite, and occasional grains of tetrahedrite. A 51-inch channel sample of such material, taken across a local enlargement in an open-cut 90 feet south-westerly from the portal of the caved adit, assayed: Gold, *nil;* silver, 14.1 oz. per ton; lead, 7.1 per cent. The exposed length of this section is about 10 feet, and in this distance the mineralization narrows to about 15 inches.

Deeply oxidized, well-mineralized material, containing large masses of galena and sphalerite in a siderite gangue, is exposed 70 feet south-westerly from the portal of the caved adit in the south-west face of a deep open-cut. A 29-inch channel sample across this mineralization assayed: Gold, 0.15 oz. per ton; silver, 70.2 oz. per ton; copper, 1 per cent.; lead, 10.2 per cent.; zinc, 11.1 per cent.; and cadmium, 0.16 per cent. As the rest of the open-cut was sloughed, the length of this ore-shoot is unknown.

The West vein is exposed in an open-cut about 500 feet westerly from the caved adit. It consists of two parallel quartz stringer-zones separated by about 40 inches of sheared argillite and gouge. It strikes south and dips 70 degrees west. The hanging wall is a rhyolite dyke and the foot-wall is argillite. The quartz stringers contain sparsely disseminated pyrite and base-metal sulphides. A composite channel sample of the two stringer-zones, aggregating 30 inches in width, assayed: Gold, *nil;* silver, 0.2 oz. per ton; and zinc, 1.2 per cent.

HOUSTON (54° 126° S.W.).†

Gold-Silver.

Owen Lake.—Some exploration-work was done by Canadian Exploration, Limited, under the direction of H. L. Batten at the Owen Lake mine.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1929, p. 171.]

* By W. H. White.

† By Charles Graham.

TOPLEY (54° 126° N.E.).*

Gold-Silver.

Topley Richfield. R. Warren Innes, Owner. The Goodrich Mining Company, Limited, of Vancouver (N. T. Watts, Managing Director), is reported to have taken an option on the property. During August the only work being done was some clearing, by the owner, of a proposed mill-site. No further work has been reported.

BABINE LAKE (54° 126° N.E.).

Copper.

Copper Island Mines, Ltd. This private company is the recorded owner of three mineral claims, which, with five adjoining claims, are situated on MacDonald (Copper) Island in Babine Lake. Diamond-drilling was done for the company in 1946. Low-grade copper mineralization and silver-lead-zinc mineralization on the island have been described under the names Copper Island, Richmond, Robin, and Newman.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1913, pp. 113, 114; 1927, pp. 149, 150; 1929, pp. 180, 181; 1940, p. 78.]

GOLDWAY MOUNTAIN (56° 126° N.E.).*

Gold.

Goldway Mountain, about 6 miles east of Sustut Lake and 30 miles north-west of Aiken Lake, was the scene of staking of numerous claims during 1946.

It is reported that the Goldway group, recorded in the name of M. G. Kerr, of Vanderhoof, and the Dot and Nonie groups, recorded in the name of Mrs. M. Baker, of Fort St. James, are under option to Goldway Peak Mines, Limited. This company, controlled by Carl Springer and Leitch Gold Mines, Limited, has other holdings in the area.

It is expected that material and equipment will be flown into the claims during the winter. A runway has been prepared for ski landings.

WHITESAIL LAKE (53° 127°).*

Continued prospecting and diamond-drilling by both standard and X-ray drills was done by Pioneer Gold Mines, Limited, on the Harrison group.

Consolidated Mining and Smelting Company, Limited, had several prospecting parties in the area.

Wakeko Mines, Limited, had a prospecting party on Quanchus Range, in charge of C. V. Harrison, of Wistaria.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1945, pp. 64–73.]

CARIBOO.†

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; C. D. Stevenson, General Manager; G. A. Gordon, Assistant General Superintendent; I. S. Comfort, Mine Superintendent. Capital: 2,000,000 shares, $1 par. The Cariboo Gold Quartz mine is a short distance south of the town of Wells, which is 56 miles by road from Quesnel, the northern terminus of the Pacific Great Eastern Railway.

Early in 1946 Quebec Gold Mining Corporation and Noranda Mines, Limited, increased the working capital of the company by buying 200,000 shares of treasury

* By Charles Graham.

† By J. W. Peck, except as noted.

stock. Since then there has been a change in directors and company management. A strike of the workers occurred on July 3rd, and the mine remained closed until November 25th, when a settlement was made. Throughout the summer the company continued its housing construction programme, and the concrete apartment buildings, designed for a total of fifty suites, are expected to be finished in 1947.

Before the strike, every level was worked from 900 level down to 2000 level, but after the strike, work was confined to levels below 1100. Development-work consisted of 1,034 feet of drifting, 1,053 feet of crosscutting, 893 feet of raising, and 5,820 feet of diamond-drilling. A start was made cleaning up and retimbering the B.C. Shaft main-haulage crosscut which had severely caved during the war years. In the cut-and-fill stopes, slushers were put in use. Total ore milled amounted to 45,224 tons, most of which came from the Sanders, Rainbow, and No. 1 zones. Net contents: Gold, 14,093 oz.; silver, 1,179 oz.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1945, pp. 73–80.]

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; P. L. Clark, Mine Superintendent. Capital: 1,100,000 shares, 50 cents par. This company, a subsidiary of Newmont Mining Corporation, operates the Island Mountain mine just west of the town of Wells. On July 3rd the mine was closed by a strike lasting until November 26th, 1946.

All levels from the 4000 level to the 3125 level were worked, but most work was done on the 3750, 3375, and 3125 levels. Most of the ore developed was in extensions of known ore-bodies. Development-work during the year consisted of 1,172 feet of drifting and crosscutting and 66 feet of raising. No diamond-drilling was done.

An average of 104 men was employed before the strike. The company put in two bulldozer trenches, totalling about 1,000 lineal feet, on Island Mountain, lying west of the Lower Johns adit. In addition, a large amount of bulldozer stripping was done on Richfield Mountain, on the company's Rich group of claims. The milling rate was 98 tons per day during the period of operations. Production was 9,298 oz. of gold and 1,249 oz. of silver from 20,807 tons of ore.

Canusa Cariboo Gold Mines, Ltd.* (53° 121° S.W.) Company office, 306 Crown Building, Vancouver. John Dunsmuir, President; W. G. McGowan, Mine Manager. Capital: 3,000,000 shares, 50 cents par. The company holds twenty-four mineral claims and fractions lying west of the heads of Lowhee Creek and Stouts Gulch. The Black Bull and Waoming are old Crown grants; the remainder are located claims. On the east the company's holdings adjoin the American, Cariboo, St. Laurent, and Mucho Oro claims, owned by Cariboo Gold Quartz Mining Company, Limited.

The section of chief interest (*see* Fig. 8) lies between Watsons Gulch and Emory Gulch, where the Lowhee and old Stouts Gulch hydraulic pits have exposed areas of bed-rock. Elsewhere bed-rock is covered by a mantle of drift and few outcrops are to be seen.

Rocks exposed in the upper part of Stouts Gulch and in the Lowhee hydraulic pit 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 is terminated by a fault at its western end.

Black argillite and argillaceous quartzite of the Basal member is exposed in the upper part of Emory Gulch, at the top end of the Lowhee ditch spillway, in a bulldozed trench south-west of the Lowhee camp, in the old Cariboo Central adit, in Lowhee pit south-west of the south-east end of the Black Bull quartz vein, and in Watsons Gulch,

* By Stuart S. Holland.

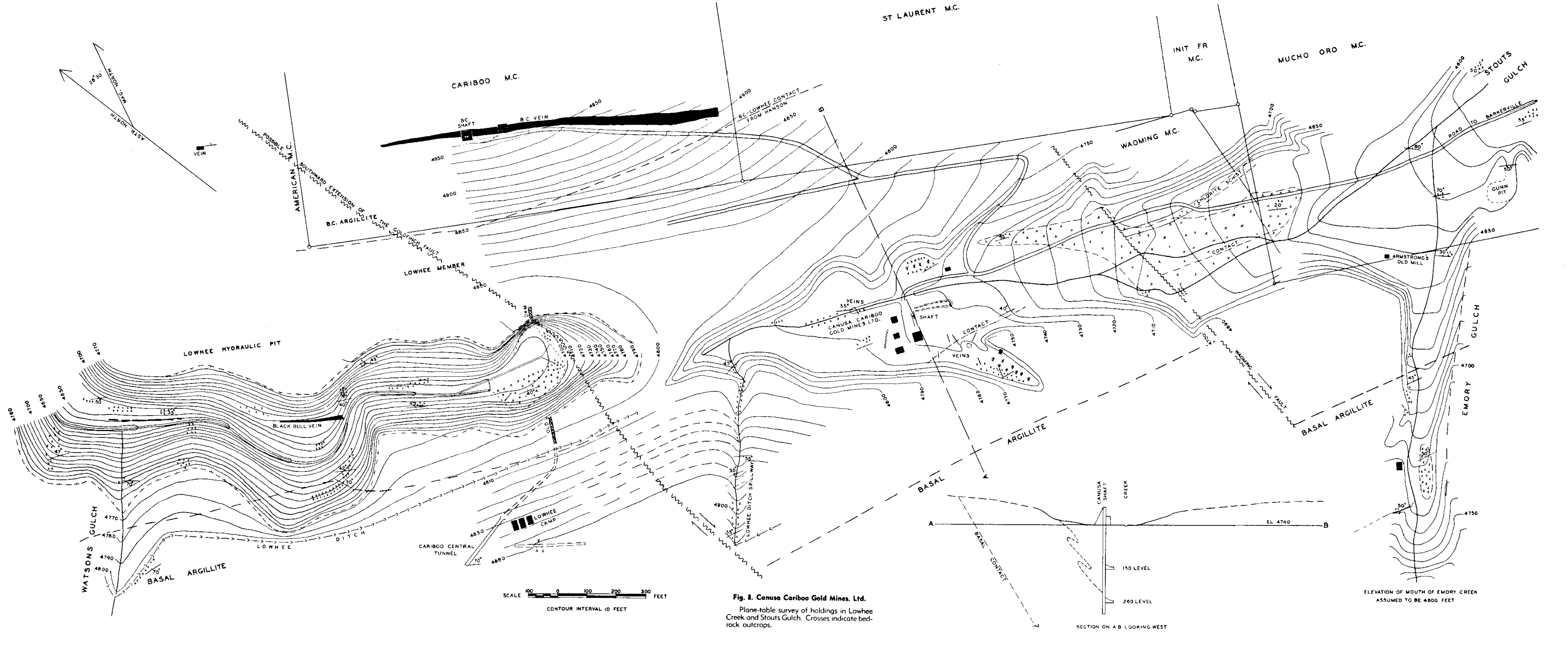


Fig. 8. Canusa Cariboo Gold Mines, Ltd.

Plane-table survey of holdings in Lowhee Creek and Stouts Gulch. Crosses indicate bedrock outcrops.

where it extends for about 1,000 feet south-west from the Lowhee ditch. The contact between Lowhee and Basal members is inferred from these exposures.

The position of the contact between the Lowhee and B.C. members could not be mapped because of the absence of outcrops. The position of the contact as shown on Fig. 8 has been taken from Hanson's map of the Barkerville Gold Belt (*Geol. Surv., Canada,* Map No. 2394).

The rocks strike fairly uniformly about north 65 degrees west and, with few exceptions, dip to the north-east. The dip generally ranges from 35 to 50 degrees north-east.

A fault, called the Waoming fault, crosses the Waoming claim on Stouts Gulch about 750 feet south-east of the Canusa Cariboo shaft. The fault terminates a band of chlorite-schist and may be seen as a 25-foot zone of broken rock and gouge at the foot of the bank on the south side of the old hydraulic pit. The fault strikes slightly east of north and apparently displaces the Lowhee-Basal contact about 400 feet to the right.

The distribution of Basal argillite north-west of the head of Stouts Gulch may be explained by postulating the existence of a second right-hand fault. This fault is inferred to extend in a direction slightly west of north from close to the head of Lowhee ditch spillway, past the east side of Lowhee camp, and to cross at the very head of Lowhee hydraulic pit beneath overburden. The apparent displacement of the Lowhee-Basal contact is about 650 feet. This fault is thought to be the southward extension of the Goldfinch fault on the Cariboo Gold Quartz ground.

The vein-showings are described in the Annual Report of the Minister of Mines, British Columbia, 1945, page 81. No new surface showings were found.

During 1946 a start was made on a programme of underground exploratory work. A shaft-site was selected on the Stouts Fraction Mineral Claim about 900 feet from the head of Stouts Gulch. The shaft head-frame was erected, together with hoist-house, dry, warehouse, and timber-framing shed. By the end of the year a two-compartment shaft, 7 feet by 11 feet, had been sunk to a depth of 300 feet, with levels cut at 150- and 260-foot depth. The average number of men employed was sixteen.

[References: *Geol. Surv., Canada,* Mem. 181, p. 27. *Minister of Mines, B.C.,* Ann. Rept., 1945, pp. 80, 81.]

Williams Creek Gold Quartz Mining Co., Ltd. (53° 121° S.W.) Company office, 184 Bay Street, Toronto. G. H. Rainville, President; P. N. Pitcher, Mine Manager. Capital: 3,000,000 shares, $1 par. The company, financed by Quebec Gold Mining Corporation and Noranda Mines, Limited, acquired the Westport group of claims from Cariboo Gold Quartz Mining Company, Limited, for 800,000 shares of capital stock. Preliminary surveys were made during the summer. In the autumn a programme of surface diamond-drilling was begun. Twelve holes, totalling 2,957.5 feet, were drilled from sites on the lower part of Williams Creek canyon, just below the Black Jack adit, and on Lower Stouts Gulch.

[References: *Geol. Surv., Canada,* Mem. 149, pp. 193, 194. *Minister of Mines, B.C.,* Ann. Rept., 1930, p. 166. *Geol. Surv., Canada,* Mem. 188, p. 29.]

Barkerville Mining Co., Ltd.* (53° 121° S.E.) Company office, 711 Yorkshire Building, Vancouver. H. T. James, President; C. E. Gordon Brown, Manager. Capital: 3,000,000 shares, $1 par. The company has a controlling interest in Proserpine Mines, Limited, on Proserpine Mountain. In addition, the company holds the following mineral claims: The Shamrock group of thirteen claims and fractions on Mount Conklin, the Xmas group of six fractions at the head of Conklin Gulch, the Antler Mountain group of ten claims and fractions on Antler Mountain, the

* By Stuart S. Holland.

Rex group of eight claims and fractions near Grouse Creek, the Hen group of four claims and fractions on Grouse Creek, the Elsie group of nine claims and fractions, and the Stevens group of twelve claims at the heads of Stevens and Beggs Gulches. On Island Mountain the company holds the former Cariboo Consolidated group of seven claims, the Willow group of six claims, the Spec group of eight claims, the Lode group of eight claims, the V.E. group of eight claims, the Peak group of eight claims, and the Bluebell group of eight claims.

The company was formed by Pioneer Gold Mines of B.C., Limited, to explore and develop claims centring around the old showings on Proserpine Mountain, and also claims lying to the north of the Island Mountain Mines Company, Limited, and Cariboo Gold Quartz Mining Company, Limited, holdings on Island Mountain. C. E. Gordon Brown is in charge of the work.

Work was begun in the autumn of 1945. Except for some drifting and diamond-drilling in the Warspite adit during the winter, all work has been on the surface and has been directed toward working out the detailed geology along the Barkerville Gold Belt. Specific information was required as to the location, distribution, and structural environment of the Rainbow member so that an underground exploratory programme could be laid out.

On Proserpine Mountain geological information has been obtained largely from stripping done by bulldozer. Bed-rock there is comparatively soft and is covered by only 2 to 3 feet of overburden, so that stripping is rapid and comparatively cheap. In addition to the 36,000 lineal feet of bulldozer stripping done by Privateer Mine, Limited, in 1941 on the Proserpine ground, bed-rock was exposed along about 16,000 feet of road built by the company in 1945 into the Warspite adit, as well as in about 38,000 lineal feet of bulldozer stripping done on Proserpine Mountain, on the Xmas, Pin Money, Rex, and Hen claims.

During the winter of 1945 and early 1946 about 900 lineal feet of underground work was done in the Warspite adit and also about 1,700 feet of underground diamond-drilling. This work partly explored a block of ground lying between two faults, the Warspite and the Tipperary, and traced a 30-foot bed of white silicified and pyritized quartzite for a length of about 400 feet. The approximate gold content of the pyritized quartzite is indicated by a selected sample which assayed: Gold, 0.10 oz. per ton.

The geological mapping on Proserpine Mountain was made difficult by the lack of exposures other than in bulldozer cuts. In geological mapping, two recognizable horizons were used—the bottom of the limestone at the base of the Barkerville formation and the top of the black argillite of the Basal member of the Richfield formation. It was found that the stratigraphic thickness of rock between these two horizons was fairly constant, ranging between 4,000 and 4,500 feet. To the north-west along the belt this section is divided from top to bottom into Baker, Rainbow, B.C., and Lowhee members. On Proserpine Mountain, however, a fourfold division is not possible, and geological mapping by the company was on the basis of whether the rock member was light or dark. By so doing, it was found that a cross-section from the top of the Basal argillite to the base of the Barkerville invariably comprised two light-coloured members separated by a central black member. The black member is thought to correspond with the Rainbow member to the north-east. The thickness and position of the central member in relation to the top or bottom of the section changes from one place to another. This is probably due to complex folding within the series.

Stripping disclosed a number of major north-striking faults, as well as numerous small ones. The major faults are the Pin Money fault, extending diagonally across the Pin Money and Proserpine claims into the Proserpine S. claim; the Warspite fault, cutting through the west corner of the True Blue claim and extending south through the Warspite claim; the Tipperary fault, extending from the True Blue southward through the east corner of the Warspite claim and through the Tipperary claim; and the Independence fault, extending southward through the Independence claim from its north-west corner. All these faults strike slightly west of north, offset the formation to the right, and dip steeply, about 85 degrees, to the east.

Besides the Grouse Creek fault, mapped by Hanson, another north-striking fault crosses the company's holdings to the north and east of the General Currie and Blighty claims.

Despite the large amount of surface stripping done, few new veins were uncovered. Two new veins—one on the Rex group and one on the Norah claim—were found, from whose outcrops free gold could be panned. On the Rex No. 1 close to the Independence fault an area of quartz stringers was found, and an area 60 feet square was drilled and bulldozed to a depth of about 10 feet.

In September, 1946, camp was moved from the Warspite adit to a site on Grouse Creek. From there work was concentrated along Grouse Creek and on Antler Mountain, where about 14,000 feet of bulldozer stripping was done. A quartz vein mineralized with galena and pyrite, previously found on the Grouse Mineral Claim by E. E. Armstrong, was opened up for a length of 110 feet.

The old Dufferin adit on Grouse Creek, length 216 feet, was opened and retimbered. This adit is a drift on a quartz vein, some of which is well mineralized with galena.

During 1946 the company did work on its holdings on Island Mountain. This comprised about 14,000 lineal feet of bulldozer stripping, 1,262 feet of surface diamond-drilling, and the digging of 219 pits totalling 1,581 feet. The bulldozer stripping was largely unsuccessful owing to the excessive depth of overburden. The surface diamond-drilling, as is commonly experienced in the Cariboo, was largely unsuccessful owing to the poor core recovery, about 20 per cent. As a consequence the company was led to sink pits for bed-rock information. Of the 210 pits sunk, only 96 reached bed-rock at a depth of 9 to 10 feet or less. No pits were sunk deeper than 10 feet.

The work afforded incomplete geological information but was sufficient to show that it was in an intensely folded section.

[References: *Geol. Surv., Canada,* Mem. 181, pp. 31–33; Mem. 149, pp. 195–206. *Minister of Mines, B.C.,* Ann. Rept., 1935, p. C 24.]

Mines Operating, Inc.*

(53° 121° S.E.) Mines Operating, Incorporated, 1052 Stuart Building, Seattle, owns the M.O. group of twenty claims and the Alpha group of four claims. These groups cover and surround a showing exposed in the hydraulic pit at Guyet Placers on the west side of Antler Creek. It was reported during the summer by S. C. Reid, who was in charge of hydraulicking at Guyet Placers, that a wide vein was exposed in the pit, and that an assay of $47 had been obtained from it.

The showing exposed by hydraulicking is a 20-foot fault-zone striking slightly west of north. The badly crushed black argillite in the zone contains numerous narrow quartz stringers running parallel to the zone, and also pyrite mineralization either in small disseminated grains or aggregates of bean-size crystals.

Three pans of soft fault-zone gouge and broken argillite were taken after the face was carefully dressed down so as to avoid being accidentally salted by placer gold. No gold was recovered on panning.

A sample of pyrite from the fault-zone was specially selected. It assayed: Gold, *nil;* no metallics were present.

The fault is undoubtedly the one shown on the Johnston and Uglow geological map of the Barkerville area as running along the contact between the Pleasant Valley and Barkerville formations.

* By Stuart S. Holland.

Canyon Cariboo Gold Mines, Ltd.* (52° 121° N.E.) Company office, 1015 Hall Building, Vancouver. Frank E. Hall, President. Capital: 3,000,000 shares, $1 par. The company holds about seventy claims and fractions lying along both sides of Antler Creek and extending northward from Sawmill Flat to California Gulch. The claims include the Gisco group, the Noranda group, the Spitfire group, the Zone, Lode, Pittman, and Norex groups, and others. All work was done on the Gisco and Spitfire groups and was under the direction of A. A. Lee.

The Gisco group consists of ten claims staked along the west side of Antler Creek and extending northward from Sawmill Flat. The main showing on the group, the Gisco vein, is about 50 feet above creek-level, on the west side of Antler Creek opposite the mouth of Victoria Creek. About 1,200 lineal feet of bulldozer stripping was done parallel to Antler Creek, to the north and south of the Gisco vein. The Gisco vein lies in grey flaggy quartzite that strikes north 45 degrees west and dips 75 degrees north-east. The vein-fracture strikes north 80 degrees east and dips 70 degrees north. The vein has a maximum exposed width of 12 inches and a length of about 40 feet before it pinches where the fracture crosses soft argillaceous rocks. The vein-quartz is mineralized with pyrite, galena, and rare specks of visible gold. The highest assay of a sample taken by the owners is reported to be 0.32 oz. gold per ton. A sample of picked pieces containing 15 per cent. pyrite and about 5 per cent. galena assayed: Gold, 0.01 oz., and silver, 1.8 oz. per ton. Several 1- to 2-inch quartz stringers lie on the foot-wall side of the vein. Ten feet on the hanging-wall side a 1- to 2-inch stringer is exposed, from which samples containing visible gold have been obtained and from whose outcrop fine flour gold may be panned.

To the north of the Gisco vein is a 25-foot limestone-bed. In it is a vein well mineralized with chalcopyrite. A selected sample of chalcopyrite assayed: Gold, 0.01 oz. per ton; silver, 10.5 oz. per ton; and copper, 26.9 per cent. No other veins were exposed.

The bulldozer stripping exposed light-coloured fissile schists striking north-west and dipping 70 degrees north-east. There are local northerly swings in the strike close to faults, several of which were seen having a strike slightly west of north.

The Spitfire group of nine located claims is on the west side of Antler Creek between Wolfe Creek and the head of California Gulch. During the summer E. S. Dowsett was engaged in prospecting these claims. He discovered a vein-zone having a known length of about 500 feet and a width of about 350 feet lying 700 to 900 feet in elevation above the China Creek cabin and on the north side of Wolfe Creek. The quartz veins occur in groups of individual veins 2 to 3 feet apart. The veins are stripped for lengths of about 20 feet; the greatest exposed width of any vein is 6 inches. The veins strike north 50 degrees east, stand vertically, and cut grey flaggy quartzite striking north 45 degrees west and dipping 65 degrees north-east. The quartz is mineralized with pyrite, most of which has been leached from the outcrops. Of the numerous veins found and partly stripped, possibly one-half contain fine flour gold that may be panned from the weathered exposures.

The veins are in a hard grey flaggy quartzite that lies stratigraphically above a thick limestone member exposed along the lower part of Wolfe Creek. The correlation of these members with mapped units to the north-west along the Gold Belt is uncertain.

Cariboo Hudson Gold Mines (1946), Ltd. (52° 121° N.E.) Company office, care of F. C. Field, 411 Royal Bank Building, Vancouver. Capital: 3,000,000 shares, 50 cents par. This company was incorporated to acquire the holdings of Cariboo Hudson Gold Mines, Limited. The mine and 100-ton cyanide-mill, closed since August, 1939, are near the head of Cunningham Creek, 21 miles by

* By Stuart S. Holland.

road from Barkerville. Most of the buildings are intact, but some of the equipment has been sold.

Development in 1946, under the direction of E. E. Mason, consisted of 345 feet of exploratory drifting and about 5,000 feet of diamond-drilling. Buildings were repaired where necessary, and the change-house was rebuilt. A compressor was installed to replace the one that had been removed during the shut-down. E. Seppanen was foreman in charge of the work; an average of ten men was employed.

This company also held an option on the adjoining Cariboo Thompson ground, where some diamond-drilling was done. In the autumn C. E. Gordon Brown took charge of work when E. E. Mason left.

Cariboo Thompson.

(52° 121° N.E.) The Cariboo Thompson property adjoins the holdings of the Cariboo Hudson Gold Mines (1946), Limited, to the north-west. The camp is below the Hudson mine road, about 19 miles south-east of Barkerville. In 1946 the Cariboo Hudson Gold Mines (1946), Limited, held an option on twenty-two claims, and during July and August 2,043 feet of surface diamond-drilling was done. Ten holes from 77 feet to 301 feet in length and with dips of from 40 to 60 degrees were drilled. All the work was done on the Native No. 3 and Uneven Fraction claims, except for 130 feet of drilling done on the adjoining Cunningham No. 1 claim, part of the Cariboo Hudson property. Work was directed by E. E. Mason.

TASEKO LAKE.*

Gold.

Hi Do, Pellaire Mines, Ltd.

(51° 123° S.W.) Company office, 184 Bay Street, Toronto. G. H. Rainville, President; J. W. Scott, Mine Manager. Capital: 3,000,000 shares, $1 par. This company is controlled by Quebec Gold Mining Corporation and Noranda Mines, Limited. The company continued to develop the Hi Do group, situated on the south-eastern side of Falls Creek about 5 miles south-west from the southern end of Taseko Lake. The property is reached by a two-day trip from Williams Lake. From Hanceville, 60 miles west of Williams Lake, a sometimes impassable road 60 miles in length connects with the northern end of Taseko Lake, where a cabin has been built for staying overnight. From this point it is 10 miles by boat to the narrows between the lakes, whence a steep road 16 miles in length, suitable for a four-wheel-drive truck, has been built to the mine. In the last 2 miles this road climbs 2,000 feet in a series of switchbacks up a talus-covered slope to reach the camp and workings situated at elevations of from 7,640 feet to 8,150 feet.

The showings, consisting of five veins, are described in the Annual Report of the Minister of Mines, British Columbia, 1937, pages F 6–F 8, and 1945, page 83. A drift was started August 21st on No. 1 vein at elevation 8,032 feet and driven 418 feet. This work eventually lost the vein, which is exposed on the surface up to elevation 8,150 feet. On October 5th No. 2 and No. 3 adits were started at elevations 7,735 and 7,633 feet respectively; No. 2 adit is on the east side of the ridge to prospect the No. 4 vein, and the No. 3 adit is on the west side to prospect the No. 3 vein or the possible continuation of the No. 4 vein. No. 2 adit was driven as a crosscut, 40 to 150 feet below the outcrop, for 78 feet and is reported to have struck the vein. No. 3 adit was a drift for 106 feet on a vein whose width was not determined as both walls were in quartz; the width of this vein on the surface is about 20 feet.

The tent-camp was at elevation 7,880 feet, and the water-tank, blacksmith-shop, and compressor-house were at elevation 7,940 feet. Weather conditions forced the shut-down of the operation on October 23rd. The average number employed was seventeen.

* By J. W. Peck.

Taylor Windfall Gold Mining Co., Ltd. (51° 123° S.E.) Company office, care of G. C. Hyatt, 789 Pender Street West, Vancouver. Capital: 2,000,000 shares, $1 par. This company's property, located on Battlement Creek near its junction with Taseko River about 12 miles south-east of Taseko Lake, remained idle during the year. The company did not continue the drilling programme begun in 1945; the equipment is still on the site.

YALAKOM RIVER-CHURN CREEK (51° 122° S.W.).*

An area west of the Fraser River drained by the Yalakom River and some of the upper tributaries of Churn Creek contains gold, copper, mercury, and magnesite prospects. The drainage is incompletely represented, and some of the high points are indicated on Department of Lands " Pre-emptor's Map, Lillooet Sheet." Part of the area lies within that mapped geologically by W. S. McCann as the Bridge River Map-area (*Geol. Surv., Canada,* Mem. 130, 1922), and another part lies within an area of which J. D. MacKenzie made a reconnaissance geological survey (*Geol. Surv., Canada,* Sum. Rept., 1920, Pt. A, pp. 70 A–81 A). A part of the area lying north-east and east of Yalakom River is well mapped topographically (Department of Lands " Yalakom Sheet "). For most of the area, however, no adequate topographic or geological map exists.

The area may be reached by pack-horse trails: from Minto, in the Bridge River District, via Liza Lake and a high pass at the head of Blue Creek; from the end of the Manitou Road via trail up Mire (Mud) Creek to Quartz Mountain; from Moha, near the junction of Yalakom and Bridge Rivers, by trail up the Yalakom; from the Fraser River at Big Bar ferry by a route following Ward Creek and the south fork of French Bar Creek, or via French Bar Creek. The last route is used in taking sheep to grazing lands extending for many miles west of Upper Churn Creek. The area has no permanent population; it is visited by big-game hunters in the hunting season, by prospectors, and by sheep-herders. The topography changes from dissected rolling upland to distinctly rugged mountains as one proceeds south-westerly toward outlying ranges of the Coast Mountains.

The area, which is not far from the Bridge River gold mining camp, has attracted the interest of prospectors from time to time. Placer gold has been mined notably from Poison Mountain Creek and Churn Creek just below Poison Mountain Creek, to which there was a small " rush " in 1932 (see *Minister of Mines, B.C.,* Ann. Rept., 1933, pp. 186–191).

It is reported that claims were staked a decade or more ago covering the outcrops of quartz veins on Blue Creek, a tributary which enters Yalakom River from the west. In 1941 new claims were staked and recorded covering quartz veins on Blue Creek, which received a good deal of publicity at that time. Bralorne Mines, Limited, acquired the Elizabeth group and many other claims on Blue Creek and near by. Work was carried on actively by Bralorne Mines, Limited, from August until the onset of winter in 1941. On the Elizabeth group, veins were explored by stripping and making open-cuts, several diamond-drill holes were drilled, an adit was started, and a three-room log camp building was built. Most of the material and supplies used were brought in via Liza Lake and over the summit at the head of Blue Creek. Some supplies were brought up Yalakom River and Blue Creek. Since that time the difficulties of the war and of the immediate post-war years have deterred the company from further work.

From 1941 to 1943 prospectors were active in parts of the area searching for strategic minerals, principally chromite and cinnabar. In the 1942 field-season the Geological Survey of Canada had a party searching for chromite in the serpentinized

* By H. Sargent, with notes by J. W. McCammon and J. W. Peck.

rocks of the Shulaps Mountains south-west of Yalakom River. Cinnabar had previously been found as float in placer-workings on Poison Mountain Creek and Churn Creek, and in-place on the south side of the divide south-east of Wilfred (Noax) Lake. Other discoveries of cinnabar have been reported on Quartz Mountain and on a tributary of Noax Creek. On Quartz Mountain cinnabar in tiny, widely spaced grains and as small veinlets is found in tan-weathering silicified and carbonatized rock derived from serpentinized ultra-basic rock. The serpentine rock is found in a north-westerly trending fracture-zone traceable for miles either way from Quartz Mountain. Cinnabar was also found in chert cobbles in conglomerate 50 feet lower than, and 150 feet south of, the summit of Quartz Mountain. The conglomerate is overlain by fresh volcanic rock.

Several prospectors were active in the area in 1945, and in 1946 F. Billings, W. M. Chenowith, L. Hansen, and two men working for H. Reynolds were active on Blue Creek, while R. Kirby was prospecting on the south-western side of the Yalakom about 10 miles down the valley from Blue Creek.

The north-eastern part of the area is occupied predominantly by a thick succession of sandstone, grit, and conglomerate with minor shales, believed to be Cretaceous in age. Within this part of the area isolated masses of Tertiary volcanic rocks are found, becoming more abundant in the north and north-east. A thick succession of layered volcanics is exposed on the conspicuous red mountain, on whose slopes rise Yalakom River, French Bar Creek (north fork), Lone Cabin Creek, and several tributaries of Churn Creek. In the south-western part of the area the rock is dominantly of serpentine. Study of a thin section* from a typical specimen indicates that the serpentinized rock was originally composed largely of pyroxene. An original crystalline texture is preserved in much of the serpentinized rock, but at joint surfaces and where the rock has been sheared, the original texture has disappeared. A mass of this rock occupying many square miles, including Mount Shulaps, was incompletely delimited by W. S. McCann (*Geol. Surv., Canada,* Mem. 130, 1922). The north-eastern contact of this mass for the most part lies south-west of Yalakom River, but near the mouth of Blue Creek the contact is found crossing a bend on the north-eastern side of the river at the foot of Mount Yalakom. From several miles up-stream to the bend the river has an average course nearly due south. The contact runs north-westerly from the river for about 5 miles, then swings to a southerly course, skirting an unnamed 9,000-foot mountain about 7 miles slightly north of west from Mount Yalakom. Continuing its southward course, the contact crosses the principal upper fork of Noax Creek just downstream from Wilfred Lake.

Serpentine is found in dyke relationship on Quartz Mountain west of Upper Churn Creek in a north-westerly trending fracture-zone, which in a general way coincides with the projection north-westward of the north-eastern contact of the large serpentine mass. Some miles below Blue Creek on the south-western side of Yalakom River a band of serpentine rock having a similar alignment has been mapped by M. S. Hedley (*B.C. Dept. of Mines,* Bull. 10, rev., 1943, pp. 60–62).

Veining and alteration of serpentine with the development of quartz and carbonate veins have been observed at several points, notably on the northern slope of Quartz Mountain. Veins filled principally with magnesium carbonate were found in the serpentine near Blue Creek (*see* page 101).

Intruding the serpentine and the sediments are numerous dykes and small stocks of granitic rock, in general having the composition of quartz-diorite. Stocks up to a mile or so in length are found in the serpentine, on and near Blue Creek, not far from the contact of the serpentine with the sediments. Stocks of some size are found between the north and south forks of French Bar Creek. Small masses and dykes are found on Nine Mile Ridge between the south fork of French Bar Creek and Upper Watson Bar

* Thin-section studies by John S. Stevenson.

Creek, and much coarsely porphyritic quartz-diorite is found on Poison Mountain and along Yalakom River near Poison Mountain. Not far from the serpentine-sediments contact dykes are found, mainly in the serpentine.

The texture of these intrusives ranges from fine to coarse, and in the porphyritic phase on Poison Mountain plagioclase phenocrysts up to half an inch or so in length are conspicuously zoned. The ground-mass of this porphyry is fine-grained.

The quartz veins of principal interest are found near the head of a fork of Blue Creek in a quartz-diorite mass of some size. Dykes near the contact, or contact phases of this mass, may be of diorite rather than quartz-diorite. On ridges between the forks of Blue Creek small masses of the granitic rock are found in the serpentine; silicification along breaks in the serpentine and quartz float have been found, but no quartz veins of consequence are known, except in the quartz-diorite stock on the claims held by the Bralorne Company.

In August, 1946, J. W. McCammon mapped the ground in which the principal veins have been found. His report and map are found on pages 98 to 101. At the end of October J. W. Peck examined a magnesite occurrence on the ridge north of Blue Creek between Blue Creek and Yalakom River. A note based on the examination is found on page 101. In the course of searching for cinnabar in the area in 1941, copper mineralization on Poison Mountain Creek was examined by the writer. This occurrence was revisited in August, 1946, and at the same time a quartz vein on Poisón Mountain Creek was examined (*see* page 101).

Blue Creek.

Gold.

Elizabeth, etc., Bralorne Mines, Ltd.*

The Bralorne property, including the Elizabeth group and numerous other claims on Blue Creek, is situated about 10 miles north-east, in a straight line, from the town of Minto. The Elizabeth is on the north fork of Blue Creek, about 4 miles from the point where Blue Creek flows into Yalakom River. The property can be reached by pack-horse over good trail, either from Moha, a trip of some 18 miles, or from Minto via Woodward's ranch, a trip of some 23 miles.

This report is based on an examination made during the period August 15th to 27th, 1946. At that time no work was in progress, and open-cuts, trenches, etc., made previously were mostly caved and one of the veins was still partly covered by snow.

In the vicinity of the property there are two main rock-types. The first is quartz-diorite,† which forms a mass approximately half a mile long and a quarter of a mile wide on the south slope of a steep ridge. The four veins seen during the examination are in this intrusive. It is a medium-grained greyish rock which, on weathered surfaces, has a slightly porphyritic appearance. It contains quartz, abundant greyish feldspar, some biotite, and plentiful hornblende.

Exposures of granitic rock of similar mineral composition but varying from very fine grain to fairly coarse porphyry texture occur within 100 yards of the main mass. Some of these have the composition of diorite rather than of quartz-diorite. The writer believes they are either small uncovered areas of the main mass or else smaller bodies that occur as offshoots of the main mass. Other minor areas of similar rock occur both east and west of the main mass on the same ridge, on the north and south sides of the ridge, and on ridges to the north and south.

The second common type of rock is composed almost entirely of serpentine, and much of it is sheared. It is a dark-green rock with a dense ground-mass of fibrous serpentine containing scattered large glistening greenish crystals of bastite (serpentine

* By J. W. McCammon, based on examination made in August, 1946.

† Classification of quartz-diorite is based on microscopic studies by J. S. Stevenson.

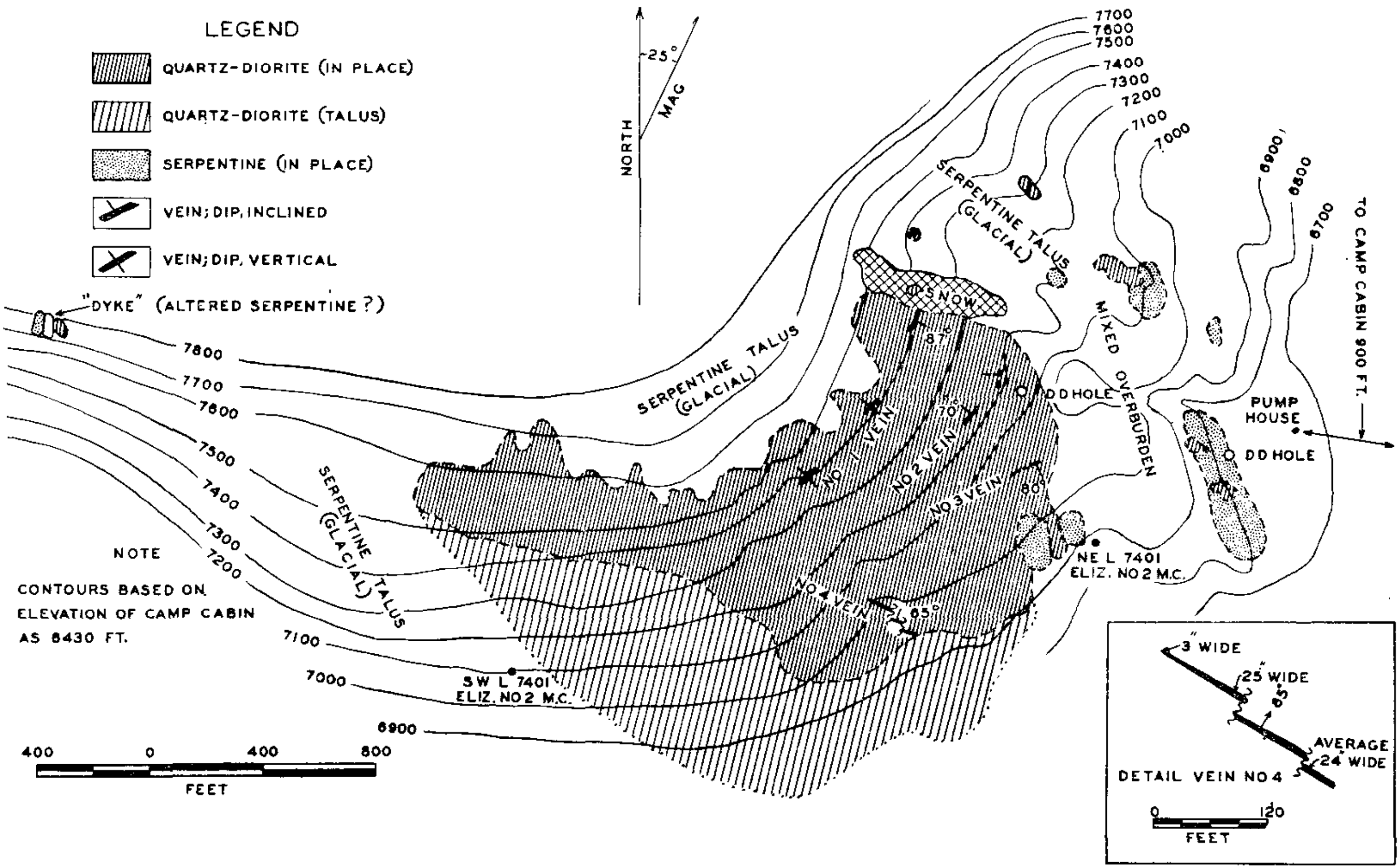


Fig. 9. Geology of part of the Elizabeth group.

derived from pyroxene).* This rock often weathers to a brown or orangeish colour, and the crystals project to give the surface a "warty" appearance. Although much of the area mapped is covered with boulders of this rock, it was only found in-place in a few small patches (*see* accompanying map, Fig. 9). The entire top of the ridge is covered with glacially deposited float of the serpentinized rock, but none was found in-place there except for a small area, by the so-called "dyke" to the west.

About half a mile along the ridge to the west of the main quartz-diorite body there occurs a prominent rusty-coloured reef, which is locally known as the "dyke." It consists of highly altered rock, much sheared, and contains carbonate, feldspar, serpentine, and quartz. It appears to be highly altered serpentine rock. The writer believes it to be a contact phase between quartz-diorite, which is found within 100 feet east, and the usual serpentinized ultra-basic rock found within 100 feet to west of the "dyke." Excessive hydrothermal action could account for the unusually large area of alteration.

Four main quartz veins are exposed by open-cuts and trenching. The one designated herein as No. 1 vein, which has been called the "High Grade" vein, occurs highest on the hill. The exposure follows the contour from east to west for some 600 feet, and at the north-east end the vein was still covered by snow late in August. At one place near this end considerable free gold was seen in the quartz. Sulphides are very scarce. The vein appears to be of the fissure type. Late movement has sheared and fractured the quartz, giving it a ribboned appearance. Wall-rock alteration is slight. At present the vein can be seen only in the quartz-diorite. The width of the vein seen varies from a few inches up to 46 inches at the extreme south-west end. It strikes from 20 degrees to 40 degrees west of south and stands vertical.

The second vein occurs some 200 feet lower, down the slope from No. 1 vein. Going from east to west, the first exposure consists of a sheared mass of vein-quartz and wall-rock approximately 6 feet wide. This strikes south 8 degrees west and dips 68 degrees to the west. No mineralization was visible. The next exposure on what is presumably the same vein occurs 110 feet to the south-west. The vein is exposed for about 100 feet along the strike south-westerly from this point. It averages 24 inches wide and consists of ribboned, fractured, and slightly rusty quartz. Wall-rock alteration is slight. The average strike here is south 38 degrees west, dip 70 degrees to the north-west. The two exposures of vein, separated by an area of heavy talus, are assumed to be segments of one vein offset by faulting, which would also explain the change of strike. This vein, as exposed, is entirely in diorite.

Vein No. 3 is exposed by four small cuts over a total length of 100 feet on a small bench below No. 2 vein. The exposures are in grassy talus, but the vein appears to be in-place in much-fractured quartz-diorite. The vein as exposed averages 37 to 42 inches wide. It strikes south 70 degrees west and dips 79 degrees to the south. The quartz is fractured but not so ribboned as in veins No. 1 and No. 2. Very little mineralization is visible.

The No. 4 vein, exposed in a dry wash about 900 feet west of No. 3 vein, has been found only in quartz-diorite. There is much small cross-faulting but not much shearing parallel to the vein. The vein varies from 25 inches wide at the lowest part of the exposure to 3 inches wide at the highest part. Little mineralization is visible in hand specimens. The vein strikes north 60 degrees west and dips 65 degrees to the north-east.

Numerous small veinlets and aplite dykelets occur in association with veins No. 1, No. 2, and No. 4. Several up to 6 inches wide were observed near vein No. 1. These strike at right angles to the main vein. All of these veins appear to be part of the same system—on the map it can be seen that they seem to radiate from a more or less common centre.

* From microscopic study of a thin section, made by John S. Stevenson.

Diamond-drilling has been done on the property, but the records were not available to the writer. At least two adits were begun, but progressed no more than a few setts and are now caved.

It is thought that the intrusion of the quartz-diorite mass produced the shearing in the serpentine. In the later stages of cooling the quartz-diorite fractured, and the fractures were filled with quartz. Still later, more shearing parallel to original fractures produced the ribboning in the veins. Without microscopic examination, little can be said of the mineralization, but from what was seen of the free gold, it appears to have been introduced very late. It is found in minute cracks in the quartz, particularly near shear-zones. So far the veins are found only in the quartz-diorite; the serpentine apparently is not likely to contain veins. Samples were taken from each vein and were found to be barren of gold, except near the north-eastern end of the exposure of No. 1 vein, where a sample across a width of 29 inches assayed: Gold, 0.08 oz. per ton; silver, *nil.* The free gold seen was also at the north-eastern end of this vein.

Magnesite.

Sunny.* Four mineral claims, the Sunny No. 1, Sunny No. 2, Sunny No. 3, and Sunny No. 4, also referred to as the Sunny Jim claims, were recorded in May, 1945, in the name of L. Hansen, of Vancouver. The claims are on a steep ridge lying north-east of Blue Creek, between Blue Creek and Yalakom River. The ridge rises approximately 1,500 feet above the junction of the river and creek. The ground drops sharply on the side towards the Yalakom River and fairly steeply on the side towards Blue Creek.

Vein-magnesite varying in width from 2 to 12 feet is exposed in several outcrops distributed over a distance of 3,000 feet along the ridge, and in that distance abundant magnesite float was found. Snow conditions and some overburden prevented a complete examination and survey of the deposit. At several outcrops the strike averages north 50 degrees west with the dip nearly vertical. Two outcrops where the strike is about at right angles to the average may represent offshoots. At the south-east end the exposures indicate the probability that parallel veins exist. Nine samples taken from the various exposures range from 32 to 42.8 per cent. magnesium oxide.

Poison Mountain Creek.

About 9 miles north-westerly from Blue Creek between Yalakom River and the head of Churn Creek the rounded summit of Poison Mountain rises to an altitude of more than 7,000 feet. Poison Mountain Creek, flowing south-westerly, forms the north-western boundary of the mountain. A tributary, known as Copper Creek, rising on the western slope flows westerly, entering Poison Mountain Creek at the head of a small swampy area about a mile from the point where the narrow valley of Poison Mountain Creek opens out into the wider trench occupied by Churn Creek. Most of the bed-rock is covered by a thick mantle of overburden, but bedrock-exposures are not infrequent along the streams and on the steeper slopes.

The principal rock-types of the area are sedimentary, consisting of green sandstone or grit with some shale, and some boulder conglomerate in which boulders of granitic rock are conspicuous. On the summit and low on the flanks of Poison Mountain, talus of coarsely porphyritic quartz-diorite is abundant in small areas, and exposures of quartz-diorite in-place are found in the Poison Mountain Creek and on the flanks of the mountain.

On Poison Mountain Creek, up-stream from Copper Creek, a little chalcopyrite and malachite are to be seen in an exposure of quartz-diorite near creek-level. On the

* Condensed from report by J. W. Peck, based on examination made at the end of October, 1946.

north side of Copper Creek numerous pits and trenches have been made in overburden which ranges from a foot to at least 8 feet thick. In many of these shallow workings, porphyritic quartz-diorite is exposed, containing a little malachite and, where unweathered, chalcopyrite. The sulphide is in tiny scattered grains and veinlets. Testing has shown evidence of this mineralization over a distance, from east to west, estimated at about 600 yards; however, most of the work has been done near the western end of the slope north-east of Copper Creek from 20 to 200 feet above creek-level. Here, in an area about 400 feet long and from 50 to about 200 feet wide, a score of pits, cuts, and trenches have been made, and a cut has been faced up for an adit.

The ground was covered by claims staked in 1935, and again by claims staked in 1941; however, the writer found no record of claims now covering this ground. The writer visited the ground in 1941 and examined a dozen or more pits and trenches, and again in 1946. A good deal of additional work had been done in the interval. Bed-rock was not exposed in several of the workings, but enough exposures were seen to indicate that the mineralization is sparingly and somewhat irregularly distributed.

The writer took eight samples, generally representing rock containing more chalcopyrite than average for this deposit. Concentrations of malachite were avoided, as they are obviously restricted to a very small volume of rock and are not rich enough to be of interest in such volume. The copper assays of the writer's samples ranged from 0.3 to 0.9 per cent. One sample assayed 0.01 oz. gold per ton; the others, *nil* or trace; silver assays ranged from *nil* to 0.6 oz. per ton.

Lucky. On the south-eastern side of Poison Mountain Creek, about 200 yards from the point where the creek-valley opens into the valley of Churn Creek, an adit has been driven easterly for 12 feet following a fracture, strike south 75 degrees east and dip 70 degrees southward. The wall-rock, consisting normally of greenish silicified sandstone or grit, is bleached to a light-buff colour for 6 to 15 inches from the fracture. As exposed in the adit, the fracture, 7 to 9 inches wide, is filled with sheared and fractured wall-rock and contains a little pyrite as small disseminated crystals. A sample taken at the face, across a width of 7½ inches, assayed: Gold, 0.04 oz. per ton; silver, 0.8 oz. per ton.

About 20 feet easterly up the slope from the portal a small cut has been made, and a few feet farther east a trench has been made, extending 12 feet. These workings expose up to 18 inches of sheared and bleached, slightly rust-stained rock along the fracture, and 2 feet south of it a narrower fracture, along which there is a little rust. The wall-rock in the trench contains a little pyrite and some pyrrhotite. About 300 feet west of the adit on the opposite slope, a pit 5 feet deep did not expose bed-rock. These workings are on ground covered by the claims Lucky No. 1 to No. 4, inclusive, of which Harry Reynolds is the recorded owner.

BRIDGE RIVER (50° 122° N.W.).*

Gold.

Pioneer Gold Mines of B.C., Ltd. Company office, 711 Yorkshire Building, Vancouver; mine office, Pioneer Mines P.O. V. Spencer, President; H. T. James, Managing Director; E. F. Emmons, Mine Manager; H. A. Rose, Mine Superintendent; P. Schultz, Mill Superintendent. Capital 2,500,000 shares, $1 par. The Pioneer mine is on Cadwallader Creek, about 55 miles by the Bridge River Highway from Shalalth Station on the Pacific Great Eastern Railway. A strike lasting five months closed the mine on July 3rd, 1946.

The main development during the year was on the "27" vein. Drifting on this vein on the 20, 21, and 25 levels amounted to 1,016 feet, and crosscutting on 21 and 23 levels to open up the vein amounted to 274 feet. The 25 is the best level opened up so

* By J. W. Peck, except as noted.

far; there, a length of more than 800 feet of ore averaging 6 feet wide is exposed. Development done in the Taylor adit on the Eagle Fraction amounted to 186 feet of crosscutting and 196 feet of drifting. The face of this drift was about 875 feet from the Bralorne boundary when work ceased. Development ore from this vein necessitated the building of a hopper at the end of the dump so that it could be trucked to the mill. Additional development was 224 feet of raising and 7,402 feet of diamond-drilling.

Ore mined, 13,706 tons; ore milled, 12,175 tons. Net contents: Gold, 5,896 oz., and silver, 1,008 oz.

To provide better power for underground equipment, a 6,600-volt line was run to a 150-kva. transformer on the 13 level, providing current at 440 volts for pumps, etc. A new 150-gallon centrifugal pump was installed on 19 level. After the strike, work was concentrated on replacing timbers which had suffered considerably owing to the five-month shut-down. The mine remained flooded below the 26 level.

On the surface, equipment was obtained for building twelve houses. The site was cleared, but no work was done when the strike occurred. At the end of the year the mill was not in operation; a new replacement classifier was installed during December. Before the strike the number of men employed averaged 158, and after 147. The mine had the lowest British Columbia accident rate and was awarded the M. S. A. Ryan Safety Trophy.

Holland.

The Holland group of sixteen claims and fractions lies north of Pioneer and east of Bralorne. Santiago Gold Mines, Limited, of 423 Hamilton Street, Vancouver (R. Crowe-Swords, President and Managing Director), acquired a 60-per-cent. interest in the property from New Holland Gold Mines, Limited, on condition it carries out approximately 10,000 feet of diamond-drilling. This agreement has been assigned to the Golden Slipper Mines, Limited, of 1305 Concourse Building, 100 Adelaide Street West, Toronto, Ont. Santiago Mines receiving for its interest 500,000 shares of Golden Slipper Mines, Limited, and an option to purchase an additional 500,000 shares. Santiago Mines, Limited, is doing the present drilling under the supervision of C. C. Starr.

A vertical diamond-drill hole was started at elevation 4,580 feet from a rock-outcrop on the south-west corner of the Langdon claim, immediately adjoining the north-west boundary of the Pioneer group. The hole was stopped at a depth of 933 feet owing to squeezing in a gouge-zone, encountered between 896 feet to 905 feet. This gouge-zone marks the position of a thrust-fault. The hole was then reamed and cased. Drilling was resumed, and at a depth of 1,301 feet, in December, the hole was still reported to be in the Fergusson sediments.

During 1946 some road and trail construction was also done. The average number employed was eight.

Pacific (Eastern) Gold Mines, Ltd.

Company office, 184 Bay Street, Toronto, Ont. G. H. Rainville, President; A. W. Stollery, Mine Manager. The company, controlled by Quebec Gold Mining Corporation and Noranda Mines, Limited, acquired the holdings of Pacific Eastern Gold, Limited, which comprise a large number of claims lying on both sides of Cadwallader Creek, extending up-stream from the Pioneer mine.

The old workings, abandoned and flooded since 1937, were cleaned out under considerable difficulties. The caved adit was opened up and retimbered. The timber in the head-frame of the shaft was replaced, and a double-drum electric hoist installed. Pumps capable of handling 450 gallons per minute were used to unwater the shaft. It was discovered that water was entering the shaft at the rate of about 300 gallons per minute at a talc slip above the 370 level. This difficulty was overcome by ringing the shaft and leading the water into a sump on the 370 level. On the lower or 520 level six cave-ins were encountered, and cleaning these up was done slowly because of the potential danger of water backed up behind the caved muck. In one place it was necessary to crosscut around a caved area. Air low in oxygen with some methane was also encountered. Finally the 1595 drift off the main crosscut was reached and cleaned up.

All this work was preparatory to the underground programme of advancing a drift in an easterly direction. A jumbo, mucking-machine, battery motor, and sliding switch were being used to advance a 7- by 9-foot working at the rate of about 19 feet per day. Twenty-two-inch fan-pipe and a 7,500-c.f.m. fan were in use; another similar fan is to be installed. In 1946, 1,150 feet of drifting and crosscutting and 2,000 feet of surface and underground diamond-drilling were done.

On the surface the old buildings were repaired, a 1,000-c.f.m. electric-driven compressor installed, the dump extended, and a change-house, blacksmith and steel shop erected. Horse-haulage is used to tram the muck from the shaft-pocket on the adit level to the outside dump. The average number employed was twenty-seven.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1936, p. F 62.]

McGillivray-McGregor Syndicate.

This syndicate controls the Manderville group of claims on McGillivray Creek, 4 miles by pack-trail from McGillivray Falls Station on the Pacific Great Eastern Railway. The Manderville group consists of sixteen claims or options, comprising the important claims of the National Gold Mines, Limited, and the Canadian Rand Gold Mines, Limited. These mines have not been operated since 1935.

Work was started in the spring of 1946 extending the former Canadian Rand California (now Central) adit. This adit was extended 145 feet, and then 113 feet of crosscut was driven, making the face approximately 600 feet from the portal. Later the crew was moved 800 feet higher up the hill and an adit started on the old National Gold, Skeena (now Anderson) claim. This adit was driven about 100 feet immediately below the third level of the National Gold mine. An iron-stained quartz vein, thought to be the downward extension of the vein on the third level, was picked up, and the adit was in 175 feet when the operation closed for the winter.

Use was made of a water-driven compressor left on the National Gold property. It ran efficiently during the summer, but failure of the water-supply forced the shutdown of the operation on October 1st. The old camp, located on the McGillivray Creek trail at elevation 3,000 feet, was repaired and used. M. McGregor, the manager, directed the operations with a crew of five to twelve men.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1934, pp. F 27, F 28.]

Bralorne Mines, Ltd.

Company office, 555 Burrard Street, Vancouver; mine office, Bralorne P.O. A. C. Taylor, President; M. M. O'Brien, Managing Director; D. N. Matheson, General Manager; C. M. Manning, Superintendent; D. Cameron, Assistant Mine Superintendent; A. A. Almstrom, Mill Superintendent. Capital: 1,250,000 shares, no par value. The Bralorne mine is on Cadwallader Creek, about 53 miles by the Bridge River Highway from Shalalth Station on the Pacific Great Eastern Railway.

Development during 1946 consisted of 2,709 feet of drifting and crosscutting, 572 feet of raising, and 5,291 feet of diamond-drilling. Most of the drift footage was done on the main "53" vein and the "53E" block on 1600 level. Ore-shoots were exposed on both these drives. Ore with widths up to 11.5 feet was exposed in the main "53" vein. Some drifting was done on the "53" vein on the 1200 level. Drifting was also done on the "51" vein on the 100, 1100, 1400, and 2000 levels. The work done on the 2000 level exposed a strong well-ribboned quartz-vein. A raise on the "51" vein from the 100 level broke through to the surface and thus bettered the ventilation in the upper workings.

On July 3rd the mine was closed by a strike lasting until November 25th, when a settlement was reached. Before the strike the underground crew dwindled from an average of 199 for the first three months to a low of 148 in June. In December the average was 231.

A 15-horsepower axial-flow Buffalo fan, with a rated capacity of 30,000 cubic feet per minute at 1-inch water-gauge, was installed on 1500 level, and a similar make of fan with a 5-horsepower motor and characteristics of 15,000 cubic feet per minute at 1-inch water-gauge was installed on 1900 level. These additions in 1946 improved the air-supply in the adjacent areas.

Very little was added to the surface plant. The Bradian Camp was reopened for use in December. A total of forty men can be accommodated at this camp, with quarters also for an additional five-man staff of cooks, stewards, and boiler-men.

In the mill the installation of a hydraulic trap in the grinding circuit of No. 1 mill materially helped to recover coarse gold and to extract steel particles, which are thus removed from the mill circuit early in the operation. The maximum tonnage milled in any month was 11,512 tons in March. Ore milled, 64,534 tons. Net contents: Gold, 31,432 oz.; silver, 8,700 oz.

Grull-Wihksne Gold Mines, Ltd. Company office, 140 Stock Exchange Building, Vancouver. E. M. Thomson, President; H. L. Hill, engineer in charge of operations. Capital: 2,500,000 shares, $1 par. The Company's property lies on both sides of Cadwallader Creek, north-west of Bralorne mine. The diamond-drilling programme, begun in 1945 to explore the soda-granite intrusive on the Alma Mineral Claim, was continued until the autumn of 1946. Four more holes were completed, making a total footage in 1946 of 4,964 feet. The last hole was jointly financed with Pinebrayle Gold Mines, Limited, and was drilled close to the boundary of the two properties. Two of the holes, 714 feet and 1,133 feet in depth, obtained vein-intersections at depths of 639 feet and 654 feet respectively. Another hole was drilled to 1,161 feet, and the hole drilled with Pinebrayle had a depth of 1,956 feet, with a reported 3-foot vein-intersection at 1,413 feet. The dip of the holes varied from 30 to 50 degrees. In most of the holes albitized sediments were encountered, then soda granite and greenstone, with the bottom of the holes in serpentinized greenstone. Veins intersected were in the soda granite and greenstone.

Pinebrayle Gold Mines, Ltd. Company office, 844 Hastings Street West, Vancouver. K. J. Springer, President; S. D. Townsend, Superintendent. Capital: 3,000,000 shares, 50 cents par. Leitch Gold Mines, Limited, has operating control of this company, which has claims on the west side of Cadwallader Creek.

The hole that was drilled jointly with Grull-Wihksne (*see* above) was put to further use. It was wedged at 1,100 feet, and drilling was deflected at this point and continued a further 374 feet. The same formation was obtained as in the original hole, but the vein assays were not duplicated.

Eight men were employed during the summer doing stripping and surveying. The Don Fraction, Peru 12 and 13 Fractions, and the Native Son claims were systematically prospected by trenches. The season's work indicated that the property is underlain by argillites, tuffs, chert, greenstone, and serpentine, but that the Bralorne intrusives are not exposed to any important extent in the workings on the property. One vein in greenstone was reported to have been found on the Peru No. 3 claim.

B.R.X. (1935) Consolidated Mines, Ltd. Company office, 616 Stock Exchange Building, Vancouver. A. E. Jukes, President; E. R. Shepherd, Managing Director. Capital: 5,000,000 shares, 50 cents par. The property lies east of the Hurley River and adjoins Bridge River Consolidated property. The main camp is on the Bridge River Highway, 3½ miles north of Bralorne. The 500-foot

Work for the year consisted in repairing the road, making the old bunk-house habitable, and improving facilities at the adit-portal, which was retimbered for the first 50 feet. On September 5th diamond-drill holes were being drilled from the west vein to test the east vein, but from the first drill set up at the crosscut, five holes were disappointing. Later in the year drilling was done to locate the veins in the region of the outer sections of the adit, with unknown results. The raise on the east vein was extended and had intersected galena ore but, at the end of 1946, had not yet reached No. 4 level. A sublevel was started at the point where ore was first encountered in the raise.

The power plant consists of a 450-cubic-foot Holman compressor driven by a Pelton wheel under a head of 250 feet. A wooden 10-inch pipe was installed, and repairs were made to the dam. A Petter blower and ventilation-pipe were installed.

About ten men were employed, in addition to the diamond-drill crew. Work during the winter was confined to raising, on contract by a reduced crew. No attempt was made to keep the road open, except for " go-devil " traffic.

Wellington Mines, Ltd.

Company office, Nelson. I. G. Nelson, President; A. W. Davis, Consulting Engineer; C. Lind, Foreman. Capital: 3,750,000 shares, 20 cents par value. The workings here described consist of the Hazel adit-crosscut on the Hazel claim at an elevation of 3,746 feet, two closely spaced Matheson adits 800 feet above on the Homestake Fraction, and two shafts on the I.C. claim.

The surface geology and some of the lower workings are described in Bulletin No. 22 of the British Columbia Department of Mines. At the time of examination (1944) the Hazel adit was not accessible beyond 300 feet from the portal, and the eastern Matheson adit was caved.

In 1946 the Hazel adit was ventilated to provide entry so that track from the inner parts and ventilation-pipe could be salvaged. The air in this adit is chronically bad owing to oxygen deficiency. The adit is 1,840 feet long, driven north 24 degrees east, except for a bend near the portal. At 150 feet from the face, drifts extend 180 feet eastward and 520 feet westward on an irregular curving fault-zone dipping 15 to 25 degrees southward. A caved crosscut is driven northward from the west drift. A raise on the fault-zone starting up at about 20 degrees above the main crosscut was inaccessible owing to bad air. There is a strong flow of water in the west drift. The zone apparently represents a strong fault, and is not mineralized where seen.

The strata crossed by the adit consist of slaty argillites and limestones. The dips are moderately steep to the south, with a reversal in dip in the innermost 60 feet of the crosscut. There may be repetition of beds by folding, but the structure could not be determined. In Bulletin No. 22, page 16, a hypothetical cross-section was drawn on the line of the Hazel adit, on the basis of the surface geology, showing the synclinal part of a drag-fold. Subsequent examination of the Hazel adit has shown that the amount of limestone in it is rather more than was expected, but the cross-section is not necessarily invalidated. The intense deformation and superposition of slaty cleavage in this region make it difficult to trace or even to recognize many of the folds, and in most instances it is necessary to have more than one line of section as supplied by a single crosscut before the structure can be worked out. Three closely spaced strike-faults near the central part of the crosscut do not appear to be large enough to have produced much duplication of strata.

The east Matheson adit, 800 feet higher than the face of the Hazel adit, is now accessible. It is driven as a crosscut, 470 feet at an average of about north 31 degrees east, then 570 feet at an average of about north 24 degrees east, then about 30 feet north, a total length of about 1,070 feet. At a point 260 feet from the portal there is a

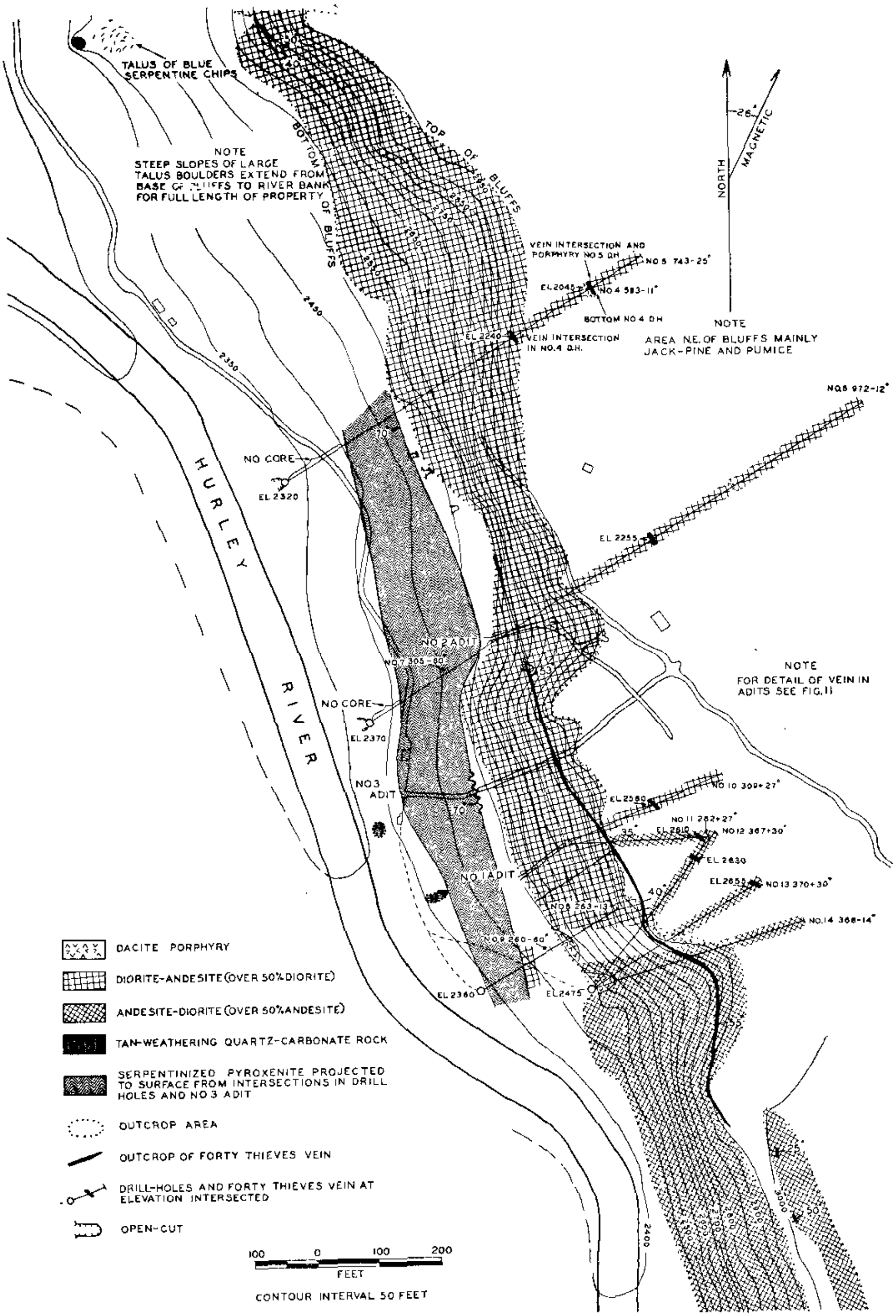


Fig. 10. Bridge River Consolidated—surface geology and underground workings on Forty Thieves vein.

The andesite and the diorite outcrop in the bluffs above the workings and are found in all the diamond-drill holes. The diorite, in bodies from a few inches to a few feet in diameter, replaces the andesite. In mapping, areas in which diorite makes up more than 50 per cent. of the rock have been differentiated from areas in which andesite makes up more than 50 per cent. Inasmuch as the rock bluffs near the workings are unscalable, the position of the boundary between the predominant rock-types has been derived from diamond-drill logs. The continuity and smoothness of a diamond-drill core permits a moderately good determination of the relative amounts of the two rocks along the section cut by the hole.

The andesite is dark green, massive, and fine-grained. Under the microscope it is seen to consist of laths of hornblende and andesine-plagioclase. In most thin sections the crystals of hornblende exhibit a marked flow-structure, suggestive of an extrusive origin for the andesite. Some of the andesite contains moderate amounts of quartz.

The diorite is dark green, massive, and medium- to coarse-grained and is cut by the cream-coloured stringers that characterize most of the diorite in the valley. Under the microscope the typical rock consists of a coarse-grained granitic intergrowth of hornblende and plagioclase. The smaller patches of the diorite, closely intermingled with the andesite, are usually finer in grain, and the texture is more granular, characteristic of textures formed by recrystallization of older minerals. These features suggest that at least some of the diorite has formed by replacement of the andesite. A replacement origin for the diorite rather than an origin by forceful intrusion would account for the intimate intermingling of the two rocks.

The light cream-yellow stringers, from a fraction of an inch to several inches in width, found in the diorite and in the andesite consist of fine-grained clinozoisite (a clacium-aluminium silicate), occasionally intergrown with carbonate and quartz.

A 4-inch andesite dyke, strike north 70 degrees west and dip 75 degrees southwestward, was seen in the hanging wall of the vein in No. 3 adit at a point 130 feet south of the crosscut.

Serpentinized pyroxenite occurs in a long narrow body, about 120 feet wide, that extends northerly past the portal section of No. 3 adit for at least the full length, 2,200 feet, of the mapped area in Fig. 10. The rock is massive in structure, glossy black in colour, and has conspicuous glistening crystals of diallage-pyroxene—crystals that are soft and easily scratched with a knife. Under the microscope the rock is seen to consist mainly of diallage-pyroxene, some of which has altered to fine-grained antigorite-serpentine.

Outcrops of tan-weathering quartz-carbonate rock are found immediately south of No. 3 adit and 1,300 feet north-north-west of the adit. This rock is thought to represent serpentinized pyroxenite that has been hydrothermally altered along a shear-zone. The texture of the rock in the outcrops is slightly schistose and, as seen under the microscope, most of the carbonate is along closely spaced, parallel stringers, a feature that indicates a preferred direction of fracturing.

The writer did not cross the river, but Cairnes (*Geol. Surv., Canada,* Mem. 213, Map 470A) places the western contact of the serpentine at the river. This suggests a width of about 300 feet for the pyroxenite and the tan carbonate-quartz rock.

Irregular dykes of dacite porphyry are found at the top and bottom of the bluffs 300 feet south of the main adit, but the steepness of the bluffs prevented tracing of their outcrop area. Similar rock is found in the collar sections of Nos. 12, 13, and 14 drill-holes; again in No. 14, between 173 and 243 feet from the collar; in No. 6, 710 feet from the collar; and in the bottom of No. 4 hole. The rock in these dykes is massive, light grey, and has conspicuous feldspar phenocrysts and quartz " eyes." Under *the microscope the feldspar is seen to be andesite, accompanied by abundant spherulites* of quartz and plagioclase, and the ground-mass seen to be a finely felted mass of plagioclase laths.

The flow-like orientation of plagioclase and hornblende crystals in several thin sections of the andesite suggests that the rock is a lava, but the lack of flow-structures in outcrops or underground prevented any determinations of the attitude of the flows. The diorite replaces the andesite irregularly over a large area, so that it does not possess any well-defined contact surface which can be assigned a definite attitude.

The contact of the diorite-andesite and serpentinized pyroxenite as seen in the No. 3 crosscut is a zone of badly sheared rock, up to 5 feet wide, strike north 20 degrees west and dip 70 degrees south-westward (Figs. 10 and 11), and the contact, as interpolated from diamond-drill holes, also dips 70 degrees south-westward. No data bearing on the relative ages of the diorite and pyroxenite, or on whether the pyroxenite was extrusive or intrusive, were found in the area mapped. No fine-grained, presumably chilled, selvages of the diorite were seen against the pyroxenite, and because of the wide zone of sheared pyroxenite at the contact, no fine-grained phases of this rock against the diorite were found. No tongues or inclusions of the one rock in the other were seen. The western side of the pyroxenite is bordered by a shear-zone that has been largely healed by quartz-carbonate mineralization. Cairnes (*Geol. Surv., Canada,* Mem. 213, Map 430A) shows a fault along the western side of the serpentine north and south from the Forty Thieves vein and assigns a westward dip to the fault north of Bridge River. Both sides of the pyroxenite therefore appear to be bordered by westward-dipping fault-zones.

The Forty Thieves vein (Figs. 10 and 11), strike north-westerly and dip 45 to 60 degrees north-eastward, can be traced in the face of the bluffs for a distance of about 2,000 feet. The most southern exposure of the vein ends in overburden at the top of the bluffs. The vein here is 3 feet wide; its continuation southerly from this exposure is uncertain, although quartz in an outcrop 200 feet southerly may represent the continuation of the vein. At the north end of the vein-outcrop some quartz has been found in a shear-zone in two open-cuts, 280 feet and 320 feet north of No. 2 adit, about on the strike of the main vein; beyond this point the projection of the vein-strike is under heavy talus, and the vein has not been uncovered.

The vein consists of long lenses of quartz that die out and come in along a strong shear-zone. The quartz-lenses range from a few feet to about 200 feet in length and from a few inches to 5 feet in width. The average of thirty-six measurements across the vein in the lower adit is 15 inches, and the average of twelve measurements in the upper adit is also 15 inches; the maximum widths are 36 inches in the upper adit and 35 inches in the lower adit. However, in the short adit 90 feet south-easterly from No. 2 adit the vein is split in two and consists of a hanging-wall section of quartz 4 feet wide and a foot-wall section of quartz 18 inches wide. Farther south, in the face of the adit and on top of the bluff, the quartz ranges from 1 foot to 5 feet in width.

The vein-matter consists mainly of quartz with a small amount of widely scattered pyrite and tetrahedrite (spectrochemical analysis shows abundant antimony but only a trace of arsenic). In parts of the shear-zone, lenses, a few inches wide, of clear white quartz follow the main shear for several feet. In other parts stringers of cloudy grey quartz, containing partly replaced inclusions of wall-rock, form stock-works, up to 4 feet wide and several feet long.

The wall-rock, from a few inches to 20 feet from the vein, is altered to a massive light-greyish rock, mottled with 1/32-inch to 1/8-inch patches of a light-green chlorite.

The altered rock consists of fine-grained ankeritic carbonate, sericite mica, chlorite, and pyrite; some rock is almost wholly ankeritic carbonate, and some half ankeritic carbonate and half sericitic mica. The light-green patches are chlorite that has replaced hornblende. A spectrochemical analysis of the chlorite showed only traces of

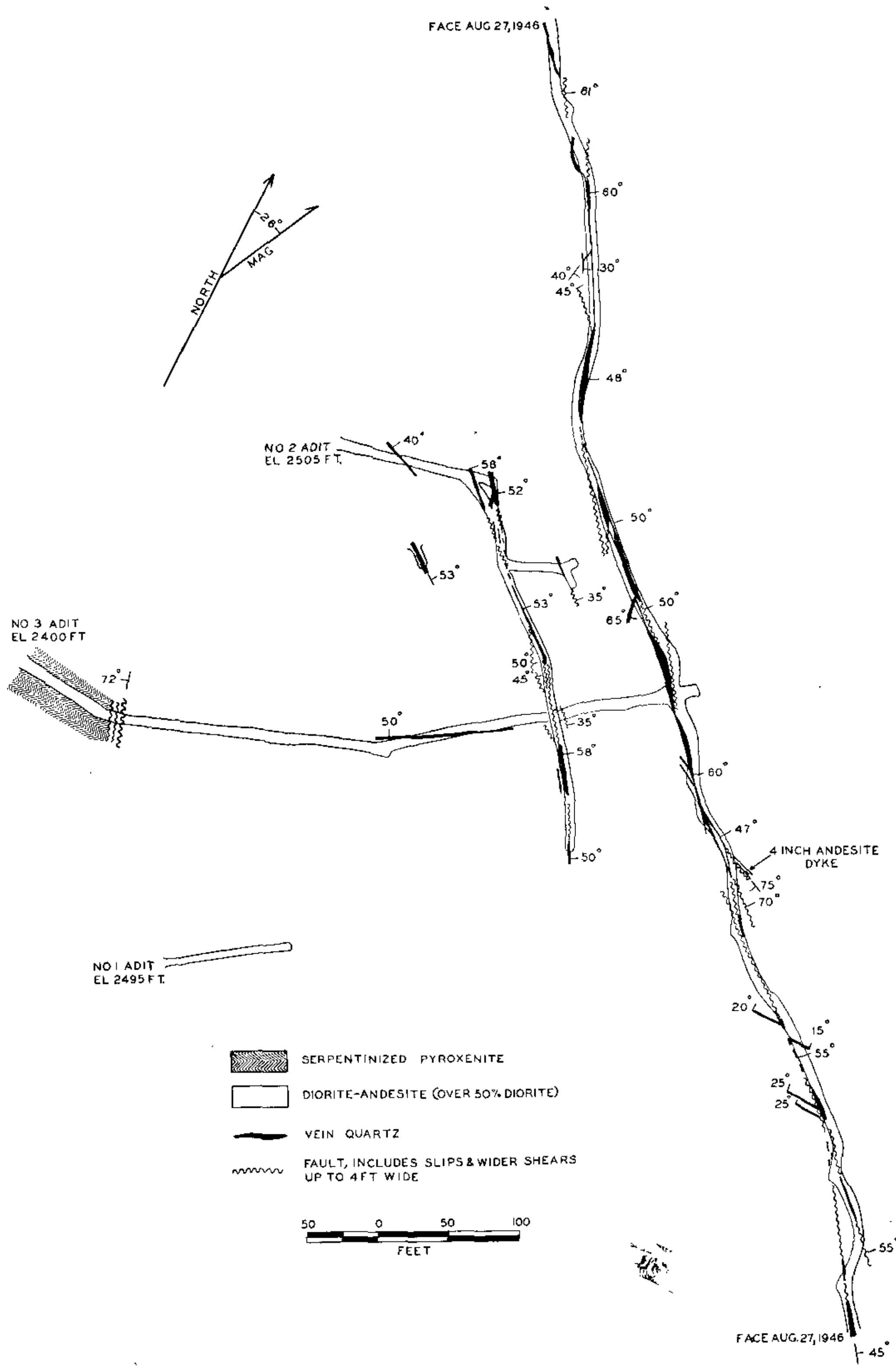


Fig. 11. Bridge River Consolidated—underground workings on Forty Thieves vein.

chromium, further indicating that the light-green mineral is not the chrome-bearing mica, mariposite.

Gradations in the altered rock can be traced from slightly altered diorite to rock in which the hornblende and feldspar are completely replaced by carbonate and sericite but may still be recognized by outlines of the original crystals. Nearer the vein, replacement may have proceeded to the point that all trace of the former texture of the rock has been destroyed. The most complete alteration yields a silicified rock that contains, in addition to ankerite and sericite, a moderate amount of vein-quartz.

The altered wall-rock of the main vein, grey in colour and much of it mottled by the spots of light-green chlorite, is not to be confused with the cream-coloured veinlets so widespread in the diorite and greenstone. These veinlets consist mainly of clinozoisite and some quartz, and represent a phase of mineralization much earlier than, and unrelated to, that of the Forty Thieves vein.

The writer took thirty-nine samples of vein-quartz and seventeen of the wall-rock in No. 3 adit, fourteen samples of vein-quartz in No. 2 adit, and three samples of vein-quartz from the top of the bluffs. The average assay of the vein-quartz in each of these places was less than 0.01 oz. of gold per ton, and the average assay of wall-rock also less than 0.01 oz. of gold per ton.

The quartz follows a strong fissure-zone and is usually bounded on the walls by several inches of gouge and crushed rock. The gouge and sheared rock continue along the strike between lenses of quartz. Branch shears lead off at small angles from the main shear, but the quartz tends to follow the main break.

Gash-veins, strike easterly and dip from 15 to 25 degrees northward, with clean-cut walls and containing from 1 inch to 6 inches of quartz, lead off from the main vein, strike north-westerly and dip 45 to 60 degrees north-eastward. Some of these extend for nearly 200 feet away from the main vein. Although these veins are of no economic interest, they are of structural interest in that they indicate that the north-east or hanging wall of the main vein-shear moved up and to the north-west with respect to the south-west or foot wall. The vein, therefore, occupies a reverse fault.

The vein-shear weaves considerably along the strike (*see* Fig. 11) and probably along the dip, and an approximate correlation exists between the direction of movement of the hanging wall, changes in the direction of strike, and deposition of quartz. A north-westerly movement of the hanging wall would produce openings or zones of tension within the vein-shear along sections of the shear striking towards the north-west rather than along sections striking towards the north. The more north-westerly striking sections would therefore be more favourable than the northerly striking sections for the deposition of vein-matter. This is, in general, true along the drift in No. 3 adit, where, for 160 feet north-west and 100 feet south-east of the crosscut, the more continuous and wider lenses of quartz are found along the north-westerly striking sections of the shears.

About 1,250 feet north of the main adit two branching shears are found near the base of the bluffs (*see* Fig. 10), where they have been stripped for 25 feet along the strike. The upper shear consists of a zone 4 feet wide containing three barren quartz stringers, 2 and 3 inches wide; and the lower shear, 3 feet in width, is connected with the hanging-wall shear by flat gash-veins of quartz, 2 to 6 inches wide, some of which lead off into the hanging wall of the upper shear. These shears roughly parallel the Forty Thieves vein in dip and strike, but they are about 400 feet in the hanging wall of the projected northern extension of the Forty Thieves vein.

Two outcrops of vein-quartz are found south of the end of the outcrop of the Forty Thieves vein on the top of the bluffs (Fig. 10). The more northerly consists of vein-quartz 6 inches wide, strike north and dip 25 degrees eastward, which may be a gashvein related to the main Forty Thieves vein. The southern outcrop consists of 6 inches of quartz, strike north-westerly and dip 50 degrees north-eastward, that may be the southerly continuation of the Forty Thieves vein. However, the quartz is discontinuous and is unaccompanied by the tan-weathering wall-rock alteration characteristic of the Forty Thieves vein-shear.

Although samples taken many years ago from the surface are reported to have shown interesting values in gold, the underground work and the diamond-drilling have so far not found vein-matter of ore-grade. It may be noted that some veins at Bralorne and Pioneer are of a very good grade where close to serpentine. The possibility of improvement of the Forty Thieves vein close to the serpentinized pyroxenite has not been completely explored. The intersection of the plane of vein with the plane of the pyroxenite-diorite contact plunges northward at about 20 degrees from the horizontal, so that at the elevation of No. 3 adit about 350 feet of vein remains to be explored between the north face of the adit and the pyroxenite. The vein is close to the pyroxenite where it has been found in the two open-cuts, but the pits are shallow and the vein so poorly exposed in them that little can be learned of the nature of the vein-matter. Exploration designed to intersect the vein where close to the pyroxenite but below the influence of surface alteration would be more satisfactory.

[Reference: *Geol. Surv., Canada,* Mem. 213, 1937, pp. 88–91.]

Ann, Cecilia, and Mint.*

These adjoining groups of mineral claims, staked in June, 1946, include the Ann Nos. 1 to 8, staked and owned by Anne Cunningham; the Cecilia Nos. 1 to 8, staked and owned by Lily Cecilia Baker; and the Mint Nos. 1 to 8, staked and owned by James Baker, all residents of Bralorne. The claims lie south-westerly from Gwyneth Lake and northerly from the Hurley River. They extend northerly from the river in adjacent groups, each two claims wide; the Ann group is the most easterly, the Mint the central, and the Cecilia the most westerly.

Access to the showings is by motor-road westerly from Bralorne to a bridge across the Hurley River, elevation 3,100 feet, near the dam of the Pioneer Gold Mines, a distance of approximately 2½ miles, thence by wood-road and trail, known as the Manson Trail, westerly for approximately 1¼ miles to the showings on the Ann group. This trail extends farther westerly and crosses the Mint and Cecilia groups.

On the southerly claims the ground slopes steeply to the Hurley River, and on the northerly claims it slopes gently towards Gwyneth Lake. Rock bluffs and outcrops are abundant. The overburden is shallow but, in places, supports a heavy growth of jack-pine and range grass.

The showings on the Ann group consist of a quartz vein and two quartz-stibnite veins. The quartz vein is near the Manson Trail, about 1¼ miles from the bridge over the Hurley River. The vein, 10 inches wide, extends with a strike of north 65 degrees east and dip 50 degrees south-eastward for a few feet in slightly sheared, fine volcanic breccia.

The one quartz-stibnite vein is exposed 350 feet west of the quartz vein and about 100 feet above the Manson Trail. This vein, strike east-west and dip vertical, is exposed in a pit 8 feet deep and in a stripping that extends 225 feet westerly from the pit. The vein consists of both fine-grained and coarsely crystalline stibnite in a lenticular rib of quartz, up to 1 foot in width, that follows a shear-zone up to 3 feet in width. A sample taken across a 3-foot width of shear-zone in the east face of the pit assayed: Gold, *nil;* silver, *nil;* antimony, 26.1 per cent.

The other quartz-stibnite vein is about 200 feet south-westerly from the west end of the above stripping and is exposed in a series of four cuts for a strike-length of about

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

70 feet. The vein consists of a rib of stibnite and quartz, 4 inches wide, that follows a 6-inch shear, strike east-west and dip 55 degrees northward.

The rock in these showings is fine volcanic breccia, dark green in colour and massive in structure.

The showings on the Mint group extend north-easterly from a shaft on the Manson Trail about three-quarters of a mile westerly from the stibnite showings on the Ann group.

A shaft, elevation 4,100 feet, has been sunk a few feet on a vertical quartz vein, strike north 52 degrees east, and 40 inches wide, that contains scattered grains of pyrite. This vein has been traced north-easterly from the shaft by a series of shallow pits and a stripping for about 210 feet to a second shaft, 15 feet deep, cribbed with jack-pine but partly sloughed. Between these two shafts the vein ranges from 16 inches to 2 feet in width, but in the second shaft it widens to 3½ feet. No further work has been done on this vein.

About 65 feet north-westerly from the cribbed shaft a second vein, strike north 35 degrees east, dip 50 degrees south-eastward and a few inches wide, has been exposed for two feet along its strike. North-easterly along the strike of this vein the ground is covered with overburden and heavily wooded, and the vein could not be traced readily. However, 450 feet north-easterly a stripping exposes a quartz vein, 6 inches wide, strike north 10 degrees east and dip vertical, that may be a continuation of the vein in the last stripping. This vein may extend 200 feet farther north-easterly to an outcrop of vein quartz, 4 inches wide, strike north 10 degrees east and vertical. The vein quartz in this last series of showings carries only a few pin-points of pyrite.

About 500 feet southerly from the shaft on the Manson Trail a pit 6 feet deep by 12 feet in a north-south and 5 feet in an east-west direction has been sunk at the base of a low bluff that exposes four quartz lenses, strike north 25 degrees west and dip 50 degrees eastward. The hanging-wall and foot-wall quartz-lenses are 1 foot thick, and the quartz-lens between these, 2 inches thick.

The showings on the Mint group are in fine-grained diorite that intrudes a few small areas of chert.

The writer has no knowledge of any workings on the Cecilia group, but the geology is somewhat similar to that on adjacent Mint group.

No production has been reported from any of the workings on these groups.

Wayside. The Wayside mine, closed since 1936, is approximately half-way between Minto and Gold Bridge, on the Bridge River Highway. In May, 1946, it was reopened by L.A.P. Mining Company. The lowest adit or mill level was cleaned up and the portal moved back 30 feet. Living-quarters were reconditioned and a change-house, blacksmith-shop, and compressor-house built. The power units, capable of supplying 312 kilovolt-amperes, situated across the Bridge River and driven by water from Fergusson (Sucker) Creek, were again put in use, and a transformer-station is being rebuilt at the mine.

In 1946 the underground programme called for unwatering the lower levels so that a development survey could be undertaken. The winze head-frame was repaired, and a small air-hoist installed. A pump was lowered down the 56-degree inclined winze, and by the end of December the water was down 270 feet, exposing the No. 7 level, leaving two more levels to be unwatered.

During the year an average of fifteen men was employed, under the supervision of M. Retan.

Congress Gold Mines, Ltd. R. E. Berry, President; E. Hanson, Mine Superintendent. Capital: 4,000,000 shares, $1 par. The Congress mine is on the Bridge River Highway, near the confluence of Gun Creek and Bridge River. Development below the lowest adit or third level continued throughout the year. A two-compartment shaft, 10 by 7 feet, was sunk from the third level at an angle of 55 degrees on the foot-wall of the shear. Two levels, the fourth and fifth, 123 feet and 275 feet respectively below the third level were established. On the fourth level a crosscut encountered the vein, and a total of 180 feet of drifting and crosscutting was done. Between the fourth and fifth levels two small veins were encountered in the shaft, but these were not explored. On the fifth level a crosscut was driven 167 feet, but owing to a fault the vein was not found. From the end of this crosscut four diamond-drill holes were drilled. Two were drilled fanwise horizontal in a westerly direction and were 250 feet and 379 feet in length. A vein was intersected at 152 feet and 183 feet respectively. The other two holes drilled back towards the shaft were 358 feet and 489 feet in length and reported to have intersected veins of 3-foot width at 274 and 186 feet respectively. Shaft-sinking is proceeding, with the intention of establishing stations at 400 feet and 525 feet. At the end of December the shaft was down 375 feet.

A larger air-hoist for sinking was obtained during the year, but otherwise the equipment remained the same. The average number of men employed was seventeen.

Olympic Gold Mines, Ltd.

Company office, 744 Hastings Street West, Vancouver. G. S. Eldridge, President. Capital: 1,500,000 shares, no par value. This company owns the Olympic group of twenty-three Crown-granted mineral claims on the south side of the Bridge River opposite Minto. A 6- by 9-foot winze, which was collared in 1945 about 200 feet inside the Leckie adit, was sunk to a depth of 85 feet on contract by J. Hagmo and P. Sandmo, of Minto. Air was supplied by a portable compressor, and a small air-hoist was used for hoisting. At a depth of 75 feet in the shaft two crosscuts were driven—one 25 feet east and the other 30 feet west, and from the former crosscut 70 feet of drifting was done on a vein. It is reported the vein showed only in the lower part of the drift. The winze was allowed to flood after this work was completed.

This company also did some diamond-drilling on the B. R. Jewel (former Ho Bo group) and also some underground work on the Lucky Jem group in Eldorado Basin.

Lucky Jem.

This property is in Eldorado Basin, at the headwaters of Eldorado Creek, a northern tributary of Gun Creek, which flows into the Bridge River. Olympic Gold Mines, Limited, hold a 75-per-cent. interest in the property. It is reported that 50 feet of adit was driven in 1945. In 1946 a contract was let to J. Hagmo and P. Sandmo, of Minto, who drove 225 feet of adit by hand-steel.

Christie.

This group is a relocation in 1945 by J. Hagmo, of Minto, of six claims and a fraction, formerly the old Kelvin group, adjoining the property of Olympic Gold Mines, Limited, on the west. No work has been done since 1936. The main workings consist of an adit driven about 150 feet below the surface outcrop. In this adit a narrow vein is followed for 150 feet in greenstone and apparently for another 500 feet in argillite. In 1946 four diamond-drill holes were put down from the surface to intersect the vein 150 feet below the adit. Two holes were drilled by W. Davidson, of Minto, and two by E. M. Thomson and associates, of 510 Stock Exchange Building, Vancouver. All holes were less than 200 feet long; narrow vein intersections were reported.

Bristol Mines (1946), Ltd.

Company office, 572 Howe Street, Vancouver. J. C. Adam, President; A. A. Lee, Mine Manager. Capital: 3,000,000 shares, 50 cents par. The property is on Tommy Creek, about 4 miles south of the Bridge River Highway, at a point 12 miles east of Minto. The mine is reached by a bridge across the Bridge River and then by a narrow road which climbs 2,000 feet in about 3½ miles.

This property was under development from 1939 to 1941 by Bristol Mines, Limited, a private company. No work has been done since 1941, when a third-level adit was started 30 feet above Tommy Creek, and 708 feet of drifting and crosscutting was done. In 1946 surface work was started on June 16th and underground work on August 3rd. The third level was further extended in a southerly direction by 128 feet of crosscutting and 387 feet of drifting. This work ceased in December, and during the winter only diamond-drilling will be done. The power plant left at the mine during the shut-down is again operating. Air is supplied by an Ingersoll-Rand 500-c.f.m. compressor driven by a Pelton water-wheel under a 224-foot head. Water-power also runs the 5-kilowatt light plant. The average number of men employed was nine.

Ranger (Truax).* This syndicate, represented by C. P. Ashmore, of Bralorne, is reported to control twenty-nine mineral claims, staked in 1944 and 1945 and held by record, in four groups. The claims are reported to include the Alpine and Alpine Nos. 1 to 8, the Arky, the Jim Nos. 1 to 4, all owned by C. P. Ashmore; the Jose 1 and 2, owned by D. C. Ault; the Marie Nos. 1 to 4, 7, and 8, owned by D. C. Ault; the Marie Nos. 5 and 6, 9 and 10, and Marie Fraction, owned by C. P. Ashmore.

Most of the claims were staked in the autumn of 1944 by D. C. Ault, a grantee under the "War-time Prospectors' Grub-stake Act." The property was originally optioned to C. P. Ashmore and subsequently turned over to a local syndicate of ten men. Shortly thereafter Bralorne Mines, Limited, obtained an option and, in the summer of 1945, drilled three diamond-drill holes on the property (*see* Fig. 12), but, because of the intensely sheared nature of the ground, coring was very difficult, and the results were inconclusive. The company dropped its option the same year. Since then development has been confined to surface prospecting.

The claims cover an area that extends northerly from the headwaters of the most western large tributary of Truax Creek, locally known as Six Mile Creek, over a high saddle, elevation 8,190 feet, and down to the headwaters of Girl, Steep, and Lindsey Creeks. These creeks are shown on Mineral Reference Map No. 21T269 of the Surveys Branch of the British Columbia Department of Lands and Forests, and the approximate position of the claims, based on information supplied at the time of recording, is shown on Fig. 13.

Work on the property has been done from a tent-camp, north of the saddle between Girl Creek and Six Mile Creek, at an elevation of 7,575 feet. The workings include a few pits in the saddle and other pits and an adit, at an elevation of 8,015 feet, south of the saddle. Timber-line is below camp, at an elevation of about 6,300 feet.

The camp is reached from the settlement of Fish Lake, on the main Bridge River Highway, by 0.16 mile of motor-road and thence by 7¼ miles of good pack-horse trail.

The main showings consist of two quartz-arsenopyrite lenses in a shear-zone in argillaceous chert. The shear-zone is 100 to 200 feet wide and strikes north-north-westerly with the strike of the chert. The rocks on the property include chert, hornfels, green and purple lava, serpentine, augite diorite, and quartz-diorite; their distribution is shown in Fig. 12.

The rocks trend north-north-westerly and are either vertical or dip steeply south-westward; very little minor folding was seen.

Two bands of chert are found, a narrow band of argillaceous chert from 100 to 200 feet wide near the adit, and north-easterly from the adit a wider, less argillaceous, band from 150 to 300 feet wide. In the wider band layers of tan- and grey-weathering chert, 1 to 3 inches thick, are separated by 1/16- to 1/4-inch layers of sheared argillite. In thin sections this chert is seen to consist of fine-grained quartz, criss-crossed by stringers of

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

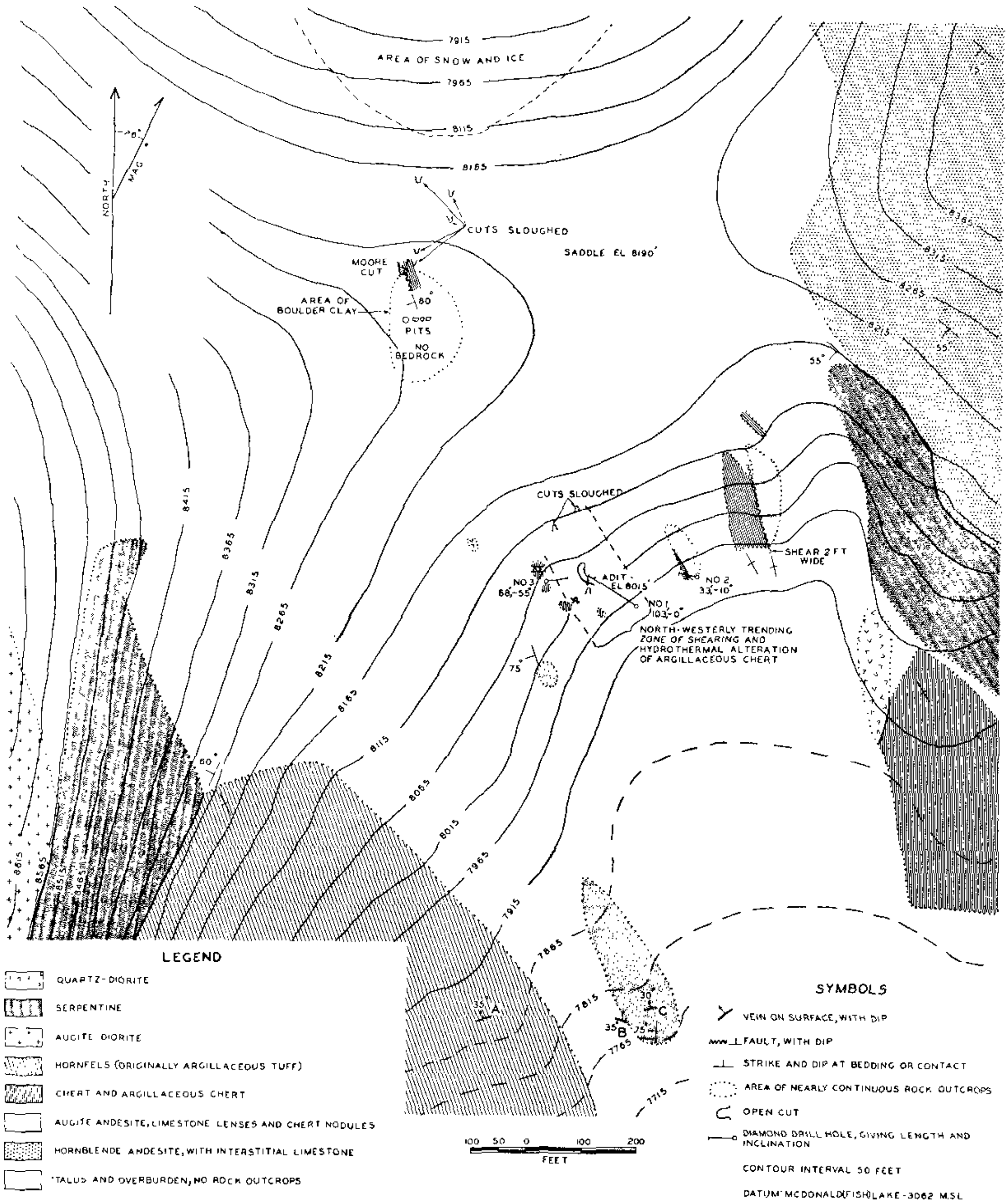


Fig. 12. Ranger (Truax)—surface geology, vein outcrops, and workings.

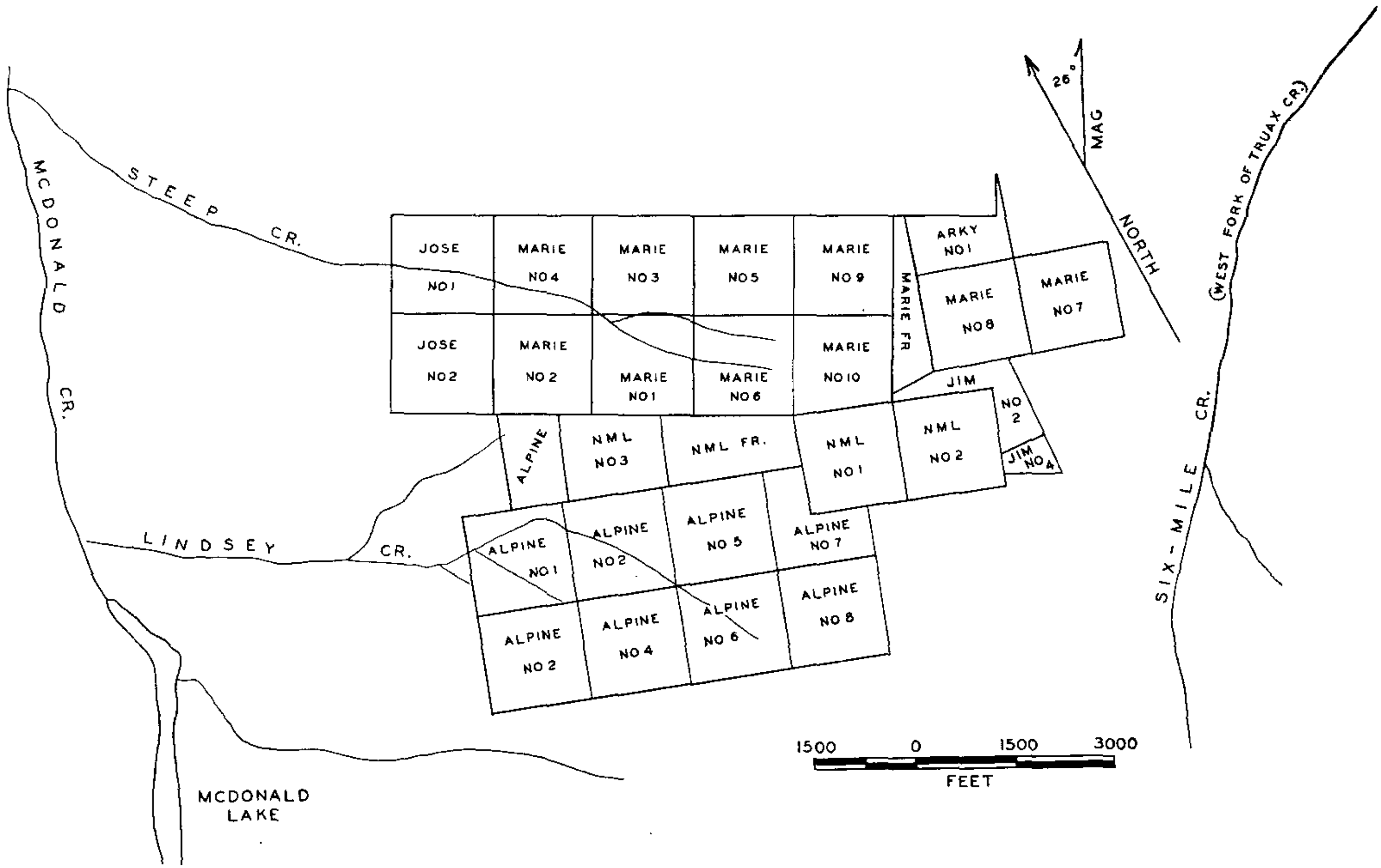


Fig. 13. Ranger (Truax)—unsurveyed claims held by location.

more coarsely crystalline quartz. The chert band in the narrow band near the adit is strongly sheared, particularly in the more argillaceous beds. Under the microscope the chert material is seen to be coarsely crystalline, and much fractured, and the argillaceous material is seen to be extensively sheared and replaced by masses of sericitic mica and ankeritic carbonate. Surface oxidation has converted much of the ankeritic carbonate to limonite.

Flows of green lava are found south-westerly and north-easterly from the adit. Purple lava about 50 feet wide is found in the wide band of chert north-easterly from the adit. Most of the lava is massive, but pillow and amygdaloidal lava are found, frequently interlayered with small lenses of limestone a few inches thick and 2 to 3 feet long. Under the microscope the lava is seen to be augite andesite and to consist of phenocrysts of augite set in a ground-mass of andesine-plagioclase laths.

A large area of green lava is found 600 feet north-easterly from the adit. Ropy structure and well-developed pillows partly or wholly surrounded by layers of crystalline limestone are characteristic of this north-easterly body of green lava. This lava is andesite but differs from the lava to the south-west, in having amphibole instead of pyroxene as the main dark mineral.

Dense, dark greenish-brown hornfels lies south-westerly from the south-western augite andesite body. Much of the hornfels is massive, but some is finely laminated. Under the microscope it is seen to consist of very angular fragments of quartz lying in dense carbonaceous and micaceous ground-mass and appears to have been derived from argillaceous tuff.

A large area of serpentine lies west of the hornfels, and another area to the north-east between the wide band of chert and the hornblende andesite. Weathering changes the colour of the serpentine from black on unweathered to tan on weathered surfaces, and by differential etching of the grains of the rock brings out the granular texture of the otherwise apparently dense serpentine. It consists mainly of the serpentine mineral antigorite, with no pyroxene or olivine remaining, but the granular texture of the areas of antigorite suggest that the rock was originally olivine-rich rather than pyroxene-rich, and, therefore, the rock a peridotite or even a dunite rather than a pyroxenite. Much of the eastern body of serpentine has been carbonatized and is cut by stringers and replaced by patches of carbonate. The eastern body is conformable to the general strike of the adjacent chert, but the western body cuts across the strike of adjacent hornfels and is therefore intrusive. Because of lithological similarity to the western area of serpentine, the eastern area is also probably intrusive.

Augite diorite lies west of the western area of serpentine and extends an unknown distance west, north, and south. The rock is dark-green medium-grained diorite, criss-crossed by many veinlets of quartz. Under the microscope it is seen to consist mainly of andesine-plagioclase and augite.

Small outcrops of light-coloured medium-grained quartz-diorite are near the adit and south-easterly from it. Under the microscope the rock is seen to consist of adesine-plagioclase, hornblende, biotite, and quartz. The rock in the large outcrop south-easterly from the adit is sheared and altered to such an extent that chlorite has completely replaced the dark minerals, and carbonate has replaced much of the feldspar.

The main showing of economic interest on the property is a sulphide vein, 2 to 12 inches wide, consisting of abundant massive arsenopyrite and small amounts of pyrite in quartz, from which high assays in gold have been obtained. The vein, strike northerly and dip 25 degrees westward, has been exposed for a distance of 3 feet in the floor of the adit at a point 13 feet from the portal and on the south wall of the adit for a slope-distance of 14 feet (*see* Figs. 12 and 14).

The gold content of this material is variable, one sample taken by the writer across 12 inches, about 40 per cent. arsenopyrite, assaying: Gold, 4.46 oz. per ton; silver,

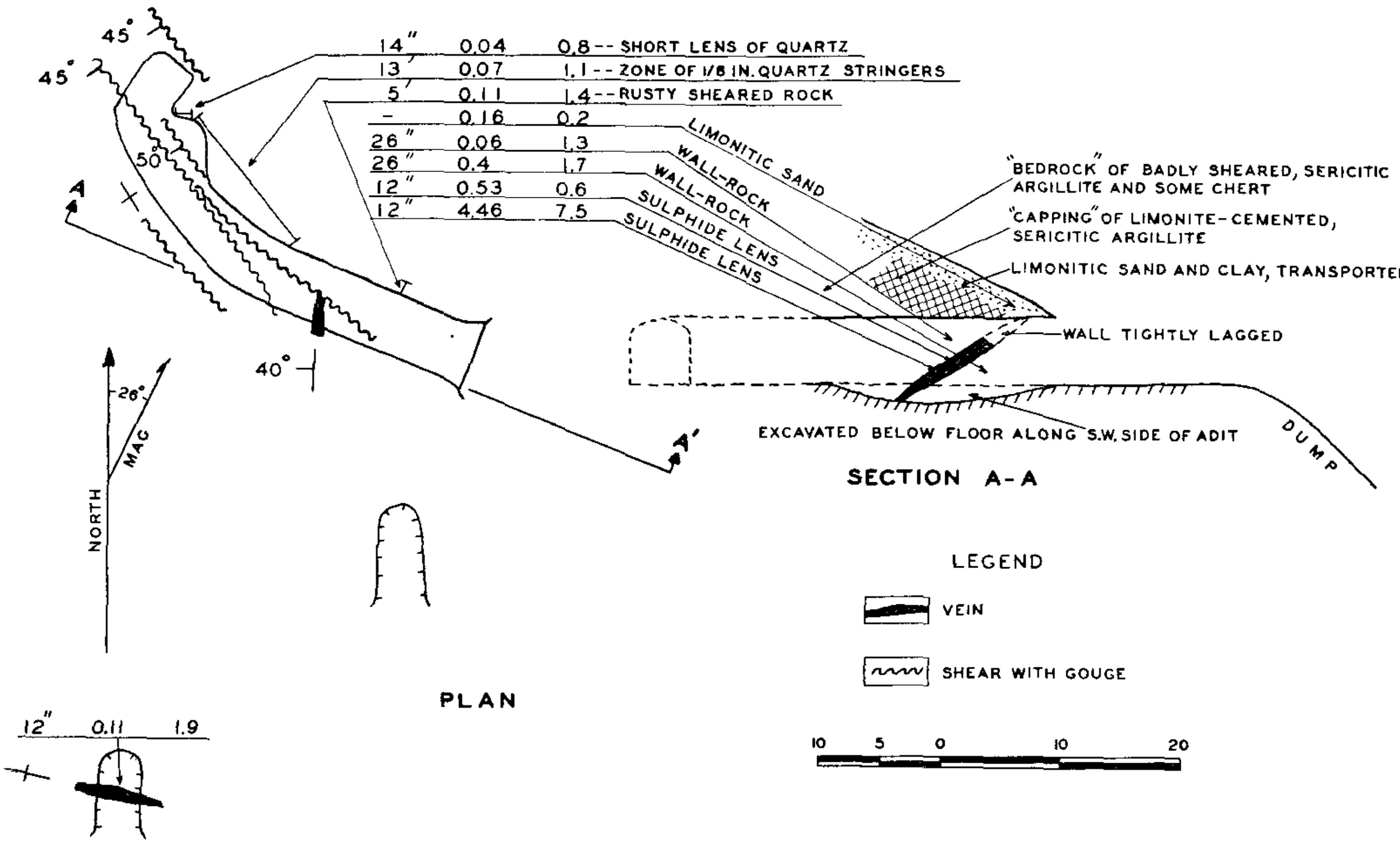


Fig. 14. Ranger (Truax)—plan and section of main workings.

7.5 oz. per ton. Another sample, also across 12 inches, about 35 per cent. arsenopyrite, assayed: Gold, 0.53 oz. per ton; silver, 0.6 oz. per ton.

The sulphide vein in the adit (*see* Fig. 14) strikes northerly across a north-north-westerly trending shear-zone that has a width of at least 100 feet. The adit follows some slips and narrow zones of intense shearing north-north-westerly beyond the sulphide vein, but no other veins were found. High-grade float had been originally found in the talus above the adit, 50 feet north of the portal, and also in the saddle, but outcrops are lacking on the hillside along the line of strike of the shear, and search for sulphide veins or lenses from which this float may have come is difficult. However, open-cuts and pits have been dug along the strike of the shear-zone northerly up the hillside in the saddle and north of the saddle (*see* Fig. 12) in search for the source of gold-bearing float found at these places. Many of them failed to reach bed-rock, but the finding of a shear and of sheared argillaceous chert in a cut, referred to as the Moore cut, in the saddle, indicates that the shear-zone extends at least this far, 700 feet in a north-north-easterly direction from the adit.

The Moore cut exposes a strong shear, 18 inches wide, strike north 40 degrees west and dip 80 degrees south-westward, that follows the contact between lava on the south-west and argillaceous chert on the north-east. The only mineralization in this cut is a flat-lying quartz stringer, 1 inch thick and 1 foot long, exposed on the east wall of the cut. This stringer is of interest because it contains pockets of decomposed sooty tourmaline, a mineral that is also found in the sulphide vein in the adit.

Several other cuts and pits were dug near the Moore cut, but they failed to reach bed-rock. The pits in the saddle are in a pocket of boulder clay left by retreating ice, and those on the north slope of the saddle are in talus from the near-by rock bluffs.

A second sulphide-quartz vein found 45 feet south-westerly from the adit portal (*see* Figs. 12 and 14) is near the south-west wall of the shear-zone. This vein, strike north 75 degrees west and dip vertical, is exposed in a cut and surface stripping for about 8 feet, and ranges from 6 inches to 12 inches in width. Like the vein in the adit it consists of abundant arsenopyrite with some pyrite and quartz. A sample taken across 12 inches of vein-matter, about 40 per cent. arsenopyrite, assayed: Gold, 0.11 oz. per ton; silver, 1.9 oz. per ton; copper, 0.1 per cent.

Several smaller sulphide veins have been found outside the shear-zone about 800 feet southerly from the adit. The position of these is shown in Fig. 12.

At *A* (Fig. 12) two short stringers of quartz and pyrrhotite, one striking easterly and dipping 35 degrees northward and the other striking northerly and dipping 80 degrees eastward, are exposed in a steep rock-face. They range from 1 to 2 inches in width and are exposed for about 2 feet. A composite sample of the two stringers assayed: Gold, 0.14 oz. per ton; silver, 0.3 oz. per ton.

At *B* (Fig. 12) three stringers of quartz and arsenopyrite from ⅛ to 4 inches thick are exposed in a steep rock-face. The lower stringer, strike easterly and dip 35 degrees northward, consists of ⅛ inch of arsenopyrite and pyrite in a shear 2 to 4 inches wide. A 1-inch stringer of arsenopyrite and chalcopyrite, same strike and dip, is 15 feet north-westerly and 5 feet above the lower stringer. This stringer is crossed by several short hair-like stringers of arsenopyrite, pyrite, and chalcopyrite. A short half-inch stringer of arsenopyrite, of similar strike, is found 4 feet above the middle stringer. A sample of sulphides, about 70 per cent. arsenopyrite, in these stringers assayed: Gold, 0.04 oz. per ton; silver, trace; copper, 0.7 per cent.

At *C* (Fig. 12) two stringers of arsenopyrite and chalcopyrite, strike north 80 degrees east and dip 30 degrees northward, are found. The lower stringer ranges from 1 inch to 3 inches in width, and the upper, 5 feet above, is half an inch in width. A sample of the lower stringer, containing about 45 per cent. arsenopyrite and 15 per cent. chalcopyrite, assayed: Gold, 0.04 oz. per ton; silver, 2.9 oz. per ton; copper, 5.2 per cent. A sample from the same stringer, but containing mainly arsenopyrite, assayed: Gold, trace; silver, 0.2 oz. per ton; copper, 0.8 per cent.

Polished sections of sulphides from several of the veins on the property were studied under a microscope, and the minerals found, in order of abundance, were: Arsenopyrite, pyrite, chalcopyrite, and hematite. The arsenopyrite and pyrite from the two lenses in the shear-zone have been very badly shattered and the fragments sealed by a matrix of vein-quartz, whereas the same minerals from the sulphide stringers 600 feet south-westerly from the adit, and outside the shear-zone, have been only slightly fractured. Hematite was seen only in sections from the adit lens. Three specks of free gold were seen in a section from the cut 50 feet south-westerly from the adit. The gold was in quartz, and ranged in size from 5 microns in diameter to 30 by 10 microns. For comparison it may be noted that the opening of a standard 200-mesh screen is 74 microns square.

CAYOOSH CREEK (50° 122° N.E.).*

Gold.

Ample. The Ample group of twelve claims, which includes the old Ample mine operated around 1900, was acquired in 1944 by S. M. Jones and J. Devitt, of Lillooet, and W. Genser, of Vancouver. The claims are on the west side of Cayoosh Creek, about 6 miles from Craig Lodge at the east end of Seton Lake. A narrow road can be travelled by car to within 2 miles of the property. The elevation of the mine is about 3,200 feet.

An effort was made to unwater the No. 1 adit or incline shaft, which slopes northward into the hill at 25 degrees. It is said to follow the vein for 240 feet. One man was employed keeping a siphon going, but this gave out after the first level was exposed and no further work was done.

PAVILION (50° 121° N.W.).*

Gold.

Rusdon Gold Mines, Ltd. Company office, 475 Howe Street, Vancouver. G. P. Ellis, President; G. R. Bancroft, Consulting Engineer. Capital: 3,000,000 shares, 50 cents par. The Rusdon holdings include all the ground formerly held by Pavilion Gold Mines, Limited, and all but one of the claims formerly held by Grange Consolidated Mines, Limited. These claims are on the east side of the Fraser River, about 3 miles south of Moran Station on the Pacific Great Eastern Railway.

During June and July about 1,900 feet of diamond-drilling was done. Two down holes at 45 degrees were reported drilled fanwise in an easterly direction from a set-up 300 feet west of the old Pavilion shaft. It is understood that two other holes were drilled from another set-up 175 feet south. Vein intersections were reported.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1933, pp. 184, 185.]

ALTA LAKE (50° 122° S.W.).*

Iron.

Iron King Quarry. This quarry has been operated by the B.C. Electric Railway Company, Limited, of Vancouver, since 1945. Limonite (bog-iron ore) is mined chiefly from the Crown-granted Morning Star Mineral Claim of the Iron King group, situated near Alta Lake on the Pacific Great Eastern Railway. The ore is shipped to Vancouver and used by the company for the removal of hydrogen sulphide from its manufactured gas.

* By J. W. Peck.

Bog-iron ore occurs in patches on a hillside and has been exposed in widths up to 300 feet. It is being mined by pick-and-shovel methods to a depth of 10 feet. Ore from the higher deposits is lowered to a road by a winch operating a car running on a 3-foot-gauge track. The material is then trucked 1½ miles to a spur track, which extends half a mile from Rainbow Station on the Pacific Great Eastern Railway.

This deposit has been mined intermittently since 1918, when the spur track was put in. The yearly tonnage has always been small. Production in 1945 was 397 tons, and in 1946, 341 tons. The company intends to build a road to the higher deposits to do away with the winch-and-track method. Seven men were employed during the summer.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1918, p. 294.]

NICOLA LAKE (50° 120° S.W.).*

Gold.

Guichon Mine, Ltd. Company office, 124 Pacific Building, Vancouver. Lewed Jesson, President; James D. Ferguson, Mine Manager. This company is developing the Frinsbury group of mineral claims, 2 miles south-west of Quilchena and 12 miles east of Merritt. The main development during the year consisted of driving the 2100 level on the Last Chance claim. This adit-level was advanced 1,000 feet in a north-westerly direction. Some development was also done on the Camperdown, Ensign, and Quilchena Mineral Claims. Total development consisted of 1,230 feet of drifting, 25 feet of sinking, 600 feet of diamond-drilling, and some surface stripping. A bunk-house, cook-house, and change-house were built for the accommodation of twenty men, as well as two dwelling-houses for the staff. A compressor-room, blacksmith-shop, and storeroom were also built near the 2100 level portal. A small portable compressor provides air for a drifter, and a small fan for underground ventilation. At the end of the year six men were employed.

COPPER MOUNTAIN (49° 120° S.W.).*

Copper.

Granby Consolidated Mining, Smelting, and Power Co., Ltd. Julian B. Beaty, President, New York, N.Y.; A. S. Baillie, Vice-President and General Manager, Copper Mountain; W. I. Nelson, Assistant General Manager, Copper Mountain; Robert S. Douglas, Mine Superintendent; J. McMynn, Assistant Mine Superintendent; Ed. Foy, Mine Foreman. The company's steam electric-power plant in Princeton supplies power to the concentrator at Allenby, 3½ miles south of Princeton, and to the mine at Copper Mountain, 12 miles south of Princeton. A branch line of the Kettle Valley Railway from Princeton connects the power plant, mine, and concentrator. A general description of the mine workings is given in the Annual Report of the Minister of Mines for British Columbia, 1945, pp. 90–92.

Further advances were made in underground mechanization, and the former grizzly system of ore-transfer has been entirely superseded by the slusher-drift method. The diamond-drill system of mining has also displaced the use of percussion drills. This modernization, in addition to reducing costs, improves working conditions, increases the safety of workmen, and greatly reduces the amount of dust resulting from drilling. Ventilation raises, equipped with auxiliary fans, ensure that each slusher unit is provided with sufficient fresh air, so that the dust and smoke from scraping and blasting are carried away quickly. All blast-hole drilling is done by the T. Connors Diamond Drilling Company, Limited. A total of 109,114 feet of diamond-drilling was done in 1946. Drifters are still used for development-work, although an experiment was made

* By E. R. Hughes.

in using diamond-drills in drift development, and 140 feet of drift was driven by this method.

Development in the 36 block was completed in 1946. Blasting was completed in the 37 block, and slusher equipment was installed. The A-14 block and the 122 East block were being developed, and a start had been made on the development of the 32–34 block. Total development consisted of 2,358 feet of drifting and 5,867 feet of raising. There were no major additions to surface equipment. Compressed air is furnished by three Ingersoll-Rand compressors and one Sullivan compressor, the four units having a total capacity of 8,600 cubic feet per minute.

Underground ventilation was generally well maintained. Fresh air enters the mine through the old glory-holes and ventilation raises, whence the fans 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. Both shafts are upcast and are closed to the levels. Eight fans are now in use on the various levels, and their aggregate capacity is 352,000 cubic feet of air per minute.

The company employs a safety engineer, and the Copper Mountain Mine Safety Promotion Committee meets once a month to discuss the prevention of accidents. The committee consists of elected workmen and company officials. Monthly tours of inspection of mine-workings, plant, shops, accommodation, etc., are made by the committee, and its recommendations are discussed at the subsequent monthly meeting. 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. A doctor visits the Copper Mountain Camp twice a week and is available in emergencies. The company maintains an ambulance for transporting sick or injured persons to the Princeton General Hospital, 12 miles from the mine. Aluminium-dust therapy is now available for all employees.

For the accommodation of employees there are eighty company houses, 161 private houses, three bunk-houses, a staff-house, and a girls' domitory. These latter five buildings have a total of 138 two-bed rooms and 13 single rooms. The buildings are provided with hot and cold running water, and the rooms are furnished with steel single beds. All bunk-house bedding is provided by the company. A charge of $1.35 per day is made for board, and the charge for a room in a bunk-house is $6.50 per month.

The mine was idle from July 3rd to November 5th because of a strike. On resumption of work, activities were confined to repairs, reinstalling underground equipment, and development-work. Milling was expected to resume at the beginning of January, 1947. At the end of the year 238 men were employed at Copper Mountain—124 underground—87 men were employed at the Allenby concentrator, and 28 at the company's steam-electric power plant at Princeton.

Ore milled in 1946 amounted to 577,671 tons, yielding 10,427,972 lb. of copper, 72,310 oz. of silver, and 1,679 oz. of gold.

HEDLEY (49° 120° S.E.).*

Gold.

Hedley Amalgamated Gold Mines, Ltd. Company office, 535 Homer Street, Vancouver. J. Y. McCarter, President; W. G. Norrie-Loewenthal, Manager. Capital: 4,000,000 shares, 50 cents par. Exploratory work was continued during most of 1946 on the Red Tunnel workings, on the southern slope of Stemwinder mountain, about 2 miles north-west of Hedley. A new adit-level, No. 2, was started at an elevation of 3,722 feet. After being driven 180 feet, a connection was made with the old Red Tunnel lower level. A winze, 180 feet deep, was sunk from the

* By E. R. Hughes, except as noted.

No. 2 level on an average grade of 19 degrees, and a crosscut 50 feet long was driven from the bottom of the winze. A crosscut from No. 2 level was driven in a north-westerly direction for a distance of 150 feet. Exploratory diamond-drilling amounted to 1,000 feet. A road 1½ miles long was constructed from the McKinnon Tunnel to the Red Tunnel workings.

Additions to equipment include a 315-cubic-foot Diesel-driven Le Roy compressor, a drifting-machine, and a small compressed-air hoist. Two buildings, each 18 by 40 feet, were erected for use as a compressor-room and storeroom. An 18- by 16-foot blacksmith-shop was also built. No housing accommodation has been provided, but a four-wheel drive army truck transports workmen daily from Hedley to the mine. A crew averaging nine men was employed from May to December.

Hedley Mascot Gold Mines, Ltd. Company office, 908 Royal Bank Building, Vancouver; mine office, Hedley. W. S. Charlton, Vice-President; C. W. S. Tremaine, Mine Manager; J. C. S. Moore, Mine Foreman. Capital: 3,000,000 shares, $1 par. This company operates the Mascot mine, 1 mile north of Hedley, and did development-work on the Good Hope property on Nickel Plate Mountain.

The concentrator and mine offices of the Hedley Mascot are on the east bank of Hedley Creek, and the mine camp is on the side of Nickel Plate Mountain. Ore is transported by an aerial tramway, 5,000 feet long, from an ore-bin at the mine to the mill. 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, to which all ore is passed. The 4300 level is the lowest ore-producing level in the Mascot Fraction, and ore from it is hoisted up the No. 2 tramway to the 4800 level. Two 3½-ton Atlas battery locomotives and one Mancha trammer provide transportation underground.

The workings of this mine are connected to the workings of the adjoining Nickel Plate mine at several points underground. These connections are open, permitting a joint ventilation system. During months when natural ventilation is inadequate, a 48-inch Jeffrey propellor-type fan in the 4800 level assists the natural air-current.

The main developments during 1946 were the continued advance on the 3700 level and the 2700 incline. The 3700 level was advanced 923 feet, and 13,000 feet of diamond-drilling was done from this level to prospect for the downward extension of the Nickel Plate ore-bodies. The 2700 incline was advanced 1,006 feet and is now in a total distance of 1,805 feet from the portal. This new incline is 15 feet wide, 7½ feet high, and slopes at 24 degrees. When completed, the incline will be 2,000 feet long and will connect with the 3700 level. No. 6 (aerial) tramway is used to transport men and materials from the 4300 level to the developing 3700 level. The 2700 incline is serviced by a truck-road from the mill. A temporary camp, consisting of a bunk-house, change-house, and cook-house, has been erected for the accommodation of workmen employed at the 2700 incline. There were no major additions to plant or equipment during the year.

The mill was operated continuously until July 3rd at an average rate of 185 tons per day. A strike caused the property to be idle from July 3rd until November 12th. Since the settlement of the strike and the end of the year, development of 3700 level has continued, and three stopes were being worked selectively. Milling had not recommenced at the end of the year. The average number of men employed during the first six months of 1946 was 165, of whom 71 were employed underground. At the end of the year 46 men were employed.

Development-work done in 1946 included 1,028 feet of drifting and crosscutting, 1,171 feet of raising, and 18,274 feet of diamond-drilling. A total of 32,448 tons of ore was milled, yielding 9,050 oz. of gold, 2,263 oz. of silver, and 51,329 lb. of copper.

Good Hope. This property, about 4 miles south-east of Hedley, was operated during 1946 by Hedley Mascot Gold Mines, Limited. Work had been in progress one month when it was halted by a strike. Work had not been resumed at the end of the year. During the short period of activity 350 tons of ore was mined and stock-piled. Development-work consisted of 407 feet of diamond-drilling, some surface stripping, and geological mapping of all the Good Hope mineral claims. Eight men were employed, under the direction of J. Hitchins and J. DeLeen.

Nickel Plate, Kelowna Exploration Co., Ltd. Company office, 75 West Street, New York, N.Y.; mine office, Hèdley. R. McLean Stewart, President; William C. Douglass, General Manager; F. A. McGonigle, Manager; Alex. Shaak, Mine 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 an elevation of 5,600 feet, 4 miles north of the town of Hedley. 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 2,000 feet higher than the lowest outlet of the Mascot, the motive column is sufficient to provide adequate natural ventilation during most of the year. However, there are times when the air is almost stagnant in some of the large stopes of the upper Nickel Plate workings.

Development during 1946 consisted of 2,381 feet of drifting, raising, and cross-cutting, and 13,020 feet of diamond-drilling. There were no major developments in either surface or underground operations, and there were no major additions to plant or equipment.

Compressed air for the mine and mill is provided by four compressors, two at Hedley and two underground at the mine. The two compressors at Hedley have a combined capacity of 3,600 cubic feet of free air per minute. The underground compressors are auxiliary to the larger surface plant and cut in only when increased power is required. The total capacity of the underground compressors aggregates 1,000 cubic feet of free air per minute.

Regular inspections of the surface and underground are made by the Safety First Committee, composed of representatives of the miners' union and the management. Aluminium-dust therapy is available to both underground and surface employees. A strike caused the property to be idle from July 3rd until December 11th. Milling had not been resumed at the end of the year. The total crew at the end of 1946 was 121.

A total of 46,494 tons of ore was mined and milled, yielding 18,490 oz. of gold, 956 oz. of silver, and 52,022 lb. of copper.

Canty, Canty Gold Mines (1945), Ltd.—B. L. Alexander, Manager. This mine is about 2 miles east of the Nickel Plate mine. Operations at this property were suspended in 1941, and the mine remained closed until early in 1946. Development-work consisted of surface stripping and diamond-drilling. No underground work was done. In September eleven men were employed. Work was suspended in October for the winter.

Hedley Gordon Gold Mines, Ltd.—Charles Gordon, Manager. This property is situated about 1 mile east of the Nickel Plate mine. Development-work consisted of surface stripping and diamond-drilling. No underground work was done. In September four men were employed. Work was suspended in October for the winter.

Hedley Basin Mines, Ltd. J. W. Gallagher, President; E. W. McFarland, Manager. This is a new property, situated about 7 miles south-east of Hedley and about half a mile from the Hedley–Keremeos Highway. Development-work consisted of surface stripping. No underground work was done. Six men were employed during the summer and autumn. Work was suspended for the winter season.

Hedley Yuniman Gold Fields, Ltd. J. W. Gallagher, President; J. M. Fraser, Mine Manager. The property is on Bradshaw Mountain, and is reached by a pack-trail 6 miles long which branches from the Hedley–Keremeos Highway at Bradshaw, a station of the Great Northern Railway 5 miles south-east of Hedley. The trail climbs steeply along the valley of Bradshaw Creek to the workings at an elevation of about 6,300 feet. The property had been idle for several years until work was resumed in the spring of 1946. The old workings consist of three adits, two small shafts, and several open-cuts. A gasoline-driven compressor was skidded up the trail, and a new adit has been started. The portal of the new adit is approximately 230 feet south-west of the old No. 1 adit. About 350 feet of drifting and crosscutting had been done when work was suspended for the winter.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1937, pp. D 8–D 11.]

OLALLA (49° 119° S.W.).*

Gold, Copper-Molybdenum.

Hedley Monarch Gold Mines, Ltd. Company office, 470 Granville Street, Vancouver. A. E. McGillivray, President; T. C. Botterill, Managing Director. Capital: 3,000,000 shares, 50 cents par value. This company owns or controls seventy-two claims and fractions, seven of which are Crown-granted, near the village of Olalla. The holdings extend southerly down Keremeos Creek nearly 2 miles from Olalla and cover both sides of the valley for distances of three-quarters of a mile east and 1¼ miles west. Keremeos, on the Great Northern Railway, 4 miles south of Olalla, is the nearest large town. The Provincial highway to Penticton runs through Keremeos and Olalla, bisecting the property. The property includes the Golconda, a copper-molybdenum prospect known for almost fifty years, and ground which was reported upon by M. S. Hedley in 1936 and 1937, when it was held by Gold Valley Mines, Limited.

The flat bottom of Keremeos Valley, elevation about 1,600 feet, and the gentle lower slopes are largely drift-covered and given over to agriculture. The upper slopes, which on the property extend up to elevations in excess of 4,000 feet, are steep and rugged, with many rock bluffs and deep gullies. Several large ravines on Olalla Creek and its tributaries dissect the northern part of the property. Meagre supplies of timber are found on the upper slopes. Water sufficient for domestic and exploratory purposes is obtained from Olalla Creek and underground seepages, but the larger quantities which would be required for milling operations might be difficult to obtain. In the dry season the total flow of Keremeos Creek is used for irrigation.

A tent-camp has been established at Olalla, and two old buildings in the village are used as a cook-house, storeroom, and office. A Sullivan portable compressor, capacity 105 cubic feet per minute, is used to operate a drifter or jack-hammer. At the end of the year nine men were employed.

The general geology of the region is shown on Map 628A of the Geological Survey of Canada. A thick sedimentary series is intruded by pyroxenite, syenite, and granite, and some dioritic rock. The sediments include argillite, chert, quartzite, and minor amounts of impure limestone. Some greenstone, probably representing andesitic flows or tuffaceous beds, is intercalated with the sediments. The sediments are found mainly in the southern part of the Hedley Monarch property, and the pyroxenite and other granitic rocks in the central and northern parts.

* By W. H. White.

Widely distributed outcrops of pyroxenite represent one or more irregular stocks. This rock is medium- to coarse-grained, dark green in colour, and is composed essentially of augite with a little biotite. The pyroxenite weathers readily, forming a green sandy soil.

Diorite, quartz-diorite, and gabbro are found near the edges of the pyroxenite area, and these may represent either border phases of the pyroxenite or separate intrusives. Exposures are insufficient to observe the relationship closely.

A small composite stock of soda granite, syenite, and aplite occurs on the Sunrise claim, about 1,000 feet south of Olalla. As shown by outcrops and diamond-drilling, this stock extends 600 feet in a north-south direction and 500 feet westerly from the Provincial highway. Its extension east of the highway beneath the floor of the valley is unknown. The stock is bounded on three sides by pyroxenite.

Distinct types of mineralization are found in four different sections of the property:—

Golconda Section: Quartz lenses with chalcopyrite and molybdenite in a fault-zone in pyroxenite.

Sunrise Section: Quartz veins with gold and silver values in syenite and soda granite.

Something Good Section: Carbonate breccia-zone with gold values in sediments near a pyroxenite contact.

T.C.B. Section: Lenses with calcite, garnetite, pyrite, and chalcopyrite in cherty sediments.

Golconda Section.—This group of six claims, held under option, is on the south fork of Olalla Creek, about three-quarters of a mile west of the highway. A truck-road 1½ miles in length switchbacks up the side of the valley to within a few hundred feet of the main workings.

The property has been developed intermittently since 1899, and small shipments of hand-cobbed copper-molybdenum ore were made in 1917 and 1922. Underground development prior to 1946, including two adits on the Golconda claim and one on the Canuck claim, totalled about 1,300 feet. In 1946 Hedley Monarch Gold Mines, Limited, extended No. 2 adit on the Golconda claim 50 feet.

This adit, elevation 2,709 feet, includes 260 feet driven southerly from the bottom of the steep ravine on the south fork of Olalla Creek, and a drift, 420 feet in length, turned off to the left 100 feet from the portal. For 10 feet from the portal the adit is in quartzite, the next 10 feet is fine-grained light-coloured rock which may be a dyke, and the remainder of the workings is in pyroxenite. The pyroxenite contact is marked by an unmineralized fault which strikes south 60 degrees east and dips irregularly north-eastward. The drift follows a diffused fault-zone for 120 feet, where it merges at an acute angle into the main mineralized zone, along which the drift turns south-easterly and follows 300 feet to the face. The fault-zone strikes easterly and dips irregularly northward.

The mineralized zone is made up of one or more slickensided and gouge-filled fault-planes bordered and separated by sheared and partly serpentinized pyroxenite. The average strike is south 56 degrees east, but abrupt changes in strike between south 30 degrees east and south 76 degrees east give the zone in plan a zigzag appearance. Similar abrupt changes in dip occur between the limits 65 degrees and 72 degrees north-eastward. Five quartz lenses found along the fault-zone are related to changes of attitude. Evidently mineralization took place in open spaces or areas of reduced pressure caused by movement on the warped surface. The quartz is rudely banded by fractures filled with pyrite, chalcopyrite, and molybdenite. The molybdenite was the last mineral deposited, and its large flakes, plating fractures in the quartz and the other sulphides, give the illusion of a much higher content of molybdenum than the assays indicate. To the south-east along the fault-zone the dimensions of the mineralized lenses are approximately as follows:—

Lens No. 1: 45 feet long by 30 inches wide.

Lens No. 2: 60 feet long by 50 inches wide, but varying from 12 inches to a maximum of 90 inches.

Lens No. 3: 40 feet long by 40 inches wide.

Lens No. 4: 35 feet long by 12 inches wide.

Lens No. 5: 30 feet long by 20 inches wide.

Samples taken include six channel samples cut across the mineralized widths only and, therefore, are not indicative of the mine-run ore, but rather of the grade which could be expected by selective mining and crude sorting. In addition, two ore-dumps near the portal were sampled; the larger contained about 80 tons of mine-sorted muck from current mining, and the smaller, about 45 tons of more carefully sorted ore from former operations. From each dump a 100-lb. sample was taken at random, and was crushed, coned, and quartered to a final sample weighing about 6 lb. Assays of the eight samples are given in the following table:—

Sample No.	Lens No.	Distance from N.W. End of Drift.	Width sampled.	Assay.			
				Gold.	Silver.	Copper.	Molybdenum.
		Feet.	Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.
1	1	20	16	0.01	0.8	0.19	1.27
2	1	50	35	*Nil*	0.8	0.30	0.59
3	2	110	14	*Nil*	0.8	3.39	1.21
4	3	165	57	0.01	1.1	1.64	1.12
5	4	223	16	0.01	1.1	9.20	1.53
6	5	262	36	*Nil*	0.1	0.11	0.33
7	80-ton dump, current operations			0.03	0.8	0.42	0.47
8	45-ton dump, former operations			Trace	0.7	2.13	0.56

Golconda No. 1 adit, collared 190 feet south-easterly from No. 2 adit and 131 feet higher, explores the same fault-zone for a length of about 170 feet. Mineralization is similar to that in No. 2 adit and appears to be of about the same grade.

On the Canuck claim, at an elevation of about 2,800 feet, 1,700 feet south-easterly from Golconda No. 2 adit, an old adit with two irregular branches explores a confused fault-zone of uncertain attitude. This contains some quartz stringers with occasional specks of pyrite, chalcopyrite, and molybdenite. The walls are unaltered pyroxenite. Several partly caved cuts near by expose narrow stringers of oxidized and copper-stained quartz. The relationship of these showings to those on the Golconda claim is not known.

Sunrise Section.—Narrow quartz veins on the Sunrise claim have been prospected intermittently since 1900. They occur in the small stock of syenite, soda granite, and aplite, which, as previously mentioned, extends 600 feet in a north-south direction and 500 feet westerly from the highway. The veins strike westerly and stand nearly vertical. None has been traced to the contact of the stock and the enclosing pyroxenite.

Development by former operators includes three adits, known as the Sunrise, Shepherd, and Powder "tunnels"; the Sunrise shaft; and several open-cuts and strippings. In 1946 five holes totalling 1,752 feet were drilled. During the year 49 feet of drifting and 16 feet of crosscutting were done in the Shepherd adit, and a new adit was driven 16 feet.

The Sunrise adit is immediately west of the highway, about a quarter of a mile south of Olalla. It extends 88 feet in a direction south 75 degrees west, following a vertical quartz vein, known as the Sunrise vein, which is from 5 to 16 inches in width.

At 68 feet from the portal a crosscut driven 10 feet north encounters a similar parallel vein, and this is followed 10 feet westerly.

The Sunrise vein is stripped above the adit a distance of 150 feet westerly to the collar of the Sunrise shaft, reported to be 45 feet deep. The shaft-collar is 110 feet above the adit-level.

In all these exposures the vein-matter is hard milky quartz containing some calcite and is very sparsely mineralized with small crystals of pyrite. It is frozen to unaltered syenite walls. Assays and widths of this vein sampled underground and at the collar of the Sunrise shaft are as follows:—

Location.	Width.	Gold.	Silver.
Sunrise adit—	Inches.	Oz. per Ton.	Oz. per Ton.
Portal + 28 feet west*	16	Trace	Trace
Portal + 68 feet west*	5	Trace	Trace
Face, north drift*	17	*Nil*	*Nil*
Sunrise shaft, collar	16	*Nil*	0.9

* Samples taken by M. S. Hedley in 1937.

The portal of the Shepherd adit is 140 feet north-westerly from the portal of the Sunrise adit and about 30 feet higher. When examined in October, 1946, this adit had been advanced 50 feet in a direction south 70 degrees west, and from the face a crosscut had been driven 8 feet north.

This adit follows a sheeted zone in syenite which dips 75 degrees northward. This zone, which is known as the Shepherd vein, contains several stringers of white unmineralized quartz from ¼ inch to 3 inches wide, and the intervening syenite is somewhat bleached and very sparsely mineralized with fine-grained pyrite. A basic dyke 4 feet wide parallels the north side of the Shepherd vein, and widely spaced sheeting in the dyke indicates that it is pre-mineral in age. At 15 feet from the portal a side-swipe to the left shows a quartz stringer on the hanging-wall side of the dyke, known as the Sweetener vein. It is ¼ inch to 1 inch wide, mineralized with scattered pyrite, chalcopyrite, galena, sphalerite, and tetrahedrite. The Sweetener vein strikes north 85 degrees west, diverging gradually from the Shepherd vein and the dyke, so that in the crosscut 50 feet from the portal of the adit it is 6 feet north of the dyke.

The Shepherd vein is exposed in two open-cuts above the adit about 80 feet south-westerly from the portal. Here it is about 22 inches wide, consisting of quartz and brecciated syenite cemented by quartz, and sparsely mineralized with pyrite, galena, and tetrahedrite. The Sweetener vein is stripped for 120 feet westerly from the portal of the Shepherd tunnel. The assays of channel samples taken from the surface, from the face of the Shepherd adit, and from the west wall of the crosscut are as follows:—

Location.	Description.	Width.	Gold.	Silver.
Shepherd adit—		Inches.	Oz. per Ton.	Oz. per Ton.
Portal + 10 feet west*	Sheeted syenite with several quartz stringers	19	0.04	Trace
Face	Sheeted syenite with stringers of quartz up to 3 inches wide	60	*Nil*	*Nil*
Crosscut, west wall, 0 to 5 feet north	Sheeted syenite north of dyke, excluding Sweetener vein	60	*Nil*	*Nil*
Crosscut, west wall, 5 to 8 feet north	Sheeted syenite	40	*Nil*	*Nil*
Crosscut, west wall, 6 feet north	Sweetener vein, including ½ inch of wall-rock on either side	2	1.61	12.5
Surface stripping, portal + 80 feet west	Sweetener vein—bulk sampled for a length of 50 feet, including ½ to 1 inch of wall-rock on either side	2½	1.27	0.8

* Sample taken by M. S. Hedley in 1937.

Two irregular quartz veins 5 feet apart in pyroxenite are exposed in a deep open-cut about 600 feet westerly from the Sunrise shaft and 260 feet higher. These strike north 75 degrees west and dip about 80 degrees northward. The vein-matter is much fractured and oxidized, but occasional grains of galena can be seen. Sampling of these veins gave the following results:—

Location.	Description.	Width.	Gold.	Silver.
		Inches.	Oz. per Ton.	Oz. per Ton.
West side of cut*	Foot-wall vein	32	Trace	0.4
East side of cut*	Foot-wall vein	8	*Nil*	*Nil*
West side of cut*	Hanging-wall vein	15	Trace	0.4

* Samples taken by M. S. Hedley in 1937.

An adit, 130 feet north of this open-cut and 100 feet lower, is driven 217 feet southerly, directly beneath the cut. No mineralization is seen in this adit, which is in pyroxenite for its entire length.

The cores from five holes drilled on the Sunrise claim were examined. The results of this drilling were inconclusive because core recovery was poor, particularly in sheeted zones and quartz veins. Although sludge samples were taken every 5 feet, frequent loss of return water reduced their dependability. In few instances did the assay of sludge and core samples from the same section check within reasonable limits.

Nos. 1, 2, and 3 holes were drilled from a set-up 120 feet north-westerly from the portal of the Shepherd tunnel. No. 1 hole, drilled south 15 degrees east at minus 46 degrees to a depth of 460 feet, encountered none of the veins and entered pyroxenite at 378 feet. Scattered pyrite, unrelated to any defined structure, was seen occasionally in the core.

No. 2 hole was drilled south 11 degrees west at minus 24 degrees to a depth of 480 feet. A sheeted zone cut between 133 and 140 feet apparently contained some mineralized quartz, but little core was recovered. This section corresponds approximately to the projected position of the Sweetener vein, 60 feet below the adit-level.

No. 3 hole was drilled south 39 degrees west at minus 8 degrees to a depth of 270 feet. Several unmineralized quartz stringers up to half an inch wide were encountered between 150 and 155 feet.

No. 4 hole was drilled from a set-up 260 feet westerly from the first set-up and 59 feet higher. This hole extended 340 feet in a direction south 9 degrees west at minus 30 degrees. The hole encountered several alternating bands of pyroxenite and syenite and remained in pyroxenite from 205 feet to the end. No mineralization was seen in the core, and no values have been reported. This important hole was particularly unsatisfactory because in many places neither core nor sludge was recovered.

From a set-up 240 feet south of the Sunrise shaft, No. 5 hole was drilled north 50 degrees west at minus 24 degrees to a depth of 388 feet. Excepting a 40-foot band of syenite, this hole was in pyroxenite and greenstone.

Something Good Section.—Development-work on this section of the property, on the steep western side of the valley about 1½ miles south of Olalla, includes three adits, totalling about 900 feet, and twelve drill-holes, totalling 1,903 feet. The workings are reached from the highway by 1,500 feet of truck-road and 1,000 feet of steep switchback trail.

No. 1 adit, elevation 2,541 feet, is driven 360 feet in a direction changing gradually from south 75 degrees west to south 55 degrees west. The portal is immediately west of a large body of pyroxenite. This adit follows the foot-wall of a sheared and brecciated zone in argillaceous and cherty sediments which dips steeply northward. For the first 110 feet the back is brecciated and cemented with calcite and some quartz. The material is soft and non-coherent. The shear-zone continues beyond this point to the face but contains little or no introduced material. Complete sampling of this adit in 1937 by M. S. Hedley, of the Department of Mines, the results of which are given below, indicates that gold values are confined to the brecciated zone in the first 110 feet of the adit:—

Distance from Portal.	Description.	Width.	Gold.*
Feet.		Inches.	Oz. per Ton.
20	Foot-wall breccia-zone	7	0.30
20	Hanging-wall side	35	*Nil*
25	Foot-wall breccia-zone	11	0.16
30	Foot-wall breccia-zone	13½	0.24
30	Hanging-wall side	36	0.02
35	Foot-wall breccia-zone	13½	0.36
40	Foot-wall breccia-zone	23	0.44
45	Foot-wall breccia-zone	23	0.36
50	Foot-wall breccia-zone	25	0.54
55	Foot-wall breccia-zone	15	0.22
60	Foot-wall breccia-zone	27	0.06
65	Foot-wall breccia-zone	20	0.06
70	Foot-wall breccia-zone	32	0.72
75	Foot-wall breccia-zone	52	0.30
80	Foot-wall breccia-zone	56	0.16
90	Foot-wall breccia-zone	11	0.32
100	Foot-wall breccia-zone	16	1.60
110	Foot-wall breccia-zone	11	2.20
120	Shear-zone on foot-wall	54	0.05
130	Shear-zone on foot-wall	25	0.08
140	Shear-zone on foot-wall	15	Trace
150	Shear-zone on foot-wall	42	Trace
160	Shear-zone on foot-wall	37	0.02
170	Shear-zone on foot-wall	70	Trace
180	Shear-zone on foot-wall	60	Trace
180	West wall crosscut, 0 to 5 feet	60	Trace
180	West wall crosscut, 5 to 10 feet	60	Trace
180	West wall crosscut, 10 to 15 feet	60	Trace
200	Flat shear in back	12	Trace
210	Flat shear in back	20	Trace
250	Shear-zone in back	50	Trace
260	Shear-zone in back	48	Trace
270	Shear-zone in back	70	Trace
280	Crushed zone on foot-wall side	40	Trace
280	Shear-zone on hanging-wall side	40	Trace
290	Shear-zone on hanging-wall side	55	0.02
300	Shear-zone on hanging-wall side	64	Trace
310	Foot-wall shear-zone	62	Trace
320	Foot-wall shear-zone	52	Trace
330	Foot-wall shear-zone	51	Trace
340	Foot-wall shear-zone	46	Trace
350	Foot-wall shear-zone in face	60	Trace
350	West wall crosscut, 0 to 5 feet north	60	Trace
350	West wall crosscut, 5 to 10 feet north	60	Trace

* Samples taken by M. S. Hedley. They were assayed for silver, but the values are omitted as none exceeded 0.6 oz. per ton. See *Minister of Mines, B.C.*, Ann. Rept., 1937, p. D 19.

The brecciated zone in No. 1 adit crops out in the steep bluffs above the portal. It widens gradually to 16 feet at a point about 40 feet above the portal and splits into several divergent members which are covered with overburden above the bluffs.

No. 2 adit, elevation 2,470 feet, extends about 150 feet westward, approximately parallel to No. 1 adit. For the most part it is in pyroxenite, the contact with cherty sediments being about 20 feet from the face, vertically below the portal of No. 1 adit.

No. 3 adit, elevation 2,342 feet, is driven 385 feet in a direction south 75 degrees west. The contact of the pyroxenite and sediments is 10 feet from the face. These exposures of the contact show that the side of the pyroxenite body dips steeply westward between the upper two levels but flattens to about 60 degrees between Nos. 2 and 3 adits. The face of No. 3 adit is dark quartzitic rock with a blocky fracture, containing sparsely disseminated pyrite crystals and calcite-filled cracks. A 60-inch channel sample across the face assayed: Gold, *nil;* silver, trace. Since the workings were examined, the face of No. 3 adit was advanced 30 feet.

From the face of No. 2 adit, six holes were drilled south-westerly at vertical angles ranging from zero to 60 degrees above the horizontal. The holes were drilled along the strike of the ore-body in No. 1 adit, and four reached the elevation of the upper working. As might be expected, some values were encountered in this drilling, but little information was gained regarding the downward continuation of the ore-body. From the face of No. 3 adit, three holes were drilled near the strike of the ore-body in No. 1 adit; two were fanned out to the south, and one was drilled north-westerly. No values of consequence have been reported from these holes. The cores from all holes showed mainly argillaceous and quartzitic sediments with minor amounts of limestone and short sections of pyroxenite. The only mineralization was scattered crystals of pyrite and calcite veinlets.

T.C.B. Section.—This part of the property is in cherty conglomerate a short distance south of the Something Good workings and on the same side of the valley. Several cuts have been made on small irregular bodies of calcite and garnetite sparsely mineralized with pyrite and chalcopyrite. No well-defined structure is present, and continuity has not been proven.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1927, p. 239 (Golconda); 1931, p. 136 (Sunrise); 1936, p. D 13 (Something Good); 1937, pp. D 17–D 21. *Geol. Surv., Canada,* Map 628A.]

FAIRVIEW CAMP (49° 119° S.W.).*

Gold, Silica.

Fairview, Consolidated Mining and Smelting Co. of Canada, Ltd.

C. E. Clayton, Mine Superintendent. This mine was formerly operated by the Fairview Amalgamated Gold Mines, Limited, but has been idle for several years, until work was resumed by the present operators late in 1946. The mine is about 5 miles west of Oliver at an elevation of 3,000 feet. In December living-quarters had been erected for the crew, and ore-bins were under construction. Underground work consisted of rehabilitating and slashing the old Main adit, in preparation for further development. Thirteen men were employed. The quartz is mined for shipment to Trail for use as flux in the smelter. It is expected that some gold will be recovered.

CAMP McKINNEY (49° 119° S.E.).†

Gold.

Cariboo-Amelia.

This property at Camp McKinney continued to be operated under lease by E. Wanke and associates, of Rock Creek. It is equipped with a small complete mining plant. The lessees continued to mine ore from a pillar extending up to the argillite contact on the 165-foot level near the east end. The ore is highly siliceous and commands a favourable smelter rate. A total of 350 tons shipped to the smelter at Trail yielded 425 oz. of gold, 394 oz. of silver, and some lead and zinc.

[Reference: *Dept. of Mines, B.C.,* Bull. No. 6, 1940.]

* By E. R. Hughes.
† By J. A. Mitchell.

RHONE (49° 119° S.E.).*

Pinecrest Gold Mines, Ltd. This is a newly incorporated company formed to develop the Boomerang, W.S., B.C., Eagle Fraction, Chaperonne, Iconoclast, and Balsac Crown-granted claims, and claims held by location near Rhone, on the Kettle Valley Railway. Work done during 1946 was confined to clearing a site for development and general exploratory work on the surface. Operations were suspended in November for the winter.

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; J. C. Dumbrille, General Manager; A. B. Staples, Mine Manager. Capital: 2,000,000 shares, $1 par. The company owns and operates the Highland Bell mine on Wallace Mountain. During 1946 Leitch Gold Mines, Limited, obtained a controlling interest in the company, and a new directorate was elected. The holdings of the company were then extended to take in the adjoining Sally mine group of claims.

Development-work done during the year amounted to 571 feet of drifting, 632 feet of crosscutting, 230 feet of raising, 20 feet of winzing, and 5,835.5 feet of diamond-drilling. Most of this work was done on or close to the No. 8 level and was incidental to stoping operations on the east and west extensions of the much-faulted vein system. Drilling done towards the end of the year indicated a block of ore between the No. 8 and No. 5 level horizons to the south of the main workings.

The No. 4 or main adit-level was extended 502 feet in the direction of the old Bell workings, and from the end of the level, a raise was driven on line to connect with the Bell workings, which had previously been unwatered.

Ore mined and shipped to Trail totalled 2,417 tons. Net contents: Gold, 126 oz.; silver, 404,393 oz.; lead, 188,426 lb.; and zinc, 239,278 lb.

The development-work was all done on contract and the stoping on company time. Man-shifts worked averaged about 650 monthly.

After control of the Sally group was obtained, a few men were employed in testing the dump at No. 3 portal. This portal was also repaired. The company also bulldozed a road to the Balaclava claim and unwatered and sampled the workings there.

New equipment put on the properties during the year includes a 500-c.f.m. Ingersoll-Rand compressor and Caterpillar Diesel plant, a mucking-machine, and a Little Mancha trammer.

After many delays caused by material and labour shortages, the bunk-houses at the foot of the hill at Beaverdell were completed. Each bunk-house consists of fourteen single-window rooms, all at ground-level, on each side of a hallway running the length of the building. The rooms are approximately 8 by 9 by 10 feet and are finished in gyproc. The outside of the buildings is finished with Johns Manville fire-proof asbestos shingles. With one man to a room there is accommodation for twenty-seven men.

In one of the bunk-houses a room has been set aside for a first-aid room and is being fully equipped. The camp has also been entirely electrified, and this makes it now possible to provide facilities for X-ray examinations.

The cook-house has been finished similarly to the bunk-houses, and improvements will be made to the change-house as soon as the necessary materials are available. A mine office and very attractive community hall have been added to the camp buildings, and an assay office and warehouse have been added at the mine.

* By J. A. Mitchell.

Silver Bell Mining Syndicate. Company office, 744 Hastings Street West, Vancouver; mine office, Beaverdell. G. S. Eldridge, President. This syndicate owns the Wellington, Tiger, Bounty, and Bounty Fraction, and has an interest in the Duncan, Logan, Black Bess, Advance, Invasion, Highway, and Byway claims, all located on Wallace Mountain.

A small crew under the supervision of J. Broach commenced work on May 1st. Since then an adit on the Bounty claim, two adits on the Highway claim, and the portal of the Wellington No. 5 adit have been reconditioned. Timber was replaced where necessary.

A 6- by 6-foot shaft was then put down 25 feet to bed-rock, elevation 3,558 feet, and widened to 15 feet at the bottom. The collar of the shaft is approximately 325 feet south of No. 5 portal, elevation 3,506 feet. From this station a hole was drilled northward 293 feet, ending under the Wellington No. 5 adit. Nothing of interest was discovered. A hole of a proposed length of 400 feet, directed southward, cut a little oxidized material at 71 feet. These holes traverse an area 425 feet west of the faulted, worked-out part of the Wellington vein. A third hole will be drilled southward at minus 25 degrees to intersect at greater depth the oxidized material encountered in No. 2 hole.

It is then proposed to move the drill to the Highway adit and drill from the end of it to explore vein systems exposed in or near this adit. With this in view the adit has been cleared, and preparations have been made to install a 200-c.f.m. portable Schramm compressor at the portal.

Some stripping was also done on the surface of the Black Bess claim.

Rambler, Highland Silver Mines, Ltd. Company office, Room 404, 470 Granville Street, Vancouver. A. Basham, President. This company owns the Rambler property on Wallace Mountain. The mine is developed by several adits. In mid-November a survey of the workings was commenced preparatory to a geological examination. The top-level workings are inaccessible, and it is proposed to fill in the portal and to use the immediately adjacent buildings for living-quarters. The other levels are in good repair, and it is proposed to advance one or more of them to explore for the downward extension of mined-out ore-bodies. Diamond-drilling may also be done in connection with this exploratory programme.

GREENWOOD-GRAND FORKS (49° 118° S.W.).*

Greenwood.

Silver-Gold.

Providence. W. E. McArthur, of Greenwood, continued to operate this property under lease for the first few months of 1946. Diamond-drilling, however, failed to reveal additional ore, and underground work was completed in March after the extraction of a pillar and stope remnant near the old shaft.

On the surface, trenching had disclosed a small faulted segment of ore. This was extracted from the surface after the underground work was completed. About four men were employed underground and one on the surface. A total of 172 tons shipped to Trail smelter yielded 46 oz. of gold, 11,464 oz. of silver, 4,573 lb. of lead, and 4,746 lb. of zinc.

E.P.U. Fraction. W. E. McArthur employed a crew of four men to unwater and repair some of the old workings on this property. Two hundred feet of an old adit which had caved was cleaned out and retimbered. Nine diamond-drill holes, averaging 200 feet in length, were drilled at one end of the workings without success. The other end was not drilled, but at the end of the year a drift

* By J. A. Mitchell.

was being driven in an attempt to locate ore. Three thousand feet of new road was built to the property.

PHOENIX CAMP.

Copper-Gold.

Granby. The old Granby property at Phoenix is owned by W. E. McArthur, of Greenwood. During the summer a number of 45-degree down holes, averaging 300 feet in length and pointed west, were drilled to cross-section the formation. These holes were located in the old townsite of Phoenix, to the north of the Victoria mine, and were arranged in rows about 200 feet apart to explore an extensive area at shallow depth.

Brooklyn-Stemwinder Gold Mines, Ltd. Company office, 530 Rogers Building, Vancouver. A. E. Sjoquist, President; E. H. Kellner, Managing Director. This company owns the Brooklyn-Stemwinder property in the Phoenix Camp. The company diamond-drilled a section of ground between and around the Brooklyn and Stemwinder mines. This work was started during the summer with a small drill, but a contract was later let to Boyles Bros., Limited. A large drill was put on the property and operated two shifts daily. A winter camp was set up, and drilling was still under way at the end of the year. It is reported that several bodies of copper-gold ore have been cut.

Gold.

Bay. It is reported that 887 feet of diamond-drilling was done on this property. The work was under the supervision of M. McGeer and was done on the Bay and Mavis adjoining claims, about 1½ miles from Greenwood and near the road to Phoenix.

JEWEL LAKE.

Gold.

Dentonia Mines, Ltd. Company office, 572 Howe Street, Vancouver; mine office, Greenwood. J. C. Adam, President; G. T. Johnson, Manager. Capital: 3,500,000 shares, no par value. Underground work to develop vein occurrences indicated by diamond-drilling was carried out throughout 1946. This work, totalling 1,027 feet, was mostly restricted to ground lying between the Jewel and Enterprise sections of the vein and comprised 634 feet of drifting on the 400 level, 203 feet of drifting on the 500 level, and 190 feet of drifting on the 400 level in the Anchor section, which lies to the north of the Enterprise.

Diamond-drilling done from the surface in an attempt to pick up the northerly extension of the vein totalled 1,741 feet. Underground diamond-drilling amounted to 3,224 feet, most of which was directed below the present accessible workings.

At the end of the year drifts were being extended north of the Anchor workings on the 400 level and towards the Jewel workings on the 500 level.

The 500 level was reconditioned for use as a main working-level. The track has been relaid to make it suitable for use with an electric locomotive, which has been installed complete with charging-station.

Electrically-driven compressor equipment was installed near the upper portal. This replaced a small portable gasoline-driven compressor.

The Jewel shaft was also being unwatered. Some slight improvements were made to the camp, but further improvements have yet to be made. An average of sixteen men was employed, but the turnover was large and at times it was very difficult to maintain the crew at the desired number.

Amandy, Quatsino Copper-Gold Mines, Ltd.—This company has purchased the Amandy group of claims on the north side of Jewel Lake. The property was last operated in

1941. The underground workings were unwatered in November and then sampled and surveyed. A portable compressor, pump, and fuel were left on the property.

Gold Drop, Boundary Gold Mines, Ltd. (N.P.L.). Registered office, Greenwood. Charles L. Cowdrill, President; John P. Knox, Secretary. Capital: 1,500,000 shares, $1 par value. This company owns the Gold Drop group of claims adjoining the Dentonia property on the south-east and is about 9 miles by road from Greenwood. On this property there are two adits approximately 1,800 feet east of the Dentonia (Jewel) vein and 52 feet apart vertically. These adits explore the Gold Drop vein at shallow depth. The lower adit, elevation 4,528 feet, driven as a crosscut, gradually changes direction from slightly west of north to almost east and reached the vein about 220 feet from the portal. The vein was followed 55 feet in a northerly direction, and a small part of it was stoped. The upper adit, at elevation 4,580 feet, is collared about 80 feet north-east of this stope and heads northerly for about 20 feet to the vein. It then follows the vein about 70 feet slightly east of north to a point where the vein splits. The left split is followed for 80 feet and the right split for about 250 feet. The latter split trends north-easterly for about 80 feet and then runs parallel to the left split. Shipments to Trail have been made by previous operators from one small stope in the left split, from several small stopes in the right split, and from the lower adit. The last was a small shipment not of commercial grade.

The vein strikes about 30 degrees east of north and dips from 40 to 65 degrees south-eastward in altered siliceous argillite. The vein-filling is sparsely mineralized quartz ranging from a few inches to about 5 feet in width and is partly oxidized at the shallow depth to which it is developed.

Diamond-drilling was done in 1946 to explore the vein for better values at greater depth. The holes are on the east side of the outcrop and directed almost at right angles to it. Three holes were drilled to check the extension of the vein beyond the adits to the north. Results of this drilling are not available.

CASCADE HIGHWAY (49° 117° S.W.).*

Copper-Gold.

Velvet. This property, 11 miles along the Cascade Highway from Rossland, has been leased by George Coryell, Jr., and associates, 730 Vance Building, Seattle, Wash., from the Velvet Gold-Copper Mines, Inc. The Copper Wonder and Princess claims adjoining the Velvet group on the west are owned by George Coryell, Jr. The mine is opened up by a main shaft, an inclined raise, two short shafts, and eight levels.

In 1946 George Coryell, Jr., and associates commenced a diamond-drilling programme, completing seven holes on the No. 8 level, aggregating 1,436 feet, and four holes from surface, totalling 565 feet. A detailed examination of the property was made by Harold Lakes, mining engineer, of Nelson.

ROSSLAND (49° 117° S.W.).*

Mount Roberts.

Gold.

Midnight. This property is owned by B. A. Lins and sons, of Rossland, who operated it during most of 1946. The shaft from the bottom adit-level was deepened 16 feet for greater sump capacity. A slash on the wall of the shaft was timbered and a drift advanced 40 feet along the vein 34 feet below the adit-level. Some stoping was done in the back of this drift. A little slashing was also done on the adit-level near the point where a spectacular high-grade pocket was

* By J. A. Mitchell.

struck in 1939. Shipments to the smelter at Trail totalled 138 tons. In addition, amalgam resulting from the milling of about 100 tons of ore was shipped to the Dominion Assay Office along with a little high-grade crude ore. Total net contents: Gold, 121 oz., and silver, 98 oz. The crew never consisted of more than three men.

Equipment at the property includes an automatically controlled 125-cubic-foot Ingersoll-Rand 2-stage compressor connected to an English electric motor by a V-belt drive; a Sullivan sharpener; furnace; 300-ampere Roe arc welder; 12 by 36 Craftsman lathe; four 17-cubic-foot end-dump cars; 5-horsepower electric hoist; new Ingersoll-Rand tugger hoist; an old-type steam or air hoist, drum diameter 30 inches, which has never been used; two air-pumps; an electric pump; and miscellaneous drilling equipment.

The mill is equipped with a 6- by 9-inch Blake-type crusher, a 3- by 3-foot Halliday ball-mill rated at 15-ton capacity at 40 mesh, a classifier and ore-feeder, a forced amalgamator, and a Straub table. The undersize from the ball-mill goes to the amalgamator. The oversize goes to the classifier, the overflow from which goes to the table. A Gibson amalgamator and three flotation cells are not in use.

I.X.L.

This property adjoins the Midnight. From February until December, when Charles Lindbergh and Walter Schwartzenhaur were taken in as partners, the property was operated under lease by Martin Doran, Gunnar Nordholm, and Emile Lalonde. Ore was mined from what is thought to be a part of the Baker vein, 50 feet above the 300 level and about 300 feet in from the portal. By stoping in the back of previous workings 116 tons were broken and shipped, yielding 108 oz. of gold and 108 oz. of silver. One hundred and fifty pounds of material from a small high-grade pocket yielded 21.9 oz. of gold. The quartz vein at this point is very badly faulted and is difficult to follow.

Ivanhoe Ridge.

Golden Leaf.

This claim is on the west slope of Ivanhoe Ridge, about 1 mile by trail west of the Patterson Highway and 3 miles north of the International Boundary. It is owned by W. Crowe and associates, of Waneta. The underlying rocks are members of the Rossland volcanic group.

The property is developed by two adits 80 feet apart vertically. The upper adit follows a quartz-filled brecciated zone for 20 feet westward to a fault of unknown displacement. This fault was followed for 32 feet in a direction south 26 degrees west. A small amount of sulphide mineralization was found in the fault material.

The lower adit started in a westerly direction, then swung north to crosscut a brecciated zone of similar attitude to that in the upper adit. This zone was then followed for nearly 300 feet. The brecciation was generally weak, and the drift may be in the wall-rock in places. There was a definite change in formation beyond a gouge-filled fracture close to the face.

A crosscut to the north, 110 feet in length, reveals a number of these parallel quartz-filled brecciated zones in the volcanics. No metallic minerals could be detected in them.

During 1946 a flat diamond-drill hole was drilled, 80 feet in a westerly direction, from the face of the lower drift to locate the mineralized fault found in the upper adit. The core shows evidence of faulting, but no mineralization was present. Some slashing was also done in the upper adit.

Red Mountain.

Gertrude Gold Mining Co., Ltd.

Charles Kenney, Manager and Secretary, Box 1512, Rossland. This company continued the development-work on the Gertrude claim. It is reported that the crosscut from the end of the No. 1 adit was extended north-westerly through the south-west corner of the You Know claim, Lot 982, and well across the eastern boundary of the Gertrude, and that three diamond-drill holes were drilled from this working.

SOUTH BELT.

Rossland Mines, Ltd. This company changed its name from Creston Gold Mines, Limited, in January, 1947. The company, in 1946, acquired the Mayflower and numerous other claims to the south of Rossland, including lapsed Crown grants leased from the Government and claims located in 1946. The property was examined and mapped, and some old workings were cleaned out or reopened.

UNION HILL.

Gold-Silver-Lead-Zinc.

Union. H. Persson, M. Gach, and P. Gach acquired this property in 1946 and cleaned out an old winze to a depth of 20 feet. This winze had been sunk more than 20 feet on a small shear containing lead-zinc mineralization. The shear strikes about north and dips steeply to the west. In June material mined from the walls of the winze was hoisted in a 3-cubic-foot bucket by means of a hand-winch, sorted on planks, and trucked directly to the smelter at Trail. Ore shipped amounted to 19 tons. Net contents: Gold, 5 oz.; silver, 848 oz.; lead, 7,104 lb.; and some zinc.

NELSON (49° 117° S.E.).*

EAGLE CREEK.

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. This company is controlled by the Quebec Gold Mining Corporation and Noranda Mines, Limited. The holdings, history, and general geology are described in the Minister of Mines, British Columbia, Annual Report, 1945, pages 96–99. From west to east the veins in the active workings include the Hardscrabble, Hardup Poorman, Yule, Midway, and the 225 vein-structure. These veins are all in diorite and are sub-parallel; they strike north 10 to 40 degrees west and dip 30 to 60 degrees north-eastward.

The development programme, started in 1945 from the old Poorman-Hardscrabble workings, was continued on an enlarged scale in 1946. The old "mill tunnel," now the 257 level, was connected with workings at the bottom of the old Hardscrabble winze, and the former sublevel drift was continued south on the Hardscrabble vein. A crosscut from this drift on 257 level was driven 1,043 feet east and encountered the Yule vein at 630 feet but passed through a fault gap in the Poorman vein. The Yule vein was drifted on for 577 feet to the north and 246 feet to the south from this crosscut. In the southernmost 46 feet of the drift on the Yule vein and the southernmost 264 feet of the drift on the Hardscrabble vein almost flat-lying quartz was encountered which bears some relation to these veins, but at the same time, in 608 feet of drifting, has been shown to be a distinct vein. This is known as the No. 1 Flat vein, striking north 70 degrees east and dipping 5 to 15 degrees southward.

Other work on 257 level included diamond-drilling to trace the faulted segments of the Poorman vein. A raise on the Hardscrabble vein 200 feet south of the crosscut was advanced 110 feet.

On 275 level (formerly known as the No. 4 level) a crosscut has been driven a total distance of 840 feet east, almost vertically above the east crosscut on 257 level. It inter-

* By J. A. Mitchell.

sects the Yule vein at 265 feet, the Midway vein at 560 feet, and the 225 vein-structure at 800 feet. Drifting on the Yule vein extends 363 feet north and 92 feet south and on the Midway vein 466 feet north and 375 feet south. Drifting on the 225 vein-structure totals 231 feet.

A raise was driven 184 feet on the Yule vein, and 287 level has been started from it. Four raises were driven on the Midway vein, the longest, at the junction with the main crosscut, being 153 feet. A total of 11,729 feet of diamond-drilling was done underground.

The mine was shut down on December 5th, pending the construction of a 125-ton mill, which it is planned to commence as soon as all the necessary supplies and equipment are available in the spring of 1947.

Additions to the plant during 1946 consist of a fully equipped assay office, modern in every respect, with provisions for drawing fumes or dust from each piece of equipment; a new compressor building, 50 by 50 feet, in which is installed a 1,000-c.f.m. Ingersoll-Rand angle compound compressor powered by a 200-horsepower synchronous motor; and, partly installed, a 1,100-c.f.m. Sullivan compressor, to be powered by a 300-horsepower motor. A new diamond-drill core-shed has also been built, and a warehouse and electric lamp house have been established in the old mill building. Other equipment includes two Eimco loaders, two Little Mancha trammers, seven DA-35 automatic drifters, eight Rand CR-58 stopers, a 250-lb. scraper, a Rand scraper-hoist No. A5NN-OH, and four tugger-hoists.

To take care of increased power requirements, the company has replaced the No. 6 line from the old mill at Taghum to the mine power-house with No. 2 wire. There is an underground battery-charging station on the 275 level and one on the surface for the 257 level requirements.

Ventilation equipment consists of a 5-horsepower motor-driven fan on the 257 level, a 10-horsepower motor-driven fan on the 275 level, and seven air-driven booster fans.

Safety work is well looked after by underground and surface safety committees, each of which consists of two men and the mine engineer, who acts as secretary. These committees hold safety inspections once every three weeks, and two days after these inspections they meet the management and the respective foremen.

In addition to the work done on the Granite-Poorman workings, the company did a considerable amount of surface drilling on its extensive holdings on Toad Mountain. This work was impeded by heavy overburden and timber, and it was necessary to keep three drills going to do the required amount of work. Some drilling was done on the Athabasca and Venus-Juno to search for faulted vein-sections and to investigate other possibilities. The old workings on these properties were also examined and sampled.

Development-work for the year included crosscuts, 1,838 feet; drifts, 5,184 feet; raises, 688 feet; diamond-drilling, 22,774 feet. Ore mined amounted to 245 tons. Net contents: 104 oz. of gold and 122 oz. of silver.

Toad Mountain.

Daylight and Silver King.—Working under lease, Peter Rolick, of Nelson, mined and shipped to Trail 38 tons of ore from the Daylight mine. He also mined a small tonnage at the Silver King, but this has not been shipped. These are adjoining properties on Toad Mountain.

Cottonwood Lake.

Perrier. A lease was obtained on the mine dump at this property by W. E. and T. Anderson, of 515 Sixth Street, Nelson. A trial shipment of 3.69 tons of hand-sorted material shipped to the smelter at Trail yielded 2.18 oz.

of gold and 2.86 oz. of silver. The silica content was 66.5 per cent. and the iron content 7.83 per cent. The partners used their own truck, which they backed against the dump and sorted directly into it. They estimate that about 10 per cent. of the dump at this point was mineralized quartz of the grade shipped. It took about forty man-hours to sort the 3.69 tons of ore. There was so little profit to the venture that no more ore was shipped.

APEX.

Humming Bird. This property, at the head of Clear (Clearwater) Creek, about 4 miles from Apex, was reported upon in the British Columbia Minister of Mines Annual Report for 1933, pages 221–223. Since then work on the showings has been confined to sinking a 50-foot winze on the Humming Bird vein at the north end of the drift on the upper level.

E. McDaniels, Leslie Hall, and Harry Wassick, who have an option on the property from the Qua estate, have staked four claims to the north, two claims to the north-west, and one claim to the south-west of the original group. McDaniels and associates worked on the property all season cleaning out old shafts and open-cuts on the Humming Bird vein until forced to stop by snow. They had previously sunk the last 36 feet of the 50-foot winze, and in 1946 they unwatered it for examination. Assays that have been obtained are erratic, possibly because of the presence of free gold, which has been detected in specimens of the vein-quartz.

Golden Age, Trimetals Mining, Inc. Company office, 745 Peyton Building, Spokane, Wash. M. A. Nelson, President. This company reopened the Golden Age mine in 1946 after a four-year shut-down. The adit-drift, collared alongside the Nelson–Nelway Highway about 10 miles south of Nelson, was advanced 405 feet. The drift follows a shear-zone, along which lenses of quartz occur in green schists of the Rossland volcanic series. The quartz-lenses generally do not exceed 14 inches in width, but in the last 35 feet of drift the quartz reached a width of almost 4 feet.

Work ceased about the end of October, 1946, but the company proposes to resume operations in the spring of 1947. Compressed air is obtained from the old Euphrates power-house, which is connected to the power-line of the West Kootenay Power and Light Company. About eight men were employed.

HALL CREEK.

Fern Mine, Ltd. Company office, 640 Pender Street West, Vancouver. Capital: 3,000,000 shares, 50 cents par. This company, financed by Premier Border Gold Mining Company, Quatsino Copper-Gold Mines, Limited, and associates, was formed to develop and operate the Fern mine. This mine is on the south slope of Hall Creek, 4½ miles from Hall Creek Siding on the Great Northern Railway, 11 miles south of Nelson. The property consists of the Fern, Hidden Treasure, Etruria Fraction, Chicora, and Eureka Mineral Claims.

The old mine-workings were bounded by a fault on the south-west end. During 1945 the vein-extension beyond the fault was located by diamond-drilling. By projection of the diamond-drill intersections the surface outcrop was located. An adit-crosscut was then collared 100 feet below the outcrop at elevation 5,037 feet.

Early in 1946 this crosscut intersected the vein at the fault 81 feet in from the portal. The working was continued as a drift along a mineralized fracture for another 467 feet. At about 50 feet from the fault this fracture changed direction from south 50 degrees west to south 33 degrees west, and the quartz gave way largely to sheared material, some of which is oxidized. Values of interest were reported in the first 51 feet from the fault and again at 283 to 390 feet from it, but the widths represented were too narrow for company operation. A section of oxidized material above an aplite dyke at 134 to 166 feet from the fault also carried gold values, and spot values were obtained elsewhere along the shear.

The drift entered granite porphyry at the point where the vein changed direction and character. A short crosscut to the right picked up a stringer of quartz following the west wall of this porphyry. It was followed for a round or so but did not improve.

Two surface drill-holes through this area cut a weak vein. Another drill-hole about 200 feet to the south-west cut 6 feet of low-grade mineralization which would project down to the projection of the first 50 feet of quartz on its south 50 degree west strike. This suggests a continuation of a vein-zone in this direction, which could be checked by further underground drilling.

At two other points in the drift, stub crosscuts were driven to test breaks with a south 50 degree west strike, but neither merited further work. Fractures with this strike are of interest because it is the approximate strike of the vein in the productive part of the mine, and the possibility of parallel productive veins has not been disproved.

Golden Eagle and T.S.

These groups are controlled by William Rozan, of Nelson. They extend up the slope on the south side of Hall Creek, over the summit, and down into the basin at the head of Fortynine Creek. The T.S. group consists of the T.S. No. 1 to T.S. No. 7 and the T.S. Fraction Mineral Claims. The Golden Eagle group, lying to the south of the T.S. group, consists of the Golden Eagle No. 2, Golden Eagle No. 3, Golden Eagle No. 5, and the Golden Eagle Fraction. All these claims were surveyed in 1946.

Work done in 1946 included trenching 300 feet on the outcrop of a narrow quartz vein cutting across a spur of granitic rock which extends along the ridge between the Hall Creek and Fortynine Creek slopes.

This trench is on the T.S. No. 3 Mineral Claim and commences at a fault about 200 feet east of the No. 1 posts of the T.S. No. 3 and T.S. No. 4 Mineral Claims on top of the ridge. The trench trends southerly down the slope towards Hall Creek. The vein appears to be lenticular but was imperfectly exposed in the trench, which required cleaning out at the time of examination. It has been sampled extensively by both Mr. Rozan and by company scouts, who have found that good values in gold are associated with small masses of hard chocolate-brown iron oxides. Particularly high values were found adjacent to the north-end fault. The granitic walls are altered and in places badly decomposed. The dip of the vein is variable but appears to be fairly low. The nature of the topography, together with the low dip, makes it possible to trace the vein with comparatively short diamond-drill holes from the surface.

Samples taken on this vein by the writer gave the following results:—

No. 1.—Taken across 15 inches of vein material at north-end fault assayed: Gold, 0.27 oz. per ton.

No. 2.—A grab sample of oxidized quartz from same location as No. 1 assayed: Gold, 0.22 oz. per ton.

No. 3.—The foot-wall, 3 or 4 inches of vein-matter immediately below sample No. 1, was too poorly exposed to permit satisfactory sampling and was not included with Sample No. 1. This material consisted of partly decomposed vein-matter rich in pyrite. Sample No. 3 taken from it assayed: Gold, 13.09 oz. per ton.

No. 4.—Taken across 2 feet of quartz and decomposed granite porphyry assayed a trace in gold.

No. 5.—Taken across 9 inches of quartz mottled with dark-brown blebs of iron oxide assayed: Gold, 0.85 oz. per ton.

No. 6.—Taken across 18 inches of oxidized quartz at south end of vein assayed: Gold, *nil.*

No. 7.—Taken across 1 foot of shear in foot-wall of No. 6 assayed: Gold, 0.28 oz. per ton.

About 400 feet to the west of the south end of this trench another shallow cut exposes a mineralized shear. This is in granite close to a contact with volcanic rocks, which it roughly parallels. It strikes to the north of west and is partly filled with a lamprophyre dyke.

About 500 feet to the east of the south end of the main trench, and at about the same elevation, another cut exposes a second flat-lying narrow vein under an oxidized capping. The vein is mineralized with occasional bunches of pyrite, some of which are much oxidized. The cut extends 5 feet into the foot-wall of this vein, exposing a network of small quartz stringers in the granite. The rock between the stringers is intensely silicified and pyritized.

Samples taken in this cut assayed as follows:—

No. 1.—Taken vertically across the foot-wall zone, assayed: Gold, *nil.*

No. 2.—Taken horizontally across the foot-wall zone at the bottom of the cut assayed: Gold, *nil.*

No. 3.—A grab sample of oxidized pyrites assayed: Gold, 3.93 oz. per ton.

No. 4.—A grab sample of comparatively fresh light-coloured pyrite assayed: Gold, 2.30 oz. per ton.

No. 5.—Taken across 8 inches of the quartz vein at centre of cut assayed: Gold, 0.10 oz. per ton.

No. 6.—Taken across 10 inches of the quartz vein at right side of cut assayed: Gold, 1.88 oz. per ton.

At the time this cut was examined, the ground was covered with snow, which prevented an examination of the adjacent surface. The position and attitude of this vein indicates that it overlies the vein exposed in the long cut to the west, but it is impossible to tell at this stage whether it parallels it or converges with it. A number of short drill-holes from the surface would prove this and, if drilled sufficiently deep, might pick up any other more or less parallel veins.

All the above work lies from one to three claim-lengths north and north-west of any work done previously.

YMIR (49° 117° S.E.).*

Lead-Zinc.

Oxide.† This property, owned by Ed. Haukedahl, A. Bremner, and A. Phare, of Ymir, is under option to International Mining Corporation (Canada), Limited. It lies on the ridge, elevation 5,500 feet, between Oscar (Bear) Creek and Porcupine Creek, about 4 miles from Ymir. A new camp, built in 1946, is reached by a new road connecting with the road on Porcupine Creek.

The mineral-zone strikes across the ridge a few degrees east of north and is nearly vertical. It has a possible length of about 2,500 feet and is locally as much as 30 feet or more wide. It conforms with the strike of the formations, consisting of quartzites on the west and argillite, quartzite, and some limestone on the east, and possibly occupies a strike-fault. The material of the mineral-zone exposed so far is completely oxidized, consisting largely of limonite, which contains locally streaks of pyromorphite, zinc oxidation products, and in one place a few small kernels of galena. One diamond-drill hole, commenced in 1945, penetrates the oxidized zone at a depth of nearly 500 feet below the crest of the ridge.

* By J. A. Mitchell, except as noted.

† By M. S. Hedley.

Workings consist of open-cuts at random intervals and two small adits, now caved. Late in 1946 it was decided to advance an old 60-foot adit on the Porcupine Creek slope, 1,200 feet south of the ridge-crest and a little more than 600 feet below it. The oxidized zone was reached in mid-January, 1947, between 110 and 130 feet from the surface, and preparations were being made to drift northward on it.

Two miles of road was constructed to a camp-site near the adit. A mining plant was installed and a camp was built. Living-quarters consist of pre-fabricated single-room shacks lined in part with fibre-board. A crew of eleven was employed under the supervision of A. Burgess. W. S. Hamilton, consulting engineer, is directing the work.

Zinc.

Ymir Good-Hope Mining Co.* Company office, 503 Westlake North, Seattle, Wash.; local office, Medical Arts Building, Nelson. John F. Meduna, President; C. Davis, Manager. Capital: 250,000 A shares, $1 par value, and 1,500,000 B shares, 10 cents par value; issued, 28,375 A and 1,500,000 B. This Washington company, registered in British Columbia, is doing development-work on the X-ray group on Huckleberry Creek (north fork of Wild Horse Creek). The camp is reached by about 6 miles of good motor-road from Ymir.

Recent workings are on ground that had been prospected and received surface development many years ago. A mineralized zone trends north-north-east up the steep hillside on the east side of the Huckleberry Creek. Old open-cuts and trenches are so caved and oxidized that it is difficult to judge the full width and character of the zone. It occurs in schists and at the upper end is associated with or cuts through feldspar porphyry dykes; it is locally 20 feet or more wide. There is a varying amount of silicification and of pyrite, pyrrhotite, and sphalerite, all more or less strongly oxidized, in the old surface workings. Although in most places the dip appears to be steep to the south-east, flat fractures or shears are present, and the deposit may consist of a network of fractures.

Work in 1944 and 1945 consisted in driving an adit at an elevation of about 4,000 feet to get under old showings on the surface. This was accomplished, and the crosscut extended a distance of nearly 500 feet, or to a point about 250 feet east of the surface showings and 175 feet below them. A vein at about 300 feet from the portal, in diorite, was drifted on to the north; this vein is as much as 16 inches wide and dips 30 to 55 degrees eastward. Locally it forms a sort of stockwork, and is mineralized with pyrite and erratic sphalerite. The greater part of the crosscut is in diorite, but the outer 55 feet and the face are in schist.

Current work, under new management, is being done on the same mineralized zone 1,200 to 1,500 feet north-east of the adit-crosscut and 800 feet higher than the camp. A section of the zone not previously stripped, about 12 by 20 feet as now exposed, is in a highly altered feldspar porphyry dyke. A short adit was driven in this zone on a stockwork of quartz-filled fractures of somewhat irregular distribution. The attitude of the zone is a matter of some doubt as the attitude of individual fractures varies. Mineralization consists of pyrite, pyrrhotite, and sphalerite in highly altered dyke-rock. An old adit 50 feet to the north and 25 feet higher is driven 45 feet north-eastward and shows flatly dipping mineralized fractures in the outer 25 feet. A selected sample, rich in sphalerite, from the new adit assayed: Gold, 0.03 oz. per ton; silver, 5.6 oz. per ton; zinc, 27.3 per cent.; cadmium, 0.82 per cent. A grab sample of the muck assayed: Gold, *nil;* silver, 3.0 oz. per ton; zinc, trace.

* By M. S. Hedley.

Gold-Silver-Lead-Zinc.

Protection. J. Turk, of Ymir, working under lease, shipped 65 tons of ore to the smelter at Trail. Mr. Turk reports having done 50 feet of stoping, 25 feet of drifting, and the construction of a new manway. Some work was also done on the road which leads up Wild Horse Creek to the property, which lies on the north side of Wild Horse Creek.

Gold-Silver.

Arizona.—B. Sterna, of Nelson, shipped 13 tons of ore to the Trail smelter from the Arizona, which adjoins the Wilcox. Net contents: Gold, 25 oz., and silver, 67 oz.

Gold-Silver-Lead-Zinc.

Yankee Girl and Centre Star (Wesko). C. Anderson, L. J. Penny, W. Marshall, and O. Gowing shipped ore to the smelter at Trail from clean-ups made around the mill-sites at these properties. At the Yankee Girl 79 tons from around the settling-tanks and from where the chips from the screens had been dumped yielded 82 oz. of gold, 279 oz. of silver, 5,252 lb. of lead, and 6,908 lb. of zinc. Material from the Wesko assay-office dump and from cleaning up the ball-mill amounted to 29 tons, yielding 11 oz. of gold, 89 oz. of silver, 2,428 lb. of lead, and 1,361 lb. of zinc.

Gold.

Porto Rico. This property on Barrett Creek, 6 miles by road from Porto Rico Siding, is owned by E. C. Wragge, of Nelson, and by the estate of C. H. Hamilton. It was leased in 1946 by W. E. Anderson and partners, of Nelson, who proposed to repair the road and do some underground work. In 1946, however, they confined their efforts to cleaning up around the old mill buildings. Six tons of ore shipped to the smelter at Trail yielded 5 oz. of gold and 2 oz. of silver.

SALMO (49° 117° S.E.).*

Boulder Creek.

Gold.

Clubine-Comstock Gold Mines, Ltd. Company office, 475 Howe Street, Vancouver. I. G. Nelson, President; Paul Lincoln, Managing Director; W. E. McQuade, Mine Superintendent. Capital: 2,000,000 shares, 50 cents par value. This mine, on Boulder Creek about 4 miles north of Salmo, is opened up by seven adits. The company is carrying out a development programme based on recommendations made by P. E. Oscarson, of Spokane, Wash.

In the vicinity of the workings the rocks are principally of volcanic origin but include some argillite. The volcanic rocks are intruded by lamprophyre dykes which vary materially in composition and texture. The past production has come from a vein which follows a lamprophyre dyke rich in mica.

It is believed that the best ore heretofore mined was in volcanics along the intersection of the principal vein and a fault, known as the " main fault." Good ore occurred both above and below the fault, which dips more steeply than the vein and strikes slightly to the left of it. The present development-work is therefore designed to locate the vein on both sides of the fault along the extensions of this rake. Work to date has been in the vicinity of the northerly extension on the 500 and 475 levels and in the vicinity of the downward extension on the 575 level.

* By J. A. Mitchell.

On the 500 level two short crosscuts were driven eastward through the fault at 260 and 300 feet north of the portal. About 140 feet north-west of the second crosscut a raise was put through to the 475 level. Fifteen feet north of this another crosscut was driven 15 feet eastward through the fault. The vein was located at the 15-foot mark, and another quartz segment, also on the hanging wall of the fault, was cut. At the north end of the 500 level two holes were drilled easterly to locate the main vein on the east side of the mica lamprophyre dyke which had cut across from the east to west side of the vein on its northerly extension.

Three other holes were drilled eastward from the south drift on the 500 level for the same purpose. These cut narrow bands of vein material. A sixth hole was drilled west to obtain information regarding the relative positions of a foot-wall vein and the argillite contact in this area. Neither was located, so it is proposed to deepen the hole.

On the 575 level a drift was driven 130 feet to the north along the foot-wall side of the lamprophyre dyke from the end of the 240-foot adit-crosscut. Some ore was found in the last 20 feet of this advance. It is now proposed to crosscut to the east through the dyke. Forty-five feet of drifting was also done southerly from the end of the adit-crosscut.

The above work amounted to 194 feet of drifting and crosscutting, 10 feet of raising, and 477 feet of diamond-drilling. Compressed air was supplied by a 380-cubic-foot Diesel-driven compressor located near the portal of the 500 level. The work was all done from June 1st to December 1st with a crew averaging seven men.

Erie Creek.

Gold-Silver-Lead-Zinc.

Arlington. This property, on the south side of Rest Creek and about 1⅓ miles due east from its confluence with Erie Creek, is owned by R. Golak, K. Golak, and A. Shrieves, of Nelson. In 1946 the Golaks shipped six car-loads of ore, totalling 240 tons, to the Trail smelter. The shipments assayed from 1.48 oz. of gold to 2.49 oz. of gold with a silver content of from 6 to 8 oz. and about 6 per cent. lead and 6 per cent. zinc. The net contents of these shipments amounted to 431 oz. of gold, 882 oz. of silver, 12,612 lb. of lead, and 16,141 lb. of zinc. This ore was stoped from and above the north end of the No. 8 level, mostly from a vein on the foot-wall side of the one worked by previous operators. The vein is in rolling flat-lying argillites, and the mining was all done with hand-steel. Power-driven equipment has never been used in this mine.

A sublease was given in June on a part of the mine to F. Lipsack, P. Lefevre, and T. Waller, of Nelson, who began mining ore left to the south of the stope known as the "bull pen." Using hand-steel these partners mined and shipped three car-loads, totalling 171 tons, of fairly uniform grade, which yielded 372 oz. of gold, 950 oz. of silver, 13,837 lb. of lead, and some zinc.

Gold.

Second Relief. This property is owned by A. and M. Burgess, G. Murray, M. Towrin, and M. C. Donaldson, of Salmo. Three to four men were engaged in salvaging the last of the ore from stopes and sills on the 100 and 200 levels. Shipments to the smelter at Trail, including about 20 tons of 1-oz. ore stoped from the No. 3 level, totalled 206 tons, which yielded 140 oz. of gold and 222 oz. of silver.

Sheep Creek.

Gold.

Kootenay Belle.—R. Thompson, of Sheep Creek, continued to lease this property, and with two men for part of the year he mined and shipped to the smelter at Trail 502 tons, which yielded 190 oz. of gold and 252 oz. of silver.

Nugget. A. Endersby, Jr., of Fruitvale, is the owner and operator of this property. He continued to haul ore over the summer road from the upper workings and to operate the lower workings through the 4900 level in the winter. Despite labour difficulties in 1946, he mined and shipped to the smelter at Trail a total of 811 tons, which yielded 390 oz. of gold and 351 oz. of silver.

Reno Mill. C. Anderson, L. J. Penny, W. Marshall, and O. Gowing made four shipments to the smelter at Trail from clean-up work around the old Reno mill. The first shipment of 52 tons was from the east side of the mill and from cleaning out the rod-mills. It returned 2.52 oz. of gold to the ton. The second shipment of 40 tons was from old tailings at the creek and assayed 1.54 oz. of gold to the ton. The third shipment of 38 tons was made up of crusher fines and assayed 0.97 oz. of gold to the ton. The fourth shipment of 38 tons was from below the storage-bins and assayed 0.58 oz. of gold to the ton. All this material was shovelled through a ¾-inch mesh screen before shipment. In addition, about 10 oz. of gold was obtained from the old retort bricks. Shipments to the smelter were reported to amount to 124 tons. Net contents: 161 oz. of gold, 142 oz. of silver, 4,824 lb. of lead, and 898 lb. of zinc.

Gold Belt Mining Co., Ltd. Company office, 616 Stock Exchange Building, Vancouver; mine office, Sheep Creek. A. E. Jukes, President; F. W. Reger, Mine Manager. Capital: 1,687,000 shares, 50 cents par value. This company, not an active producer and, therefore, not affected by the general strike, continued the development programme begun in 1945.

The 600 level crosscut and drift were both advanced; the total of new driving on this level was 1,000 feet. The main raise from 1400 level was advanced 500 feet to make a connection between the two levels. This made a tremendous difference to the amount of fresh air entering the mine. A hoist-station was cut at 600 level, and a 35-horse-power electric hoist was installed. Stations were also cut at 1000 and 900 levels, and a battery-charging station constructed at 1400 level. A 110-volt line was installed for bells and lights.

On the 1100 level the crosscut north was continued from the 39 vein to the 46 vein, and a further 210 feet was driven north from the 46 vein. Another vein, named 48 vein, was cut in this last section.

The 39 vein on 1100 and the 35 vein on 600 and 1100 levels were followed westerly into the upper quartzite, and about 170 feet of ore was exposed in the 1100 level drift on the 35 vein. Assay values obtained from the other two drifts encourage the belief that ore-shoots may be found in both when they are further opened up.

At the end of the year work was being done to the east on the 46 vein on 1100 level, where values were improving, and to the east on the 48 vein on 1100 level. Almost the whole of this work has been done in hard white quartzite.

All this work amounted to 1,642 feet of drifting, 1,507 feet of crosscutting, and 470 feet of raising. About 300 tons of ore, averaging about half an ounce of gold per ton, was broken and was stored in the mine until such time as sufficient ore may be developed to warrant the reopening of the mill. An average of forty men was employed.

Sheep Creek Gold Mines, Ltd. Company office, 616 Stock Exchange Building, Vancouver; mine office, Sheep Creek. A. E. Jukes, President; H. E. Doelle, General Superintendent and Managing Director. Capital: 2,000,000 shares, 50 cents par. The company owns and operates the Queen mine on Waldie Creek, a tributary of Sheep Creek. The present workings are described in the Annual Report of the Minister of Mines, British Columbia, 1945, page 101.

At the start of 1946 the crew was almost up to full strength and the mill was treating 140 to 150 tons daily. The management was instituting a training period for inexperienced men in an attempt to increase the over-all efficiency of the crew. By

May, however, labour unrest and the threatened strike action had reduced the underground crew to forty men, and the mill production was down to 120 tons daily. Shortly after this the mill was shut down for several weeks to allow broken reserves to build up.

Along with other producers the mine was closed on July 3rd by a strike. It was reopened again late in the year with a skeleton crew engaged to put the mine into shape for normal production. The ground stood up well during the period of shut-down, but there was some timber deterioration both in drifts and stopes owing to rock-pressure and dry-rot. Some stopes which normally would have been finished are now in a weakened condition because of timber failure and must be mined at an accelerated rate.

The management reports that 12,316 man-shifts were worked during the year in about 177 working-days, and that seventy-one was the average number of men employed per day. During this time 23,903 dry tons of ore was mined and 18,208 dry tons was treated in the mill. Development-work totalled 430 feet of drifting, 1,027 feet of cross-cutting, and 74 feet of raising. In 131 days of milling, 5,678 oz. of gold and 1,457 oz. of silver were produced.

The requirements of safety work were well attended to. A safety committee consisting of four workmen and an equal number from the staff meets at least once each month. The meetings are preceded by an inspection of all working-places by a workmen's committee. Causes of all accidents are analysed and suggestions received for accident-prevention. A mine and departmental bonus system has been in operation whereby every accident-free man has a chance in a sweepstake draw to win his department's bonus each quarter. The bonus is calculated on accident-free shifts with a differential rate for each department according to past severity.

Eureka. This claim on Muskrat Creek, a tributary of Sheep Creek, was acquired during 1946 by A. G. Cameron, of Trail, and M. L. Craig, of Nelson. A survey was made and an application made for a Crown grant. In the past, ore extracted from a small high-grade gold vein was treated in a small water-power grinding and amalgamation unit. The vein was lost in the old workings but is reported to have been found in 1946 by advancng the raise from these workings one round, also in a cut on the crest of the ridge and in a short adit advanced about 20 feet on the west side of the ridge.

Tungsten.

Sapples. This group, previously known as the Udiville group, is located on the west side of Bennett Creek, which flows into Sheep Creek 3½ miles east of Salmo River. Four men in the employ of the Canadian Exploration Company over a four-month period did open-cutting and trenching. Ground lying between this group and the Emerald mine to the south-west has been staked by the company.

IRON MOUNTAIN.

Tungsten.

Emerald.—This property was bought early in 1947 by the Canadian Exploration Company after examination during the latter part of 1946 by company engineers.

LOST CREEK.

Zinc.

Truman. This group, formerly the Mona group, is on Lost Creek, about 3 miles by motor-road from the Nelson–Nelway Highway. During 1946 the Valley Mining Company, a subsidiary of New Jersey Zinc Company, took an option on the Truman group from L. R. Clubine, of Salmo, who had previously cleaned out some of the old open-cuts and the trails leading to them. The company made a geological examination and cleaned out additional old cuts.

NELWAY (49° 117° S.E.).*

Silver-Lead-Zinc.

Boundary. This property is on the west branch of the south fork of Salmo River, adjacent to the International Boundary-line. Four men were engaged for two months on stripping and numerous open-cut operations, under the supervision of B. N. Murphy, of the Canadian Exploration Company.

Lomond (International).—This is the old International group on Lomond Creek, between Nelway and Reeves McDonald group on the Pend d'Oreille River, 2 miles west of Nelway. Sheep Creek Gold Mines, Limited, commenced a diamond-drilling programme on this property during the latter part of December, 1946.

Gold.

Blue Ridge. The Blue Ridge in September, 1939, and the Ironside in September, 1946, were recorded in the name of George Maitland. The Mewasind was recorded in November, 1945, in the name of R. H. Winter. The Porphyry in August and the Blue Grouse in September, 1946, were recorded in the name of E. M. Winter. The Mary was recorded in August, 1946, in the name of M. L. Craig. These claims are about half a mile west of the Tillicum (Fifteen Mile) Creek Bridge on the Nelway–Waneta Road and are reached by branch wagon-road. It is reported that a 30-foot adit-drift and eleven open-cuts have been made to explore a vein containing gold-bearing sulphide mineralization.

SOUTH KOOTENAY LAKE.*

SUMMIT CREEK (49° 116° S.W.).

Gold.

Bayonne Consolidated Mines, Ltd. Company office, 308 Pacific Building, Vancouver; mine office, Sirdar. E. M. Thomson, President; R. B. King, Mine Manager. Capital: 3,000,000 shares, 50 cents par value. This company owns the Bayonne mine on Summit Creek, 23 miles from Tye Siding. The mine was reopened in 1945 after being closed since 1943, but difficulties brought about by the location of the property and the shortage of labour and materials made it necessary to close it again in July, 1946, until such time as operating conditions became more favourable.

A shaft-station was cut and 113 feet of shaft sunk at a point near the "B" vein on the crosscut connecting the "A" and "B" veins on the No. 8 level. No. 9 level was started 100 feet below No. 8 level by drifting on the "A" vein both to the east and to the west from the shaft. In mid-June the heavy flow of snow-water into the shaft area made it necessary to abandon temporarily this part of the mine so that sufficient power could be kept available for mining purposes in the productive areas. It is reported that about 200 feet of vein, averaging better than 20 inches in width and slightly better than 0.30 oz. of gold to the ton, was exposed by the No. 9 level development.

In the older part of the mine, development, largely in ore remnants and pillars, was carried out on all levels up to and including No. 3. On the No. 4 level, drifting to the east on the south branch of the main vein showed greater persistence of the vein in this direction than was anticipated.

Before the mine closed in July, 1946, 170 feet of shaft-sinking, 521 feet of raising, and 656 feet of drifting and crosscutting were done. About 1,500 tons of ore was broken, and 2,196 tons was milled after the mill started in May. Net contents: Gold, 263 oz., and silver, 707 oz.

* By J. A. Mitchell.

In June twenty-two men were employed underground, of whom only seven were miners, and forty men were employed on the surface. A severe winter, for which the company was not well prepared, together with a shortage of good men willing to accept pioneer conditions, made it necessary to keep a large surface crew. Much work had to be done around the camp and plant and on the road over which supplies were hauled from Tye Siding.

HUGHES CREEK (49° 116° S.W.).

Gold.

Black Douglas. The Black Douglas group, consisting of the claims Silver Iron Nos. 1, 2, 3, and 4, and Gold Iron Nos. 1 and 2, with the claims Ohio Nos. 1 and 2, Iowa Nos. 1 and 2, and Ace Fraction, were recorded in 1946 in the names of T. A., A. W. F., E. B., J. W., and W. G. Hamilton, A. Barker, W. H. Gray, and R. J. Marks. These claims are on the south slope of Hughes Creek, a tributary of Midge Creek, which flows into Kootenay Lake at Mile 95 on the Cranbrook–Nelson section of the Kettle Valley Railway.

The Hamilton brothers have done a considerable amount of surface trenching on the ground and have exposed several quartz veins on both sides of a schist-granite contact. The veins in the schists are narrow but persistent, and much of the quartz is cross-fractured. One vein in particular is mineralized with bunches of galena and sphalerite, from which samples assayed a trace in gold and up to 5.5 oz. of silver.

The principal exposed occurrence on the property is a fracture, striking north 70 degrees east, in the granite. It is about 150 feet down the south slope of Hughes Creek from the almost parallel granite-schist contact which appears to extend through from the Wisconsin property to the west. This fracture, which is filled with quartz and mineralized sheared granite, varies in width and is covered with a manganiferous iron gossan containing up to 11 per cent. manganese. The wall-rock is impregnated to a depth of several feet with manganese oxides. At one point about 100 feet east of the west-end cut the owners obtained a sample which assayed 0.62 oz. of gold per ton. This was taken across 5 feet of mixed soft black oxides, lenses of much decomposed quartz mineralized with arsenopyrite, and sheared and leached granite. The writer cut a deep channel at this point and obtained a sample which assayed: Gold, 0.65 oz. per ton; silver, 6.9 oz. per ton; manganese, 1.88 per cent. Other samples along the vein, including a sample of arsenopyrite, gave negligible values in gold and silver.

A. Ruby, of Tulameen, did a little open-cutting on his group of claims, which adjoin the Black Douglas group on the east.

GINOLS LANDING (49° 116° S.W.).

Sanca, Creston Gold Mines, Ltd. This property is on the east side of Kootenay Lake, about 2 miles from Ginols Landing. Creston Gold Mines, Limited, acquired an option on two claims owned by A. T. Robson, of New Westminster, and staked twelve claims and two fractional claims in the immediate vicinity. Five men were employed doing assessment-work and mapping. Their work proved an additional 300 to 400 feet to the exposure of the original vein discovery.

ROSE PASS (49° 116° N.W.).*

Silver-Lead-Zinc.

Humboldt. The property is situated about 1 mile west of Rose Pass on the summit between Kootenay Lake and St. Mary River. It is reached by 9 miles of logging-road and 6 miles of pack-trail from Crawford Bay. The Canadian Exploration Company reopened the adits and unwatered the shaft on this

* By J. A. Mitchell.

property in order that it could be examined. Two open-cuts were also cleaned out. Three men were employed at this work from September 1st to October 15th under the supervision of B. N. Murphy, who made the examination.

SITKUM CREEK (49° 117° N.E.).*

Gold.

Alpine, Metal-smith Mines, Ltd. Company office, 415 Baker Street, Nelson. J. B. White, President and Treasurer; B. N. Sharp, Mine Manager. Capital: 700,000 shares, 50 cents par value; issued, 425,000 shares. In April, 1946, a small crew of men was sent to the Alpine mine to prepare the buildings for occupancy and to prepare the plant and equipment for the reopening of the mine after a four-year shut-down.

Underground work was started in August, and shortly after that the mill started on a 15-tons-per-shift basis. Mill-heads having a gold-silver ratio of about 2 to 1 were reported to average about $18 per ton.

It was soon evident that the combination of labour troubles, material and equipment shortages, and the fall in the price of gold made it impossible to continue. Mining was stopped, and when the broken ore had been milled, the mill was shut down again on September 27th.

There was no underground development in 1946, but during the period of operation ore was broken in old stopes in No. 6 and No. 7 levels. There has been development-work, but no mining below this, down to No. 10, which is the main adit. Nothing has been mined above No. 5 level. The level interval is 100 feet on the dip or about 50 feet vertically. The vein dips at 30 degrees between granite walls.

The mill was operated for forty-nine shifts and treated 655 tons of ore, producing 16 tons of concentrates valued at $11,475. The net contents were: Gold, 355 oz.; silver, 181 oz.; lead, 1,508 lb.; and zinc, 495 lb.

AINSWORTH (49° 116° N.W.).*

Silver-Lead-Zinc.

Ainsmore Consolidated Mines, Ltd. Mine office, Ainsworth. A. E. Silverwood, President; Carl Mohr, Manager. This Ontario company has extensive holdings near Ainsworth, extending from Coffee Creek to Cedar Creek. The company owns the Kootenay Florence mill, has a lease and bond on the mine, and a long-term lease on the surface plant. Operation was continuous throughout the year, and lead and zinc concentrates were shipped to Kellogg, Idaho.

Development-work was confined to the Kootenay Florence mine, and included 60 feet of sinking, 183 feet of drifting, and 26 feet of crosscutting. Most of the work was confined to No. 9 level and a new sublevel below No. 9, but a little work was done on No. 7 level.

A winze was sunk 60 feet on the dip of the vein beneath 955 stope which extends up to the west end of No. 8 level. A sublevel 50 feet down the dip was drifted on about 50 feet to east and west. A considerable amount of pyrrhotite was noted locally in the ore from this working, as was some extremely fine steel galena. No. 940 drift, south of the main raise to No. 5 level, was connected with the face of No. 955 drift 70 feet to the west and 6 feet higher.

With the exception of approximately 1,000 tons trucked from the Spokane mine dump near the end of 1946, mill-feed was derived largely from work in Nos. 940 and 955 stopes; minor tonnage was derived from development-headings.

The mill was operated one or two shifts daily, depending upon the supply of ore. An average of fifteen men was employed, excluding salaried employees. The mine and

* By J. A. Mitchell.

mill operated 292 days. Ore mined amounted to 8,873 tons. Net contents: Silver, 9,600 oz.; lead, 676,115 lb.; and zinc, 181,467 lb.

Krao.—A small tonnage of ore, mined in 1940 by V. Eposito, of Salmo, and stockpiled in Ainsworth, was shipped to Trail smelter.

Number 1.—Consolidated Mining and Smelting Company of Canada, Limited, owners of this property, gave permission to W. E. Lane, of Ainsworth, to ship a small tonnage from the dump left by previous leasers.

WOODBURY CREEK (49° 117° N.E.).*

Silver-Lead-Zinc.

Scranton Consolidated Mining Co. Mine office, Kaslo. Y. C. Bressie, President; C. J. Bailor, Secretary-Treasurer. This is an extra-provincial company incorporated in the State of Oregon, with a capitalization of 650,000 shares, $1 par value. The company owns the Scranton-Pontiac and Sunset groups of claims on both sides of Pontiac Creek, a tributary of Woodbury Creek near its head.

Recent work has been restricted to road-building, all of which is privately financed. This road starts at the highway, about 8 miles south of Kaslo, and reaches Woodbury Creek in the first 1½ miles. The road was started in 1945 and, under the supervision of W. T. Graham, has been extended along the north side of Woodbury Creek to a point about 5½ miles from the highway.

Silver Coin.—J. Burns, of Ainsworth, and associates leased this property on Woodbury Creek and shipped 7.38 tons of ore to Trail. Net contents: Silver, 935 oz.; lead, 1,458 lb.

SLOCAN DISTRICT.†

General Note.

The Slocan is a mining district east of Slocan Lake with Sandon as its approximate centre. The part lying in Slocan Lake drainage is included in the Slocan Mining Division and the part lying in Kootenay Lake drainage in Ainsworth Mining Division. The district has never been accurately defined, and local usage varies to some degree, but for present discussion it refers to the area covered by the two Geological Survey maps, Sandon Sheet (No. 273A) and Slocan Sheet (No. 272A).

The metal production of the district is chiefly silver, lead, and zinc. The average or typical ore-body contains lead and zinc, or commonly both lead and zinc, in excess of 5 per cent. of the ore. The value of the base-metal content is, in addition to that of silver, as a rule essential to the success of an operation. The relative value of silver and base metals within individual ore-bodies varies widely throughout the camp due, very probably, to the presence of grey copper and, locally, of ruby silver in the ore as much as to variations in silver content of the galena. A few lodes, such as those of the McAllister and Ottawa, contain values almost entirely in silver. By contrast, recent production from the Lucky Jim has been of zinc only.

Some gold has been recovered as a by-product from many of the mines, but only from a few has gold constituted a major or important part of the value of production. A distinction could be made on an arbitrary basis between gold and gold-silver ores, but mineralogically little, if any, proper distinction can be made. Gold-silver lodes are most numerous east and north-east of Slocan City and occur at other scattered points. The combined production from the gold and gold-silver deposits has been small.

The following table lists the production from the Slocan District under Slocan and Ainsworth Mining Divisions in five-year periods. Gold properties have been omitted;

* By J. A. Mitchell.
† By M. S. Hedley.

namely, the Kilo and L.H. in Slocan, and the Highland Surprise in Ainsworth Mining Division. A few other properties might have been excluded as being gold producers, but the tonnage is so small that their inclusion cannot affect the total.

PRODUCTION OF SLOCAN PROPERTIES IN FIVE-YEAR PERIODS, 1892–1945.

Slocan Mining Division.

Years.	Ore.	Gold.	Silver.	Lead.	Zinc.
	Tons.	Oz.	Oz.	Lb.	Lb.
1892–95	19,946	175	2,646,706	13,869,800	....
1896–1900	129,480	192	12,863,124	113,208,619	....
1901–05	217,592	988	8,552,924	54,567,929	3,691,529
1906–10	129,466	375	3,714,005	25,236,325	1,852,807
1911–15	482,703	181	7,880,730	76,458,403	30,397,305
1916–20	616,073	317	7,196,612	59,091,469	64,482,707
1921–25	237,407	1,279	4,192,972	26,781,949	21,366,004
1926–30	242,947	939	3,604,783	19,854,670	26,905,450
1931–35	38,827	208	623,359	4,503,419	2,350,817
1936–40	185,180	594	1,247,877	5,538,758	9,200,133
1941–45	513,815*	364	1,434,816	6,678,241	92,106,361
Totals	2,934,236	5,612	53,957,908	405,789,582	252,353,113

Ainsworth Mining Division.

Years.	Ore.	Gold.	Silver.	Lead.	Zinc.
	Tons.	Oz.	Oz.	Lb.	Lb.
1892–95	554	229	68,407	418,840	....
1896–1900	13,760	380	992,726	8,718,201	....
1901–05	10,960	130	702,165	5,279,337	1,366,065
1906–10	87,850	530	1,257,382	10,777,975	6,914,431
1911–15	16,600	136	585,286	3,008,702	1,113,992
1916–20	21,502	78	661,470	3,677,188	2,359,701
1921–25	40,465†	87	221,325	2,282,252	1,020,108
1926–30	73,148‡	390	365,373	3,660,886	13,371,392
1931–35	16,868	48	156,787	2,698,886	2,155,359
1936–40	20,514	192	76,711	988,261	2,408,063
1941–45	69,186	16	32,114	618,149	6,825,551
Totals	371,407	2,216	5,119,746	42,128,667	37,534,662
Grand totals	3,305,643	7,828	59,077,654	447,918,249	289,887,775

* Does not include 119,300 tons of tailings dredged from Slocan Lake at Silverton and 1,500 tons of tailings recovered from Enterprise mine. The metal content is included.

† Does not include 480 tons of tailings recovered from Kaslo Creek in 1925 by Metals Recovery Company, Limited. The metal content is included.

‡ Does not include 37,321 tons of tailings recovered from Kaslo Creek in 1926–29 by Metals Recovery Company, Limited. The metal content is included.

The tables follow the procedure of the Annual Reports of the Minister of Mines, British Columbia. From 1892 to 1924, inclusive, the figures represent gross metal content of ore or concentrates. From 1925 to 1945 the figures represent the gross metal content less calculated smelting and refining losses.

The silver-bearing ore deposits of the Slocan were discovered in 1891. The first location was the Payne, in September, and before the end of the year several other finds were made, which later became producing mines. By the end of 1892 a great deal of the main ore-bearing belt had been staked, most of the important lodes had been found, and a few shipments of high-grade ore had been made. The camp won immediate recognition at a time when the West Kootenay and Boundary Districts were booming, and outside capital was attracted to it almost at once. Railroad construction from Nakusp to New Denver was started in 1893, and by 1895 Sandon was connected by standard-gauge railway to Nakusp and by narrow-gauge railway to Kaslo. The first concentrator was in operation in 1895 and was soon followed by others.

The first shipments were from six properties in 1892. Fourteen others shipped for the first time in 1893, four in 1894, and eleven in 1895. These were shipments of selected silver-lead ore from oxidized zones at or near the surface. Zinc was of no practical value and was discarded. Silver-bearing lead ore has continued to be the mainstay of the camp, but zinc ore is now of great importance.

It seems extraordinary now that the early reports on the camp, made about 1896, barely mentioned the presence of sphalerite; even though many of the outcrops known at that time contained prominent amounts of that mineral. The first shipment of zinc ore, almost massive sphalerite, was made from the Bell mine in Jackson Basin in 1901. The next shipments were in 1903, of zinc ore from the Enterprise, Springfield, and Wonderful, and of zinc concentrates from the Payne. Other properties followed suit, including the Whitewater in 1904 and the Lucky Jim in 1905, but not every property mining mixed ores shipped the zinc-bearing fraction, even when equipped with a concentrator. Most of the earliest gravity concentrators in operation simply wasted the zinc, and it was not until about 1910 that selective shipments of lead and zinc concentrates became the rule. It was not until the early 1920's that selective flotation was perfected to the point that relatively complete extraction and clean separation could be made between sphalerite and galena, so that most of the values in the ore could be recovered and the best smelter rates could be obtained.

During the growth of the district, first the saleability of zinc and second the improvements in selective concentration encouraged more operators to mine mixed ores after the relatively clean lead ore-bodies had been extracted. At the present day, milling-ore yields both lead and zinc concentrates in most cases and shipping-ore is sorted to either a high lead or a high zinc content.

Although the effect of metallurgical technique has been important, variation in metal prices has proved the most important factor governing the mining of Slocan ores. The peak of production was reached in 1918, when metal prices were at a record high level and forty-four mines were producing. With recession of prices at the close of the First World War the Slocan suffered a serious setback, from which it has never fully recovered. A rise in prices in the late '20's brought a real boom, which subsided rapidly with the depression, and a mild boom was experienced in 1937–38, when prices again advanced.

At the start of the Second World War the only milling operation in the Slocan was that of the Western Exploration Company, Limited, and in addition there were, in 1940, eighteen small shippers of sorted ore. In 1941 the Lucky Jim mine was again brought into production and has since continued as the largest producer of zinc and one of the largest producers of all time in the Slocan. In 1943, armed with war contracts for shipment of concentrates to American smelters at somewhat advanced prices, the Whitewater and Noble Five mines again came into production.

In 1946 a strengthening of the position of lead and zinc and a marked increase in the price of silver created an interest that was dampened by labour troubles and by the difficulty in obtaining men and supplies. Production ceased owing to a general strike from July 3rd to November 15th, but some of the mines affected were able to continue with development-work. The strike was aimed at producing mines only, and so new development was not hampered directly by it. The uncertainty of the times, however, prevented some projected developments from taking place.

New work was done in 1946 on several old properties, notably the Ruth-Hope, Utica, Wellington, Charleston, Bosun, Hartney, Hewitt, and on the ground of the Silver Ridge and Silverite mining companies; other old properties were examined, and much staking was done in the general Sandon-Retallack area. Details of this activity will be given below.

With promise of continued activity during 1947 a few general notes may be in order, summarizing some of the facts and factors governing exploitation. Anyone interested in this camp should read the two excellent publications by C. E. Cairnes, of the Geological Survey, Memoir 173, "Slocan Mining Camp, British Columbia," 1934, and Memoir 184, "Descriptions of Properties, Slocan Mining Camp, British Columbia," 1935. The former deals with the geology of the camp and the latter with individual properties up to the year 1933. Memoir 184, in addition to describing the geology, summarizes the history of each property, using for the historical summary many facts obtained from the Annual Reports of the British Columbia Minister of Mines.

Few of the older workings are accessible, and even of those properties currently being worked some parts are caved. Many of the workings date back forty to fifty years, and in these all but the wettest timber has rotted. Drifts on the larger lodes are caved, with few exceptions, and crosscuts are apt to be blocked where large faults are encountered. Adit-portals are caved in most instances, and the outer parts of the adits which penetrate overburden may be completely collapsed. Those adits which are collared in rock may as a rule be entered, but most of the lower adit-levels in the camp are driven for some distance through overburden before bed-rock is reached.

The air in many of the longer unventilated workings is deficient in oxygen, which deficiency can be detected with a lighted candle. Old, strange workings should not be entered with an electric light alone unless there is a positive current of air.

The cost of making examinations may, as a result of the condition of the workings, be high. If only a short portal section is caved, access is relatively cheap and easy, but the cost of opening up long caved sections either in overburden or strongly sheared rock may exceed the cost of driving a new heading. There is little chance of estimating the extent of caved or open workings in advance; study of maps may help, although maps of older workings are rather scarce and do not as a rule indicate the character of ground encountered. Unfortunately there is a great dearth of underground geological information, and the older maps and reports are incomplete or entirely lacking in geological detail. Even reports made in more recent years are to a degree incomplete in this respect because they were of necessity based on examinations limited to those parts of a mine that were accessible. Few assay maps can now be obtained, so that the distribution of values and the variations in metal content in stoped ground are matters for conjecture.

Unfortunately little is known regarding ore-controls. Geological factors which influenced the deposition of ore can be determined in parts of some workings. Most of these are structural features such as have been many times described in text-books and papers on the controls of ore-deposition, but the structural framework of few properties has been worked out sufficiently well to be certain of the major factors and to direct development with any degree of certainty. The same is true of the major correlations between properties in so far as they may affect long-range development of the camp.

It has been proved in many instances that folded structures in the sedimentary rocks have had a direct influence on the localization of ore-bodies, as well as a marked effect on the localization of faults and shears, whether or not these were mineralized. The satisfactory working-out of structure underground is as a rule very difficult, and the working-out of structures on the surface on such a scale that they may be correlated with those underground may be equally difficult. This is due not only to the abundance of overburden on one hand and the inaccessibility of workings on the other, but to the intricacy of some of the structures in question.

It is known that in some properties ore was deposited preferentially in one rock-type, as in quartzite or thickly bedded argillite, but was not deposited in thinly bedded argillites. This is a matter of relative competency of the rock and is of general enough occurrence to be considered by many as an invariable rule. It is not an invariable rule, however, and much ore has been mined from thinly bedded incompetent argillites that in another property would be considered not likely to contain any ore. Although little is understood, and much research-work remains to be done, even the least competent rocks under some conditions of folding may maintain fractures and become the site of ore-deposition, providing the fractures meet the bedding at a proper angle and the fracturing or shearing has not been too intense.

A widely accepted theory in the Slocan is that the ore has a zonal arrangement within the camp, namely, that high silver, siliceous ores occur at higher levels and grade down through lead ore into zinc and finally into uneconomic pyritic mineralization. Cairnes has well summarized the evidence and points out also that the ideal sequence appears to be represented at all levels within a country of 5,000 feet of natural relief. The lead-bearing horizon cannot be represented by a plane or even by a simple curved surface, but is apparently a highly irregular zone which is as irregular as the topographic surface to which it may be likened in general form. The thesis is not proved beyond doubt because at no time has it been possible to gather together sufficiently full data on metal distribution throughout the depth-range of a sufficient number of mine-workings to furnish incontestable proof. The origin of this thesis lies probably with mining practice in the history of the camp. The earliest shipped ores were strongly oxidized, high in silver and lead and low in zinc. Later mining was carried out inexpensively near the surface on ore that was sorted to be as nearly " clean lead " as possible, and the zinc was discarded. Lower workings, involving longer adits, became more expensive. If the lowest adit encountered zinc and little lead, all further exploratory work may have been stopped because in most cases the zinc ore was not of sufficient value to pay the expenses of operation. The production for many years was of silver-lead ore alone, won by selective mining and hand sorting or milling. Later, zinc also was recovered and became increasingly important. The increased production of zinc was in part due to the increasing efficiency of selective concentrating and more favourable marketing conditions, and in part to the fact that with the increased financial return from zinc which they made possible, it became economically feasible to mine entire sections of a lode rather than to select merely those parts relatively high in lead. The relative value to the mines of sphalerite and argentiferous galena can be judged by the fact that in the accessible abandoned workings very little galena is to be seen and remnants of ore are dominantly sphalerite.

The zinc-lead ratio in some mines does increase with depth, but before applying the theory of metalliferous zoning to the Slocan in general and to any particular property or area, it should be determined whether a change in metal content is brought about by a change in geology. At the Whitewater mine the higher workings are on silver-lead-zinc ore in a shear-zone in slates, whereas the lower workings are on zinc-lead replacement ore in limestone. In the Lucky Jim mine local conditions in the upper workings containing some lead appear different from local conditions in the lower workings, which contain zinc but no lead. The continuity of metal content in individual ore-shoots and the variations in metal content between different ore-shoots in the same property has not been sufficiently studied. In at least one property on a single lode there are different shoots, localized by different factors, which have a different metal content on the same mine level.

It has been a matter of some concern to companies planning long-term mining that the Slocan appears to be a shallow camp. Individual mines on a single lode have shown a depth as great as 1,300 feet, but the vertical range over which mining has been conducted in the vicinity of Sandon is about 4,000 feet. Many mines are shallow, meaning that an ore-body has been worked close to the surface and that deeper development, if it has been attempted, has failed to demonstrate a profitable downward continuation of that ore-body. Most, but not all, of the more important ore-bodies cropped out at the surface, and those that have been entirely delimited underground occurred somewhat like plums in a pudding. The statistical record of ore-bodies which were followed down from surface until they played out and the mine abandoned points to a shallow camp, inasmuch as most ore has been found close, or relatively close, to the surface, no matter what the elevation of the outcrop. The ore-bodies which were found in more or less isolated positions underground are too few to balance the foregoing, but the fact that they occur leaves room for doubt that some of the older and larger mines have been bottomed. Additional work might find ore-bodies at greater depth or farther along the course of the lodes, but in many instances the cost of doing this additional exploratory work from workings in poor repair is a serious consideration.

Detailed mapping underground and on the surface indicates that the controls of ore-deposition and the localizing factors may be many. Mapping in some instances should be extended over a relatively large area in order that the setting of a known ore-body may be properly understood. Detailed surface mapping to date has shown that interpretation of structure is not as a rule easy. Overturning of strata has taken place locally over large areas, and it may be that overturns in some instances provide a favourable site for ore-deposition. In some instances drag-folds bear an important relation to ore.

There is an important relation between folds and faults. Lodes and post-mineral faults tend to follow bedding in many instances, and the course of a lode or fault may be deflected round a fold, particularly if the normal course of the fissuring is tangential to the fold. For this reason the relative movement and the amount of displacement on a given fault or vein-fracture are often hard to determine, and if the fault crosses an area of complex folding, it is probable that the amount of movement on it varies from place to place. Some crosscutting lodes or faults can be seen to turn rather abruptly to follow along bedding-planes, and it is then commonly a matter of doubt whether the crosscutting relationship may be resumed, and, if so, where.

The importance of drag-folding is illustrated in the Lucky Jim, where the favourable host-rock, limestone, is greatly thickened by drag-folding to provide sites for larger ore-bodies than could otherwise have occurred. The same is true in the lower part of the Whitewater mine. Bulletin No. 22, British Columbia Department of Mines, contains a detailed description of these properties and an outline of the surrounding structure.

The foregoing remarks apply to those deposits in sedimentary rocks. Deposits in Nelson granite present simpler problems, and although the lode-fractures in granite may be complex in detail, some of the lodes appear to form relatively simple and continuous breaks.

KASLO-THREE FORKS (50° 117° S.E.).*

Silver-Lead-Zinc.

Voyageur. This property, near the head of Tenmile Creek, at an elevation of about 6,500 feet, is reached by 7½ miles of recently constructed truck-road from the Kaslo–Retallack Highway. It is under development by Empire Mines Corporation, of Walla Walla, Wash., under the direction of Roy Wallace.

The workings in September, 1946, consisted of an adit-crosscut driven northward 50 feet and drifts extending from the face for 55 feet to the north-west and 21 feet to the east in carbonatized greenstone. A raise from the end of the crosscut is about 30 feet long. This is a highly irregular zone of shears and quartz stringers, with erratic mineralization across widths as great as 18 inches. Mineralization includes pyrite, galena, sphalerite, and chalcopyrite.

* By M. S. Hedley, except as noted.

A sample of selected galena assayed: Gold, 0.16 oz. per ton; silver, 10.5 oz. per ton; lead, 53.3 per cent.; zinc, 6.4 per cent. A sample of selected chalcopyrite assayed: Gold, 0.32 oz. per ton; silver, 9 oz. per ton; copper, 3.4 per cent.; lead, 4 per cent.; zinc, 0.50 per cent.

It is understood that underground work has been discontinued in favour of surface stripping by bulldozer on the carbonatized zone.

Emerald Hill.*—This property is owned by J. Jardine and is in Emerald Hill Basin 1 mile west of the Voyageur. During 1946 a good trail was built to the camp from the Voyageur road.

Utica Mines (1937), Ltd. Company office, 850 Hastings Street West, Vancouver; mine office, Kaslo. C. C. Keyes, Managing Director. Capital: 3,000,000 shares, 50 cents par value. This company owns the Utica mine on and north of Paddy Peak, reached by nearly 6 miles of road up Twelve Mile Creek from the Kaslo–Retallack Highway. The workings are in argillites, schists, and some limestone between the main body of porphyritic granite to the south and a granitic stock to the north. The property, which has a long history, was not worked between 1940 and 1946.

Total production to date has amounted to 5,569 tons between the years 1909 and 1935, with an approximate average silver content of 129 oz. per ton and an average lead content of 15 per cent. The highest grade shipped during a single year averaged 208 oz. of silver per ton. Zinc-bearing ore was shipped during five separate years only. There is no uniform silver-lead ratio, owing apparently to the variable amount of argentiferous grey copper present.

All present work is restricted to the lowest, or No. 5, adit. This adit starts as a crosscut driven north 75 degrees west for 2,010 feet, then it turns southward for 450 feet, from which point a 200-foot branch trends south 40 degrees east and the main working extends 560 feet at about south 70 degrees west to intersect the western of two sub-parallel veins, which is followed about 850 feet to the face. Argillaceous rocks in the outer 600 feet of the adit dip at moderate to steep angles north-eastward, from 600 to 1,500 are almost flat, and past 1,500 feet throughout the rest of the level the dip is to the south-east.

About 420 feet from the face of the west vein a crosscut extends south to the east vein, which is followed to the south-west for about 470 feet. The two veins are 50 to 90 feet apart. A raise on the east vein was up 185 feet as the result of former operations, leaving 180 feet to be driven up the dip to reach No. 4 level, which was inaccessible in 1946.

The veins are shear and fracture zones 1 to 6 feet wide and, at a few points, even wider. They strike north-easterly and the dip is 50 to 75 degrees south-easterly. The strike of the veins is generally that of the strata; but the veins are not strictly bedded, and, at least locally, they intersect the strata at an acute angle. The gangue material is siderite, calcite, country rock, pyrite, and a little quartz. The ore minerals are galena, sphalerite, and grey copper. The wall-rocks are argillite and andalusite schist, with some limestone and limy interbeds. Some of the mineralization seen extends across several feet, and the wider sections of the vein-zone appear to be, in part, the result of replacement of limestone and limy strata.

The presence of a fault in the inner part of No. 5 level probably accounts for the fact that the veins were not encountered in the first straight section of the adit. The apparent movement on this fault is such that the veins would be thrown north of this section of the adit at its inner end.

* By J. A. Mitchell.

Work for the year consisted in repairing the road, making the old bunk-house habitable, and improving facilities at the adit-portal, which was retimbered for the first 50 feet. On September 5th diamond-drill holes were being drilled from the west vein to test the east vein, but from the first drill set up at the crosscut, five holes were disappointing. Later in the year drilling was done to locate the veins in the region of the outer sections of the adit, with unknown results. The raise on the east vein was extended and had intersected galena ore but, at the end of 1946, had not yet reached No. 4 level. A sublevel was started at the point where ore was first encountered in the raise.

The power plant consists of a 450-cubic-foot Holman compressor driven by a Pelton wheel under a head of 250 feet. A wooden 10-inch pipe was installed, and repairs were made to the dam. A Petter blower and ventilation-pipe were installed.

About ten men were employed, in addition to the diamond-drill crew. Work during the winter was confined to raising, on contract by a reduced crew. No attempt was made to keep the road open, except for "go-devil" traffic.

Wellington Mines, Ltd. Company office, Nelson. I. G. Nelson, President; A. W. Davis, Consulting Engineer; C. Lind, Foreman. Capital: 3,750,000 shares, 20 cents par value. The workings here described consist of the Hazel adit-crosscut on the Hazel claim at an elevation of 3,746 feet, two closely spaced Matheson adits 800 feet above on the Homestake Fraction, and two shafts on the I.C. claim.

The surface geology and some of the lower workings are described in Bulletin No. 22 of the British Columbia Department of Mines. At the time of examination (1944) the Hazel adit was not accessible beyond 300 feet from the portal, and the eastern Matheson adit was caved.

In 1946 the Hazel adit was ventilated to provide entry so that track from the inner parts and ventilation-pipe could be salvaged. The air in this adit is chronically bad owing to oxygen deficiency. The adit is 1,840 feet long, driven north 24 degrees east, except for a bend near the portal. At 150 feet from the face, drifts extend 180 feet eastward and 520 feet westward on an irregular curving fault-zone dipping 15 to 25 degrees southward. A caved crosscut is driven northward from the west drift. A raise on the fault-zone starting up at about 20 degrees above the main crosscut was inaccessible owing to bad air. There is a strong flow of water in the west drift. The zone apparently represents a strong fault, and is not mineralized where seen.

The strata crossed by the adit consist of slaty argillites and limestones. The dips are moderately steep to the south, with a reversal in dip in the innermost 60 feet of the crosscut. There may be repetition of beds by folding, but the structure could not be determined. In Bulletin No. 22, page 16, a hypothetical cross-section was drawn on the line of the Hazel adit, on the basis of the surface geology, showing the synclinal part of a drag-fold. Subsequent examination of the Hazel adit has shown that the amount of limestone in it is rather more than was expected, but the cross-section is not necessarily invalidated. The intense deformation and superposition of slaty cleavage in this region make it difficult to trace or even to recognize many of the folds, and in most instances it is necessary to have more than one line of section as supplied by a single crosscut before the structure can be worked out. Three closely spaced strike-faults near the central part of the crosscut do not appear to be large enough to have produced much duplication of strata.

The east Matheson adit, 800 feet higher than the face of the Hazel adit, is now accessible. It is driven as a crosscut, 470 feet at an average of about north 31 degrees east, then 570 feet at an average of about north 24 degrees east, then about 30 feet north, a total length of about 1,070 feet. At a point 260 feet from the portal there is a drift westward on formation with crosscuts north and south from the drift, a total of 360 feet of accessible workings. At 220 feet from the portal a drift is run to the east on a large mineralized fault-zone. This drift is about 410 feet long, the face being 25 feet south of and about 200 feet below the collar of the I.C. shaft on the surface.

The rocks exposed dip steeply northward for the most part. They are dark-coloured slates, except for limestone at least 60 feet wide at the portal and a second limestone-band 30 feet wide against a steep fault in the hanging wall of the mineralized fault-zone. This fault-zone dips steeply to the south, is intersected by the western workings in a caved face, and apparently was not encountered in the western Matheson adit, which was collared north of it. There is little doubt that it is the western continuation of the Whitewater vein.

In the east drift the fault-zone or vein is irregular and has a tendency to branch. The zone contains up to 3 feet of sheared material and lenses, and small veins of galena and sphalerite. Locally there is some mineralizaton on both foot-wall and hanging-wall branches and some replacement in limestone which locally adjoins or is close to the lode. There is some extremely dense sphalerite, dark brown in colour, and of a stony or horn-like texture. This is essentially of the same character as some of the sphalerite found in the old upper workings of the Whitewater mine and in one or two other localities.

Starting in June, 1946, the road from Retallack to the Hazel adit was repaired, and a new road about a mile long was built up to the Matheson adit. The ventilation-pipe and the track from the inner section were removed from the Hazel adit for use above, and small buildings near the Hazel portal were dismantled and re-erected near the Matheson portal. A Diesel-driven compressor was installed.

The Matheson crosscut was reconditioned and was extended a few rounds northward from the face with a view to crosscutting to the Wellington vein. Galena was then found in an old pit 10 feet east of the eastern, or newest, I.C. shaft (caved), and it was decided to reopen the east drift. This surface showing consists of a lens of galena 8 inches wide in a mineralized zone about 18 inches wide and dipping steeply to the south. A sample of the galena assayed: Gold, trace; silver, 93.7 oz. per ton; lead, 82.9 per cent. The mineralized zone would, if continuous down the same dip as that observed at the surface, lie in the hanging wall of the vein followed in the east drift 175 feet below, so it was decided to explore a hanging-wall branch of the vein in that drift. Work had not progressed far when the operation was suspended for the winter. A crew of six men was employed.

[Reference: *Dept. of Mines, B.C.*, Bull. No. 22, 1946.]

Slocan Charleston Mining Co., Ltd.* Company office, 609 Baker Street, Nelson. Ray MacDonald, President. Capital: 1,000,000 shares, $1 par value. This company purchased the Keystone and Charleston groups of claims, adjoining the Whitewater mine at Retallack, from A. J. Harris. During 1946 the company repaired about 1 mile of road, which involved widening five switchbacks. In addition, about 3,000 feet of new road was built, making it possible to get a truck or car within 400 feet of the Charleston No. 5 adit-portal.

Underground work consisted of opening the Colorado No. 1 adit, Keystone No. 1 adit, the Harris adit, and the Charleston No. 5 adit. The last named was badly caved, and recovery operations, requiring considerable face-boarding, were still under way when winter conditions made it advisable to discontinue work. The face was then 150 feet from the portal.

It is the announced purpose of the company, once this caved area is penetrated, to extend the No. 5 drift 180 feet and then to drive a 220-foot raise to connect with the Harris adit above.

* By J. A. Mitchell.

Quebec Gold Mining Corp. In May and June of 1946 more than eighty claims in the area drained by Jackson Creek, extending as far east as Robb Creek, including a few claims north of Kaslo Creek, were staked for this company. Compilations of geological information were made, and some properties in the vicinity were visited.

Whitewater, Retallack Mines, Ltd.—This property was inactive during 1946. Some machinery not required for future operations was sold.

[Reference: *Dept. of Mines, B.C.*, Bull. No. 22, 1946.]

Lucky Boy. This claim, owned by L. Garland, of Retallack, is on the southern slope of Goat Mountain, at the head of Jackson Creek. A caved adit on a north-easterly striking lode was being opened up by Mr. Garland in September, 1946. Little is known of this claim other than that a strong zone of shearing is evident at the portal of the old adit and a shipment of 2 tons in 1938 contained 38 oz. of silver per ton and 50 per cent. lead. Late in the year this claim was acquired by Silverite Mines, Limited.

Lucky Jim, Zincton Mines, Ltd.* Mine office, Zincton. J. S. McIntosh, Mine Manager; G. Avison, Mill Superintendent. This company, operating the Lucky Jim mine, is a subsidiary of Sheep Creek Gold Mines, Limited. At the start of 1946 the mill was treating 350 tons daily, six days a week, but with a total crew of only fifty-four it was impossible to mine this tonnage. Previously broken ore from old stopes was salvaged, mining on No. 10 level was discontinued, and development-work was at a standstill. The labour situation became worse, and the mill ran at reduced capacity during April, May, and June. Production ceased while the strike was on, was resumed in November, and returned to normal in December. During the period of the strike a skeleton crew was kept on development.

Principal development was on the upper levels. No. 1 was advanced until lead-zinc ore was encountered in a cross-fracture in the limestone, and the work was then halted until facilities could be provided for handling ore. The narrow, steep, and crooked outer section of No. 3 adit was by-passed by a new drive designed to reach the bottom of an old raise which passes through the Larson stope and connects with No. 1 level. Work was started on a jig-back tram to transport the ore from No. 3 level to the mill level, but had to be discontinued for the winter. Lead cells were installed in the mill to recover galena from the ore indicated by surface diamond-drilling above the level of No. 1 adit.

A little development-work was done on the lower levels, partly stope preparation and partly exploration. Diamond-drilling was done underground, and some was done on the surface along the old narrow-gauge right-of-way west of the mine workings; this was designed to test the downward continuation of the Lucky Jim limestone.

Work done during the year included 1,172 feet of crosscutting, 253 feet of raising, and 112 feet of sinking in the main winze. Underground and surface diamond-drilling totalled 14,636 feet. An average of forty-seven men was employed. Ore mined amounted to 45,064 tons. Net contents: 6,005 tons of concentrates containing 5,820,401 lb. of zinc.

[Reference: *Dept. of Mines, B.C.*, Bull. No. 22, 1946.]

Rambler. This old property on McGuigan Creek was optioned by George A. McMillan and associates, of Toronto, and was given a preliminary geological examination. No. 3 and No. 14 levels were accessible, but it was not definitely determined whether intervening levels could be reached.

* By J. A. Mitchell.

Silver-Lead.

McAllister.* This property is being developed under lease by a private company, the Allan Nelson Mining Company, Limited. It is located on the western slope of London Ridge, about 5½ miles by road from Three Forks Station on the Kaslo-Nakusp Railway. The road to the property leaves the New Denver–Kaslo Road at Three Forks, and it is necessary to travel along the railroad a short distance to reach the bridge across Kane Creek. The road then follows the west side of Kane Creek for 1½ miles and then the east side for 2½ miles. From this point the mine road leads to the mine by about 1½ miles of switchbacks.

Work during 1946 was confined to cleaning out and retimbering some of the old workings. A small tonnage was mined, but not shipped. Three men were employed.

Miner Boy and Jo Jo.* These claims, on London Ridge, were acquired during 1946 by the Trimetals Mining, Incorporated, 745 Peyton Building, Spokane, Wash. Late in the year a road was made from half-way up the McAllister mine road along the west slope of the ridge to a point just below the Jo Jo workings. No work was done on the Miner Boy.

SANDON (49° 117° N.E.).†

Silver-Lead-Zinc.

Ruth-Hope, Kelowna Exploration Co., Ltd. The Kelowna Exploration Company, Limited, of Hedley, a subsidiary of South American Development Company, of New York, has acquired a large group of claims in the vicinity of Sandon. The Ruth-Hope and Wakefield groups are optioned, and intervening ground, including the Carnation group, is owned. Work in 1946 was under the management of F. A. McGonigle, of Hedley, and the local direction of A. E. Buller. Paul Billingsley is consulting geologist. Work was confined to the Ruth No. 5 adit-level and to geological examination.

The property, lying immediately south of Sandon, is an old one. Prior to 1923 five adits explored the Ruth vein, a fault-fissure striking about north 75 degrees east and dipping steeply to the south. At higher elevations, west and south of the Ruth, five adits explored the Hope vein, an irregular vein-zone dipping to the south at angles between 25 and 40 degrees. After the formation of Ruth-Hope Mining Company Limited, in 1923, development and exploration were carried out under the direction of R. H. Stewart. The Ruth No. 2, or Stewart, vein was discovered between the Ruth and Hope veins and developed from the surface down to the Ruth No. 5 level. This is an irregular vein-zone that dips to the south at about 45 degrees.

The Silversmith vein had been mined from the east to the Ruth property boundary on the Silversmith No. 10 level, about 40 feet above the Ruth No. 5. A crosscut on the Ruth No. 5, starting at a point 1,160 feet from the portal, was driven almost due south for a distance of 2,730 feet to intersect the Silversmith vein on Ruth ground close to the property boundary. The vein had branched in the Silversmith workings, and the two branches were crossed at distances of 3,735 and 3,825 feet from the Ruth No. 5 portal. Between 1,300 and 1,400 feet of workings were driven in developing these veins on No. 5 level, and a No. 6 level was driven from a winze before company operations ceased in 1930. With one year's exception, leasing operations were continuous from 1931 to 1942 in various parts of the property.

The Silversmith vein or lode is a broad complex structure dipping to the south. In 1946 the Ruth No. 5 adit was accessible as far as the Silversmith vein intersections, and the Silversmith No. 10 adit was open to the vein and for 400 feet to the west and 450 feet to the east. These crosscuts are 900 to 1,300 feet apart and are at comparable

* By J. A. Mitchell.
† By M. S. Hedley.

elevations. The rocks traversed by the crosscuts are the common type of Slocan argillites and some quartzites cut by two major north-westerly trending faults. The major structure in the outer part of the Silversmith crosscut is an anticlinal flexure with a plunge of 10 to 20 degrees south-eastward in flatly dipping rocks. The same general fold is seen in the outer part of the Ruth crosscut, but with a more irregular outline. Other folding is more difficult to describe.

In the angle between the Silversmith crosscut and the accessible eastern workings there is partly outlined a warped structure, with one limb dipping steeply to the east and rolling over to dip flatly to the south. Faults follow round this fold parallel to the bedding or slicing it at small angles, and a north-west-striking fault merges with these faults at the point of curvature. The steep north-striking fault-planes are distinct, but the east-west faulting has produced a broad shear-zone with a low southerly dip, which should by strike and position be the vein, but it is not mineralized. There is an east-west gap in the known vein of approximately 400 feet, and either the shear-zone represents the vein at a non-mineralized horizon or else the fold has served to deflect to an east-west course faulting which is post-mineral.

It is certain that fracturing in general is at least locally influenced by and tends locally to follow the outlines of folds. In this connection Cairnes (*Geol. Surv., Canada,* Mem. 184, p. 126) has noted that when the lode follows the bedding of the sedimentary rocks, it tends to be more complex in outline than when it crosses the bedding at greater angles. This seems to be borne out by observations of both lode and faults in the exposed Silversmith and Ruth No. 5 workings; in particular, the conjunction of a low-angle fault with flatly dipping beds produces a zone of shearing and shattering of considerable magnitude.

The vein is offset progressively to the north by northerly to north-westerly striking faults which dip south-westward. These are branching and curving fault-zones in at least some instances, and seem to merge locally with the vein-zone. The fact that mineralization occurs in a north-westerly striking zone west of the Silversmith crosscut proves that the faults with this strike are not exclusively post-mineral, and although they offset the vein-zone they may be rather closely related in time of origin with the vein-fracturing.

Earlier reports describe the vein as following both an east-west mineralized and north-west unmineralized course in this section of the Silversmith mine. Another interpretation is one of north-westerly post-mineral faulting. It seems probable, by projection, that the vein is stepped progressively to the right, with the west blocks moving north, and that the Hope and Silversmith veins are the same, with a total offset of nearly 2,000 feet from the main body of the Silversmith workings to the Hope workings. At least two of these north-west faults appear to be post-mineral throughgoing breaks, but the vein-fault relationship is a complex one. The possibility should be kept in mind that they were not formed at different times as the result of different stress conditions. The problem is common to more than this one part of the Slocan.

The porphyry-body referred to in earlier reports as having a localizing influence on the deposition of ore was not sufficiently exposed in 1946 for any opinion of its importance to be formed.

In 1946 Kelowna Exploration Company, Limited, started at a point 3,360 feet from the No. 5 portal and drove south 80 degrees west to pass just to the north of the westernmost workings on the Silversmith vein. The new cross-cut was driven a distance of 550 feet, and a connection was made to the south with the former workings, which were otherwise inaccessible. Diamond-drilling was then done to explore for extensions of the Silversmith vein or veins and also partly to outline the boundaries of the porphyry-body. No. 4 level on the Ruth vein was opened up in order to give information on the general structure. Buildings were purchased in Sandon for bunk-house, mess-house,

and office. The Silversmith hydro-electric plant was rented as a source of power. The work was suspended owing to heavy snow conditions in mid-January, 1947.

Silver Ridge Mining Co.

Company office, Sandon. John B. Babbage, President; R. A. Grimes, Vice-President; Harry P. Pearson, Managing Director. Capital: 2,000,000 shares, 50 cents par value. This company owns nine claims south-west of Sandon and has an option on eight others. The company was incorporated in 1935 and, under the management of R. A. Grimes, did some work on the old Sunshine property. In 1937 a large amount of stripping by bulldozer was done on the Oregon, Yakima, and Cuba claims; several small showings were encountered, and some exploratory underground work was done on them. It was then decided to drive a long crosscut to get beneath all old and new showings at depth, and a site was chosen near the north side of the Oregon claim at an elevation of 5,225 feet. This crosscut was started in 1938 and was suspended in March, 1940. Work recommenced in the autumn of 1945 and continued until July, 1946, when the crosscut was abandoned because of unsatisfactory results and a heavy flow of water.

Preparations were then made to drive a new crosscut at a lower elevation and closer to Sandon. The site chosen, 1 mile west of Sandon, is on the Lookout No. 2 claim, on the west side of Tributary Creek at an elevation of about 4,340 feet. This adit-crosscut, to be driven westward, was collared late in 1946.

The Oregon adit-crosscut is driven to a point vertically beneath the old Yakima workings. This is a distance from the portal of approximately 2,150 feet, in a direction of south 23 degrees 30 minutes west. There is a total of 2,835 feet of underground work. The crosscut was driven south 22 degrees west for 910 feet when caving in heavily sheared ground was encountered, and this was by-passed to the west from a point 30 feet back from the face. The second section of crosscut is 945 feet long, with a strong flow of water near the face. A fault, crossed 180 feet short of this face, although not mineralized, had an attitude similar to that of known veins near by. This fault was drifted on for 120 feet at south 68 degrees west, where it was cut off by another fault. From this point crosscutting to the south was resumed for 407 feet, and the latter fault was followed north-westward for 280 feet.

From the portal the adit crosses flat-lying thin-bedded argillites for the first 290 feet, then quartzites, apparently in an anticlinal fold, for another 600 feet. Then for about 630 feet there is much lagging in a disturbed zone containing considerable sheared ground in which a variety of argillaceous and quartzitic rocks show many variations in attitude. Beyond this last point thin-bedded rocks dip at angles of 30 degrees and less, with some reversals. There are, in the innnermost 400 feet of the crosscut, four sill-like granitic bodies which are strongly fractured and from which there is an exceptionally strong flow of water.

A steep zone of fracturing, strike north 80 degrees east, was encountered 210 feet from the portal and was drifted on 75 feet to the west. There was reportedly some mineral encountered in this zone, although none can now be seen. A second mineralized zone was encountered about 900 feet from the portal and was drifted on for 30 feet to the west. Neither of these zones appears to be of importance. The third possible vein drifted on is, in the observed length, an unmineralized fault.

The air in this adit is deficient in oxygen, and it was found to be impossible to reach the face even after brief shut-downs of the ventilating system.

The rock types and structures encountered in the Oregon adit were not those expected from a study of the surface. Current detailed field-work by the Department of Mines indicates to date the presence of complex folding, and it is hoped that further work may clear up some of the problems involved.

An extensive excavation was made at the site of the new adit, and the resulting cut-bank was cribbed. A 7- by 9-foot adit was collared and had been advanced about 150 feet by the end of the year. A 500-cubic-foot Diesel-driven Gardner-Denver compressor was installed in a frame power-house. A gasoline-driven lighting plant and 62-horsepower alternator were also set up, and an electric fan procured, but inability to obtain necessary auxiliary equipment prevented completion of the electrical installation. The road to Sandon was improved, and the lower end was relocated. A building was purchased in Sandon for use as a mess-house and bunk-house.

Silverite Mines, Ltd. This company owns a group of seven claims, including the Black Colt, Silver Ridge, and Silver Ridge Fraction, 2 miles north-west of Sandon. This ground adjoins that of the Victor, the Silver Ridge Mining Company, Limited, and part of the Consolidated Queen Bess group. Two Black Colt adits and one formerly known as the Silverite adit penetrate thinly bedded argillites which for the most part dip flatly but are locally folded and contorted. Mineralization occurs in fractures of various attitudes and locally is seen to be influenced by bedding. Bedded slips of low dip complicate development and the problem of correlating mineralized fractures.

A programme of stripping by bulldozer downhill from the existing workings was started late in 1946. It is understood that winter conditions stopped the work before the programme was completed.

Victor. This group of six claims, about 1 mile south-east of Three Forks and reached by good road from Sandon, is owned by Mrs. D. Petty, of Nelson. It has been leased since 1931 by E. Doney, of New Denver. The first showing on this property was discovered by the late George Petty in 1921 beneath a thick covering of overburden. Production started in 1923 and has since been continuous, with the exception of 1930 and 1931. To the end of 1946 a total of 1,384 tons has been shipped to the Trail smelter. Net contents: Gold, 120 oz.; silver, 250,338 oz.; lead, 1,288,053 lb.; and zinc, 295,131 lb.

Ore occurs in several steeply dipping fractures which strike north-eastward. These are members of a set of strong joints. The rocks are argillaceous sediments which dip south-westward into the hill at angles of 35 degrees and less.

In 1946, 25 feet of crosscutting, 80 feet of drifting, and 20 feet of raising were done, and ore was mined from an underhand stope on No. 3 level. Ore shipped in 1946 amounted to 33 tons. Net contents: Gold, 7 oz.; silver, 6,364 oz.; lead, 40,344 lb.; and some zinc.

SILVERTON-NEW DENVER (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. This old property on the shore of Slocan Lake, midway between Silverton and New Denver, had been worked for many years by lessees, and underground work had been confined to upper levels. No. 6, the lowest, adit-level has been reclaimed at considerable cost, as it was necessary to retimber and in part almost redrive about 550 feet through overburden before bed-rock was reached; this work was started in 1945. Except for parts near the inner end, the remainder of the level was found in fair condition, although in places the track was poor. The winze to No. 7 level was pumped out, and although the shaft-timbers were sound, new bins, skipway, and ladderway had to be built. About 5,000 feet of pipe-lines were laid.

No. 6, the longest level, is 550 feet to bed-rock and then follows the vein-zone for a straight-line distance of 2,930 feet in a direction of north 77 degrees east. The vein-

* *By M. S. Hedley.*

strike ranges between north 55 and 80 degrees east and the dip is south-eastward at angles between 50 and 80 degrees. The vein is apparently offset by faults striking north 50 to 70 degrees west, but the lack of continuity of some of these and the fact that the vein swings to meet them suggests that they may be related fractures rather than strictly post-mineral faults. Some follow highly altered porphyry dykes. The sediments crossed by the vein are argillites, quartzites, and biotite-argillite. The bedding in these rocks is not as a rule apparent because of their relative uniformity and thickness of bedding, but there is some folding which has not been worked out. Some of these rocks contain finely disseminated pyrrhotite as well as pyrite.

The main vein is followed only in the inner part of the level and has not been recognized with certainty in the outer part. There is also a hanging-wall vein or branch, which has been partly developed by an inaccessible stope. The vein is well defined in most places, but in some is merely a tiny fracture. It has not been found at the inner face of No. 6 level, north-east of a relatively flat shear-zone, which supposedly is represented at the surface by a gully on the hillside. It is not known whether the zone represents a fault of some magnitude or a relatively soft band of sediments.

The outer part of No. 4 adit is accessible, and an escapeway exists between Nos. 4 and 6. An inner section of No. 5 level, driven from a raise above No. 6, is also accessible.

Apart from cleaning up and exploration on No. 6 and the inner section of No. 5 levels, work has been restricted to the north-eastern part of No. 7 level. The face of the level was advanced 45 feet, and a former small stope at the previous face was extended. The vein contains much siderite with a central band of galena from 1 to 18 inches wide and locally some additional mineralization of irregular occurrence. This is coarse- to fine-grained galena, gneissic in part, with little associated sphalerite. Locally the ore contains very small quantities of arsenopyrite and pyrrhotite.

The production from this mine has been on a shipping basis, with the exception of 1918–19, when, under the ownership of the Rosebery Surprise Mining Company, 46,401 tons of relatively low-grade ore was milled at the peak of silver prices. The remainder of production, at no time exceeding 3,000 tons per year, amounted to 21,080 tons with an average grade of 69 oz. of silver, 19 per cent. lead, and 10 per cent. zinc. In 1946 ore mined amounted to 60 tons. Net contents: Gold, 1 oz.; silver, 5,940 oz.; lead, 58,180 lb.; zinc, 2,505 lb.

The company reports small assays in tin associated with the sphalerite, an occurrence not uncommon in mines in this area.

Hartney, Santiago Mines, Ltd. This company controls the old Hartney group of three Crown-granted claims and, between the Hartney and Bosun groups, owns five other claims held by record. The workings, including adits and stopes which came through to the surface, are between elevations of about 4,000 and 4,500 feet a mile east of the Bosun, and are reached by a branch from the New Denver–Sandon Road.

Production between 1900 and 1917 amounted to 282 tons, containing 16,809 oz. of silver and 180,506 lb. of lead. Zinc was apparently discarded from most shipments, although 23 tons shipped in 1914 contained 30 per cent. zinc.

The vein strikes easterly in argillites and dips steeply to the south, but locally has a reverse dip. It appears to be largely stoped out in most of the upper levels. The two lowest adits were cleaned out in 1946, and the lowest was found to be off the vein. The second lowest adit, referred to as No. 3, is about 645 feet long, with a stoped section 220 feet long, largely inaccessible. A winze is sunk below the stope and was reportedly pumped out.

Three samples were taken at the west end of the stoped section, about 18 feet above the track. The foot-wall, 6 inches on the west face of a small stope, assayed: Silver, 8.3 oz. per ton; lead, 3.1 per cent.; zinc, 33.7 per cent.; cadmium, 0.49 per cent.; tin, 0.08 per cent. The succeeding 5 inches at the same point assayed: Silver, 10.7 oz. per ton; lead, 4.2 per cent.; zinc, 31.3 per cent.; cadmium, 0.21 per cent.; tin, 0.07 per cent. A third sample taken 20 feet to the east across 18 inches assayed: Silver, 1.6 oz. per ton; lead, 0.36 per cent.; zinc, 9.5 per cent.; cadmium, 0.06 per cent.; tin, 0.04 per cent.

SILVERTON (49° 117° N.E.).*

Silver-Lead-Zinc.

Western Exploration Co. 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. In 1946 the mill was operated for two or three months, but development was carried on for a longer period. The flume leading to the power plant at Silverton was rebuilt. The Standard and Enterprise mines were operated until closed by the strike in July. The Standard reopened in October and the Enterprise early in November.

Standard.—Development-work of most interest was the start of cleaning out the Standard No. 7 adit-level, which had been caved for many years. A total of 871 feet had been reopened by the end of 1946. Raises between No. 6 and No. 7 are impassable, and it is not known how much work will be necessary to get through No. 7 level and up to No. 6. No. 4 level of the Standard was reached in two places from No. 5, but the workings were found to be so badly caved that it has not yet been possible to get through to No. 3 level, which was cleaned out in 1945. A little work was done on No. 5 and most was done on No. 6 level. The winze below No. 6, commenced in 1945, was deepened 5 feet. Drifting totalled 151 feet and raising 171 feet.

Enterprise.—At the Enterprise mine 62 feet of drifting was done on No. 8 level and 448 feet on No. 5 level. The raise from No. 7 to No. 5 was completed, a short distance of 235 feet, and 290 feet of additional raising was done. A new Ingersoll-Rand compressor, driven by a Caterpillar Diesel engine, was installed. Bunk-houses were completed, eliminating the necessity of transporting the crew from Silverton daily.

Production.—The mill treated 2,462 tons from the Standard mine. Concentrates, including some carried over from 1945, were shipped to smelters in Utah and Montana. Net contents: Silver, 36,518 oz.; lead, 276,550 lb.; zinc, 1,069,130 lb.; cadmium, 3,776 lb.

Hewitt, Granby Consolidated Mining, Smelting, and Power Co., Ltd.† In the latter part of the year the three lower levels of this old property were cleaned out preparatory to a development campaign. In 1929 this property was worked in conjunction with the Galena Farm. In that year a long haulage-tunnel was started on No. 10 level, on the west side of the hill, to connect with No. 10 level being driven from the east side, but the work was not completed. A tramway was built from the west portal to the Galena Farm mill. Company operations were stopped in 1930, and several years later the tramway was sold and removed. The property made some production under lease, from 1935 to 1942.

Between No. 9 and No. 10 levels ore found by earlier company work had not been developed. A stope, started from No. 10 level by leasing operators, is up a maximum distance of about 90 feet on the dip and shows widths as great as 11 feet. The ore-shoot is not fully developed but appears to be about 60 feet long.

A current lease was bought out by the Granby Company, and in 1946 the company had a small crew working under the direction of Fred H. Crosby. Caves on No. 8, No. 9 and No. 10 levels were being cleaned out, necessitating some heavy driving. The No. 10 west adit is caved at a big fault-zone, which is apparently the lode. It is

* By J. A. Mitchell, except as noted.

† By M. S. Hedley.

reported that 750 feet remains to be driven between the faces of No. 10 west adit and No. 10 east adit.

Van Roi.*—This old property is owned by the Clarence Cunningham estate. Early in the year the Granby Company did some rehabilitation-work but withdrew because of the apparent difficulty in obtaining title to the property.

Oakland.* This group of nine located claims, owned by Frank Mills, of Silverton, is on the north side of Silverton Creek 4 miles from Silverton and is reached by trail from the Hewitt mill. The showings are on the steep hillside between elevations of 4,225 and 4,500 feet.

Five short adits explore a well-defined fault-zone which strikes north-easterly and dips at about 45 degrees south-eastward. The lower adit, 52 feet long, is on a zone of shearing 5 to 6 feet wide containing some oxidized material; no sulphides were observed. One hundred feet west of the adit there is a shattered zone 10 to 20 feet wide with calcite stringers dipping steeply to the west.

No. 2 adit, 180 feet higher than No. 1, is 185 feet long. It follows a mineralized and silicified zone 1 to 6 feet wide, associated with a strongly altered dyke which appears chiefly on the north-west wall. Two short crosscuts to the north-west show a strong foot-wall fault-zone dipping from 30 to 40 degrees south-eastward. The two zones together form a zone of faulting and shearing about 24 feet wide, of which only the hanging-wall part is mineralized.

A third adit, 60 feet higher than No. 2, is 103 feet long on a fracture-zone in quartzites. A fourth short adit is 20 feet, and a fifth is 60 feet, above the third. A foot-wall fault-zone, evident but not explored near the portal of the third adit, is seen also at the highest adit, where it is 8 feet wide and is mineralized with sphalerite.

These adits are on a strong multiple zone of faulting which is reported to be a continuation of the Wakefield vein. Mineralization in seams and lenses is chiefly of sphalerite but includes a lens of galena 1 to 4 inches wide and 15 feet long. A sample of the galena assayed: Silver, 86 oz. per ton; lead, 47.5 per cent.; zinc, 5.6 per cent. A selected sample of sphalerite from the top showing assayed: Silver, 1.6 oz.; lead, 0.28 per cent.; zinc, 26.7 per cent.

Silver-Lead-Zinc.

ENTERPRISE CREEK (49° 117° N.E.).†

Terley Mining, Milling, and Smelting Co. Head office, Nelson. Sarkis Terzian, Managing Director. This company owns the Mabou, Ohio, and Neepawa claims on Enterprise Creek. Work commenced in June, 1946, on a road from the Enterprise road to the camp on the Ohio claim. Because of numerous large granite boulders and inadequate equipment at the start of operations, it took four months to complete the mile of road.

It is reported that six adits on the Ohio and Mabou and No. 5 adit on the Neepawa have been cleaned out. It is also reported that repair-work was done in the raise between No. 3 and No. 4 levels on the Neepawa.

Lumber for camp buildings was hauled to the property before it was necessary to cease operations for the winter.

Silver-Lead.

SPRINGER CREEK (49° 117° S.E.).‡

Ottawa Silver Mining and Milling Co., Ltd. Company office, 401 Sherwood Building, Spokane, Wash.; mine office, Slocan City. C. R. Thomas, President; J. A. Leslie, Secretary-Treasurer; W. E. Graham, Managing Director. Capital: 3,000,000 shares, $1 par value. This company, incorporated in Washington, intermittently operates the Ottawa mine on Springer Creek, 5½ miles

* By M. S. Hedley.
† By J. A. Mitchell. *See also* Western Exploration, p. 166.
‡ By J. A. Mitchell.

by good road from Slocan City. Work was confined to No. 8 level on drifts on the east and west veins. On the east vein W. E. Graham, J. Berquist, and E. Olsen, working under a lease which expired on September 1st, mined and shipped to Trail 29.4 tons of ore from a shoot near the end of the drift.

Company work was carried out on the west drift. This consisted of retimbering portions of the drift and advancing the face 160 feet. About 1,000 tons of low-grade material was piled on the dump for future milling, and a shipment of sorted ore was made to the smelter at Trail. The camp buildings were renovated and equipped to accommodate a crew of eight men.

Total shipments to the smelter in 1946 amounted to 52 tons. Net contents: 0.6 oz. of gold and 14,162 oz. of silver.

Gold.

Morning Star.* This old property, held by record, is on Springer Creek opposite the mouth of Dayton Creek, about 3 miles by road from Slocan City. It was optioned from W. R. Clement, of Slocan City, by G. A. McMillan, of Toronto. Three shipments in 1936–37 contained on the average 1½ oz. gold per ton and presumably were made from the upper of two adits in granite. The upper and older adit, about 500 feet in elevation above the creek, is driven northward 102 feet; a winze near the portal is reported to be 20 feet deep. It follows a mineralized zone as much as 2 feet wide and containing about 50 per cent. quartz. The second adit, about 100 feet lower, was 390 feet long, which with lateral workings made a total of more than 600 feet driven by hand-tunnelling on this level. It explores several quartz veins or quartzose zones between strongly altered walls, of which the continuity and relationship are a matter of doubt.

Before the face of the lower adit was advanced in 1946 about 40 feet of continuous mineralized quartz showed in the fracture, mostly in the floor of the drift. The vein strikes a few degrees west of north and dips 55 degrees or more westward. It is as much as 16 inches wide and averages about 1 foot, including some chalcedony; the walls locally are a chalcedony-filled breccia. One sample, at the face, across 4 inches of well-mineralized quartz assayed: Gold, 9.18 oz. per ton; silver, 9.7 oz. per ton; lead, 8.4 per cent.; zinc, 16.5 per cent. A second sample across 6 inches of poorly mineralized quartz assayed: Gold, 0.5 oz. per ton; silver, 0.5 oz. per ton.

A small portable compressor was installed, and the lower adit was advanced 120 feet by the end of 1946. In this distance the quartz-bearing section of the vein had been passed, although the fracture and alteration persisted.

Graphic and Rosebud.—These claims on the north fork of Springer Creek are about 3 miles from the Ottawa mine. It is reported that work was done at the property in 1946 by the owner, D. B. O'Neail, and his son, of Slocan City.

Lemon Creek (49° 117° N.E.).†

Gold.

Joan. This claim, 1 mile north of the Kilo mine, on the north side of Chapleau Creek, was located over old showings in 1946 by H. M. and W. E. Parker, of Slocan City. A road was built half-way to the claim from the Kilo, and 4 tons of ore was rawhided to the end of the road but was not shipped.

Gold-Silver.

Chapleau. This old property on Chapleau Creek, about 6 miles from the mouth of Lemon Creek, was acquired in 1946 by M. L. Craig and Ron. Somers, of Nelson, and several additional claims, including the Hope group to the west, were acquired by purchase and location. The road from the Chapleau mill to

* By M. S. Hedley.

† By J. A. Mitchell.

the Kilo mine was improved, and a route blazed from there to the Chapleau mine before snow fell. Some equipment was purchased, and an old stope in the mine was cleaned out.

DUNCAN RIVER (50° 116° S.W.).*

Silver.

Surprise. This property, on Glacier Creek 3½ miles above its junction with Duncan River, has been acquired by Pinebrayle Mines, Limited, from Joe Gallo, of Nelson. During November a small crew with the necessary equipment, under the supervision of J. Ross, started to build a road from Duncan River to the mine. It is understood that about 1 mile of road was completed by the end of the year.

FERGUSON (50° 117° N.E.).*

Silver-Lead-Zinc.

True-Fissure, Comara Mining and Milling Co., Ltd.—Company office, 815 Queen Street West, Toronto 3, Ont.; mine office, Ferguson. O. Tischauer, Mine Manager. No work was done in 1940 on this property near Ferguson.

Cansil Consolidated Mines, Ltd. Company office, 208 Yorkshire Building, Vancouver. R. B. Gayer, Managing Director. Capital: 3,000,000 shares, no par value. This company holds by location thirty-two claims and fractions along a 5½-mile strip between the Nettie "L" and Silver Cup mines, and holds an option on the Nettie "L" mine. The management reports that during the summer and early autumn old adits were reopened, surveys made, trails built and renewed, bridges constructed, and camps rehabilitated.

A 220-cubic-foot Ingersoll-Rand compressor was taken to the Nettie "L" and set up near the lower portal to supply air for underground diamond-drilling. Diamond-drilling and surveying have been carried out through the winter months.

KIMBERLEY (49° 115° N.W.).*

Silver-Lead-Zinc.

Sullivan, Consolidated Mining and Smelting Co. of Canada, Ltd. Company office, 215 St. James Street, Montreal, Que.; 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, about 3 miles away. A great deal of new work was done at this mine in 1946. Much of this work involved changes in operation which will simplify and expedite the mining of the lower part of the orebody. A report covering details of the 1946 operation, drawn up by the management, follows:—

"1. DEVELOPMENT.

"The development footages for 1946 totalled 46,900 feet (December footage estimated). A breakdown of these footages shows:—

	Feet.
Drifts and crosscuts	8,525
Sublevels	15,025
Raises	22,610
Shafts	740
	46,900 (estimate)

* By J. A. Mitchell.

"This is the greatest annual footage ever driven at the Sullivan mine. The increased development footages were required by the change in mining methods from the open-stope system to slusher drifts for scraping, and sublevels for diamond-drill blast-hole drilling in pillar-extraction.

"Ore produced from development was 176,119 tons.

"2. STOPING AND PILLAR-EXTRACTION.

"*Slusher Drifts.*—These drifts are driven 7 by 7 feet with draw-holes at 12.5-foot intervals on alternate sides of the drift. This method has been adopted for:—

(1) Recovery of ore under open stopes, cave or fill.

(2) For recovery of pillars surrounded by cave or fill.

(3) For recovery of pillars which will induce caving.

"*Diamond-drill Blast-hole Stoping.*—The system of sublevel stoping and diamond-drilling is under way in the 3900 area, and follows the same pattern in all stopes. Pillars above the 3900 level are extracted by variations of the same method. Ore broken by diamond-drills was 1,365,000 tons.

"*Pillar-extraction.*—The bulk of the tonnage from this operation came from four large pillars above the 3900 level. In three of these the ore was drawn through slusher drifts, while in the other the ore was drawn through grizzlies.

"The total tonnage produced is divided as follows:—

	Tons.
Open stopes	740,901
Pillar-extraction	457,830
Sublevel stopes	994,000
Total stoping	2,192,731
Development ore	176,119
Total production, including development	2,368,850

"This total is approximate; December performance is estimated.

"3. MINE SAFETY.

"The accident record at the Sullivan mine during recent years is unsatisfactory when compared to the pre-war years. The large labour turnover during and since the war is partly responsible for many accidents. Many men have entered the mining industry with no previous underground experience. The course in Job Instruction Training, which is sponsored by the Canadian Vocational Training, has been given to 159 supervisors at the mine. The supervisors will also be given a course in Job Safety Training in the near future. All new men, whether they have had previous underground experience or not, are first turned over to an underground supervisor who instructs them in mine safety and on-the-job training. The period of initial instruction depends on each man's ability and may vary from three days to three or four weeks. No man is transferred to a regular working-shift until the instructor is satisfied that the new man has been thoroughly trained for underground work.

"Accident-prevention and mine safety are constantly stressed through a public address system, which is used to broadcast to the men going on and coming off shift. The Underground Safety Committee meets every two weeks to discuss means of preventing accidents and to further mine safety. A Surface Safety Committee holds a meeting once a month to discuss accident-prevention on the surface.

"The company has sponsored a quarterly safety-award drawing in which all employees at the mine having an accident-free record during the quarter are eligible to participate in the draw. Twelve cash prizes are awarded at each drawing.

"A centrally located first-aid station has been fitted out underground and is attended by a qualified first-aid attendant on each shift. All underground accidents are first treated by the first-aid attendant on duty, and if further treatment is necessary, the patient is sent outside in a heated ambulance. First-aid classes were held during the year, and of the ninety-three employees attending, ninety passed the examination. The mine first-aid teams took part in the following competitions during the year: Lindsay Cup, Oughtred Cup, East Kootenay Mine Safety Association, and the Blaylock Rose Bowl. The mine rescue team competed in the East Kootenay mine safety competition.

"4. VENTILATION.

"The return air shaft, No. 23, at the north end of the mine was completed and a Sheldon 86–96 fan installed temporarily with 100-horsepower drive, which handled 132,000 c.f.m. at 1.9 inches w.g. on exhaust duty. Approximately 94 per cent. of this volume was return air from the levels below 3900. Twin fan equipment was ordered for this shaft air circuit for installation during 1947. The fans selected were Jeffrey Aerodyne 8H60 type with 125-horsepower drives, to be operated in parallel with combined capacity of 250,000 c.f.m.

"A new steel and concrete adaptor was built on No. 14 shaft, with tile motor-house. A Jeffrey 8-foot Aerodyne Junior 2-stage fan operated here at 2 inches w.g. with 100-horsepower drive on exhaust duty and handled 104,000 c.f.m.

"At No. 9 shaft the old Jeffrey centrifugal fan operated at 1.4 inches w.g. on exhaust duty and handled 54,000 c.f.m.

"The air-intakes to the mine remained practically the same as before, with the exception of No. 1 shaft. In order to improve intake facilities in the area served by the No. 1 shaft, development on the No. 24 air-shaft was carried on. This shaft is now connected with the No. 1 shaft through the 3900 level and eventually will be connected with the lower levels.

"The auxiliary and booster fans operating underground range from 2,500 c.f.m. to 24,600 c.f.m. in capacity. The total fan equipment is:—

Fans on mine exhaust	3
Boosters operating	4
Auxiliaries operating	23
Total units operating	30
Fans discarded	2
Fans on order	7

"Total mechanical exhaust volume from the mine is 295,000 c.f.m. plus an estimated return flow of 50,000 c.f.m. by natural draught.

"Aluminium-dust treatments commenced in April, and 7,736 cans of powder were consumed in administering 436 treatments, with an average number of 399 men per treatment.

"5. PLANNING.

"*Lower-level Development.*—The No. 1 pilot shaft was sunk from just below the 3350 level to the 3050 level, a distance of 500 feet, at 39 degrees. The full-size shaft was completed for 157 feet below the 3350 level. The programme in 1947 calls for completion of the shaft to the 2900 level and crosscutting on three levels below the 3350.

"6. BACK-FILL.

"During 1946 a total of 1,196,324 cubic yards of back-fill was placed. This fill will support 231,605 square feet of the hanging wall. The total was made up as follows:—

	Cubic Yards.
Gravel fill	927,025
Development waste from underground	103,999
Forced caving (estimated)	165,300
Total	1,196,324

"7. 3700 HAULAGE.

"This project consists of 248 feet of concrete adit in gravel, 1,000 feet of timbered adit in gravel, 10,212 feet of adit in rock, and 10,123 feet of graded track from the portal to the mill-bins. The total fill required on the surface is 550,000 cubic yards. The size of the adit is 10 by 12 feet.

"Work was started on the adit, excavation, and the grading of the track late in 1946.

"Underground work in connection with the sink-float project and the 3700 haulage-level was well advanced on the 3500 level, the 3700 level, and the 3800 level.

"8. NO. 1 SHAFT INSTALLATIONS.

"During 1946 construction and installation of equipment was carried on. On the surface the hoist-house was completed, the head-frame, including waste-bin and idler-tower, were erected. A power-line, transformers and switching-gear, motor-generator, and hoist were installed. Underground the raise was enlarged to full size (9½ by 21 feet) for 394 feet. Steel shaft sets were erected for a distance of 1,496 feet. Steel was erected for stations on the 3500, 3650, 3800, and 3900 levels.

"9. PERSONNEL DIVISION.

"The average number of day's pay employees working at the mine and mill during the year was 1,465, as follows:—

Underground employees	839
Surface employees	324
Mill employees	302
Total	1,465

"The employment situation was considerably better during the year, and no serious labour shortage was evident."

Conwest Exploration Co., Ltd.—During 1946 this company acquired a large number of mineral claims lying south-west of the Sullivan mine. Work done to date has been confined to a geophysical survey.

MOYIE LAKE (49° 115° S.W.).*

Silver-Lead-Zinc.

St. Eugene Mining Corp., Ltd. Alex. Smith, field geologist for this company, began an areal geology and detailed mapping programme on the company holdings at Moyie Lake. A number of diamond-drill holes were put down along the eastern edge of Moyie Lake to explore the structural and ore possibilities in the vicinity of the old workings. Holes were drilled at intervals from a point 1 mile south to a point 1 mile north of the town of Moyie. The workings of the Midway mine, a gold-silver property at the south end of the lake, were also mapped.

* By J. A. Mitchell.

GOLDEN (51° 116° S.E.).*

Silver-Lead-Zinc.

Base Metals Mining Corp., Ltd. Company office, 350 Bay Street, Toronto, Ont.; mine office, Field. J. H. C. Waite, President; H. D. Forman, Manager; John Vallance, Mill Superintendent. Capital: 3,000,000 shares, no par value. The Monarch mine on Mount Stephen and the Kicking Horse mine on Mount Field, on the opposite side of the Kicking Horse River, were operated by this company. Both mines were shut down on July 3rd as a result of a strike and had not reopened by the end of the year.

From January 1st to July 3rd little development-work was done, but a total of 15,678 tons of ore was mined and milled, most of which came from the Kicking Horse mine. This ore averaged 3.63 per cent. lead and 10.4 per cent. zinc. Concentrates produced amounted approximately to 615 tons of lead concentrates, assaying 81.3 per cent. lead, and 2,424 tons of zinc concentrates, averaging 59.8 per cent. zinc. The lead concentrates were shipped to the American Smelting and Refining Company smelter at East Helena, Mont., and the zinc concentrates to the American Zinc Company of Illinois. Net contents: Silver, 12,088 oz.; lead, 847,240 lb.; zinc, 2,470,512 lb.

The ore reserves as at July 3rd are estimated by the company at 15,700 tons, averaging 0.98 per cent. lead and 14.1 per cent. zinc. Less than 2,000 tons of this is in the Monarch mine, and the rest is in No. 4 stope of the Kicking Horse mine. It is possible that additional ore may be found as mining progresses.

The mines are opened by adits driven into the precipitous slopes of the mountains and are served by aerial tram-lines. The upper tram terminals of both are underground. The lower terminal of the Monarch is alongside the mill. The Kicking Horse tramway discharges into a bin alongside the Banff Highway, and the ore is trucked to the mill.

The ore is mined by an open room-and-pillar method, which requires little timber, except at chutes and manways. The producing stopes in 1946 were the 175D and 200C at the Monarch and the No. 4 at the Kicking Horse.

From twenty-five to thirty men, about evenly divided between the two mines, were employed underground. The surface crew varied from thirty-five to forty men, of whom all but three or so were employed on the Monarch side.

WINDERMERE (50° 116° N.E.).*

Silver-Lead-Zinc.

Excelda, Thunderbird Mines, Ltd. Company office, P.O. Box 743, Seattle 11, Wash. R. C. Moffit, President; J. E. Barbour, Mine Manager. This company is developing the Excelda prospect at the head of Michelson Creek, in the Toby Creek watershed, about 21 miles from the town of Invermere. In 1936 and 1937 No. 3 adit was extended to a point 440 feet from the portal. Work was discontinued in 1937 and was not resumed again until 1946. During the first part of the 1946 season the 4-mile long " go-devil " trail from the end of the road to the mine camp, at 7,500 feet elevation, was cleaned out. Underground work commenced on August 12th, and the adit was advanced approximately 400 feet before it was necessary to shut down for the winter. This drift follows the strong hanging wall of a 14-foot easterly dipping shear or shatter zone in limestone and is approximately parallel to the strike of the bedding. Little mineralization has been found in the drift or in short crosscuts into the footwall. It is tentatively proposed to install a jig-back tram, about 1 mile in length, to gain easy access to the uppermost and best showing near the top of the ridge, at an elevation of more than 10,000 feet.

* By J. A. Mitchell.

A compact power plant, about 100 feet from the portal of the No. 3 tunnel, consists of a Gardner-Denver 2-stage compressor of 360-cubic-foot capacity at sea-level and a 440-volt alternator, both driven by a 100-horsepower Hercules motor. A bit grinder and a Ventair fan are driven by electric motors. Ventube, 16 inches in diameter, is used for ventilation. Because of the wet conditions in the drift, all blasting is done electrically from the light wires and is controlled by a safety-switch at the portal. Even without the fan running, the working is quickly cleared of smoke by natural draught during the warm summer days. Only one shift was working in mid-August.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1935, pp. E 12, E 13.]

Parridice.—(50° 116° S.E.) The property is owned by Sheep Creek Gold Mines, Limited. Work done during 1946 was confined to a geological examination by A. G. Pentland and to the salvaging of tram-line and other equipment not necessary for possible future operation.

VERMONT CREEK (50° 116° N.E.).*

Silver-Lead-Zinc.

Ruth Vermont.—It is reported that two men were employed at this property during the summer of 1946.

REVELSTOKE (51° 118° S.E.).*

CARNES CREEK.

Gold-Silver-Lead-Zinc.

J and L, Raindor Gold Mines, Ltd.—Company office, 184 Bay Street, Toronto 1, Ont.; mine office, Revelstoke. G. H. Rainville, President; John E. Riddell, Manager. Capital: 3,000,000 shares, $1 par value; issued, 1,300,006. This is an Ontario company controlled by Quebec Gold Mining Corporation and Noranda Mines, Limited, and registered in British Columbia. The company is developing a group of claims which lies between Carnes Creek and its east fork.

After acquiring the old J and L group of Crown-granted claims, the nucleus of the property, additional claims were located. The company now holds or controls a total of sixty-one claims and seventeen fractional claims, extending 12,000 feet along Carnes Creek and easterly for a width of about 10,000 feet.

The camp is on the south bank of the east fork of Carnes Creek at elevation 2,600 feet, and is reached by 8 miles of good pack-horse trail from the Big Bend Highway at the mouth of Carnes Creek, 24½ miles north of Revelstoke.

A tent-camp was established in May, 1946, a short distance below the portal of the upper adit on the J and L vein. A contract to extend this adit was given to I. Skeen, of 966 Thirty-eighth Avenue East, Vancouver, who sent a picked crew of hand-miners to the property. On August 21st this adit had been advanced 70 feet, and it was planned to advance it another 200 feet to get below any possible surface oxidation. The manager reports that the oxidation extends to at least 125 feet below the outcrop, and that the effects of oxidation were noted in the last face of the adit at 230 feet below the outcrop, possibly because of transverse slips cutting the ore-zone at that point.

This adit follows a vein consisting of massive sulphides of lead, zinc, iron, and arsenic, with minor amounts of quartz and carbonates. The vein lies between a limestone foot-wall and a sericite schist hanging wall. The strike is north-westerly and the dip from 40 degrees to 50 degrees to the north-east. There are two shafts and a number of open-cuts on the property, but these were not visited.

* By J. A. Mitchell.

Samples of the ore, which is difficult to treat, have been sent to several research laboratories in order to find an economical method of treatment.

At the time of inspection, log cabins were being erected for a permanent camp, and it is understood that some of these were completed before the operation was closed down for the winter on October 24th. The crew consisted of five men underground and fifteen on the surface.

Zinc.

Mastodon. This property is owned by D. F. Kidd and associates, of Vancouver. There was a little activity on the property between 1933 and 1937, when the Fawn Mining Company had control of it. The Valley Mining Company, of New Jersey, held an option on the property during 1946. E. P. Kaiser, field geologist for this company, had a small crew engaged in surface trenching, in an attempt to locate the continuation of mineralization north-westward from the 130-foot winze. The overburden is deep, and the work was discontinued.

HOWE SOUND (49° 123° N.E.).*

Copper.

Britannia Mining and Smelting Co., Ltd. Company office, 730 Fifth Avenue, New York City; mine office, Britannia Beach. H. H. Sharpe, President; C. P. Browning, General Manager. During the year the Secretary-Treasurer, C. P. Charlton, retired, and was succeeded by J. E. Nelson. Capital: 100,000 shares, $25 par value. This company operates the Britannia mines at Britannia Beach, Howe Sound. The properties were operated throughout the year, except for the period between July 3rd and October 21st, when they were closed because of a strike. The mines being worked at present include the No. 8, Bluff, Fairview, No. 5, and Victoria.

The employment situation showed some improvement. The total number of men on the mine pay-roll at the end of the year was 423, as compared to 399 at the beginning of the year. The total number of shifts worked during the year in the mining department was 78,586, as compared with 82,329 in 1945, the strike being responsible for the reduction.

The production from all mines was likewise reduced by the strike. The total ore mined during the year was 435,982 tons, as compared with 566,500 tons in 1945. Production, including copper from the copper precipitation plant, amounted to 7,002,577 lb. of copper, 4,800 oz. of gold, 27,104 oz. of silver, and 9,023 dry tons of pyrite. The quantities of ore broken in the various sections of the mine by the different mining methods were as follows:—

Mine.	Tons of Ore broken.						
	Shrinkage.	Cut and Fill.	Powder Blast.	D.D. Blast.	Open Square Set.	Filled Square Set.	Total.
No. 8	18,945	3,627	....	1,041	5,002	....	28,615
Bluff	60,000	....	100,000	131,616	....	....	291,616
Fairview	13,027	....	40,000	137	....	....	53,164
No. 5	11,264	....	....	....	7,157	....	18,421
Victoria	....	....	....	....	....	20,465	20,465
Totals	103,236	3,627	140,000	132,794	12,159	20,465	412,281

The increasing importance of diamond-drill-hole blasting is shown by the fact that about 25 per cent. of the ore is now being broken by this method.

* By H. C. Hughes.

During the year, 7,298 cases of powder, 131,002 No. 6 blasting-caps, and 838,426 feet of safety-fuse were used. In addition, 5,908 electric blasting-caps were used, chiefly in diamond-drill blast-holes.

Development-work totalled 4,447 feet in all sections of the mine and was made up as follows:—

Type.	No. 8.	Bluff.	Fairview.	No. 5.	Victoria.	Total.
Drifting	834	133	....	186	187	1,340
Crosscutting	244	226	....	....	20	490
Raising	254	1,347	206	349	202	2,358
Powder blast	....	217	....	....	....	217
Winzes	....	42	....	....	....	42
Total	....	....	....	....	....	4,447

In addition, 1,943 feet of core diamond-drilling was done in No. 8 mine and 807 feet in Bluff mine. Blast-hole diamond-drilling included 291 feet in No. 8 mine, 27,242 feet in the Bluff mine, and 250 feet in the Fairview mine.

Changes in mining methods are being brought about by introducing, where possible, electric slusher hoists scraping from draw-holes, to take the place of bulldoze chambers.

Considerable attention was paid to ventilation and dust-control. The use of aluminium-dispersal units in all active dry-rooms is being continued. Special attention was given to the ventilation of the lower Bluff area. The adoption of detachable bits eliminated undesirable dust conditions in the steel-shop and increased the efficiency of drilling.

New equipment purchased during the year included two 3-drum 30-horsepower electric Ingersoll-Rand slusher hoists. New Edison P-3 electric cap-lamps were provided for all underground workmen, and suitable lamp-rooms with charging equipment were built at the beach and mine camps.

An excellent safety programme was maintained. This included informal safety meetings in each section of the mine every two weeks, monthly meetings of the Accident Prevention Committee with equal representation from labour and management, safety posters, a new quarterly bonus safety plan, and safety bonuses to foremen and shift bosses for accident-free months. First-aid classes were held at the beach and mine camps, and an annual first-aid competition was held at the tunnel camp, in which eight teams competed. In addition, a programme of job safety training by all supervisors was instigated during the year. The results of this work were shown by a substantially improved accident record over the previous year.

TEXADA ISLAND (49° 124° N.W.).*

Gold-Copper.

Little Billie, Vananda Mining Co., Ltd. — Company office, 711 Yorkshire Building, Vancouver. H. T. James, President; Charles R. Cox, Manager. Capital: 3,000,000 shares, $1 par value. The Company operates the Little Billie mine, near Vananda, on Texada Island. During 1946 the main crosscut on the 480 level was advanced 620 feet and some 230 feet of exploration and development drifts driven. On the 280 level 380 feet of crosscutting and 250 feet of drifting on ore-zones was done. On the 180 level 110 feet of drifting was done on ore-zones. A total of 11,617 feet of diamond-drilling was done during 1946, distributed as follows: 480 level, 4,994 feet; 380 level, 376 feet; 280 level, 1,034 feet; 180 level, 1,044 feet; and surface, 4,169 feet. Equipment was acquired for a new power plant. The power-

* By H. C. Hughes.

house was completed, and the first unit, a 375-horsepower Fairbanks Diesel direct-connected to a 300-kilowatt 2,200-volt Fairbanks-Morse generator, was installed, together with the power lines necessary for distribution. The second unit is to be a duplicate of the first. An average of thirty men was employed. Early in 1946 the sawmill was destroyed by fire.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1944, pp. 162–174.]

Marble Bay Mine, Marble Bay Mining Co., Ltd. Company office, 626 Pender Street West, Vancouver. A. G. King, President, S. M. Barrowman, Manager. Capital: 3,000,000 shares, $1 par value. The Marble Bay shaft was unwatered to the No. 7 level, and a diamond-drill programme undertaken. A total of 7,349 feet was drilled from underground and 12,285 feet from the surface. An average of five men was employed. Work was suspended on August 16th because of adverse labour conditions.

VANCOUVER ISLAND.

Deep Inlet (50° 127° S.E.).*

Gold.

Fil. The Fil group consists of twelve unsurveyed claims, staked in 1938 by J. J. Pugh and associates. In 1941 it was leased by W. H. Patmore and associates, of Kyuquot. It is on the south side of Deep Inlet, about 2 miles from its entrance into Kyuquot Sound, and can be reached by gas-boat from either Kyuquot or Chamiss Bay, the distances being 15 and 9 miles respectively.

On the property there are a number of narrow fissures and shear-zones in granodiorite, striking generally a few degrees east of north and dipping steeply to the west. Where underground work was done, two types of mineral occurrence were noted. The first is a shear which is almost completely filled with a light-coloured fine-grained dyke resembling aplite and sparsely mineralized with pyrite, sphalerite, and chalcopyrite. In the second type the shear is partly quartz-filled and the remainder filled by a dark-coloured fine-grained dyke resembling lamprophyre. This dyke is evidently pre-mineral. It is not mineralized, and the quartz is found on either wall or cutting it. Minerals observed in the quartz were sparsely disseminated pyrite, sphalerite, chalcopyrite, and free gold. Both the dykes and the vein outcrop along the side of a steep, narrow creek-bed and are also exposed by several cuts and trenches. These showings are about 4,000 feet from tide-water. They have been developed by three adit-levels. No. 1 adit, elevation approximately 1,425 feet, was driven as a crosscut for 15 feet until it cut the mineralized aplite dyke, and has been driven on this dyke for an additional 100 feet. About 35 feet from the face a crosscut has been driven 30 feet to the south-west, where it cut the quartz vein and lamprophyre dyke. This showing has been drifted on for 115 feet. No. 2 adit, elevation 1,600 feet, has been driven on the quartz vein and lamprophyre dyke for 145 feet. No. 3 adit, elevation 1,730 feet, has been driven on the same showing as No. 2 for 275 feet. The aplite dyke ranges in width from 2 to 26 inches and averages about 12 inches. The quartz vein ranges from 1 to 30 inches in width and averages 8 inches. No samples were taken, but free gold was visible in parts of the quartz vein. All the underground workings have been driven by hand-steel.

Equipment on the property includes a gasoline-driven portable sawmill, a small gasoline-driven single-drum hoist, a 7-horsepower agricultural-type tractor with power take-off, and an acetylene welding outfit. Buildings include two small cabins at the mine and three cottages, machine-shop, and tram-terminal shed at the beach. In addition, there is a substantial float. The tram right-of-way from the mine to the beach has been cleared, and fourteen towers erected. The construction of a planked road

* By H. C. Hughes.

from the wharf to the mine has been commenced. Three or four men were employed throughout the year.

Eclipse. This property consists of six recorded claims and is owned by J. J. Pugh and associates, of Kyuquot. It adjoins the Fil group on the east. It is reached by 2½ miles of rough trail, which commences at tide-water on Deep Inlet about half a mile above the Fil landing. The claims lie on a steep, rough, heavily timbered hillside. The main showing, exposed by stripping, is a very narrow fissure (a quarter of an inch wide) in the granodiorite, showing some sulphides on the walls and weak shearing for 3 to 4 inches on either side. A sample taken across 6 inches of sheared material showing some sulphides assayed: Gold, 0.04 oz. per ton, and silver, trace. The presence of a considerable amount of lamprophyre dyke float similar to that associated with the quartz vein on the Fil group indicates that this should be a favourable area for prospecting. Two men were engaged, chiefly on trail-work, during the summer.

ARTLISH RIVER (50° 127° S.E.).*

Gold-Copper.

Scrutor Gold. The Scrutor Gold group, owned by A. W. and J. Young, of Kyuquot, comprises ten recorded claims on a tributary, locally known as Young Creek, which enters the Artlish River from the north side about 2½ miles from the mouth. A foot-trail about 4 miles in length runs from the beach, about half a mile north of the mouth of the Artlish River, to the showings. These are near the junction of Young Creek and its tributary, locally known as Naish Creek, about 1½ miles from the mouth of Young Creek, and are at an elevation of about 2,300 feet. They consist of two well-defined shears in the volcanics, about 90 feet apart, striking east and with steep dips. The shears are mineralized across a width of from 2 to 16 inches with pyrite, chalcopyrite, pyrrhotite, and minor amounts of sphalerite. The more northerly shear is the stronger and has been developed by cuts and short adits for a length of about 90 feet and the other for a length of about 20 feet. On Naish Creek, about 600 feet from the showings on Young Creek, a narrow shear, 2 to 6 inches wide, is exposed in the bed of the creek for a distance of about 20 feet. It carries similar mineralization to the other showings and might possibly be an extension of the most northerly shear on Young Creek. No samples were taken. Values are in gold and copper. The owners did surface and underground work by hand on the property during the summer.

ZEBALLOS (50° 126° S.W.).*

Gold.

Privateer Mine, Ltd. Company office, 602 Stock Exchange Building, Vancouver. D. S. Tait, President; N. E. McConnell, Managing Director; C. Harry Hewat, Mine Manager. Capital: 2,500,000 shares, no par value. The Privateer mine is in Spud Valley, about 4 miles by road from Zeballos. The mine was reopened in October, 1945, after having been closed for two years. A development programme was undertaken but was suspended on May 23rd, 1946, when the power-house was destroyed by fire. The construction of a new power-house on the site of the old one was commenced immediately, and sufficient power was available to resume development-work on October 29th, 1946. Milling was commenced on November 14th, 1946, and should continue without interruption. The new power equipment includes two 375-horsepower 5-cylinder Fairbanks-Morse Diesel engines direct-connected to 312-kva. 550-volt alternators, one Bellis-Morcom compressor direct-connected to a 200-horsepower motor, and one Rushton-Hornsby 2-cylinder 156-horsepower Diesel

* By H. C. Hughes.

belt-connected to a Westinghouse 125-kva. 550-volt generator. In addition, it is planned to install another compressor, which will be driven by a 150-horsepower motor. Development-work done during the year included 1,207 feet of drifting, 209 feet of crosscutting, and 218 feet of raising. An average of about forty men was employed. Ore milled amounted to 3,661 tons. Net contents: Gold, 1,801 oz., and silver, 893 oz.

Spud Valley Gold Mines, Ltd. Company office, 703 Royal Trust Building, Vancouver. P. F. Knight, President; W. Elliott, Manager. Capital: 2,500,000 shares, $1 par value. This company operates the Big Star group on Gold Creek, adjoining the Spud Valley mine. In October a development programme was undertaken. A new low-level adit was commenced, 230 feet vertically below the present adit-level, and by the end of the year had been driven about 500 feet on a wide shear. The property is equipped with a small Diesel-driven mining plant. The work was done on contract by ten men.

Central Zeballos Gold Mines, Ltd. Company office, 543 Granville Street, Vancouver; mine office, Zeballos. N. F. Brookes, Manager. Capital: 2,500,000 shares, $1 par value. The property is controlled by Reno Gold Mines, Limited, under a lease agreement. Operations were resumed in 1946 at the Central Zeballos mine, which has been closed since the autumn of 1942. Development included 640 feet of drifting, 16 feet of crosscutting, 196 feet of raising, and 130 feet of diamond-drilling. The drifting was done on the 9 and 5 levels and the raising between the 5 and 4 levels. Milling was commenced on August 12th and was continued throughout the rest of the year. An average of thirty men was employed.

I.X.L. This is a fractional claim lying between the Privateer and Spud Valley holdings. It is owned by Victor Davies, 3149 Norfolk Street, New Westminster. During the summer two men were engaged in drifting, with hand-steel, on a narrow quartz vein. The development ore was sacked for shipment.

Conquest Mining Co., Ltd. Company office, 510 Dawson Building, Vancouver. Isaac Rosenthall, President. Capital: 1,000,000 shares, $1 par value. The company operates the Tagore mine, 1½ miles from Zeballos. A crew of three men was engaged in rehabilitating the camp buildings and installing mining equipment. This included a 150-horsepower 6-cylinder Cletrac Diesel engine and a 351-cubic-foot Schramm compressor.

Friend.—G. V. Clayton, Zeballos, Manager. This property is in the Little Zeballos Camp. During the summer two men were engaged in driving an adit-level about 70 feet below the present level.

MUCHALAT ARM (49° 126° N.E.).*

Gold.

June. The June group, at the head of Muchalat Arm, is reported to consist of the June, June Nos. 1 to 7 Mineral Claims, and the "A," "B," and "C" Fractions, staked in June, 1939, by H. Medlend and L. Paulcer and transferred the same year by bill of sale to the present owner, William Sloan, of Zeballos, who is trustee for the Burman River Gold Mines Syndicate, 689 Hornby Street, Vancouver.

At the time of examination, September 12th and 13th, 1946, the owner and his two sons were rehabilitating the beach camp preparatory to resuming work on the property after a shut-down of four years. No production has been reported from the property.

The claims are on the west side of Muchalat Arm, about 1,500 feet from the head of the arm, and extend, two deep, up June Creek for about 6,000 feet from the beach.

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

Table of Assays—June Group, Muchalat Arm.
(*See* Fig. 15.)

Sample No., Location and Description.	Width.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.
1. Across hanging-wall portion of silicified shear-zone, containing abundant chalcopyrite, pyrite, and pyrrhotite	13	Trace	0.10	0.50	*	0.90
2. Across hanging-wall portion of silicified shear-zone, containing abundant chalcopyrite, pyrite, and pyrrhotite	12	0.040	1.60	1.60	*	*
3. Diagonal quartz-vein in shear	12	0.060	3.10	*	0.32	2.70
4. Across foot-wall part of shear, containing chalcopyrite, sphalerite, pyrite, and magnetite	18	0.200	7.80	7.10	0.54	4.30
5. Across 4 inches of quartz plus 4 inches of chalcopyrite and pyrite	8	1.780	6.50	2.80	0.68	0.70
Face of adit—						
6. Across foot-wall rock in face of adit	60	*Nil*	*Nil*	*	*	*
7. 6 feet from floor; microscope shows abundant chalcopyrite, arsenopyrite, pyrrhotite, and magnetite; no galena seen in section	2	16.680	22.90	20.00	1.13	*
8. 4 feet from floor; full width of vein; mainly sulphides; microscope shows abundant chalcopyrite, smaller amounts of galena, matildite, pyrrhotite, arsenopyrite, and magnetite	10	2.330	8.50	7.80	0.87	*
9. At floor, full width of vein	16	0.672	5.10	3.50	0.59	*
10. Vein in face of adit, picked sulphides from floor; abundant chalcopyrite	....	0.610	12.70	18.20	0.43	*
11. Adit, face minus 5 feet, vein in floor; sulphides; microscope shows abundant chalcopyrite, galena, matildite, some magnetite, pyrrhotite, and arsenopyrite	12	1.103	18.30	6.10	2.32	*
12. Adit, face minus 10 feet, full width of vein in back	14	0.160	2.90	1.45	*	*
13. Adit, face minus 12 feet, full width of vein in back	16	0.560	5.50	4.30	0.50	*
14. Adit, face minus 12 feet, full width of vein in back	15	Trace	0.40	*	*	*
15. Across short lens of pyrrhotite	9	Trace	*Nil*	*	*	*
16. Partly silicified shear, with pyrite	72	*Nil*	0.70	0.87	*	*
17. Quartz with chalcopyrite, pyrite, and pyrrhotite	20	0.910	5.40	0.86	0.98	*
Selected Samples from ore-pile in Open-cut near Portal of Adit.						
18. Mixed sulphides in quartz	....	0.848	17.60	4.40	2.39	*
19. Mixed sulphides in quartz	....	1.293	3.20	1.30	0.38	*
20. Mixed sulphides in quartz; microscope shows small amounts of chalcopyrite, galena, matildite, and pyrite in quartz	....	2.832	5.00	2.60	*	*
21. Mainly chalcopyrite, no quartz	....	0.724	13.50	22.00	0.40	4.95
22. Abundant sulphide; including "grey mineral" (matildite); microscope shows quartz cut by pyrite that has been brecciated and partly replaced by abundant galena and matildite	....	2.360	26.90	9.30	9.39	*
23. 1-inch streak of pyrite beside a 2-inch quartz stringer	1	0.060	1.60	0.43	*	*
24. Streak of pyrite beside a 2-inch quartz stringer	1	0.080	0.70	0.64	*	*
25. No. 4 vein, 500 feet easterly from adit; across 6-inch width of quartz	6	0.020	0.80	0.50	*	*
Open-cut on Beach at Mouth of June Creek.						
26. In wall-rock of shear, including a thin seam of sphalerite and pyrite	24	*Nil*	*Nil*	*	*	5.80
27. Main shear, strongly oxidized	6	*Nil*	0.50	*	*	0.53
28. Across shear, 10 feet above floor of open-cut, containing pyrite and sphalerite	18	*Nil*	0.10	*	*	*
29. Pile of mineralized rock at mouth of beach open-cut, mainly sphalerite	....	0.040	*Nil*	*	*	17.20
30. Pile of mineralized rock at mouth of beach open-cut, mainly pyrite	....	0.020	0.10	*	*	1.00
31. Pile of mineralized rock at mouth of beach open-cut, some sphalerite and a little galena	....	0.040	0.20	*	*	0.98

* Means less than 0.5 per cent.

The lowermost showing is on the beach, on the north side of the creek, and others extend westerly up the hillside for about 1,300 feet. An adit and surface workings near it are 300 feet north of a point on the creek about 1,000 feet from its mouth.

The hillside near the showings slopes steeply to the beach and to the bed of the creek. It is heavily wooded, but the depth to bed-rock is not great and outcrops are numerous.

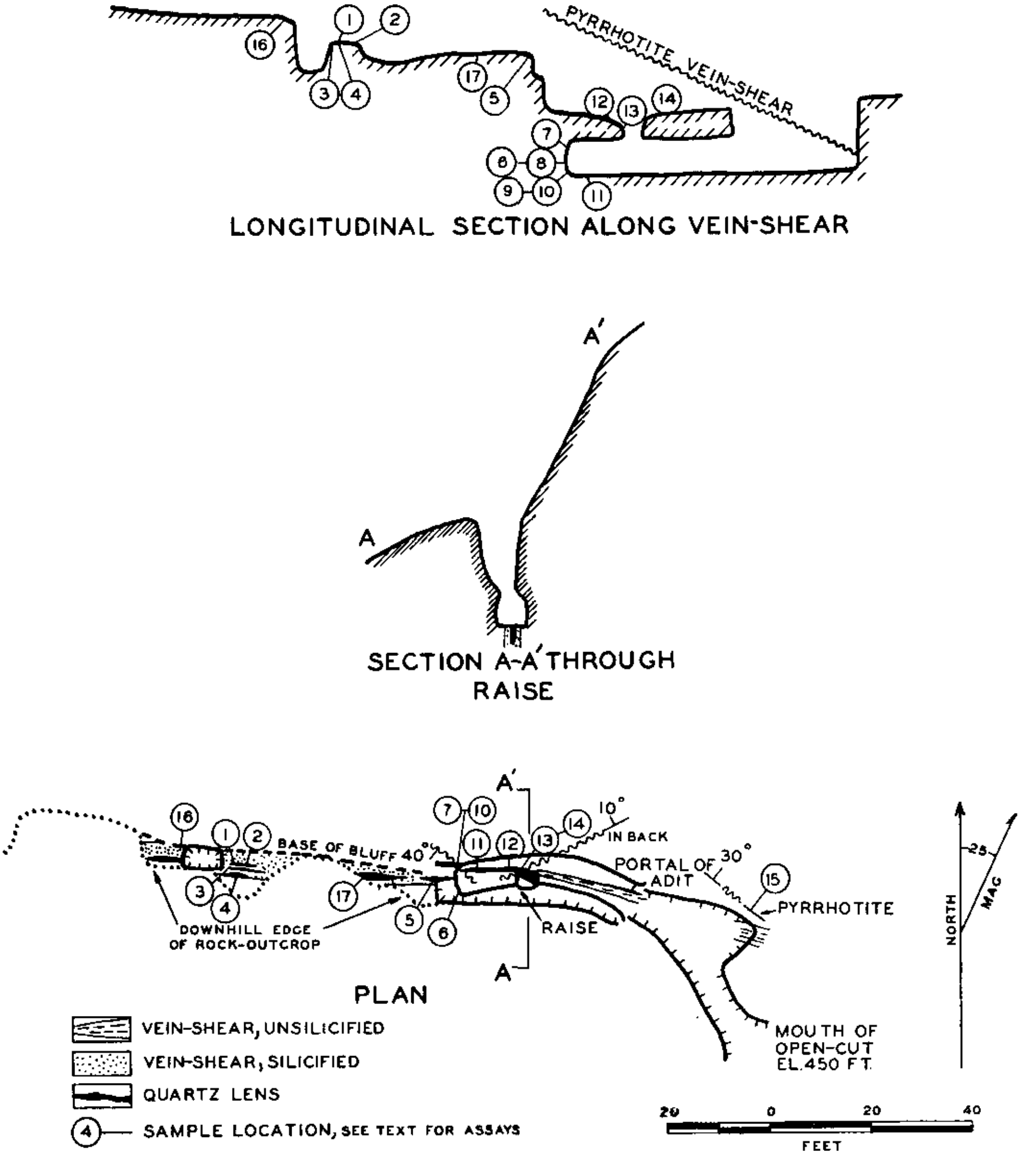


Fig. 15. Workings on June group, Muchalat Arm.

The rock near the workings is andesitic lava, cut, in the main open-cut, by a 3-inch felsite dyke and at the west end of main showing by two flat dykes from 1 inch to 2 feet thick, also of white felsite. Granodiorite is reported to occur on the southerly part of the property; the contact between it and andesite on the north-west is reported to trend westerly across June Creek about 1,500 feet south of the workings.

One main vein has been developed on the property, and several smaller ones have been exposed by stripping. The main vein is a well-defined shear-zone, from a few inches to 6 feet wide, that has been exposed in open-cuts and in the adit for a distance of 120 feet (Fig. 15) and is reported to have been found in a small pit about 220 feet farther west. The owner and the writer searched for the pit but, probably because of the sloughing, were unable to find it. Some tight shearing is found in an outcrop of andesite about 200 feet east of the adit and may be the eastward continuation of the main vein-shear. At the western end of the exposure (Fig. 15) the shear is strongly silicified over widths ranging from 1 foot to 6 feet and consists of fine-grained dark-grey quartz mineralized with pyrrhotite, chalcopyrite, and small amounts of galena and magnetite. A few narrow stringers of white, later quartz cut the silicified shear. In the eastern end, mainly in the adit, although the silicified width is less, being from 3 to 14 inches, the silicification is more intense and results in a well-defined lens of quartz that contains a few wisps of unreplaced andesite and, around and extending from them, streaks of massive sulphide.

The metallic minerals seen in polished sections under the microscope are, in order of abundance: Chalcopyrite, magnetite, and chalcopyrite with smaller amounts of arsenopyrite, pyrrhotite, pyrite, sphalerite, galena, and, closely associated with the galena, a silver-bismuth sulphide, tentatively identified by polarization, etch reactions, and composition as matildite. Further studies of this mineral are being made. Magnetite is abundant in some sections, and a few grains of sphalerite were seen in the chalcopyrite. The magnetite, arsenopyrite, pyrrhotite, and pyrite are all strongly fractured and replaced by chalcopyrite and galena. The matildite occurs in small blades in the galena. No free gold was seen in any of the sections studied, but those sections containing abundant magnetite, arsenopyrite, and chalcopyrite assayed highest in gold.

The assays of material from this silicified shear-zone are given by Sample Nos. 1 to 24 in the accompanying table of assays.

A quartz vein, strike north 48 degrees west and dip vertical, and referred to as No. 4 vein, is found about 500 feet east of the adit. This vein consists of 5 to 6 inches of quartz that follows a strong shear, 6 inches wide, in andesite. It has been intermittently stripped for 50 feet. Sample No. 25 in the accompanying table of assays was taken across this vein.

A strong shear, strike north 85 degrees west and dip 75 degrees south, has been opened by an open-cut at the beach, on the north side of the mouth of June Creek. This cut, 12 feet wide at the mouth, has been driven westerly on the shear, horizontally for 8 feet and then upward on a slope of 55 degrees for 12 feet. The shear has an over-all width of 4 feet, but the strongest shearing is confined to a 4-inch width close to the hanging wall. Short gashes of solid pyrite up to ½ inch thick and of sphalerite up to 1 foot long by 3 inches thick are found in the shear. Quartz is restricted to a few hair-like stringers. Assays of this material are given by Sample Nos. 26 to 31 in the table of assays.

Bedwell River (49° 125° S.W.).*

Gold.

Buccaneer Mine. Operations by the Bralorne Mines, Limited, were suspended in 1942, and all the plant and equipment removed from the property. In 1946 a lease was taken on the mine by S. Craig and associates, of Tofino. Considerable repair-work was done on the road. The aerial tram, from the low-level portal to the road, was replaced. Pillars and stope-remnants, chiefly from the 1601 south drift, were mined by hand-steel.

[Reference: *B.C. Dept. of Mines,* Bull. No. 13, 1941, pp. 47–61.]

* By H. C. Hughes.

Prosper. This property, on the east side of the Bedwell River about 3 miles from the mouth, is now being operated by the Prosper Mining Syndicate (S. J. D. McClay, Manager, Yorkshire Trust Building, Vancouver). Late in the year preliminary work was undertaken with a view to bringing the property into production.

[Reference: *B.C. Dept. of Mines*, Bull. No. 8, 1940, pp. 22–26.]

Noble. This property, owned by J. L. Gibson, is a prospect on the west side of the Bedwell River about 5 miles from tide-water. The showings consist of a number of narrow quartz veins in the volcanics, with values in gold. Noble Cornelius did a small amount of open-cutting and trenching by hand.

Tranquil Creek-Warn Bay Area (49° 125° S.W.).*

General Note.

The Tranquil Creek-Warn Bay area is on the western coast of Vancouver Island, about 15 miles north-easterly by water from Tofino, the nearest base for supplies and transportation.

A launch or small boat may be taken from Tofino to the head of Tranquil Inlet or Warn Bay. A boat capable of passing the bars at the mouth of Tranquil Creek, where the depth of water at high tide is about 4 feet, may continue two-thirds of a mile up-stream to the beach camp. From the camp a tractor-road extends up the western side of Tranquil Creek to a point about 1¾ miles from the mouth. Rough trails extend from the end of the tractor-road to the Fandora and Gold Flake properties and about 5 miles up the valley towards the headwaters of the two main forks of Tranquil Creek.

One mile of truck-road leads from the beach at the head of Warn Bay to the Moscena camp-site. Rough trails branch from the road bridge to various other discoveries near Bulson Creek. Other rough trails extend from Warn Bay to the Free Gold and Gold Flake properties.

The Tranquil Creek-Warn Bay area is rugged, mountainous, and heavily wooded on the steep, bluffy slopes from the valley-bottoms to most of the ridge-tops. The highest peak in the area is just over 4,400 feet above sea-level.

Tranquil Creek is fed by small lakes at its headwaters and has a steep gradient down canyons to the junction of its two main forks, about 3½ miles from the head of Tranquil Inlet. The average gradient of the valley-bottom from the forks to the mouth is less than 100 feet per mile. Down-stream from a 50-foot waterfall about 2 miles from tide-water, the width of the valley-floor increases gradually from a few hundreds of feet to half a mile.

Bulson Creek, within the area, flows through a narrow canyon and has an average gradient of 200 feet per mile to its mouth at the head of Warn Bay.

Of numerous mineral claims staked in the late '90's, nineteen, on the eastern side of Tranquil Creek valley about 3 miles north of the head of Tranquil Inlet, were Crown-granted between forty and fifty years ago and were in good standing in 1946. On these claims lenticular bodies of low-grade copper ore have been explored by surface and underground workings. Most of this work was done before 1904, but some further work has been undertaken from time to time.

In the late '30's several auriferous quartz veins were discovered, claims staked, trails put in, and development-work undertaken. Development-work continued for several years. Surface stripping and some underground development by the Maple Leaf Syndicate in 1941 disclosed interesting possibilities on a property, now owned by Moscena Mines, Limited, near Bulson Creek, 1 mile north of Warn Bay. Surface strip-

* By W. J. Lynott.

ping and underground development on the Fandora property by E. G. Brown and P. Donahue exposed narrow but fairly rich and continuous vein-matter in a strongly sheared andesite dyke. Little was done during the later war years, but work was resumed in 1946 on the Moscena Mines, Limited, and on the Fandora by Privateer Mine, Limited. Gold-bearing veins have been discovered on the Free Gold, Eldorado, 3 J's, and Yankee Boy claims, but they were not being prospected in 1946.

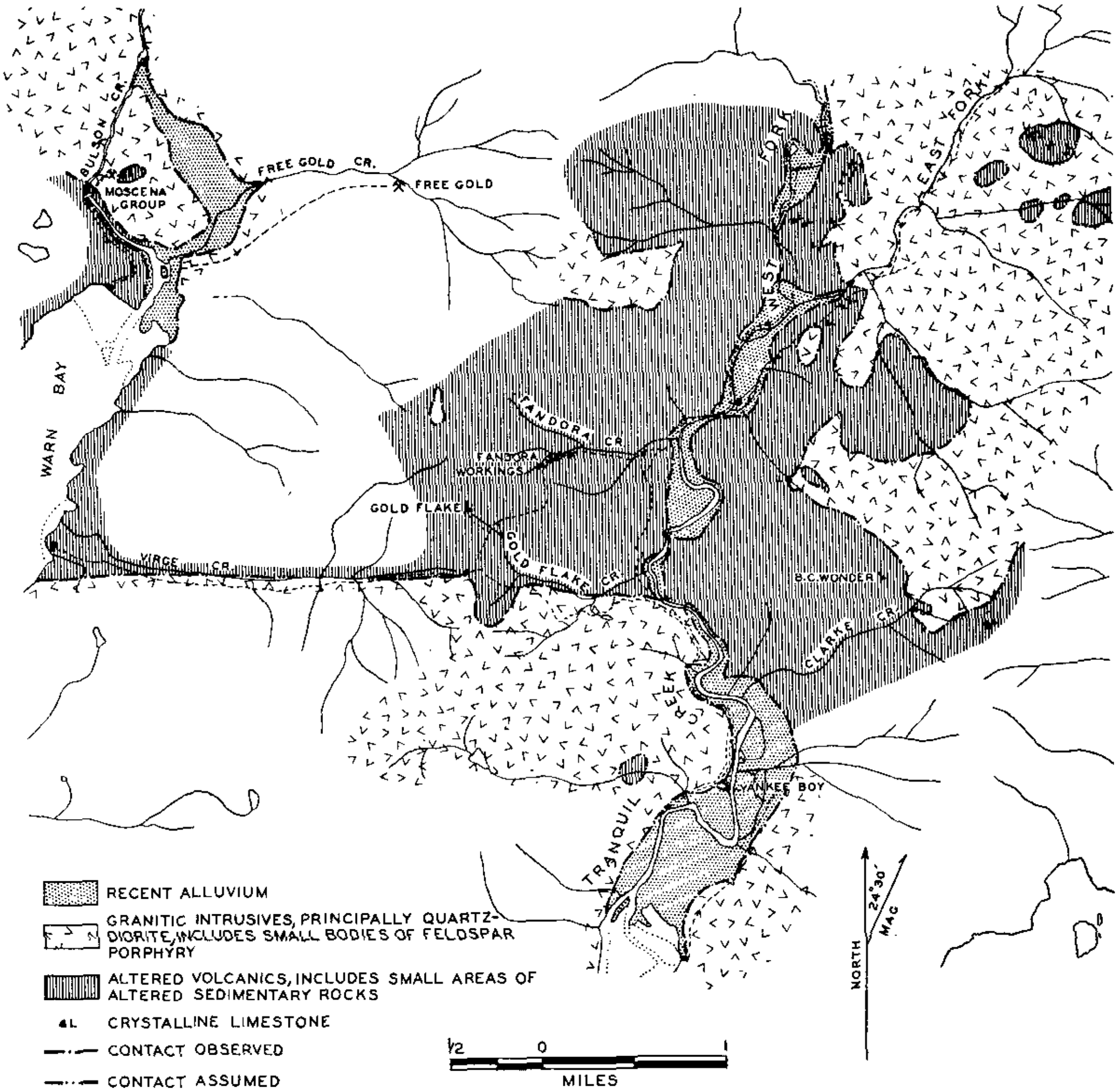


Fig. 16. Preliminary map showing geology of Warn Bay-Tranquil Creek area, Vancouver Island.

In 1905 production of 214 tons, containing 2 oz. of gold, 168 oz. of silver, and 29,379 lb. of copper, was recorded from the Hetty Green property on Tofino Creek, just east of the present area.

In 1940 production of approximately 35 oz. of gold and some silver was recorded from three properties, the Gold Flake, Maple Leaf, and the Yankee Boy.

Altered volcanic rocks and granitic rocks, principally quartz-diorite, are the chief rock-types found in the area. Their distribution is shown in Fig. 16, a map on the scale of 1 mile to 1 inch, based on field-work done in the summer of 1946.

The volcanics found in much of the northern two-thirds of the area extend north from a body of quartz-diorite, of which the northern contact runs easterly from Warn Bay, just south of Virge Creek. Another incompletely mapped body of quartz-diorite is found in the vicinity of Bulson Creek and its principal tributary, Free Gold Creek, which empties into the head of Warn Bay. An unmapped area extends east from Bulson Creek to the divide between Free Gold Creek and the west fork of Tranquil Creek. At the divide a tongue of quartz-diorite about one-third of a mile wide has been mapped for a length of about half a mile. A third considerable body of quartz-diorite is found in the north-eastern part of the area.

The volcanic rock is now altered to greenstone and is composed largely of secondary minerals. Probably the rock was originally andesitic in composition. Lenses of crystalline limestone with a maximum length of a few hundred feet, lenses of other sedimentary rocks and of garnet-diopside rock are found in the altered volcanics. Dykes and small masses of feldspar porphyry and some small masses of quartz-diorite are found in the areas of greenstone, which are also cut by later andesitic and basaltic dykes.

Most of the quartz-diorite is massive, but it is gneissic along the quartz-diorite side of some contacts with older rocks. The most extensive area of gneissic quartz-diorite is along the border zones of the large area lying south of Virge and Gold Flake Creeks. Along the contacts of other bodies of quartz-diorite, breccia-zones of varying width are found, in which the bordering volcanics have been brecciated and the fragments sealed by quartz-diorite.

The quartz-diorite bodies contain pendants and small masses of andesite and sediments. These included rocks are particularly abundant in an area about three-quarters of a mile in diameter on the east side of the east fork of Tranquil Creek, about 1 mile up-stream from its junction with Tranquil Creek. The abundance of included rock here and brecciation of much of it, suggest that this area is close to the original roof of the batholith.

The typical quartz-diorite of the area is greyish-white in colour and medium-grained in texture. The principal minerals are quartz, 10 to 35 per cent.; feldspar, up to 70 per cent., of which less than one-third is orthoclase and the remainder oligoclase plagioclase; hornblende and biotite. The minor accessory minerals include apatite, magnetite, sphene, pyrite, and hematite, and the secondary minerals include sericite, epidote, clinozoisite, and chlorite. The feldspars are sericitized, the orthoclase usually more than the plagioclase, and the hornblende and biotite are partly altered to chlorite. The moderate amount of quartz and an orthoclase-feldspar to plagioclase-feldspar ratio of less than 1 to 3 serve to classify the rock mineralogically as a quartz-diorite.

Dykes of several types and ages are found in both the andesite and the quartz-diorite. They include basalt, andesite and feldspar porphyry, and quartz feldspar porphyry. Most of the dykes cut both the quartz-diorite and andesite, but none were seen cutting the altered sediments and only one dyke, an altered fine-grained andesite or basalt, was seen cutting limestone.

Isolated outcrops of feldspar porphyry were seen within areas mapped as underlain by quartz-diorite, but nowhere was the rock seen in contact with the quartz-diorite. The feldspar porphyry consists of plagioclase feldspar (oligoclase-andesine) and some quartz phenocrysts in a fine-grained ground-mass. It also contains some patches of hornblende, magnetite, ilmenite, sphene, hematite, and pyrite. Secondary minerals include chlorite, epidote, clinozoisite, and leucoxene. The rock has a fresh appearance and is thought to be a quickly cooled or low-pressure phase of the quartz-diorite. Similar rock intrudes the andesite.

Three different strike and dip groups of fractures constitute the main structural features of the area. One group strikes north 65 to 80 degrees east and is approximately vertical in dip, a second group strikes north-west and is also approximately vertical in dip, and a third group is nearly flat-lying. The north-easterly striking group of fractures is reflected in the topography by deep, narrow chimneys and gorges, approximately transverse to the northerly trending ridges and steep valley-sides. The flat-lying fractures are marked by benches and small caves on the precipitous bluffs of the hillsides.

Gold-bearing quartz veins occupying well-defined shear-zones and sheeted zones constitute the main type of ore deposit in the area. Such veins are found in the altered volcanics, in the quartz-diorite, and in later andesite dykes.

The time of mineralization was later than the intrusion of the quartz-diorite and of the andesite dykes that cut the quartz-diorite. An early period of mineralization, characterized by the development, in shear-zones, of narrow veins or lenses of quartz with sparse sulphides was followed, after further movement along the shear-zone, by later mineralization characterized by the introduction of sulphides and gold along sheeted zones within the earlier quartz. Gold may also have been introduced in the early period of mineralization.

Gold.

Fandora.

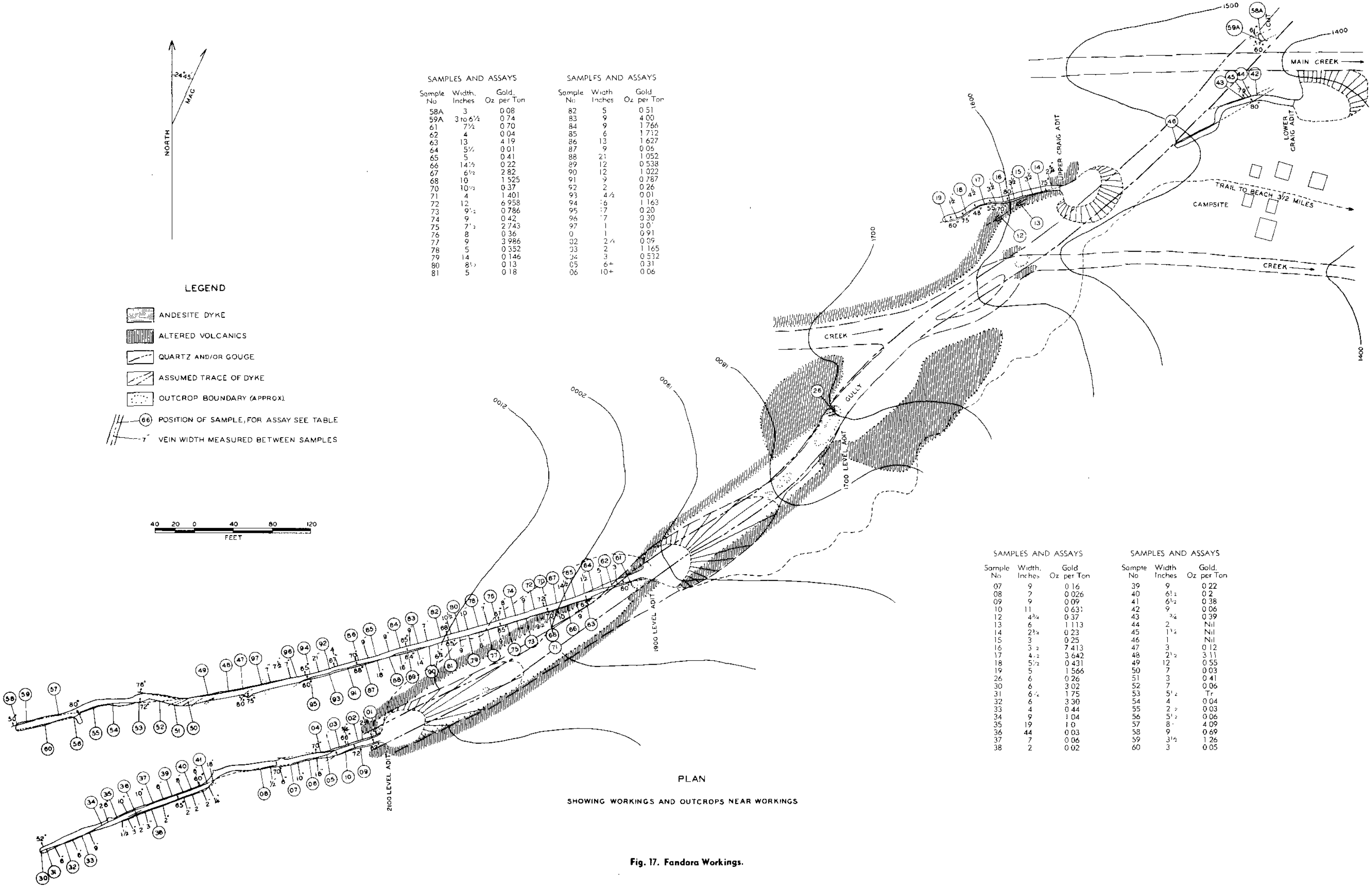
This property, held under option by Privateer Mine, Limited, consists of three groups of unsurveyed claims as follows: The Fandora, owned by Fandora Gold Mining Company, Limited, and consisting of the Edmar, Edmar No. 1 Fractional, and Edmar Nos. 2 to 7, inclusive; the Gold Flake, owned by Gold Flake Mines, Limited, and consisting of Gold Flake, Gold Flake Nos. 2 to 5, inclusive, and Tranquil Gold Nos. 3 and 4; the Tofino, owned by Mary Mining Company, Limited, and consisting of Mary, Mary No. 1, Mary No. 2, Mary No. 4, and Mary No. 5.

The main showings lie on the Mary and Mary No. 1 claims and on the Edmar and Edmar No. 1 Fractional claims, on the western side of Tranquil Creek, between about 1,400 and 2,100 feet above sea-level, some 2½ miles north of the head of Tranquil Inlet.

From the end of the tractor-road, 1¾ miles from the mouth of Tranquil Creek, a rough trail about 2 miles long leads to the present Fandora camp-site and the near-by showings. The last half a mile of trail climbs steeply up a series of bluffs from an elevation of 500 feet to the camp-site at an elevation of about 1,500 feet.

The area of the claims is steep and rugged, but, notwithstanding the steep and bluffy nature of the mountain-slopes, a heavy mantle of overburden obscures much of the bed-rock. The slopes are heavily wooded, affording ample timber for mining. In Tranquil Creek an abundant supply of water is assured all year round for power, mill, and camp purposes. At an elevation of 500 feet, about 1½ miles east of the mine and easterly towards Tranquil Creek, much gently sloping ground is available for a camp-site and mill-site.

The discovery of gold-quartz veins was made in the late '30's, when several claims were recorded and development was undertaken, including driving the Craig adits. For several years in the early '40's work was on a very modest scale. Some of this work, however, disclosed a shear-zone usually containing two narrow but fairly rich veins separated by 3 or 4 feet of andesite dyke-rock. An adit 400 feet long at about 1,900 feet elevation and another 100 feet long at about 2,100 feet elevation were driven along the shear-zone. Continuity, width, and values proved much more promising than in earlier workings driven on gold-quartz veins cutting altered volcanic rocks near the andesite dyke.



SAMPLES AND ASSAYS

Sample No	Width, Inches	Gold, Oz per Ton
58A	3	0.08
59A	3 to 6½	0.74
61	7½	0.70
62	4	0.04
63	13	4.19
64	5½	0.01
65	5	0.41
66	14½	0.22
67	6½	2.82
68	10	1.525
70	10½	0.37
71	4	1.401
72	12	6.958
73	9½	0.786
74	9	0.42
75	7½	2.743
76	8	0.36
77	9	3.986
78	5	0.352
79	14	0.146
80	8½	0.13
81	5	0.18

SAMPLES AND ASSAYS

Sample No	Width Inches	Gold Oz per Ton
82	5	0.51
83	9	4.00
84	9	1.766
85	6	1.712
86	13	1.627
87	9	0.06
88	21	1.052
89	12	0.538
90	12	1.022
91	9	0.787
92	2	0.26
93	4½	0.01
94	16	1.163
95	17	0.20
96	17	0.30
97	1	0.01
0	1	0.91
02	2¼	0.09
03	2	1.165
04	3	0.532
05	6+	0.31
06	10+	0.06

SAMPLES AND ASSAYS

Sample No	Width, Inches	Gold Oz per Ton
07	9	0.16
08	7	0.026
09	9	0.09
10	11	0.633
12	4¾	0.37
13	6	1.113
14	2¾	0.23
15	3	0.25
16	3½	7.413
17	4½	3.642
18	5½	0.431
19	5	1.566
26	6	0.26
30	6	3.02
31	6¼	1.75
32	6	3.30
33	4	0.44
34	9	1.04
35	19	1.0
36	44	0.03
37	7	0.06
38	2	0.02

SAMPLES AND ASSAYS

Sample No	Width Inches	Gold. Oz per Ton
39	9	0.22
40	6½	0.2
41	6½	0.38
42	9	0.06
43	¾	0.39
44	2	Nil
45	1¾	Nil
46	1	Nil
47	3	0.12
48	2½	3.11
49	12	0.55
50	7	0.03
51	3	0.41
52	7	0.06
53	5½	Tr
54	4	0.04
55	2½	0.03
56	5½	0.06
57	8½	4.09
58	9	0.69
59	3½	1.26
60	3	0.05

PLAN

SHOWING WORKINGS AND OUTCROPS NEAR WORKINGS

Fig. 17. Fandora Workings.

The property was optioned by Privateer Mine, Limited, in 1946. In the period May to July 29th, 1946, the 2100 level was extended from 100 feet to 370 feet, the 1900 level was extended from 400 feet to 660 feet, and a new level was started in the dyke at an elevation of 1,700 feet. A crew of eight men continued driving the 1,900- and 1,700-foot levels by hand-mining after July 29th. The rock breaks easily, and proved particularly amenable to hand-mining; much timbering was required.

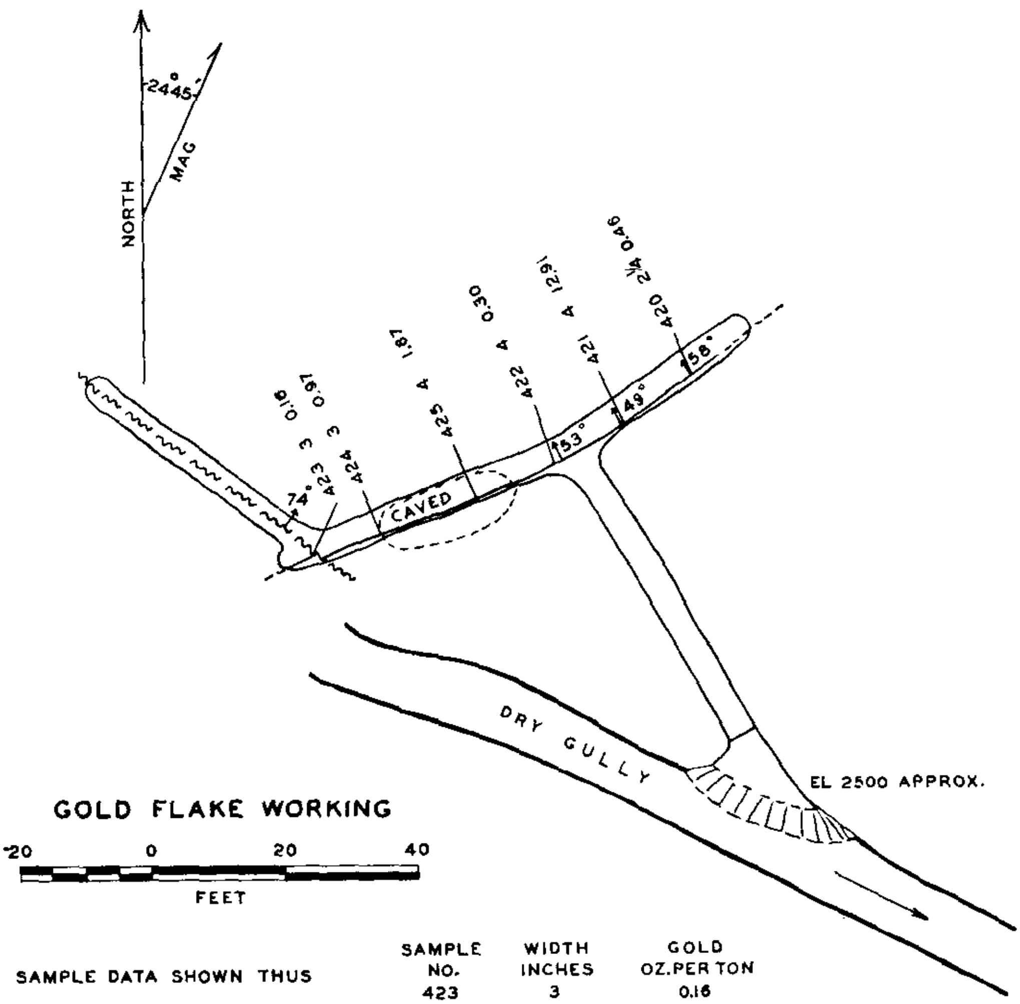


Fig. 18.

The claims are underlain by altered volcanics, tuffs, and breccias. These rocks are cut by dykes and small bodies of feldspar porphyry and by dykes of andesite and basalt. Quartz-diorite is exposed half a mile to the north-west and about half a mile to the south-west and south.

Steeply dipping fractures, striking north of east to south of east, cut the volcanic rocks and are often reflected in the topography as narrow canyons. In the area of the showings an andesite porphyry dyke 10 to 20 feet wide, strike north 70 to 80 degrees east and dip 60 to 75 degrees north-westward, follows such a fracture. The dyke is exposed in the workings and in a few places along the gully-bottom marking its course, from an elevation of 2,100 feet down to an elevation of about 1,450 feet, a horizontal distance of about 1,200 feet. Extensions of the dyke beyond the 2,100- and 1,450-foot elevations are covered by overburden. On top of a ridge at an elevation of about 2,700 feet, 1,300 feet south-westerly from the Fandora workings, a similar dyke outcrops but apparently dips about 45 degrees south-east. Along the extended trace, about half a mile south-westerly from the Fandora workings, the Gold Flake working at about 2,500 feet elevation exposes a narrow auriferous quartz vein in altered volcanics near an andesite dyke. This working is close to a small mass of quartz-diorite intruding the altered volcanics.

In the three levels, at 2,100-, 1,900-, and 1,700-foot elevations, and in an open-cut at 1,450 feet, two narrow but continuous veins about 4 to 5 feet apart occur along parallel shears in a zone that, in part, follows the dyke. Values in the veins are spotty but are high in parts of their lengths (*see* Fig. 17). In places the veins narrow and, as a result of post-vein movement along the walls, pass into gouge, crushed rock, and quartz fragments that may contain moderate amounts of gold.

The vein-matter is sheeted; thin partings of rusty material or fine sulphides separate plates of unsheared vein-filling. Varying widths of rusty gouge are found along the walls. Oxidation is noted in most parts of the veins so far exposed.

The vein-matter consists of quartz; some carbonate; altered wall-rock; finely crystalline pyrite, where free from oxidation; and, rarely, finely crystalline chalcopyrite, galena, and sphalerite. Although fine colours may often be seen in panning vein-matter, gold is rarely visible in hand specimens.

The effect of oxidation and circulating ground-water within the vein-shears may have some effect on the concentration of gold values by leaching the other vein-matter.

The sampling and measurement of veins was handicapped by lagging. Where possible, channel samples were taken 20 feet apart across maximum accessible vein-widths on both the hanging-wall and foot-wall veins. The width sampled is not necessarily the full width of the vein. The details of sampling and assay results are shown in Fig. 17.

Gold-quartz veins cutting altered volcanics in the hanging-wall and foot-wall rock of the dyke are exposed in the near-by Craig adits (Fig. 17). These veins are apparently weaker and less regular than those in the more competent dyke-rock.

Other veins in greenstone have been discovered about 1,400 feet north-westerly and northerly from the Fandora workings.

A working on the Gold Flake property shows a 4-inch vein cutting altered volcanics near a contact with quartz-diorite and fresh andesitic rock. The details of sampling this vein and the assay results are shown in Fig. 18.

Moscena. This property, consisting of the unsurveyed mineral claims Maple Leaf Nos. 1 to 7, inclusive, Kim, and Kim Fractional is owned by Moscena Mines, Limited. The main showings lie on the Maple Leaf Nos. 1 to 4, inclusive, on the eastern side of Bulson Creek at elevations between 240 and 500 feet above sea-level.

One mile of 8- foot tractor-road leads from the head of Warn Bay up the western side of Bulson Creek, across a bridge over Bulson Creek to the Moscena camp-site. Short trails extend from the camp-site to the various workings.

The claims extend over a relatively low, glaciated, rugged rocky knob. Overburden obscures much of the geology in the vicinity of the showings, but the vein-shears are marked by straight, narrow, rock-walled, remarkably persistent parallel gullies.

The area is covered by heavy growth, and mine-timber is plentiful. An abundant year-round supply of water is available from Bulson Creek for power, mill, and camp purposes. Much flat ground is available for a camp-site.

The discovery and early development in this area were practically contemporaneous with that of the Tranquil Creek area. The property was acquired in 1941–42 by staking and purchase by the Maple Leaf Syndicate, who did most of the surface and underground development and in 1942 suspended operations because of war-time conditions. Moscena Mines, Limited, later acquired the property and resumed activity in 1946, completed the tractor-road and bridge to the camp, and with machine-drills commenced a crosscut at 225 feet elevation to intersect several veins on the property at varying distances below the surface.

The claims are underlain by quartz-diorite and by pendants of volcanics and sedimentary rocks which are cut by dykes of andesite and andesite porphyry. The altered volcanics are cut by small bodies of fresh feldspar porphyry.

Four veins now exposed in the workings follow fractures, strike north 40 to 45 degrees west, dip almost vertical, that are marked by long, narrow draws. The wall-rock of the veins is either quartz-diorite, fresh andesite, or a breccia composed of altered sediments and volcanics with quartz-diorite matrix.

The straight gullies extend from the quartz-diorite and breccia into the garnet rock and coarsely crystalline limestone without apparent deflection. No quartz veins are exposed in unbrecciated zones of the altered older rocks.

Of the four veins and stringers mentioned above, most of the development has been done on the Shaft and the " E " veins. A vein known as the " H " vein is exposed in surface cuts.

The Shaft vein (Fig. 19) is exposed in a gully about 500 feet long. The vein has been exposed intermittently for a length of about 400 feet in a 15-foot adit, a 25-foot vertical shaft, and several open-cuts, some of which are now filled. Elevations on the vein-outcrop range from 260 to 310 feet above sea-level. The gully is terminated to the north-west by a bluff. The vein has not been traced to the south-east beyond a contact between andesite and limestone about 40 feet south-east of the shaft. The details of the sampling and the assay results shown in Fig. 19 are for channel samples, which, where possible, were taken across the width of the vein.

The " E " vein (Fig. 19) is exposed in a gully about 900 feet long by open-cuts distributed along a length of 800 feet. Some 70 feet below the vein-outcrop a crosscut and drift have been driven where the vein is exposed over a length of 200 feet. Elevations on exposed vein range between 430 feet in the drift to about 550 feet at the surface. Channel samples were taken in surface workings and in the drift; details of the sampling and assay results are shown in Fig. 18.

The " H " vein (Fig. 19) is exposed intermittently in open-cuts extending along the base of a 10- to 20-foot bluff over a distance of some 170 feet. Channel samples were taken in the open-cuts; the details of sampling and assay results are shown in Fig. 19.

A small vein is exposed in an open-cut about 30 feet north of the crosscut at 240 feet elevation and again in the crosscut about 23 feet in from the portal. A channel sample taken across the vein in the open-cut assayed 0.01 oz. gold per ton across 5¼ inches.

Small stringers are exposed along the trail between the Shaft vein and the 430 level portal at points about 180 feet, 230 feet, and 254 feet northerly from the shaft. No samples were taken.

A straight, narrow gully, about 500 feet long and parallel to the " E " vein, occurs between the " E " and " H " veins, about 50 feet south-west of the " H " vein. It has been reported that single cuts in such gullies have exposed vein material, and possibly a vein was discovered here, referred to as the " F " vein.

The veins on the Moscena property, where mineralized, are sheeted, but massive, and contain varying amounts of sulphide in bands parallel to the walls. The walls are separated from the vein by a thin parting of gouge and iron oxide.

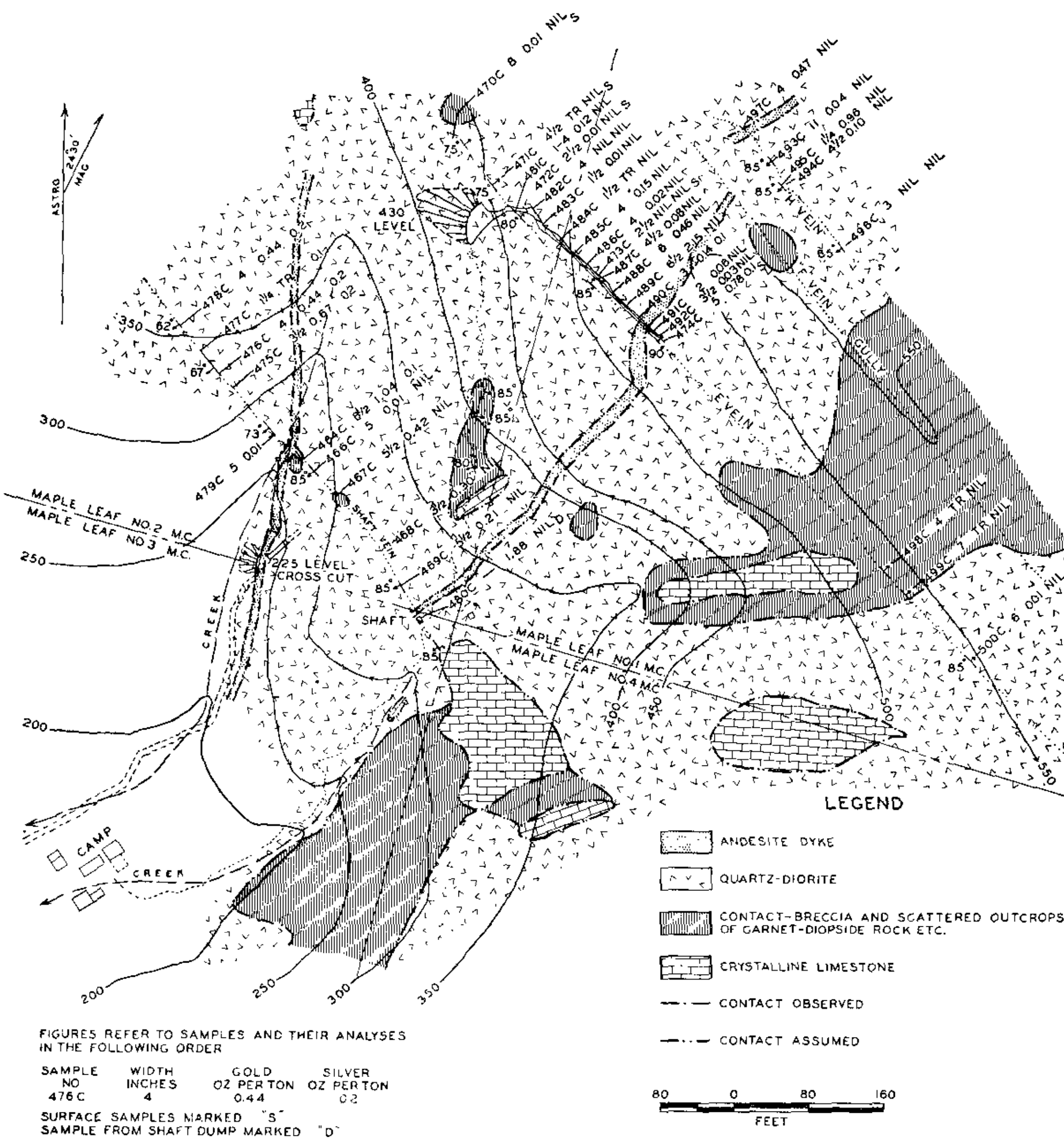


Fig. 19. Moscena—surface geology and plan of workings.

The vein-matter consists of quartz, carbonates, and sulphides, including pyrite, chalcopyrite, arsenopyrite, sphalerite, and galena. One speck of free gold associated with finely disseminated galena in quartz was seen in a specimen from the shaft dump. The sulphides are coarser in texture than those seen in vein-matter of the Fandora property.

Mineralization in the form of sulphides is sparse in the quartz-diorite wall-rock, although alteration close to the veins is evident.

GREAT CENTRAL LAKE (49° 125° S.W.).*

Gold.

Sherwood, Cangold Mining and Exploration Co., Ltd. Company office, 711 Credit Foncier Building, Vancouver. M. A. Connelly, President. Capital: 3,000,000 shares, no par value. The company has the Sherwood group of twenty claims under option. In the summer of 1946 the road from the end of the old logging-grade to the mill-site, a distance of 18,000 feet, was completed. A gasoline-powered sawmill was built, and a quantity of lumber cut in preparation for camp and mill construction. Operations were suspended on October 10th, 1946, because of adverse weather conditions. A crew of fifty men was employed.

[References: *B.C. Dept. of Mines*, Bull. No. 13, pp. 86–95. *Minister of Mines, B.C.*, Ann. Rept., 1945, p. 115.]

DUNCAN (48° 125° N.W.).*

Gold-Copper-Zinc.

Twin J Mines, Ltd. Company office, 507 Stock Exchange Building, Vancouver. Olier Besner, President; P. E. Peterson, Mine Manager. Capital: 3,000,000 shares, $1 par value. This property, closed since the termination of the Wartime Metals operation in 1944, was reopened during the summer of 1946. All mining and milling equipment, as well as camp buildings, was left on the ground. A small crew has been repairing and retimbering the underground workings in preparation for the resumption of milling operations in the spring, when power becomes available.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1944, p. 67. *Can. Inst. Min. and Met.*, Trans. Vol. XLVIII, 1945, pp. 294–308.]

* By H. C. Hughes.

PLACER-MINING.

CONTENTS.

ATLIN.*

Spruce Creek (59° 133° N.W.).

Dream, Shamrock, and New Year Leases, Columbia Development, Ltd. J. H. Eastman, Managing Director. Capital: 50,000 shares, $1 par value; issued 50,000. The company has been working the Dream, Shamrock, and New Year leases under a lease agreement with J. W. Noland. The agreement covered a lineal distance of 2,000 feet along Spruce Creek and had a time-limit of six years. At the expiration of the lease on August 25th, 1946, all the unworked ground reverted to

* By Charles Graham.

Noland. Owing to the shortage of labour during the war years the company was unable to mine up to the up-stream limit, being short about 450 feet. As the agreement called for all company equipment being off the property on the expiry date of the lease, mining ceased on August 3rd. Active development ceased early in January, and extraction of pillars was carried on until abandonment. The B drive, the main development drive on the south side, was continued up to the time development ceased.

The pillar along this drive was left intact, and the drive was open up to the face at last inspection, July 26th, 1946. Owing to the pay-channel swinging slightly to the north, J drive ran into the main pay-channel and was discontinued as a development drive. All pillars along the north boundary were drawn as far back as 29 crosscut. J drive was open up to that point, approximately 1,700 feet from the shaft. All equipment, including track, air-lines, water-line, fan and pipe-line, battery locomotive, and the electric pumps at the bottom of No. 2 shaft and Dream shaft, was taken out. Nothing has been done in this shaft since.

J. W. Noland Placers. J. W. Noland, owner and operator. All leases from the Dorothy Lease No. 608 up-stream to St. Nicholas Lease No. 707, with the exception of Clydesdale Lease No. 607, are owned or controlled by J. W. Noland, who has purchased the holdings of Spruce Creek Mining Company, Limited (Colpe Mining Company), which contained the Knapp No. 1063, Chance and Last Chance No. 863, Goodwill No. 645, and Sunlight No. 644 leases. These leases had all been worked by their former owners, and Noland's object is to use them for draining the up-stream leases. Formerly No. 2 and No. 4 shafts were unconnected, but Noland has driven a drain from No. 2 shaft down-stream to connect with the old workings in No. 4 shaft. He also completed a connection from the Dream lease to the Goodwill lease. No effort was made to acquire the equipment, in place, of the Columbia Development, Limited, so that section has been idle since the company moved out. A maximum of seven men was employed during the summer.

Northern Resources, Ltd. Company office, 616 Stock Exchange Building, Vancouver. T. W. Thompson, Manager. The company has acquired the holdings and equipment of Spruce Creek Placers, Limited, the only surface operation on the creek, which was closed in 1942 owing to shortage of labour. Northern Resources, Limited, took over this summer (1946) but did not get into production.

Thirty Keystone-drill holes were put down to bed-rock, which, in this section, is less than 50 feet deep. Some repairs were made to the flume through which the creek is diverted past the pit. The pit was cleaned out and 300 feet of bed-rock drain put in. The shovel, sluice plant, and drag-line for handling tailings were overhauled. The company expects to start active production in 1947 as soon as water conditions permit.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1941, p. 82.]

A number of small lay operations employing from one to three men were operating in the benches during most of the year.

Pine Creek (59° 133° N.W.).

Northern Resources, Ltd. T. W. Thompson, Manager. Operations were resumed in the spring of 1946 for the first time since 1942. A drainage-ditch, 5 by 6 feet in section, was excavated by drag-line shovel for a distance of 1,600 feet along the northern edge of Pine Creek. It gives bed-rock drainage for the old hydraulic pit operated in previous years by Mr. Acheson and sons. The greatest depth of bed-rock cut through was 15 feet and the maximum depth from surface was 56 feet. The ditch was covered to a depth of 6 feet with loose fine dirt. The company has an ample supply of water from Surprise Lake for hydraulic and power purposes.

It is proposed to wash off the surface dirt with monitors and to use the drag-line shovel to load the pay-gravels into a mobile sluicing plant. Power is supplied by a hydro-electric plant, working under an effective water-head of 132 feet. The drag-line and all the equipment in the sluicing plant are operated electrically. Tailings are disposed of by a belt conveyer.

It required all season to dig the ditch and to get the water piped into the pit. Sluicing will start in 1947 as soon as the season opens.

Five holes were put down by Keystone drill along Willow Creek, the deepest hole, at the edge of Moose Lake, being 90 feet, entirely in glacial muck.

Ruby Creek (59° 133° N.E.).

Gladstone, Graystone, and Redstone Leases, Columbia Development, Ltd.

J. H. Eastman, Managing Director. The company has an option on the Gladstone, Graystone, and Redstone leases. The former owner, E. Krumbeigel, had sunk a shaft on the Gladstone lease and got down through the lava overburden into the gravels when lack of finances forced him to suspend operations. The company repaired the surface plant in 1945, and in 1946 completed the sinking of the shaft to bed-rock at 173 feet. There is about 38 feet of gravel between bed-rock and the overlying lava. A drift was driven from the shaft-bottom for 44 feet north 24 degrees west, then a crosscut was turned left from that point to cross the valley to define the pay-channel. This was in 36 feet when operations were suspended for the winter. Some gold was found on bed-rock. The elevation is about 3,700 feet, and the plant is not fully equipped for winter operation.

J. H. Eastman, managing director of the company and in charge of the operations in Atlin, died suddenly in September. The future policy of the company is not yet clear.

Farmer Lease.—Messrs. Wickstrom, Sunde, and Nelson, owners. These men purchased the lease from J. W. Noland and are drifting up-stream on bed-rock. Entrance is by a short slope, and hoisting is done by drum, powered by water-wheel.

Boulder Creek (59° 133° N.E.).

The hydraulic property owned and formerly operated by Consolidated Mining and Smelting Company is now worked on a lay by Norman Fisher and six other men, all partners in the lay. Water is scarce, and they have only two runs of water of from three to four hours duration daily.

McKee Creek (59° 133° S.W.).

Messrs. Swanson and Watts have moved their hydraulic plant to a new location farther up-stream.

Mr. Conroy and partner are drifting in the right bench.

Gus Gaensbaurer and son are drifting in the left bench.

Otter Creek (59° 133° N.E.).

Nothing was done on the creek during the year.

Consolation Creek (59° 133° N.E.).

Trailer Lease, Northern Resources, Ltd.

T. W. Thompson, Manager. Eleven holes were drilled to a depth of 140 feet. Bed-rock was not reached in any hole, and no values were obtained. The company set a depth-limit of 140 feet on the drill-holes and apparently is not interested in the possibilities of a deep lead. A truck-road, which goes in by way of Fourth of July Creek, was completed to the property during the summer.

Norman Fisher and five partners sank a small shaft during the early spring of 1945, reaching rim-rock at 45 feet. They were not on the channel. The creek was not visited.

OMINECA.*

Germansen Creek (55° 124° N.W.).

Hydraulicking was continued by Mr. Loper on the property formerly operated by Germansen Ventures, Limited.

Twenty Mile Creek (55° 124° N.W.).

Mrs. Tate did some work on the W. Martin leases on Twin Creek, a tributary of Twenty Mile Creek, preparatory to hydraulic operations in the spring.

Manson Creek (55° 124° N.W.).

Gruen Placer, Ltd.

James M. Dunsmore, President. The company has acquired two bench leases—one on each bank of Manson River—and one bench lease on the west side of Wolverine Lake. Some work was done on a road from the main highway, and preparations made to begin operations in the spring of 1947. The company plans to work what is claimed to be a Tertiary channel about 70 feet above Manson River. The channel is estimated to be 40 feet wide and to have approximately 20 feet of overburden.

CARIBOO.†

All hydraulic operations were severely curtailed by the very dry season.

Willow River Area (53° 121° S.W.).

Lowhee Mining Co., Ltd.

This private company (office, 605 Tacoma Building, Tacoma 2, Wash.) continued to operate the Lowhee placer mine near Barkerville. In 1946 the pit became wider than in previous years (*see* Fig. 8, facing page 91), and no connection was made with Stouts Gulch. With J. House in charge and thirteen men employed on two shifts, 125,000 cubic yards of gravel was hydraulicked.

J. Chouse on Coulter Creek.—The pay-streak on Coulter Creek is overlain by 60 to 90 feet of overburden. The small amount of water available restricts the amount of bed-rock pay-gravel that can be hydraulicked each season. The clean-up was less than in previous years. It is reported that Cariboo Metals, Limited, acting through Alvo V. Alvensleben, optioned the property in the later part of the year.

L. Bedford and K. Huttula in Devil's Canyon.—In previous years Messrs. Bedford and Huttula had drifted in on a high rim on the Barton lease. In 1946 hydraulic operations were started, and though only a 40-foot head of water was available, about 5,000 cubic yards was hydraulicked.

Eric Rask on Devil's Lake Creek.—Three thousand cubic yards is reported to have been hydraulicked.

William Hong on the Toon Sing Tong Claim on Slough Creek.—Hydraulic operations were carried on here, with three men employed. The hydraulicking uncovered a fault-zone 100 feet wide containing numerous quartz stringers, abundant silicification and pyritization. A quartz vein on the foot-wall side of the fault-zone is sparsely mineralized with pyrite and sphalerite.

* By Charles Graham.

† By J. W. Peck, except as noted.

Ketch Placers.—R. MacDougall, employing six men, removed an estimated 30,000 cubic yards in opening up a hydraulic pit on the lower part of Olally Creek. Bed-rock was not reached in the pit. Later a test-shaft was sunk about 45 feet to reach bed-rock.

J. J. Gunn on Red Gulch, near Wells.—Continued to hydraulic near the head of the old drift workings on Red Gulch.

Alert Placers, Ltd.—With R. M. VanBibber in charge, 5,000 cubic yards of gravel was hydraulicked from a pit on Williams Creek, east of the town of Barkerville. Four men were employed.

W. H. Savery on Mink Gulch.—Four men removed 500 cubic yards of gravel early in the year.

M. A. Andersen.—Hydraulicking operations removed 1,360 cubic yards from this lease on Eight Mile Lake.

A. Tremblay on Jubilee Creek.—In 1946 only road-building, ground-sluicing, and testing were done.

Roy Taylor on Queen of Clubs Creek.—About 1,000 cubic yards of gravel was reported removed by ground-sluicing.

J. Fry on Rouchon Creek.—Work was continued.

K. K. Langford on Aura Fina Creek.—Two men drove 50 feet of rock tunnel with hand-steel. This crosscut was begun in 1944, with the expectation of breaking through the rim of a buried channel.

Hyde Creek.—P. McColm worked the O. R. Hougen lease and removed 2,000 cubic yards.

ANTLER CREEK (53° 121° S.E.).

Guyet Placer. Mines Operating, Incorporated, company office, 1052 Stuart Building, Seattle, Wash., has acquired the placer and mineral rights to this property on Mount Guyet. The workings are reached from the Barkerville–Hudson Mine Road by about 1½ miles of road and trail. It is believed that an unworked channel exists on the western side of the old hydraulic pit. During 1946 hydraulicking was done at the mouth of the pit to obtain a grade to work towards this objective. S. C. Reid and one man were employed.

Waverly Placer.—W. Moore allowed two men and two women to snipe on the shallow pits on Grouse Creek.

A. Holm and P. M. Peterson.—These two men had a successful year, removing 2,500 cubic yards from their lease at Sawmill Flats.

CUNNINGHAM CREEK (52° 121° N.E.).

W. Beamish and one man worked out a pit with a small hydraulic. The operation is on the Barkerville–Hudson Mine Road.

COTTONWOOD RIVER AREA (53° 122°).

Little Swift River.

Lease of O. Mattreson and A. Gustafason.—These two men reported driving 124 feet of 4- by 6-foot drift and also ground-sluicing a total of 12,500 cubic yards.

Lightning Creek.

Mr. and Mrs. Leroy Biggs continued to work their lease on Houseman (Eagle) Creek. They also did some ground-sluice testing at the east end of Dunbar Flat.

Jack Hind and Frank Freeman built a dam on the upper part of Grub Gulch to enable them to use water diverted from Upper Van Winkle Creek through an old high-level ditch.

Emil Falck continued to work near the mouth of Anderson Creek.

Magnus Sundberg sold his three leases on Donovan Creek to F. Peterson and M. Rottaker, who began reconditioning the ditch system preparatory to working in 1947.

Wingdam and Lightning Creek Placer.*

(53° 121° S.W.) Five special placer leases and five placer leases are held by J. A. Maller, care of 744 Hastings Street West, Vancouver. These leases lie along Lightning Creek and extend down-stream from the mouth of Anderson Creek as far as the mouth of Meadow Creek, near Cottonwood. They cover the ground formerly held by Consolidated Gold Alluvials of B.C., Limited. During the summer a camp was established at Wingdam, a crew of men was gathered together, preliminary surveys made, and testing and exploratory work begun. W. N. Taylor was in charge of operations.

Work undertaken during 1946 was a geophysical survey of the property, followed by Keystone drilling to determine depths to bed-rock and gold content of the gravels. The geophysical survey was made by the Geophysical Prospecting Company, Limited, of London, under the supervision of J. C. Templeton, with Philip D. Brown in charge on the ground. Surveyed section lines were cut across the valley-bottom at right angles to the valley direction and at 1,000-foot intervals. Determinations of depth to bed-rock were made (by an electrical resistivity method) at stations 100 feet apart along the section lines. Keystone-drill holes will be put down to check the bed-rock depth determinations and to determine gold values at selected points.

The first cross-section drilled was at the up-stream end of the holdings and lies between the mouth of Anderson Creek and the old LaFontaine shaft. Five drill-holes were completed.

The drilling was being done by one Keystone drill, rented locally, and by one of three drills shipped out from England. The drillers were Jim McHardie and Leroy Biggs.

Ten shallow test-shafts were sunk at the western limit of the leases, near the junction of Lightning Creek and Swift River.

Cottonwood River.

Swift River Dredging Co., Ltd.*

(52° 122° N.E. and 53° 122° S.E.) E. A. Kent, 260 California Street, San Francisco, Calif., has extensive placer lease holdings on Swift and Cottonwood Rivers and on Quesnel River. Test-work had been done on the Swift River leases in 1940, 1941, and 1945. In June, 1946, a drag-line dredge was shipped into the property by the Swift River Dredging Company, assembled in three weeks, and began digging on July 7th. J. V. Rice is president and general manager and G. Hinkley was superintendent in charge of the dredge. The boat is built from five steel pontoons, 8 by 40 feet by 41 inches deep, made by Yarrows in Victoria.

The washing plant was assembled from sectionalized parts shipped in from California and designed for easy bolting together and dismantling. A feature of the design of the washing plant is the incorporation of a distributing system, patterned after those used on bucket-line dredges. It necessitates 7 feet additional height to accommodate the two launders, the second of which splits the feed into a number of equal parts, each of which goes to a riffle-box 30 inches wide. The top launder has riffles of expanded metal screen over cocoa matting, and in it about three-quarters of the gold is caught. In other respects the washing plant follows standard practice and differs only in size from plants operating elsewhere.

The riffles are set on a grade of 1½ inches per foot and consist of expanded metal screen laid over rubber mats. They are charged with mercury to help retain the fine gold.

* By Stuart S. Holland.

The digging unit is a 2½-yard North West Diesel-powered shovel, using a 2-yard Paige bucket. The depth being dug ranges from 7 to 15 feet and averages about 9 feet to clay false bed-rock.

The dredge was assembled at the junction of Lightning Creek and Swift River. It began digging on July 7th and continued until November, dredging a strip down-stream along the east side of Cottonwood River ranging from 100 to 250 feet wide and more than 4,000 feet long. The dredge started by taking some of the low benches on the west side of the river, but it was decided to leave them and take only the bed of the river and the bars going down-stream.

The dredge employed fifteen men on two shifts, in addition a four-man crew is employed continuously on testing ground ahead of the dredge.

Umity Valley Gold Mines, Ltd.* (53° 122° S.E.) Company office, 361 Main Street, Penticton. William D. Jones, President. Capital: 100,000 shares, $1 par value. The company holds seven leases along the Cottonwood River at and near the mouth of Umity Creek. The operation is reached by 2¼ miles of road that takes off to the north from the road between Quesnel and Barkerville, at a point 2.7 miles west of the Cottonwood Bridge.

During the early summer Mr. Jones was working on the south side of the Cottonwood River opposite the mouth of Umity Creek and was using a bulldozer to feed gravel into the wings of a short string of sluice-boxes. Water was pumped from the river by a 6-inch centrifugal pump and delivered to the boxes through a small hydraulic monitor. The pay-gravel, covered by 4 to 6 feet of fine silt, lies under a low bench along the south side of the river. This operation was soon abandoned.

In September a drag-line dredge was brought in from California and leased by its owner, Mr. Weaver, to the Inland Dredging Company. This company, whose president is H. O. Anderson, has a working agreement with the Umity Valley Gold Mines, Limited. The dredge was assembled and began digging on September 15th.

The shovel is a 1-yard Bucyrus Erie, and the washing plant has a capacity of about 70 yards per hour. A D-6 Caterpillar was being used to clear and strip about 5 feet of overburden on the south side of the river. The shovel was digging 5 to 7 feet of river-gravel to a false bed-rock of grey clay.

The riffle-tables were covered with two layers of expanded metal screen and were charged with mercury. Fine flaky gold seen on the riffles at the point of discharge into the tail sluice indicates that gold was being lost. Seven men were employed on one ten-hour shift.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1938, p. C 42.]

Quesnel River Area.†

Quesnel River.

North American Goldfields, Ltd. (52° 121° N.E.) Company office, 513 Royal Bank Building, Vancouver. G. A. Collins, President. Capital: 2,000,000 shares, 50 cents par value. The company holds two special leases on the Quesnel River; one covers French Flat on the west bank, about 24 miles by road from Quesnel, the other covers Drummond Flat, about 34 miles from Quesnel and just above the mouth of Beaver Creek. Both flats have been the scene of former placer operations.

The company, through arrangements made with St. Eugene Mining Corporation, Limited, built and operated a drag-line dredge on the Ashby and Speers leases on the south side of Quesnel River, about a mile west of the mouth of Spanish Creek. Dredging was started June 8th and was stopped the first week in September. The drag-line

* By Stuart S. Holland.

† By J. W. Peck.

was a Dominion-type excavator with a $1\frac{1}{2}$-yard bucket and powered by a 135-horse-power engine. The washing plant was built on the spot, using timber sawn in the company's sawmill. The undersize from a 26- by 4-foot diameter trommel mounted below the feed-hopper feeds sixteen sluice-boxes. The washing plant floated on pontoons in a pond dug by the shovel. At first, operations were carried on by three shifts, but later by two shifts. After moving from 60,000 to 90,000 cubic yards, the dredge was dismantled and trucked to French Flat, about 30 miles from Quesnel. Work was stopped, according to company statement, " when it was found the deposits of alluvial gold were not as extensive as the original estimate had suggested."

R. Collins was in charge of operations and, when operating, fourteen men were employed.

The Ashby-Speers bench lies about 70 feet above the Quesnel River. About 15 feet of gravel lies on a soft silty-clay false bed-rock. It had formerly been worked for a number of years as a small hydraulic. Lack of water had limited the size of operation.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1930, pp. 167–170; 1934, pp. C 33, C 34.]

Collins Pacific, Ltd. Company office, 513 Royal Bank Building, Vancouver. G. A. Collins, President. Capital: 400,000 shares, 50 cents par value. This company controls North American Goldfields, Limited. The company holds nine leases on Peters Creek, tributary to Lightning Creek, and one special lease on Quesnel River at Beavermouth, extending down-stream from the junction of Beaver Creek.

Some drilling was done on the Peters Creek leases in 1945, but no work was done there in 1946.

Beavermouth Dredging Co., Ltd. (52° 122° N.E.) Company office, 513 Royal Bank Building, Vancouver. E. Nipple, President; A. M. Whiteside, Secretary-Treasurer. Capital: 200,000 common shares, 50 cents par value, and 600,000 preferred shares, 50 cents par value. This company holds no placer leases but has a royalty agreement to operate a dredge on the Collins Pacific Company's special lease at Beavermouth, on Quesnel River, about 30 miles from Quesnel. On October 1st the company took over from Collins Pacific, Limited, a newly built 2,000-cubic-yard-per-day floating washing plant. A 2-yard Lima drag-line shovel is being used. This operation started on October 5th at the mouth of Beaver Creek and worked for six weeks, until freezing weather forced a shut-down. Nine men were employed on two shifts.

Cedar Creek.

Cariboo Metals, Ltd. (52° 121° N.E.) This company (also called the Cariboo Northland Gold Mines, Limited) continued testing its ground on Cedar Creek under the direction of Alvo V. Alvensleben. Many test-pits were put down, and all gravel was sluiced. A bulldozer was purchased in 1946, the old storage-dam on Cedar Creek was repaired, and a small reservoir was excavated to the south-west of the camp. No mining was started. To the east of the camp-site a secondary channel has now been proved to the company's satisfaction to have commercial values for a distance of about 3,200 feet. The camp is 6 miles by road from Likely.

In 1946 a group of mineral claims was staked over the old placer-ground. A. Chisholm brought in a bulldozer to clean up the bottom of the old hydraulic pit near the camp buildings, but water-flooding forced him to give up the project.

Poquette Creek.

El Toro Mining Co. (52° 121° N.W. and 52° 120° S.W.) Company office, 511 North Carson Street, Carson City, Nevada, U.S.A. This company, under the direction of J. E. Callaghan, did a considerable amount of drilling in Poquette Pass, about 2 miles from Likely. A 4-inch aeroplane drill was used to drill nine holes down from the false bed-rock of the worked-out hydraulic pit. True bed-rock was reached at depths up to 75 feet. A shaft, started in April, was abandoned at a depth of 10 feet. Five men were employed. The site was given up, and the drill moved to H. B. Hill's lease on the upper reaches of the Horsefly River.

KEITHLEY CREEK.

Those working in the Keithley Creek area during 1946 include:—

A. E. McGregor with two partners, G. A. Goldsmith and C. G. Dunham, on Keithley Creek, between Donaldson Creek and Honest John Creek.

Cariboo Keithley Gold Placers hydraulicking on French Snowshoe Creek.

Barney Boe on Pine Creek.

HORSEFLY RIVER AREA.

Horsefly River (52° 121° S.E.).

Bentibo Mine. A special placer lease on the Horsefly River is owned by A. E. Horne. It is approximately 25 miles by road from Horsefly and extends up-stream from the junction of McKinley Creek. About 1½ miles down-stream from Club Creek and below the falls a hydraulic operation was started on the north bank of the river with the intention of working in a westerly direction to investigate a buried channel thought to be a continuation of one that Lay indicated on a sketch-map on page C 34 of the Annual Report of the Minister of Mines for 1938. A flume constructed from above the falls leads to a penstock to give an 85-foot head at the monitor. Operations were expected to be under way by late autumn.

Black Creek (52° 121° S.E.).

Leases of H. Armes. Since 1938 hydraulicking has progressed up Black Creek until the south rim of a buried cross-channel has been reached. Just beyond this rim a pit with about 100-foot walls has been sluiced out. The water-head was getting progressively lower, so it was decided to test the cross-channel in 1946 by drilling before further hydraulicking was done. Several hundred feet to the north-east three drill-holes were put down to depths of 40 feet, 60 feet, and 80 feet. None of these holes struck bed-rock. Their depth is difficult to explain if it is believed the gold in Black Creek came from the buried cross-channel. Now it would appear that the bed-rock in the cross-channel is lower than the south rim outlet of Black Creek. It is intended to deepen the 80-foot hole to bed-rock and to survey them for relative elevations.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1938, p. C 31.]

LILLOOET (50° 122° N. AND 50° 121° N.W.).*

Very little placer gold was produced in the Lillooet Mining Division in 1946. There was, however, some staking of ground, especially on the Bridge River above its junction with the Yalakom River. Fourteen leases were staked along Bridge River and extending down-stream from the B.C. Electric's new dam-site being constructed on the Bridge River below Mission Mountain. When the dam diverts a greater quantity of water

* By J. W. Peck.

through the Mission Mountain tunnel, the stakers expect to be able to work gravels not worked before.

W. Haylmore advanced his open-cut work at the mouth of the Hurley River.

F. Haugh, on Marshall Creek, built a dam 25 feet wide and 6 feet high. He ground-sluiced a cut 200 feet long and 20 feet wide.

J. Hogstrom, on the Hurley River below the California adit of the B.R.X. mine, sluiced 400 cubic yards from a prospect cut. E. Nilson of an adjoining lease assisted with the loan of a double-drum gasoline-winch.

W. B. Sirrett on the Fraser River near Lillooet.

A. C. Hutton on the Fraser River near Lillooet.

L. Leonard on Sallus Creek.

G. Powell on the Fraser River 4 miles above the Bridge River. A road was constructed from the fish-ladders at the Bridge River junction to the property, and preparations made for starting hydraulic operations in 1947.

LYTTON.

Lytton Bar Co., Ltd.

(50° 121° N.W.) T. S. Pierce, Manager. This company is operating a drag-line dredge and washing plant on a high gravel-bar in the Fraser River just north of the junction with the Thompson River. The washing plant, capable of handling up to 30 cubic yards per hour, was constructed on the spot. The gold-recovery equipment, called a "jig circuit," is especially designed so as to catch fine gold, such as is found on the Fraser River bars. From the hopper the gravel is fed onto a 1½-inch grizzly, the undersize going onto the "jig table." Coarse gold, if any, is caught here, but the fines are pulled through the table by suction and enter a ball-mill and mercury recovery unit. The black sands may be shipped to a smelter. The shovel has a 1½-yard bucket. The washing plant is a dry-land plant and is dragged along the bar; no attempt is made to dig under water. Thus the operation can only work in a period of low water. Little ground was moved in 1946, as construction was not completed until late in the autumn. Two men were employed.

TULAMEEN.

Eagle Creek Placer, Big Jim Gold Mines, Ltd.*

(49° 120° N.W.) W. L. Newman, President; George Stevenson, Manager. This placer property is about 8 miles up the Tulameen River from Tulameen, and near the mouth of Eagle Creek. A No. 4 monitor, working under a head of 120 feet, uses water flumed from Eagle Creek. A temporary camp was built to accommodate the crew. After only a few days' actual hydraulicking the work was suspended for the season because of insufficient water. Seven men were employed.

* By E. R. Hughes.

STRUCTURAL MATERIALS AND INDUSTRIAL MINERALS.

CONTENTS.

The following brief notes on properties and operations producing structural materials and industrial minerals are subdivided under headings indicating the material mined.

A note regarding a deposit of palagonite at Falkland appears on page 207. In its water content this material resembles perlite, from which light-weight insulating material is prepared.

A note regarding iron ore (limonite) mined near Alta Lake from the Iron King property and used as a purifying agent in the production of gas in Vancouver and Victoria will be found on page 121, in the section on Metal-mining.

No notes are offered concerning sulphur, a non-metallic item of great value, recovered from waste gases at the Trail smelter, and a constituent of pyrite concentrates recovered as a by-product in milling the copper ore of the Britannia mines.

Statistics regarding structural materials and industrial minerals are given in the following tables:—

Table I, page 11, sub-headings " Non-metallics " and " Clay Products and other Structural Materials."

Table X, page 22, " Production in Detail of Structural Materials."

Table XI, page 23, " Production in Detail of Miscellaneous Metals, Minerals, and Materials."

BARITE.

Golden.

Mountain Minerals, Ltd.* (51° 116° S.W.) Company office, Morris Building, P.O. Box 273, Lethbridge, Alta.; mine office, Parson. Ralph A. Thrall, Managing Director. This company owns barite deposits 6 miles west of Parson, and near Brisco. During 1946 a total of 2,688 tons of very pure barite was mined and shipped from the Parson quarry; of this amount, 2,495 tons was shipped to Montreal, to be pulverized for paint and other industries, and some of this

* By J. A. Mitchell.

was exported to Europe. The other 193 tons was shipped to the Crowsnest, to be processed for use in the glass industry and for weighting material for drilling-mud.

The barite on the claims at Brisco is discoloured and cannot be used if freedom from discoloration is important. Material from this deposit was used during the war years as permanent ballast for ships built in British Columbia.

The deposit being mined has irregular walls and dips about 70 degrees to the west. Because of this it is necessary to cut back the hanging wall to prevent an overhang, and mining was stopped in September so that development-work could be caught up. Four men were employed in one shift at the Parson quarry.

CLAY AND SHALE.*

NEW WESTMINSTER.

Clayburn Co., Ltd. (49° 122° S.E.) Company office, Credit Foncier Building, Vancouver. R. Ball, Manager; W. H. Baines, Mine Superintendent. Three mines and a shale quarry, near Kilgard, are operated intermittently to supply fire-clay, clay, and shale as required for the Kilgard plant. The mines are all worked on a room-and-pillar system, similar to coal mines. The total production for 1946 was as follows: Fire-clay from the Kilgard mine, 21,330 tons; clay from No. 4B mine, 3,595 tons; clay from No. 9 mine, 3,705 tons; and shale from the quarry, 1,645 tons. The number of men employed throughout the year averaged 21 in the mine and 100 in the plant.

Richmix Clay Co. (49° 122° S.E.) Company office, 2890 Twelfth Avenue East, Vancouver. George W. Richmond, Manager. The company operates a small mine on the eastern boundary of the Clayburn Company's Kilgard fire-clay mine, near Kilgard. Late in the year a seam of clay about half a mile to the west was also opened up. All material mined was shipped out for processing. A crew of three or four men was employed for the greater part of the year.

Abbotsford Fire and Pressed Brick Co. (49° 122° S.E.) Company office, Abbotsford. F. L. Connon, Manager; W. Freeman, Plant Superintendent. The company operates a clay quarry and brick-making plant on the outskirts of the Municipality of Abbotsford. About 40 tons of clay per day is being mined from the quarry and hauled to the plant by truck. Four men are employed in the quarry and twelve in the plant.

GYPSUM.

FALKLAND.

Gypsum, Lime, and Alabastine, Canada, Ltd.† Head office, Paris, Ont.; British Columbia office, 509 Richards Street, Vancouver. Norman Jessiman, British Columbia Manager; Alex. Jessiman, Quarry Superintendent. This company again confined work at Falkland, 40 miles south of Kamloops, near the Vernon–Kamloops Highway, to the No. 2 and No. 5 quarries, at an elevation of 500 to 600 feet above the railway. As the overburden is thin, the gypsum is mined in open quarries. The height above the floors increases as the quarries advance into the hillside; therefore, the safety of the workmen requires that the walls be kept at a safe inclination and well barred down. Drilling is done by compressed-air jack-hammers. After being blasted, the gypsum is loaded into trucks by gasoline-shovels and transported to the railway bunkers at Falkland. The gypsum is shipped over the Canadian National Railways to the company's mill at New Westminster. A new crusher has been installed and a new machine-shop has been built. Loading and transportation facilities have

* By H. C. Hughes.

† By E. R. Hughes.

been augmented, and two gasoline-shovels and five trucks are now in use. The average daily production during December was 200 tons of gypsum and waste. The crew has been increased, and at the end of the year twenty-five men were employed.

CRANBROOK.

Western Gypsum Products, Ltd.*

(49° 115° S.W.) Head office, 504 MacArthur Building, Winnipeg, Man.; mine office, Box 785, Cranbrook. B. M. Jordan, Mine Manager. This company operates the Mayook gypsum quarry, near Mayook, about 16 miles east of Cranbrook. The management reports that a total of 5,420 tons of gypsum rock was mined and shipped during 1946. This was all mined from an open pit, from which approximately 4 feet of overburden was removed. So far the workable deposit averages about 6 feet thick. Below this for the next 10 or 12 feet the material gets darker in colour and cannot be used.

The company owns seven claims and did a considerable amount of prospecting work on them. So far the gypsum appears to be confined to the Mayook, Sheeny, and Primrose claims. Erosion has removed the gypsum from other parts of the holdings.

An adit was started on the Primrose claim, but at 50 feet from the portal it broke into an underground sand-filled cavern. Here again the top 6 feet of gypsum was found to be the best. The material changed in colour and deteriorated as the adit was advanced.

Shipments were suspended early in January, 1947, as a result of the destruction by fire of the Calgary mill. In the meantime it is intended to continue with surface prospecting and diamond-drilling.

LIMESTONE.

Koeye Limestone Co.†

(51° 127° N.W.) P. Christensen, Manager. The quarry is located on Koeye River, less than a mile from tide-water. Two small quarries are being worked; the quarries are separated by a dyke, through which a tunnel was driven to facilitate tramming. A total of 10,432 tons of limestone was produced, the lowest tonnage for some years. This was due partly to the need for driving the tunnel between the quarries and partly to shortage of labour. Only six men were employed on the average, and 273 days were worked. The entire output is taken by Pacific Mills Company at Ocean Falls.

VANCOUVER ISLAND.‡

British Columbia Cement Co., Ltd.

(48° 123° N.W.) Company office, corner of Fort and Wharf Streets, Victoria. N. A. Tomlin, Managing Director; G. S. Williams, Plant Manager. This company operates a limestone quarry and cement plant at Bamberton. The quarry and plant were operated continuously at capacity throughout the year. An average of 20 men was employed in the quarry and 140 in the plant. New equipment acquired during the year included one 3-ton truck and one standard 4-foot Symonds cone-crusher for secondary crushing. A water-front rock-storage bin, with a capacity of 5,000 tons, is also under construction.

TEXADA ISLAND.

British Columbia Cement Co., Ltd.

In addition to the Bamberton quarry, this company operates a limestone quarry and crushing and screening plant on the east shore of Blubber Bay (49° 124° N.W.). The quarry and plant operated continuously throughout the year, employing a total of twenty-one men.

* By J. A. Mitchell.
† By Charles Graham.
‡ By H. C. Hughes.

Construction-work and additions to the plant during the year included an 18,000-ton rock-storage bin, a reclaiming-tunnel equipped with a conveyer-belt, and complete dock repairs, including the replacing of piling. New equipment included a shuttle conveyer for loading at the wharf, a 2-cubic-yard Marion electric shovel, eight 6-cubic-yard Koppel side-dump cars, one 20-ton Vulcan gasoline-locomotive, one 350-cubic-foot Sullivan compressor driven by a Caterpillar 8 Diesel engine, and one 7½-K Allis-Chalmers gyratory crusher.

Pacific Lime Co. (49° 124° N.W.) Company office, Blubber Bay. H. S. Fowler, Manager. The quarry and plant were operated at capacity during the year. All limestone was mined from No. 2 quarry. The construction and installation of substantial additions to the mechanical equipment was commenced. These include a new crushing plant, located near the No. 2 quarry, and additions to the power plant. The crushing plant is of a conventional type but is so arranged that material of different sizes can be delivered by conveyer-belt to various parts of the plant for roasting, shipment, or stock-piling. The additions to the power plant include two 5-cylinder 375-horsepower Fairbanks-Morse Diesel engines direct-connected to 440-volt 200-kva. generators. An average crew of 20 men was employed in the quarry and 115 in the plant.

Vananda Quarries.—(49° 124° N.W.) Operated by Beale Quarries, Limited. W. D. Webster, Vananda, Superintendent. The quarry is 1 mile east of Vananda. It was operated continuously at capacity throughout the year, an average of twenty-five men being employed.

GRAND FORKS.

Fife Limestone Quarry.* (49° 118° S.E.) This quarry, beside the Canadian Pacific Railway tracks, near Christina Lake, is owned and operated by the Consolidated Mining and Smelting Company of Canada, Limited. This is the thirty-sixth year of its operation by the company. During 1946, 38,740 tons of lime rock was quarried and shipped to the Trail smelter, where it is used as a flux. The material is loaded into mine-cars by a gasoline-shovel and hand-trammed to a bin above the Canadian Pacific Railway track. The crew, averaging six men, was under the supervision of G. E. Clayton.

MARL.†

Allison (Burns) Lake Marl Deposit. (49° 120° N.W.) B.C. Marl Company, Limited. Company office, 744 Hastings Street West, Vancouver. E. W. Johnstone, Manager. Marl is being excavated from the southern shore of Allison (Burns) Lake, approximately 20 miles north of Princeton on the Princeton–Merritt Highway. The gasoline-shovel formerly used for loading has been replaced by a drag-line scraper, and a rotary drier has been added. The marl is scraped into a grizzly, then elevated to the drier. After being dried, the marl is elevated to a bin, from which it is drawn and put into sacks ready for shipment. The product is shipped to Fraser Valley and Coast points for agricultural use. A small amount of this material was used at a Princeton coal mine in treating the underground workings to combat the coal-dust hazard; the colour, fineness, and composition of the marl proved to be satisfactory for this purpose. Three men were employed.

Roany Marl Deposit. (49° 120° S.W.) H. Knighton and W. R. Foster, owners. This is a new marl operation, about 5½ miles in a south-easterly direction from Granite Creek. A drag-line scraper is used to scrape the marl from the bottom of the dried-up-lake deposit and onto a truck-loading plat-

* By J. A. Mitchell.
† By E. R. Hughes.

form. The marl is then taken by truck to a railway loading-point at Coalmont. Two men were employed during the few weeks of operation in the autumn of 1946.

PALAGONITE BRECCIA.*

Falkland (50° 119° S.W.).

Mount Tuktakamin, elevation 5,800 feet and about 2 miles south-west of Falkland, is capped by several hundred feet of palagonite breccia. Samples of this material were collected for analysis and testing with a view of determining its suitability for expanding or bloating to prepare a light-weight insulating material, comparable to expanded perlite.

The palagonite breccia consists of angular fragments of black basaltic glass, ranging from ¼ inch to several feet across, surrounded by orange to light-brown palagonite (hydrated basaltic glass).

Analyses of a representative sample of palagonite breccia gave: SiO_2, 52.2 per cent.; H_2O (105° C.), 8.2 per cent.; and ignition loss, 12.9 per cent.

Analyses of basaltic glass, separated from the palagonite, gave: SiO_2, 57 per cent.; H_2O (105° C.), 1.2 per cent.; and ignition loss, 3.1 per cent.

SILICA.

Bailey Silica Quarry.† (49° 118° S.E.) This quarry, 3 miles south of Grand Forks, is owned and operated by the Consolidated Mining and Smelting Company of Canada, Limited. In previous years the talus lying at the bottom of a 400-foot high bluff was loaded into trucks by a gasoline-shovel, trucked to railway-cars at Grand Forks, and shipped to Trail for use as a flux at the smelter. In 1946 a series of 80-foot vertical diamond-drill blast holes were drilled from the top and close to the edge of the high bluff. The holes were loaded with 40 per cent. forcite and blasted, making available 5,000 tons of material averaging 87.1 per cent. silica. This material was reblasted where necessary and loaded by Diesel shovel into trucks. Including material from the talus-dump, total shipments for 1946 amounted to 8,809 tons. An average of eight men was employed under the supervision of G. E. Clayton.

SAND, STONE, AND GRAVEL.

North Vancouver.‡

Deeks McBride Co., Ltd. (49° 123° S.E.) Company office, 1051 Main Street, Vancouver. H. T. Hamilton, Manager; J. Mills, General Superintendent; T. O. Burgess, Plant Superintendent. The company operates a sand and gravel quarry on Seymour Creek. Mechanical equipment consists of one steam-driven clam-shell bucket, one gasoline-driven drag-line scraper, one gasoline-driven aerial drag-line for removing boulders, one No. 2 monitor, and two trucks. In addition, there is a complete crushing, screening, and washing plant. The quarry was worked continuously throughout the year. An average of twenty-one men was employed in the plant and quarry. The whole operation has a capacity of about 500 cubic yards per day.

Highland Sand and Gravel Co. (49° 123° S.E.) Company office at the plant. W. J. Barrett-Lennard, Lynnmour P.O., Manager. The company operates a sand and gravel plant and quarry near Seymour Creek. Operations were continuous throughout the year. Mechanical equipment consists of one gasoline-

* By Stuart S. Holland.

† By J. A. Mitchell.

‡ By H. C. Hughes.

shovel, one conveyer-belt loader, one clam-shell bucket, and three trucks. In addition, there is a complete crushing, screening, and washing plant. The operation has a capacity of from 300 to 350 cubic yards of gravel per day. An average of thirteen men is employed.

Road Materials, Ltd. (49° 123° S.E.) J. E. Priest, Lynmour P.O., Manager. The company operates a sand and gravel quarry and processing plant for road material near Seymour Creek. Mechanical equipment consists of a drag-line scraper, a crushing and screening plant, both electrically driven, and one truck. The plant is equipped to make asphalt road-surfacing material and has a capacity of 200 cubic yards per day. An average of nine men was employed throughout the year.

Burrard Inlet.*

Coast Quarries, Ltd. (49° 123° S.E.) J. H. Davidson, 1840 Georgia Street West, Vancouver, Manager; T. H. Burrows, Granite Falls P.O., Plant Superintendent. The company operates a granite quarry at Granite Falls, on the north arm of Burrard Inlet. In September, 1946, the bunk-house and cook-house were completely destroyed by fire. Temporary accommodation has been provided, pending the erection of new structures. Two adjacent quarries are worked, each having a capacity of 400 tons per day. The material is loaded directly onto scows by a steam-shovel, crane, or truck. An average of ten men is employed.

Coquitlam.*

Deeks McBride Co., Ltd. (49° 122° S.W.) Company office, 1051 Main Street, Vancouver. H. T. Hamilton, Manager; Jack Mills, General Superintendent; Harry Wick, Plant Superintendent. The company operates a sand and gravel quarry on the Pipe-line Road near Coquitlam. Mechanical equipment consists of an electrically driven drag-line scraper and a gasoline-driven locomotive and cars. There is also a crushing, screening, and washing plant. Loading facilities for both trucks and railroad-cars are provided. The quarry and plant have a capacity of about 400 cubic yards of gravel per day. An average of ten men was employed throughout the year.

Maryhill Sand and Gravel Co., Ltd. (49° 122° S.W.) Company office, 902 Columbia Street, New Westminster. J. H. Gilley, Manager. The company operates a sand and gravel quarry on the Fraser River near Coquitlam. Mechanical equipment includes two electrically driven shovels, two monitors, and several trucks. There is also a crushing, screening, and washing plant. The whole operation is very completely mechanized and electrified, and all material from the quarry to the plant and from the plant to the scows, where it is loaded, is handled by conveyer-belts. The capacity of the operation from two pits is about 1,800 cubic yards of gravel per day. An average of forty men was employed throughout the year.

This company also operates a granite quarry on the Pitt River about 7 miles from Coquitlam. Mechanical equipment consists of a water-driven compressor and lighting plant, a steam-shovel, and several trucks. Facilities for loading material on scows are provided. The quarry was operated from February 1st to May 1st, 1946, and about 4,000 tons of rock produced. Operations were then suspended until August, when reconstruction and repair work were undertaken, with production planned for the first of the year. A crew of ten men was employed.

* By H. C. Hughes.

OKANAGAN.*

Ellis Street Rock Quarry.—Operated by the Corporation of the City of Kelowna. Rock is broken from this quarry and crushed for road-surfacing. Ten men were employed.

Kelowna Sand and Gravel Pit.—Operated by the Corporation of the City of Kelowna. A bulldozer is used to push the sand and gravel from the pit into a loading-chute. Two men were employed.

K. Urquhart's Gravel-pit.—Operated by K. Urquhart, Salmon Arm. This gravel-pit is about 5 miles in a westerly direction from Salmon Arm. The gravel is hand-loaded from the face of the pit into a truck. Two men were employed.

Pleasant Valley Road (Vernon) Gravel-pit.—Owned by William Hall, Vernon. A drag-line scraper hauls gravel from the pit into a loading-chute. One man was employed.

Vernon Municipal Gravel-pit.—Operated by the Corporation of the City of Vernon. This gravel-pit is on the Pleasant Valley Road, Vernon. The gravel is hauled from the pit to the screening-bins by means of a drag-line scraper. Two men were employed.

Knutsford Gravel-pit.—Operated by the Corporation of the City of Kamloops. This gravel-pit is at Knutsford, about 5 miles south of Kamloops. The pit is worked intermittently, and the material is mechanically loaded. Two men were employed.

Summerland Municipal Gravel-pit.—Operated by the Corporation of the District of Summerland. The gravel-pit is at West Summerland. The material is hauled from the pit to the gravel-bin by means of a drag-line scraper.

Peachland Municipal Gravel-pit.—Owned by the Corporation of the District of Peachland. This gravel-pit is about 2½ miles in a westerly direction from Peachland on the Peachland–Princeton Road. The pit is now inactive, and the drag-line machinery has been removed.

* By E. R. Hughes.

INSPECTION OF LODE MINES, PLACER MINES, AND QUARRIES.

By James Dickson.

PRODUCTION.

The output of metal mines for 1946 was 3,705,375 tons. This tonnage was produced from fifty mines, of which thirty-two produced 100 tons or more.

FATAL ACCIDENTS IN METAL MINES (INCLUDING UNDERGROUND PLACER MINES).

There were six fatal accidents in and around the metal mines and concentrators in 1946, being a decrease of three from 1945. In addition to the above, there was a fatal accident to a bulldozer operator in the Cariboo District, while making a road to a mine. He was not working for the mining company. There was one fatality in a quarry during 1946. There were 3,735 persons employed under and above ground in the metal mines and 672 persons in the concentrators in 1946. The ratio of fatal accidents per 1,000 persons employed was 1.36, compared with 1.99 in 1945.

The tonnage mined per fatal accident during 1946 was 617,562 tons, compared with 486,413 tons in 1945.

The tonnage mined per fatal accident during the last ten-year period was 533,391 tons.

The following table shows the mines at which fatal accidents occurred during 1946 and the comparative figures for 1945:—

Mining Division.	Mine.	No. of Fatal Accidents.	
		1946.	1945.
Vancouver	Britannia	1	1
Lillooet	Bralorne	....	2
Lillooet	B.R.X. Consolidated	1	....
Similkameen	Copper Mountain	2	1
Ainsworth	Whitewater	....	1
Fort Steele	Sullivan	2	3
Portland Canal	Silbak Premier	....	1
Totals		6	9

The fatal accident to Tyko W. Beekman, grizzly-man, Britannia Mining and Smelting Company, Limited, on January 12th, was due to deceased falling through a grizzly. He had attempted to bar a large rock through the grizzly, and failing in this, he prepared to blast the rock. While placing the bulldoze charge, he slipped and fell through the grizzly, with immediately fatal results.

The fatal accident to John Lind, blacksmith and mechanic, B.R.X. Mines, Limited, on June 15th, was due to the bursting of an oil-storage tank. Deceased was cleaning the sludge from this tank by means of compressed-air blower and, after having removed most of the sludge by this means, apparently attempted to clean out the remainder by closing the outlet by installing fittings which would enable an air-pressure to be built up in the tank, with the idea of releasing these fittings and blowing out the remaining sludge under pressure. The end of the tank blew out and cut deceased's head off. This tank was not designed for pressure.

The fatal accident to Rolf Johanson, miner, Sullivan mine, on October 4th, was due to deceased being struck by a large slab of rock while he was operating a mucking-machine in a drift. This place had been barred down by the barmen before the shift started and had also been barred down several times during this shift, but the above-mentioned large slab fell and killed deceased instantly.

The fatal accident to Bruno Sellan, electrician, Sullivan mine, on May 11th, was due to deceased being struck on the left leg by a timber which fell down a skipway to a level where deceased was standing. This timber slipped from the hands of men who were removing a bulkhead farther up the raise. Deceased sustained a complicated fracture of the left thigh and leg, and died from shock several hours later.

The fatal accident to Max Konigseder, mucking-machine operator, Copper Mountain mine, on December 6th, was due to deceased being crushed between a derailed car of a train and the side of a drift. Deceased had gone with the driver of an electric-trolley locomotive to pick up some empty cars which had been located in a drift some distance from where he had been working. Deceased had gone ahead of the train, which was backing up on a curve; the driver heard a shout and stopped his train to investigate, and found that one of the cars had become derailed and that deceased was pinned by this car. The track had been recently repaired and was found to be in good order. Konigseder was killed instantly.

The fatal accident to Albert Neill, miner, Britannia Mining and Smelting Company, Limited, on November 28th, was due to deceased falling some 20 feet in a raise when a staging on which he was working gave way due to a supporting-stull breaking. This was a temporary staging for the purpose of cleaning and repairing a small flume which had been silted up. Part of the flume was dislodged and fell on the staging, which collapsed as above. Deceased suffered a broken neck and instant death.

A fatal accident to Peter Carutti at the Hedley Mascot mill, which is not listed as a mine accident, occurred in the following manner: On April 19th, about 1 a.m., the mill operator found Peter Carutti sitting on the mill roof severely injured and in a dazed condition; he was moved into the mill for first-aid treatment and then conveyed to Princeton Hospital, where he died twenty-four hours later. Carutti had been on shift at the mine the previous day and, after finishing work, changed his clothes and went by regular passenger-skip to the mill terminal, and thence to Hedley, where he spent the evening. He did not return to the mine on the last passenger-skip at 9.30 p.m. or on the workmen's skip at 11.30 p.m. It would appear that in the early hours of the morning, unknown to anyone at the mill, he attempted to get into an empty ore-skip while it was in motion and got dragged along the timbers.

Quarries.

The fatal accident to Robert G. McIntyre, power-shovel operator, Boundary Bay gravel-pit, Ladner Municipality, on May 20th, was due to deceased being struck by some hard-pan material which fell from the side of the gravel-pit, which was approximately 20 feet high at this point.

DANGEROUS OCCURRENCES.

On January 17th two men were being hoisted in the Morning shaft, Nickel Plate mine, and had given the signal to be hoisted to the main station at the shaft-collar. The hoist is equipped with an electric overwind device set to operate a few feet above this station in the event of an overwind when men are being hoisted. The hoistman accepted the above signal to hoist the two men to the main station and set the overwind for "men on." He then forgot that he was hoisting men and overran the station, and ran the skip into the overwind contact, which cut off the power and brought the skip to rest. The hoistman reset the overwind, with the skip above this point, and, still forgetting there were men on the skip, hoisted the skip into the ore-pocket above, where both men were slightly injured. This hoistman was removed from this work.

On February 6th a fire of unknown origin completely destroyed the compressor and steel-shop buildings at the Bridge River Consolidated, Ural adit. The fire occurred between shifts, and no persons were in the mine. As there was no fire in the forge after 12 noon, it is surmised the fire started in the compressor-house.

On February 23rd, at Copper Mountain mine, during Saturday night shift, dense smoke was discovered on No. 5 level. All men were immediately checked out of the mine. Upon investigation it was found that a chute was on fire in No. 6 level. Eight men were engaged for five hours extinguishing the fire. Trained men using McCaa oxygen rescue apparatus and Burrell all-service gas-masks worked in the smoky area. An oxy-acetylene torch had been used the previous day to cut some of the heavy chute fittings. Apparently some of the heated iron had fallen unobserved and lodged among the chute timber, where it had smouldered some thirty-seven hours before actual open fire had resulted. No one was injured.

On May 23rd, at the Privateer mine, the power-house was completely destroyed by fire. It was thought to have started from an overheated exhaust-pipe. No one was injured.

On August 7th, at the Sullivan mine, a section was being prepared for blasting and some diamond-drill holes were in the process of being loaded. These diamond-drill holes had been drilled through the block of ore into an open stope from which broken ore was being moved by a slusher. The diamond-drill holes had been plugged at the stope ends and had been loaded but not primed. Apparently one of the plugs had been driven out in the loading process, or else one hole had been overlooked in the matter of plugging, as the powder was exposed at the stope end of one hole. The men who were loading the diamond-drill holes had gone out for lunch, and the slusher-man prepared and lit four bulldoze charges on large ore-blocks in the stope, and when these bulldoze charges went off, the diamond-drill hole with the exposed powder also went off, probably due to being struck by flying fragments from the bulldoze shots. No person was injured.

On August 14th and 15th, in the Sullivan mine, one of the areas being back-filled with surface gravel impounded a considerable body of the fill, carrying water which ultimately broke loose and flooded a considerable section of the workings and carried some of the gravel fill with it. No serious damage was done, although a length of the 3900 level was filled to within 3 feet of the back by the gravel, while the finer material carried by this overflow silted up the normal drainage system. No person was injured.

In September, 1946, at Granite Falls quarry, North Burrard Inlet, the bunk-house and cook-house were completely destroyed by fire. It was thought to have started from an overheated flue. No injuries to personnel resulted.

On October 10th, in No. 2 compartment of the Island Mountain shaft, during the initial run up the shaft the cage hung up 50 feet below the collar. The sensitive dog action, together with poor winding on the drum, was believed to be the reason. The drum had a bad wind on the third lay, and when the fourth lay reached this point, the cable dropped in with sufficient " bounce " to release the dogs. Two sets of guides were torn out, but as this was the initial run called for by the Act, no persons were on the cage.

EXPLOSIVES USED IN MINES.

During 1946 the quantity of explosives used in metal mines and quarries showed an increase over 1945. The high explosives amounted to 3,960,150 lb.; fuse detonators, 1,464,300; electric detonators, 4,910; delay electric detonators, 29,425; primacord, 135,500 feet; and safety-fuse, 11,625,300 feet.

During 1946 the Inspector of Mines supervised the removal and destruction of small amounts of explosives found at abandoned properties.

PROSECUTIONS (METALLIFEROUS).

There was only one prosecution—Consolidated Mining and Smelting Company for failure to observe section 39, general rule 91, of "Metalliferous Mines Regulation Act." Fined $100 and costs. The offence was committed by employees of a contracting firm, but the company was held responsible.

AIR-SAMPLING.

Air-samples were taken in cases where conditions indicated the possibility of noxious gases such as carbon monoxide or nitrous oxide being present, or oxygen content being below normal. The analyses showed no dangerous conditions, but in some cases augmented ventilation was considered necessary and was ordered by the Inspector.

DUST AND VENTILATION.

There is a noticeable improvement in ventilation at most of the mines, particularly in long drifts, crosscuts, and raises where fans and ventilating-pipes are in greater use.

The main ventilating system at many of the larger mines is now power produced and controlled.

The use of aluminium-dust therapy is general in the larger mines, and provision is being made at many of the smaller operations to take advantage of this treatment.

Good progress is being made towards more efficient control of dust in both the working-places and at transfer-points.

SAFETY AND FIRST-AID WORK.

The Mine Safety Associations in the different mining areas of the Province continued the good work of fostering first-aid and safety education in their respective districts, to which the safety engineers and District Inspectors added their efforts throughout the year.

In addition to their regular activities, the above associations held first-aid safety demonstrations in their districts. Not only did first-aid teams drawn from the various mines compete in these demonstrations, but teams of women, girls, and boys from the various mining camps took part.

The Department of Mines supplies most of the financial aid to carry on these competitions, but the success of the work depends on the combined efforts of the officials and men at the various mines. The interest shown in these demonstrations is proof that this co-operation is very much in evidence.

COAL-MINING.

By James Dickson, Chief Inspector of Mines.*

CONTENTS.

* Information about the officers of the Inspection Branch will be found on pages 43 and 44.

PRODUCTION.

The total tonnage produced by the coal mines of the Province for the year 1946 was 1,463,640 tons, being a decrease of 55,033 tons or 3.6 per cent from 1945.

Vancouver Island collieries produced 547,468 tons, a decrease of 10,310 tons or 1.8 per cent. from 1945.

The Northern District produced 13,009 tons, a decrease of 20,034 tons or 60.6 per cent. from 1945.

The Nicola-Princeton District produced 40,494 tons, a decrease of 17,711 tons or 30.4 per cent. from 1945.

The East Kootenay District produced 862,669 tons, a decrease of 6,978 tons or 1.3 per cent. from 1945.

The following table shows the output and *per capita* production daily and for the year 1946 at the various mines:—

Output and per Capita Production, 1946.

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. 5 mine)	103,413	256	289	1.40	358	216	1.87	478
Comox Colliery (No. 8 mine)	150,762	257	346	1.58	407	271	2.16	556
Tsable River mine	1,147	......	7	......	......	5	......	......
South Wellington No. 10 mine	223,345	258	265	3.26	843	230	3.76	971
Prospect mine	3,067	249	6	2.05	511	5	2.45	613
White Rapids mine	53,787	265	109	1.86	493	99	2.05	543
Chambers' mine	3,212	251	7	1.83	459	5	2.56	642
Loudon mine	1,388	233	4	1.48	347	4	1.48	347
Cassidy mine	699	124	4	1.41	175	3	1.87	233
Lewis mine (Timberlands)	980	289	2	1.69	490	2	1.69	490
Deer Home mine	1,985	222	5	1.78	397	4	2.23	496
Lake Road mine	21	1	2	......	......	2	......	......
Wellington No. 9 mine	801	257	2	1.55	400	2	1.55	400
Pacific mine	377	243	2	0.77	188	2	0.77	188
Stronach mine	1,750	231	5	1.51	350	5	1.51	350
Furnace Portal mine	734	212	2	1.73	367	2	1.73	367
Tulameen Collieries, Ltd.	37,877	280	93	1.45	407	74	1.83	512
Taylor mine	1,012	182	5	1.11	202	4	1.39	253
Coldwater coal mine	1,605	237	18	0.32	88	10	0.69	160
Bulkley Valley Colliery	10,706	240	32	1.39	334	26	1.71	412
Packwood mine	670	......	4	......	......	4	......	......
Peace River mine	1,333	110	9	......	......	5	......	......
Gething mine	300	......	4	......	......	3	......	......
Elk River Colliery	281,821	267	366	2.88	770	283	3.73	996
Michel Colliery	579,693	269	706	3.05	821	507	4.25	1,143
Coal Mountain Coal Co., Corbin	1,155	......	11	*	*	*	*	*

* Surface stripping.

Collieries of Vancouver Island Inspection District.

The output of Vancouver Island collieries was 547,468 tons. Of this amount, 93,107 tons or 17 per cent. was lost in preparation for the market, 3,925 tons or 0.7 per cent. was consumed by operating companies as fuel, 448,577 tons was sold in the competitive market. Of the amount sold in the competitive market, 418,292 tons or

93.2 per cent. was sold in Canada and 30,285 tons or 6.7 per cent. was sold in the United States; 1,859 tons was added to stock.

Collieries of the Nicola-Princeton District.

Of the gross total of 40,494 tons produced by the collieries of the Nicola-Princeton District, 72 tons was consumed by the operating companies as fuel, 5 tons was added to stock, and 40,417 tons was sold in the competitive market.

Collieries of the Northern District.

Out of a total of 13,009 tons produced, 116 tons was used by the operating companies as fuel and the remainder was sold in Canada.

Collieries of the East Kootenay District.

The output of the collieries in the East Kootenay District was 862,669 tons. Of this amount, 83,738 tons or 9.7 per cent. was lost in preparation for the market, 18,894 tons or 2.2 per cent. was consumed by the operating companies as fuel, 94,752 tons or 10.8 per cent. was used in making coke, and 665,126 tons was sold in the competitive market. Of the amount sold in the competitive market, 557,032 tons or 83.7 per cent. was sold in Canada and 108,094 tons or 16.3 per cent. was sold in the United States; 159 tons was added to stock.

The following table shows the *per capita* production of the various districts for the year 1946:—

Output and per Capita Production in Various Districts, 1946.

District.	Gross Tons of Coal mined during Year.	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	547,468	1,057	518	857	638
Nicola-Princeton District	40,494	116	349	88	460
Northern District	13,009	49	265	38	342
East Kootenay District	862,669	1,083	791	790	1,092
Whole Province	1,463,640	2,305	634	1,773	825

The following table shows the production and distribution of coal by the various collieries and districts, compiled from returns furnished by the owners:—

Collieries of British Columbia—Production, 1946.

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 1946.
Vancouver Island District.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Canadian Collieries (D.), Ltd.—													
Comox Colliery (No. 5 mine)	83,252	5,156		88,408	13,479		1,281	14,760	1,318	1,563	245		103,413
Comox Colliery (No. 8 mine)	119,579	7,407		126,986	21,587		1,839	23,426	199	549	350		150,762
Tsable River mine	1,105			1,105						42	42		1,147
South Wellington (No. 10 mine)	154,399	13,674		168,073	53,709		621	54,330	1,284	2,226	942		223,345
Prospect mine	2,296			2,296	771			771					3,067
White Rapids mine	45,714	4,048		49,762	3,561		184	3,745	150	430	280		53,787
Chambers' mine	3,212			3,212									3,212
Loudon mine	1,388			1,388									1,388
Cassidy mine	699			699									699
Lewis mine (Timberlands)	980			980									980
Deer Home mine	1,985			1,985									1,985
Lake Road mine	21			21									21
Wellington No. 9 mine	801			801									801
Pacific mine	377			377									377
Stronach mine	1,750			1,750									1,750
Furnace Portal mine	734			734									734
Totals, Vancouver Island District	418,292	30,285		448,577	93,107		3,925	97,032	2,951	4,810	1,859		547,468
Nicola-Princeton District.													
Tulameen Collieries, Ltd.	37,877			37,877									37,877
Taylor mine	1,012			1,012									1,012
Coldwater coal mine	1,528			1,528			72	72		5	5		1,605
Totals, Nicola-Princeton District	40,417			40,417			72	72		5	5		40,494
Northern District.													
Bulkley Valley Colliery	10,792			10,792			46	46	922	790		132	10,706
Packwood mine	650			650			20	20					670
Peace River mine	1,283			1,283			50	50					1,333
Gething mine	300			300									300
Totals, Northern District	13,025			13,025			116	116	922	790		132	13,009
East Kootenay District.													
Crow's Nest Pass Coal Co., Ltd.—													
Elk River Colliery	169,948	80,737		250,685	27,346		3,631	30,977	53	212	159		281,821
Michel Colliery	386,089	27,197		413,286	56,392	94,752	15,263	166,407					579,693
Coal Mountain Coal Co., Corbin	995	160		1,155									1,155
Totals, East Kootenay District	557,032	108,094		665,126	83,738	94,752	18,894	197,384	53	212	159		862,669
Coal.													
Grand totals for Province	1,028,766	138,379		1,167,145	176,845	94,752	23,007	294,604	3,926	5,817	2,023	132	1,463,640
Coke.													
Crow's Nest Pass Coal Co., Ltd.—													
Michel Colliery	32,688	36,950		69,638					5,122	1,615		3,507	66,131

Collieries of British Columbia—Men employed, 1946.

Mine.	White Men.																		Indians.			Japanese and Chinese.									Total Men employed.		
	Supervision and Clerical.			Miners.			Helpers.			Labourers.			Mechanics and Skilled Labour.			Boys.			Labourers.			Miners.			Helpers.			Labourers.					
	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.	U.	A.	T.
Vancouver Island District.																																	
Canadian Collieries (D.), Ltd.—																																	
Comox Colliery (No. 5 mine)	11	8	19	103		103				37	15	52	59	33	92	6	1	7											16	16	216	73	289
Comox Colliery (No. 8 mine)	15	8	23	143		143				33	19	52	72	31	103	8		8											17	17	271	75	346
Tsable River mine	1		1	4		4								2	2																5	2	7
South Wellington No. 10 mine	10	4	14	111		111				93	18	111	16	13	29																230	35	265
Prospect mine	1		1	4		4								1	1																5	1	6
White Rapids mine	6		6	66		66				18	6	24	9	4	13																99	10	109
Chambers' mine	1		1	4		4								1	1														1	1	5	2	7
Loudon mine				4		4																									4		4
Cassidy mine	1	1	2	2		2																									3	1	4
Lewis mine (Timberlands)				2		2																									2		2
Deer Home mine	1		1	3		3					1	1																			4	1	5
Lake Road mine				2		2																									2		2
Wellington No. 9 mine				2		2																									2		2
Pacific mine				2		2																									2		2
Stronach mine	1		1	4		4																									5		5
Furnace Portal mine				2		2																									2		2
Totals, Vancouver Island District	*48*	*21*	*69*	*458*		*458*				*181*	*59*	*240*	*156*	*85*	*241*	*14*	*1*	*15*											*34*	*34*	*857*	*200*	*1057*
Nicola-Princeton District.																																	
Tulameen Collieries, Ltd.	1	5	6	46		46	15		15	8	3	11	4	10	14														1	1	74	19	93
Taylor mine		1	1	4		4																									4	1	5
Coldwater coal mine	1	1	2	5		5	4		4		5	5		2	2																10	8	18
Totals, Nicola-Princeton District	2	7	9	55		55	19		19	8	8	16	4	12	16														1	1	88	28	116
Northern District.																																	
Bulkley Valley Colliery	3	2	5	16		16	4		4	1		1		4	4				2		2										26	6	32
Packwood mine				2		2	2		2																						4		4
Peace River mine	1	1	2	2		2	2		2		2	2		1	1																5	4	9
Gething mine	1	1	2	2		2																									3	1	4
Totals, Northern District	5	4	9	22		22	8		8	1	2	3		5	5				2		2										38	11	49
East Kootenay District.																																	
Crow's Nest Pass Coal Co., Ltd.—																																	
Elk River Colliery	*14*	*12*	*26*	*166*		*166*	*101*		*101*		*55*	*55*	*2*	*12*	*14*		*4*	*4*													*283*	*83*	*366*
Michel Colliery	26	28	54	250		250	223		223		120	120	7	50	57	1	1	2													507	199	706
Coal Mountain Coal Co., Corbin		1	1											10	10																	11	11
Totals, East Kootenay District	40	41	81	416		416	324		324		175	175	9	72	81	1	5	6													790	293	1083
Grand Totals for Province	95	73	168	951		951	351		351	190	244	434	169	174	343	15	6	21	2		2								35	35	1773	532	2305

Note.—U=Underground; A=Above ground; T=Total.

LABOUR AND EMPLOYMENT.

During 1946, 2,305 persons were employed in and about the coal mines of the Province, a decrease of 125 from 1945. Taking the average of the principal mines in the Vancouver Island District, about 14 per cent. of the working-days were lost, principally due to mine crews not working on Saturdays. In the Nicola-Princeton District about 10 per cent. of the working-days were lost. In the East Kootenay District the mines worked about 88 per cent. of the working-days, the remainder being lost principally through the mine crews not working on Saturday.

COMPETITION OF COAL PRODUCED OUTSIDE BRITISH COLUMBIA.

During 1946 the shipment of Alberta coal to British Columbia totalled 982,413 short tons. Coke shipped was 43,209 tons and briquettes 43,485 tons. The following table shows the amount of Alberta coal brought into British Columbia during past years:—

Year.	Short Tons.	Year.	Short Tons.
1937	269,023	1942	652,222
1938	238,435	1943	963,000
1939	239,227	1944	678,960
1940	311,232	1945	868,396
1941	304,928	1946	982,413

Of the 1,167,145 tons of British Columbia coal marketed, 208,534 tons was sold for domestic and industrial uses in the Provinces of Alberta, Saskatchewan, Manitoba, and Ontario; 296,778 tons was sold for railroad use in Canada; 8,419 tons was sold for railroad use in United States; 127,761 tons was exported to United States; and 75,550 tons was sold for ships' bunkers. The tonnage of British Columbia coal used for domestic and industrial purposes in the Province was 450,103 tons.

ACCIDENTS IN AND AROUND COAL MINES.

During 1946, 2,305 persons were employed in and around coal mines. Four fatal accidents occurred during the year, as compared with five during 1945. The ratio of fatal accidents per 1,000 persons employed was 1.73, as compared with 2.05 for 1945.

In 1944 the ratio was 1.06; in 1943, 2.80; in 1942, 4.23; in 1941, 1.47; in 1940, 2.08; in 1939, 0.67; in 1938, 3.37; and in 1937, 3.17. The average for the ten-year period was 2.25.

The number of fatal accidents per 1,000,000 tons produced during 1946 was 2.73; during 1945 the figure was 3.29; in 1944, 1.55; in 1943, 4.33; in 1942, 5.15; in 1941, 2.21; in 1940, 3.65; in 1939, 1.35; in 1938, 7.63; and in 1937, 6.92. The average for the ten-year period was 3.78 per 1,000,000 tons raised.

The following table shows the collieries at which the fatal accidents occurred during 1946 and comparative figures for 1945. One employee was killed by a falling tree in the bush near Michel (this is not included in mine accidents).

Name of Company.	Name of Colliery.	1946.	1945.
Canadian Collieries (D.), Ltd.	No. 10 mine, South Wellington	....	1
Canadian Collieries (D.), Ltd.	No. 5 mine, Comox Colliery	2	....
Lewis & Son	Lewis mine	....	1
Crow's Nest Pass Coal Co., Ltd.	Elk River Colliery	1	1
Crow's Nest Pass Coal Co., Ltd.	Michel Colliery	1	2
Totals		4	5

The following table shows the various causes of fatal accidents in 1946 and their percentages of the whole and comparative figures for 1945:—

Cause.	1946.		1945.	
	No.	Per Cent.	No.	Per Cent.
By falls of roof and coal	1	25.00	3	60.00
By mine-cars and haulage	3	75.00	....	....
By bumps	....	....	1	20.00
Miscellaneous (surface)	....	....	1	20.00
Totals	4	100.00	5	100.00

The following table shows the number of tons of coal mined for each fatal accident in their respective classes in the years 1946 and 1945:—

Cause.	1946.		1945.	
	No. of Fatal Accidents.	Tons of Coal mined per Fatal Accident.	No. of Fatal Accidents.	Tons of Coal mined per Fatal Accident.
By falls of roof and coal	1	1,463,640	3	506,224
By mine-cars and haulage	3	487,880	....	....
By bumps	....	....	1	1,518,673
Miscellaneous (surface)	....	....	1	1,518,673
Totals	4	365,910	5	303,734

The number of tons of coal mined per fatal accident during 1946 was 365,910 tons, compared with 303,734 tons in 1945. The average for the ten-year period was 264,160 tons.

The following table shows the fatalities from various causes in coal mines during the year 1946, compared with 1945, according to Inspection Districts:—

District.	Number of Deaths from Accidents.				Totals.	
	Falls of Roof and Coal.	Mine-cars and Haulage.	Bumps	Miscellaneous (Surface).	1946.	1945.
Vancouver Island	....	2	....	....	2	2
Nicola-Princeton	....	....	....	....	....	....
East Kootenay	1	1	....	....	2	3
Northern	....	....	....	....	....	....
Province, 1946	1	3	....	....	4	....
Province, 1945	3	....	1	1	....	5

Ratio of Accidents.

District.	Accident Death-rate.			
	Per 1,000 Persons employed.		Per 1,000,000 Tons of Coal mined.	
	1946.	1945.	1946.	1945.
Vancouver Island	1.89	1.76	3.65	3.58
Nicola-Princeton	......	......	......	......
East Kootenay	1.84	2.71	2.31	3.44
Northern	......	......	......	......
Province, 1946	1.73	......	2.73	......
Province, 1945	......	2.05	......	3.29

The details regarding the occurrences of fatal accidents in coal mines during 1946 are as follows:—

The fatal accident which occurred to Nicholas Kovalievich, track-layer, No. 9 mine, Elk River Colliery, on February 27th, 1946, was due to a runaway car on a slight grade; only 20 feet of track was in use, and this had been installed on the previous day. He had been called back on the day of the accident to make some track adjustments, and while this was being done, the car, which apparently had not been securely blocked, moved down and crushed him. He died from a broken neck.

The fatal accident which occurred to John I. Warren, winch-boy, No. 5 mine, Comox Colliery, on July 9th, 1946, was due to deceased being struck by a runaway trip of loaded cars on No. 1 West slope due to the haulage-rope breaking. This rope was 5/8 inch in diameter and had a breaking strain of 17 tons when installed during the previous November, since which time it had done comparatively light duty, and the total load on the rope at the time it broke was approximately 15 tons. Deceased had apparently signalled for this trip to be hauled up the slope and was struck by the runaway trip at about the point from which he signalled. There was no information available to indicate that this rope had been subjected to an undue strain at any time.

The fatal accident which occurred to John W. Watson, miner, No. 5 mine, Comox Colliery, on November 19th, 1946, was due to deceased being struck by a runaway car at the face of No. 1 West slope. A loaded car had been blocked on the slope some 60 feet from the face where deceased and his partner were drilling the floor with a jack-hammer, when the blocking holding the car failed and allowed the car to run down to the face. The noise of the drill prevented the men from hearing the car, which injured deceased so severely that he died two hours later.

The fatal accident which occurred to Pasqual Anselmo, miner, Michel Colliery, on December 4th, 1946, was due to a fall of roof and timber on the roadway leading to the working-place. Anselmo and partner had noticed that one of the roof-stringers was bent and decided to reinforce it with a centre-post. While Anselmo was clearing the floor for this purpose, the stringer broke suddenly and allowed several tons of material to fall on him and cover him completely; the body was recovered one and one-half hours later.

EXPLOSIVES.

The following table shows the quantity of explosives used in coal mines during 1946, 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 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 Explosives per Shot fired.
Comox Colliery (No. 5 mine)	24,797	103,413	38,976	4.17	0.63
Comox Colliery (No. 8 mine)	53,415	150,762	76,050	2.82	0.70
Tsable River mine	1,750	1,147	1,300	0.65	1.35
South Wellington No. 10 mine	65,394	223,345	66,765	3.44	0.97
Prospect mine	1,200	3,067	3,300	2.55	0.36
White Rapids mine	22,400	53,787	30,300	2.41	0.73
Chambers' mine	1,800	3,212	2,600	1.78	0.69
Loudon mine	1,250	1,388	893	1.11	1.40
Cassidy mine	250	699	500	2.79	0.50
Lewis mine (Timberlands)	1,200	980	2,300	0.81	0.52
Deer Home mine	1,550	1,985	2,380	1.28	0.65
Lake Road mine	....	21	....	......	......
Wellington No. 9 mine	680	801	730	1.18	0.93
Pacific mine	400	377	600	0.94	0.66
Stronach mine	2,400	1,750	2,400	0.73	1.00
Furnace Portal mine	600	734	1,100	1.22	0.54
Totals for district	179,086	547,468	230,194	3.05	0.77

Nicola-Princeton District.

Tulameen Collieries	12,067	37,877	21,036	3.14	0.57
Taylor mine	1,000	1,012	1,200	1.01	0.83
Coldwater coal mine	700	1,605	500	2.29	1.40
Totals for district	13,767	40,494	22,736	2.94	0.60

Northern District.

Bulkley Valley Colliery	3,925	10,706	6,000	2.73	0.65
Packwood mine	700	670	2,000	0.95	0.35
Peace River mine	1,450	1,333	2,600	0.92	0.56
Gething mine	300	300	200	1.00	1.50
Totals for district	6,375	13,009	10,800	2.04	0.59

East Kootenay District.

Elk River Colliery	18,800	281,821	19,750	14.99	0.95
Michel Colliery	36,850	579,693	61,473	15.73	0.60
Coal Mountain Coal Co.	....	1,155	....	....	......
Totals for district	55,650	862,669	81,223	15.50	0.68
Totals for Province	254,878	1,463,640	344,953	5.74	0.73

Quantity of Different Explosives used.

	Lb.
Monobel of different grades	225,439
Permissible rock-powder	29,439
Total	254,878

MACHINE-MINED COAL.

During the year 1946 mining-machines produced approximately 913,500 tons or 62 per cent. of the total output.

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 Under-cutting.	Puncher Type.
Vancouver Island	....	26	22	4
Nicola-Princeton	....	8	....	8
East Kootenay	....	45	20	25
Northern	....	2	....	2
Totals	....	81	42	39

In addition to the above, 132 air-picks are used in the mines of the Crow's Nest Pass Coal Company.

SAFETY-LAMPS.

There were 2,382 safety-lamps in use in the coal mines of the Province. Of this amount, 200 were flame safety-lamps of the Wolf type and 2,182 were electric lamps of various makes.

The following table shows the distribution of lamps by district, method of locking, and illuminant used:—

Vancouver Island District.

Colliery and Mine.	Method of Locking.		Illuminant used.	
	Magnetic Lock.	Automatic Clip.	Naphtha or Gasoline.	Electricity.
Comox Colliery (No. 5 mine)	59	204	21	242
Comox Colliery (No. 8 mine)	84	251	34	301
Tsable River mine	2	24	2	24
South Wellington No. 10 mine	13	290	13	290
Prospect mine	3	23	3	23
White Rapids mine	5	109	5	109
Chambers' mine	2	8	2	8
Loudon mine	7	....	2	5
Cassidy mine	2	....	2	....
Lewis mine (Timberlands)	1	2	1	2
Deer Home mine	3	18	3	18
Lake Road mine	2	....	2	....
Wellington No. 9 mine	2	5	2	5
Pacific mine	1	2	1	2
Stronach mine	2	9	2	9
Furnace Portal mine	1	2	1	2
Totals for district	189	947	96	1,040

Nicola-Princeton District.

Tulameen Collieries	84	....	4	80
Taylor mine	7	....	1	6
Coldwater coal mine	3	13	3	13
Totals for district	94	13	8	99

NORTHERN DISTRICT.

Colliery and Mine.	Method of Locking.		Illuminant used.	
	Magnetic Lock.	Automatic Clip.	Naphtha or Gasoline.	Electricity.
Bulkley Valley Colliery	33	....	3	30
Packwood mine	8	....	1	7
Peace River mine	13	....	1	12
Gething mine	13	....	1	12
Totals for district	67	....	6	61

EAST KOOTENAY DISTRICT.

Colliery and Mine.	Magnetic Lock.	Automatic Clip.	Naphtha or Gasoline.	Electricity.
Elk River Colliery	412	....	30	382
Michel Colliery	660	....	60	600
Coal Mountain Coal Co.	....	....	....	....
Totals for district	1,072	....	90	982
Totals for Province	1,422	960	200	2,182

APPROVED SAFETY-LAMPS, ELECTRIC AND FLAME.

A list of the approved safety-lamps, both electric and flame, was published in the 1930 Annual Report. The following lamps, all electric, are now also approved:—

No. 8.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 18 of the United States Bureau of Mines. The only bulb approved for use in this lamp carries the symbol BM-18 and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio.

No. 9.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 18F of the United States Bureau of Mines. This model of Edison lamp in reality represents an extension of the lamp approval given under Approval No. 18. The only bulb approved for use with this lamp carries the symbol BM-18F and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio.

No. 10.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 18H of the United States Bureau of Mines. This lamp represents an extension of the No. 18 approval of the United States Bureau of Mines. The only bulb approved for use with this lamp carries the symbol BM-18H and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio.

No. 11.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 24 of the United States Bureau of Mines. The only bulb approved for use with this lamp carries the symbol BM-24 and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio. This lamp is known as the Edison Model J lamp.

No. 12.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 25 of the United States Bureau of Mines. The only bulb approved for use with this lamp carries the symbol BM-25 and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio. This lamp is known as the Edison Model K lamp.

No. 13.—The electric lamp manufactured by the Koehler Manufacturing Company, and known as the Super-Wheat Model " W " electric safety cap-lamp under Approval No. 20 of the United States Bureau of Mines.

No. 14.—The electric lamp manufactured by The Portable Lamp and Equipment Company, and known as the " Portable " electric safety cap-lamp under Approval No. 27 of the United States Bureau of Mines.

(Unless otherwise specified, all lamps are cap-lamps.)

NOTE.—*While the use of flame safety-lamps is permitted, it is the policy of the Department of Mines to encourage the use of approved electric safety-lamps for all persons underground in the coal mines, except such flame-lamps as may be required by the officials of the mines in the carrying-out of their duty and in such cases as it is considered advisable to provide flame safety-lamps in addition to the electric safety-lamps.*

ELECTRICITY.

Electricity is used for various purposes on the surface at eight mines and underground at four.

The purpose for which it is used, together with the average horse-power in each instance, is shown in the following table:—

Nature of its use.	Average Horse-power.
Above ground—	
Winding or hoisting	2,145
Ventilation	1,930
Haulage	1,097
Coal-washing	2,637
Miscellaneous	7,011
Total horse-power	14,820
Underground—	
Haulage	1,412
Pumping	1,200
Coal-cutting	------
Miscellaneous	43
Total horse-power	2,655
Approximate total horse-power above and below ground	17,475

Of the above, practically all the current is alternating.

VENTILATION.

The reports of the District Inspectors give detailed information regarding the amount of ventilation in the main airways and working splits of the different mines. In a number of instances where the methane content on the face-lines tends to become too high, the Inspectors prohibit the use of explosives until the outflow of methane decreases or sufficient additional ventilation is provided. In such cases the Inspector makes a further inspection before the use of explosives is again permitted. All such instances were due to excessive methane outflows, and none was due to the volume of ventilation falling to the minimum of 100 cubic feet per man per minute, set out by the " Coal-mines Regulation Act," General Rule 2.

METHANE DETECTION.

The Burrell methane detector and the M.S.A. methane detector were in general use throughout 1946 to detect the presence of methane in percentages less than could be detected by means of the flame safety-lamp.

The flame safety-lamp is in general use as the everyday means of testing for the presence of methane by the firebosses and mine officials, and during 1946 intensive efforts were made by the Inspectors to train firebosses and miners to estimate closely the percentage of methane indicated by very small "gas-caps" on the flame safety-lamp. This work was carried out underground where the gas-caps could be calibrated immediately with the results found at the same time and place by one of the above-named methane detectors.

While practically all workmen underground use the electric safety-lamp, many of the miners were given practical instruction in the use of the flame safety-lamp as a methane detector, and all new men who apply for a coal-miner's certificate of competency must show that they possess this knowledge.

Mine-air Samples.

The work of sampling mine-air was maintained throughout 1946 according to the conditions existing or anticipated. While the results of the analyses of the samples are not as immediately available as the information obtained by the methane detectors or the flame safety-lamp, the report of analyses forms a valuable record and offers a means of checking the accuracy of the other means of methane testing. During 1946, 153 samples were taken.

INSPECTION COMMITTEES.

At all the larger mines the miners fully observed the provisions of the "Coal-mines Regulation Act," section 101, General Rule 37, by appointing and maintaining Inspection Committees to inspect the mines on behalf of the workmen every month, and as the personnel of these committees is changed frequently, a considerable number of men are brought into a direct contact with safety-work in the course of time.

The reports of the various committees are generally of a practical nature and cover current conditions underground as seen from the view-point of the miner.

A report of each monthly inspection is sent to the District Inspector of Mines for his information.

COAL-DUST.

During 1946 the sampling and analysing of coal-dust was well maintained, 985 samples being analysed.

Very few samples showed less than 50 per cent. incombustible content. If samples show less than 50 per cent. incombustible content, or if in successive samples a tendency for the incombustible content to decrease is noted, further treatment with lime-dust is ordered immediately.

DANGEROUS OCCURRENCES.

On January 16th, at No. 5 mine, Comox Colliery, while a car was being hoisted in the shaft, the short connecting-rod between the control-lever and the rheostat broke, leaving the power on, causing the cage to overwind. The cut-out, however, acted effectively and no damage resulted.

On February 8th, at No. 8 mine, Comox Colliery, while a number of 1-inch pipes were being lowered in the shaft, the sling gave way, allowing all the pipes, forty-five in number, to fall. Apparently only four of the pipes reached the shaft-bottom, the rest being hung up at various points in the shaft. No damage was done to the shaft. This accident was entirely due to a faulty method of slinging the pipes in the shaft.

On March 7th, at No. 10 mine, South Wellington, while twelve loaded cars were being hoisted on No. 1 Diagonal slope, the shackle on the haulage-rope broke and allowed the trip to run back down the slope some 20 feet, where the trip was derailed by the safety-drag. No person was injured. The men employed in this area are hoisted on this slope at the end of each shift.

On April 11th, at No. 10 mine, South Wellington, while a loaded trip was being hoisted on the main slope to the surface, a coupling-pin between the second and third cars failed and allowed ten cars to run back some 20 feet, where they were derailed by the safety-drag. No person was injured. The mine crew is hoisted in the ordinary cars on this slope at the end of each shift.

On April 29th, in No. 5 mine, Comox Colliery, heating was discovered in a long-wall gob in No. 5 East section. The heating was indicated by the smell and a haze in the air at this point. The gob material was loaded out for a distance of 20 feet from the roadside, and the foot of one post was found to be charred, but the heating had been discovered before any flame resulted. No further heating resulted during the remainder of the year.

On May 19th, at No. 8 mine, Comox Colliery, a small fire occurred at the collar of the main shaft manway. The top wall-plate and the lagging were charred, but the fire was controlled and extinguished as soon as it was discovered. This shaft was equipped, at the collar, with an electric heating grid to warm the intake air to prevent the formation of ice in the shaft, and it is believed that the heat from this grid started the fire. The electric grid was removed.

On August 2nd, at White Rapids mine, while a trip loaded with timber was being lowered on the main slope from the surface, the coupling-pin between the first and second cars failed and allowed six cars to run wild to the foot of the slope. No person was injured. The mine crew is hoisted on this slope at the end of each shift.

On August 21st, in No. 10 mine, Elk River Colliery, an underground hoistman reported that on August 15th he had discovered two small fires burning in crosscuts near his hoist and claimed that he had extinguished the fires. He showed some small pieces of charred wood in support of his statement. He stated that his failure to report the above occurrences immediately was due to a desire to catch the person who had set the fires in the event of further outbreaks. This man was promoted to surface work.

Bumps.

During 1946 there were several bumps of a minor nature in No. 1 East mine, Elk River Colliery, and one severe enough to cause considerable material damage. Details of this bump are given in the report of the Inspector of Mines, page 242.

Outbursts of Gas.

There were no outbursts of gas reported during 1946, but the regulation established at No. 10 mine, South Wellington, Canadian Collieries (Dunsmuir), Limited, to deal with areas susceptible to outbursts during 1944 still remains in force:—

"Re 'Coal-mines Regulation Act,' Section 101, General Rule (c), Amendment, 1940.

"In view of the emergent conditions that exist due to repeated outbursts of gas in the workings of the Dip side of the 7 Right level, No. 1 Diagonal slope, No. 10 mine, Canadian Collieries (Dunsmuir), Limited, and in accordance with the provisions of the 'Coal-mines Regulation Act,' Section 101, General Rule 12 (c), 1940 Amendment, I prescribe hereby the conditions under which explosives may be used in above-described area, namely:—

"(1) That an interval of not less than two hours shall elapse between the firing of shots in any one working-face.

"(2) That two shots, but not more than two shots, may be fired simultaneously in one working-face by being connected electrically.

"(3) That where two shots are fired simultaneously, no one shot shall be dependent on the work of the other shot.

"(4) That where a new working-face is being started near the face of an existing working-face, both faces, for the purposes of this regulation, shall be considered as one face until both working-faces have been advanced at least twenty-five feet from the point of their divergence.

"(5) That all persons authorized to fire shots in the above-defined area shall be supplied with and acknowledge the receipt of this order.

"(6) That this regulation is now in force and until further notice."

PROSECUTIONS.

During 1946 there were five prosecutions made for infractions of the "Coal-mines Regulation Act," as follows:—

Date.	Colliery.	Occupation of Defendant.	Offence charged.	Judgment.
Mar. 8	Michel (Crow's Nest Pass Coal Co., Ltd.)	Fireboss	Fired shots without means of examining atmosphere for inflammable gas	Fined $28 and costs.
Mar. 12	Michel (Crow's Nest Pass Coal Co., Ltd.)	Three miners	For not reporting above infraction of rules to the manager	Each fined $5 and costs.
May 14	Michel (Crow's Nest Pass Coal Co., Ltd.)	Fireboss	Used explosives in a place where inflammable gas showed a blue cap on flame of safety-lamp	Fined $24 and costs.
June 10	No. 10 mine, South Wellington (Canadian Collieries (D.), Ltd.)	Fireboss	Failed to see that all persons were clear before firing a shot in a working-place	Fined $10 and costs.
Aug. 7	Michel (Crow's Nest Pass Coal Co., Ltd.)	Fireboss	Was about to fire a shot where explosive gas was present	Case dismissed.
Dec. 6	Elk River (Crow's Nest Pass Coal Co., Ltd.)	Miner	Had a lucifer match in his possession underground	Fined $5 and costs.

GOVERNMENT MINE-RESCUE STATIONS.

During the year 1946 the mine-rescue stations of the Department at Nanaimo, Cumberland, Princeton, and Fernie were fully maintained, with a trained instructor in charge at each station.

Training in the use of mine-rescue equipment was given to all who presented themselves for this work, and certificates of competency issued to those who completed the training and passed a satisfactory examination.

The principal work done was in maintaining the semi-monthly training of the mine-rescue teams maintained at the mines in the Nanaimo, Cumberland, and Fernie areas.

During and since the war there has been a scarcity of younger men in the mines, who should be the mainstay of mine-rescue work, as this strenuous work requires young men of good health and stamina.

The main units of rescue equipment at each station consist of the McCaa & Gibbs two-hour oxygen machines and the Burrell all-service gas-mask. During the year the new Chemox oxygen-generating machine was introduced at all the stations for demonstration purposes and to permit all those interested in mine-rescue work to become familiar with this newer apparatus, which was generally hailed as a definite advance in this work.

In cases where men desire mine-rescue training at mines some distance from the station, the instructor may take rescue apparatus to such mines and give the necessary training there. During the year this was done at the Hedley Mascot, Nickel Plate, and Copper Mountain mines.

During the latter part of the year arrangements were made to install some rescue apparatus in the Wells area, and ten sets of the new Chemox oxygen-generating units have been stationed at the Cariboo Gold Quartz mine for the service of the other mines in that area. The Inspector of Mines for the district and the mine-rescue instructor from Nanaimo established the equipment and gave preliminary instruction to some forty men in the use of the Chemox.

The Chemox apparatus in use weighs only some 13 lb., as compared with 40 lb. weight of the presently standardized McCaa & Gibbs oxygen machine at the other rescue-stations, and the simplicity of design, together with reduced number of connections and fittings, reduces the hazard of a failure where the wearer is in an irrespirable atmosphere, and also reduces the time necessary to make a new man familiar with the machine and gain confidence in its use.

The oxygen supply of the Chemox is produced by a chemical reaction in a self-contained canister which is an integral part of the machine when assembled, and which permits the wearer to remain and work in an irrespirable atmosphere for approximately one hour, when a fresh canister is required.

It is probable that further research and modification of design will result in extending the period of use of the canister to two hours. Such an advance by the Chemox or some other similar apparatus would be a definite forward advance in mine-rescue apparatus that would immediately render existing equipment obsolete.

During 1946, in addition to the regular teams in training, forty new men took the full training and were granted certificates of competency:—

Cert. No.	Name.	Where trained.	Cert. No.	Name.	Where trained.
1218	Melvin Jenner	Princeton.	1238	John G. Forsythe	Copper Mountain.
1219	Guerrino Schulli	Princeton.	1239	George P. Hollinan	Copper Mountain.
1220	George Kassa	Princeton.	1240	Richard G. Miller	Copper Mountain.
1221	Robert K. Allan	Hedley.	1241	Denis Ralph Parsons	Copper Mountain.
1222	James T. Duncan	Hedley.	1242	Lenard Rash	Copper Mountain.
1223	Harry Fenton	Hedley.	1243	Cyril Reid	Copper Mountain.
1224	James Forgaard	Hedley.	1244	George T. Warner	Copper Mountain.
1225	Gerald Fetterly	Hedley.	1245	Harold E. Banks	Cumberland.
1226	Raymond Eric Coke Richards	Hedley.	1246	Thomas Clive Banks	Cumberland.
1227	Sidney Dannhauer	Hedley.	1247	Lawrence Donelan	Cumberland.
1228	Ernest Arthur Hendsbee	Hedley.	1248	Archie Allan	Cumberland.
1229	Barry Woodin	Hedley.	1249	John A. Thomson	Cumberland.
1230	David Forsyth	Hedley.	1250	James Murray Clarkson	Cumberland.
1231	Ole Aardal	Copper Mountain.	1251	John H. Buchanan	Cumberland.
1232	Walter Braitenback	Copper Mountain.	1252	George Albert Angstadt	Princeton.
1233	Paul Brunner	Copper Mountain.	1253	Sydney Scott Hughes	Natal.
1234	Fred Buck	Copper Mountain.	1254	Daniel Bernard Bobchak	Natal.
1235	Frank Burges	Copper Mountain.	1255	Mario Joseph Pettoello	Michel.
1236	George F. Chase	Copper Mountain.	1256	Charles Landry	Michel.
1237	Nelson Fletcher	Copper Mountain.	1257	Dennis Leonard Ramshaw	Michel.

SUPERVISION OF COAL MINES.

During 1946 twenty-one companies operated thirty-three mines, employing 1,773 men underground. In the supervision of underground employees there were nine managers, fourteen overmen, and seventy-five firebosses and shotlighters, or one official to every eighteen 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.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS.

By James Strang.

FIRST-, SECOND-, AND THIRD-CLASS CERTIFICATES AND MINE-SURVEYORS' CERTIFICATES.

The Board of Examiners which was formed on July 10th, 1919, in 1946* consisted of James Dickson, Chief Inspector of Mines, chairman; Robert Bonar, member; and James Strang, member and secretary of the Board.

The Board has lost the services of a valued member in the person of H. E. Miard, who retired in April, 1946. Mr. Miard has been a member since the Board was formed in 1919.

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 on September 28th, 1929.

Two examinations were held in 1946—the first on May 15th, 16th, and 17th, and the second on November 20th, 21st, and 22nd.

The total number of candidates at the examinations was as follows: For first-class certificates, 1 (0 passed, 1 failed); for second-class certificates, 5 (3 passed, 2 failed); for third-class certificates, 23 (13 passed, 10 failed); for mine-surveyors' certificates, 3 (2 passed, 1 failed).

The following is a list of the candidates who successfully passed in the various classes:—

Second-class Certificates.—Muir A. Frame, James J. E. Anderson, and Samuel Fowler.

Third-class Certificates.—Thomas B. Morris, Benjamin A. Volpatti, Stanley Menduk, David G. Brown, Fred Apponen, Kenneth F. Kniert, Lawrence Donelan, Robert T. S. Craig, William H. Davey, Roger Girou, William Verkerk, Archie M. Allan, and Mario J. Pettoello.

Mine-surveyors' Certificates.—Brockwell L. Montgomery and Eric F. Hornquist.

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. By miner is meant any person employed underground in any coal mine to cut, shear, break, or loosen coal from the solid, either by hand or machinery. Examinations are held regularly in the coal-mining districts.

No certificate has been granted in any case 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 1946 there were 98 candidates for coal-miners' certificates; of these, 95 passed and 3 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 when 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 applicants, 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.

* As at May 1st, 1947, the Board consists of James Strang, Robert Bonar, and John MacDonald, *see* page 43.

NOTES ON COAL MINES.

VANCOUVER ISLAND INSPECTION DISTRICT.

NANAIMO (49° 123° S.W.).

By John MacDonald.

Canadian Collieries (Dunsmuir), Ltd. J. A. Boyd, President, Montreal, Que.; H. R. Plommer, Vice-President, Nanaimo; P. S. Fagan, Secretary, Nanaimo; S. V. Isaacson, Treasurer, Nanaimo; R. K. Smart, General Superintendent, Nanaimo; J. A. Quinn, District Superintendent, Cumberland. During 1946 this company operated No. 10 mine at South Wellington, White Rapids mine at Extension, and Prospect mine at Extension, in the Nanaimo district; and Nos. 5 and 8 mines of Comox Colliery and the Prospect mine at Tsable River, in the Cumberland area. Operations in the latter area were carried on steadily but with greatly reduced crews as a result of the current labour shortage.

No. 10 Mine, South Wellington.—W. Frew, Manager; J. Wilson, Overman; A. Hannah, T. Jordan, F. Bell, W. Roper, D. McMillan, E. Heyes, J. McArthur, F. Johnson, and T. McCann, Firebosses. This mine is situated 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, but the office formerly used by the manager was remodelled and equipped as a first-aid room. This is near the lamp-cabin and is under the direct supervision of the lampman, who is a qualified first-aid attendant.

This mine, in the Douglas seam, maintained its position as the chief producing mine in the Vancouver Island District, with a production of 223,342 long tons over a working period of 258 days, with an average crew of 200 men employed underground and 35 on the surface. As in the past three years the major portion of this tonnage has come from pillar-extraction. The remainder came from new development-work in Nos. 1 and 1½ headings off the main slope and No. 1 Right off No. 1 Diagonal slope. These roadways were driven to open up areas that were by-passed in the first working, a total of 5,000 feet of drivage being done. The area of coal so far opened up will help materially to prolong the life of the mine. As operations are on a three-shift per twenty-four-hour basis, extraction is fairly rapid and the workings are gradually converging on the main haulage-roadways. At the end of the year pillar-extraction had progressed outby from the Granby (Cassidy) boundary for a distance of 2,400 feet, with a very high percentage of recovery being maintained.

First-aid requirements have been kept at a fairly high standard. In addition to the main first-aid station at the lamp-cabin, nine emergency stations are located at strategic points—six underground and three on the surface. All emergency stations are inspected regularly by a competent attendant who checks supplies and renews same as required. In cases of emergency thirty employees at this mine are qualified to render first aid to the injured. Two mine-rescue teams of six men each have kept up regular training during the year. This consists of assembling the apparatus and working out practical problems at the experimental mine adjacent to the mine-rescue station at Nanaimo. To supplement the above teams, six additional trained men could be called upon if necessary.

No blowouts occurred during the year, but two other dangerous occurrences were reported and investigated. Both were haulage mishaps. One was caused by a rope-shackle breaking and allowing twelve loads to run back down the Diagonal slope for a distance of 20 feet before they were stopped by the drag. The other occurred on the Main slope when a bent pin slipped out from between the second and third cars of the trip, allowing ten loads to run back a distance of 20 feet before they were derailed by the drag. No one was injured in either case, but some of the cars were damaged and several sets of timber displaced.

As may be expected in a mine where pillar-extraction is general, considerable crushing has occurred on some of the main roadways, necessitating frequent grading and repairs. As a general rule, however, working conditions have been found fairly satisfactory during the course of inspection. Good ventilating conditions have been maintained during the year. Measurements taken at the last inspection in December showed a quantity of 73,810 cubic feet of air a minute passing in the main returns for the use of ninety-five men. Twenty-two samples of air were collected in the Main return airways, the methane content of these varying from 0.05 per cent. in the Main Slope split return to 0.25 per cent. in the main East return. One hundred and twenty-seven samples of dust were gathered from the various roadways, all of which were well above the minimum standard of incombustible content as set by the Coal-dust Regulations. One hundred and twenty tons of limestone-dust was used to alleviate the coal-dust hazard and 20 tons for tamping purposes during blasting operations. Searches were made regularly for matches, etc., but no articles of a prohibited nature were found. Ninety-eight accidents were reported and investigated. Four of these were reported as serious, with the balance being classed as minor accidents.

White Rapids, Extension.—A. Newbury, Manager; J. T. Brown, Overman; A. Bennett, J. Marrs, and T. McCourt, 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 53,789 long tons over a working period of 265 days, with an average crew of ninety men employed underground and nine on the surface.

An important addition to the surface plant during the year was a modern wash-room and change-house for the use of the employees. This was practically completed at the end of December, but a leak which developed in the storage-tank delayed the opening of this building until some time in January, 1947. Accommodation has been provided for 180 lockers and a wash-room 24 by 34 feet equipped with eighteen sprays. The building also contains an officials' change-room, boiler-room, a separate room provided with the necessary lavatory facilities, and a drying-room for wet clothes.

New development-work in 1946 included 400 feet of drivage in the Diagonal slope proper and 1,200 feet in opening up new walls. There are six long-wall faces, each averaging 300 feet in length, but only three of these are in operation. The seam, which has a height of from 30 to 40 inches, is undercut by Anderson-Boyes long-wall coal-cutting machines. Meco conveyers are used to transport the coal along the face-lines to the loading-points on the levels. The roof consists of an extremely soft shale, and the greatest possible care must be exercised at all times by all concerned to guard against accident.

The main first-aid station is located adjacent to the lamp-cabin and is supervised by the lampman, who is a fully qualified first-aid attendant. Emergency kits are taken into the mine each shift by the "chunkers" for the convenience of the men near the different loading-points. Seventeen employees are qualified to render first aid to the injured. One mine-rescue team of six men has taken regular training each month. This consists of assembling the apparatus and doing a certain amount of practical work in the experimental mine adjacent to the mine-rescue station at Nanaimo.

Notwithstanding the friable nature of the roof, general conditions have usually been found fairly satisfactory in the course of inspection. Ventilating conditions have been good throughout. The quantity of air passing in the main return at the last inspection in December amounted to 23,500 cubic feet a minute for the use of thirty men and one horse. Nine samples of air were taken in the Main return airway, and analyses showed that none of these exceeded 0.2 per cent. methane. Seventy-two samples of dust were collected around the roadways and loading-points, all of these being well above the minimum standard of incombustible content as set by the Coal-dust Regulations. Ten tons of limestone-dust was used in the treatment of coal-dust and for tamping purposes in blasting operations. Searches for matches were made periodically, but no articles of a prohibited nature were found. Fifty-seven accidents were reported and investigated. Two of these were serious, and the remainder were classed as being of a minor nature.

Prospect Mine, Extension.—M. Brodrick, Fireboss. This mine is in the Wellington seam at Extension, on the southern end of the Harewood Ridge. Production in 1946 amounted to 3,067 long tons over a working period of 249 days, with an average crew of six men employed. No new development was undertaken during the year, all operations being confined to pillar-extraction in the two upper levels off the slope. Working conditions have been found generally satisfactory in the course of inspection, and no accidents were reported from this mine during the year. Sixteen accidents of a minor nature were reported from the various surface departments in the Nanaimo area, all of which were duly investigated.

Lake Road Mine, Extension. A. Dunn, Fireboss. Although an output of 21 long tons was reported from this mine in the early part of January, this coal was actually mined in December, 1945, and stored in the surface bunkers. The operators worked one day only in the beginning of January, pulling out several sets of timber at the portal and caving the slope for final abandonment.

Chambers' No. 4 Mine, Extension. R. H. Chambers and associates, Operators; R. H. Chambers, Fireboss. This mine, in the Extension district, is still being operated in the old barrier pillar which was left to separate the former Extension Nos. 1 and 3 mines. A fairly large area of coal, from the view-point of the small operator, has been developed during the year, assuring employment for the present crew for several years. Production in 1946 amounted to 3,210 long tons over a working period of 251 days, with a crew of seven men employed. General conditions have been found fairly satisfactory in the course of inspection. No accidents were reported from this mine during the year.

Deer Home No. 2 Mine, Extension. R. Hamilton and associates, Operators; R. Hamilton, Overman. This mine is near the old Vancouver slope, in the Extension District, and is operated in isolated portions of the Wellington seam which were abandoned in this area when the old Extension No. 3 mine was closed down. Production in 1946 amounted to 1,984 long tons over a working period of 222 days, with a crew of four men employed. Working conditions as a rule have been found fairly satisfactory at all inspections. No accidents were reported from this mine during the year.

Furnace Portal Mine, Harewood. J. Biggs, Operator and Fireboss. This mine is on the Harewood Ridge, in an isolated area of coal left by former operators. Production in 1946 amounted to 727 long tons over a working period of 212 days, with a crew of three men employed. General working conditions have usually been found fairly satisfactory during the course of inspection. No accidents were reported from this mine during the year.

Old No. 8 Mine, Timberlands. (49° 124° S.E.) J. R. Wilson and G. Lewis, Operators; J. R. Wilson, Fireboss. This mine is operated in the Wellington seam, in a section of outcrop that was left in this area when the Wellington mine was abandoned by Canadian Collieries (Dunsmuir), Limited. Production in 1946 amounted to 979 long tons over a working period of 289 days, with a crew of two men engaged. General working conditions have been found fairly satisfactory in the course of inspection. No accidents were reported from this mine during the year.

No. 5 Mine, Cassidy.

J. McKellar and associates, Operators; L. Dickie, Fireboss. This mine, in the Cassidy district, is in a portion of the Douglas seam lying to the south of the abandoned Granby No. 2 mine. Production in 1946 amounted to 672 long tons during a working period of 124 days, with a crew of four men engaged. This mine was closed down from May to September, inclusive, as a result of decreased demand for coal on the local market. General conditions have been found satisfactory in the course of inspection. No accidents were reported from this mine during the year.

Loudon's No. 5 Mine, Wellington.

(49° 124° S.E.) W. Loudon and associates, Operators; W. Loudon, Fireboss. This mine, on the opposite side of the ridge from the old No. 9 mine in the Wellington district, is in the upper Wellington seam. Production in 1946 amounted to 1,422 long tons over a working period of 233 days, with a crew of four men engaged. General working conditions have usually been found satisfactory in the course of inspection. No accidents were reported from this mine during the year.

Carruthers and Wakelam No. 3 Mine, Wellington.

(49° 124° S.E.) R. B. Carruthers and W. Wakelam, Operators; R. B. Carruthers, Fireboss. This mine is near the Loudon mine and also in the upper Wellington seam. During the early part of the year the main level holed through into the old No. 9 mine, thus providing a good airway and also a good connection with the Loudon mine. Production in 1946 amounted to 805 long tons over a working period of 257 days, with a crew of two men engaged. As a rule working conditions have been found generally satisfactory in the course of inspection. No accidents were reported from this mine during the year.

Pacific No. 2 Mine, Wellington.

(49° 124° S.E.) F. John and H. Gerloch, Operators; F. John, Overman. This small mine, in Wellington district, was operated in a few very small outcrop pillars left in this area when the old Wellington slope was abandoned. All available coal that could be mined with safety was recovered, and this mine permanently abandoned in the early part of December. Production in 1946 amounted to 379 long tons over a working period of 243 days, with a crew of two men engaged. Working conditions were found fairly satisfactory during inspections. No accidents were reported during the year.

Stronach No. 2 Mine, Wellington.

(49° 124° S.E.) C. Stronach, Operator; H. Gilmuir, Fireboss. This mine is operated in a section of the upper Wellington seam adjacent to old No. 9 mine, to which connection has been made by three levels driven off to the right of the Stronach main slope. Production in 1946 amounted to 1,589 long tons over a working period of 231 days, with a crew of six men engaged. General conditions have been found fairly satisfactory in the course of inspection. No accidents were reported from this mine during the year.

Comox.

By John MacDonald.

Canadian Collieries (Dunsmuir), Ltd.

No. 8 Mine, Comox Colliery, Cumberland.—(49° 125° S.W.) J. S. Williams, Manager; A. W. Watson, Overman; D. Morgan and W. Johnstone, Shiftbosses; W. Bennie, F. Coates, A. Dean, M. Frame, A. Maxwell, J. Queen, P. Queen, T. Shields, J. W. Smith, D. Waddington, S. Hunt, J. Weir, and T. Robertson, Firebosses. This mine is close to the Lake Trail road and about 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 the upper, or No. 2, seam, which lies at a depth of 700 feet, is the only one where operations have been carried on to any extent to date. A new rock slope, 870 feet in length, has been driven during the year. At the end of December this reached the lower, or No. 4, seam, but development-work in this district will be delayed pending the driving of a return airway to make connection with existing roadways already driven from the foot of the upcast shaft. A general description of the surface plant and general method of working has appeared in previous Annual Reports, and no change has been made during 1946. Six long-walls, each with an average length of 300 feet and a seam thickness varying from 24 to 36 inches, were in operation at the end of December. Production in 1946 amounted to 139,689 long tons over a working period of 258 days, with an average crew of 230 men employed underground and 35 on the surface.

General conditions have been found fairly satisfactory during the course of inspection, excepting on infrequent occasions when an abnormal outflow of methane necessitated the prohibition of blasting operations pending the effective removal of all visible gas-caps from the general body of the air in the particular places affected. At the last inspection in December the fan was producing a total quantity of 240,000 cubic feet of air a minute, under a water-gauge of 6.6 inches, for the use of 225 men and 5 horses engaged in the full three shifts of twenty-four hours. Thirty-three samples of air were collected in the main returns, the methane content of these varying from 0.29 per cent. in the north side return to 0.59 per cent. in the No. 1 main south return. Two hundred and sixteen samples of dust were gathered from the various roadways, all of which were above the minimum standard of incombustible content as set by the Coal-dust Regulations. A total of 127 tons of limestone-dust was used to combat the coal-dust hazard on roadways and face-lines and for tamping purposes in blasting operations. Searches were made frequently for matches, etc., but no articles of a prohibited nature were found. One hundred and forty-six accidents were reported and investigated, all of these being classed as of a minor nature, although some involved the loss of a considerable amount of working-time.

No. 5 Mine, Comox Colliery, Cumberland.—(49° 125° S.E.) S. Lawrence, Manager; J. Christie, Overman; T. Eccleston and A. Somerville, Shiftbosses; J. Cochrane, R. O'Brien, L. Cooper, M. Brown, A. Jones, F. Dixon, J. Vaughan, M. Frobisher, and L. Hutcheson, Firebosses. This mine is approximately 1½ miles from Cumberland and is entirely in the No. 2 seam, which is reached by a shaft 280 feet in depth. Three walls operated during the year had an average length of 280 feet with a seam thickness of 40 inches. A general description of the surface plant and method of working has appeared in previous Annual Reports, the only change made in 1946 being the installation of a first-aid room in a part of the general warehouse building.

Development-work included 300 feet of drivage in the Main slope proper, 200 feet in No. 1 West slope, and the reopening of a portion of the old No. 5 East district, where a long-wall face was opened up in a large pillar left in the first workings. During the latter part of the year the No. 6 East section was unwatered for further examination. Development-work is being considered for this area in the near future. Working conditions in general have been found fairly satisfactory during the course of inspection, and ventilating conditions have been fairly satisfactory throughout the mine. A considerable amount of repair-work has been carried out on the right side return airway in the Main Slope district, and a new airway has been driven to serve the left side workings off the slope. At the last inspection for the year the two fans were producing a total quantity of 166,000 cubic feet of air a minute for the use of 123 men engaged in the full three-shift period of twenty-four hours. Nineteen samples of air were collected in the main returns, the methane content of these varying from 0.01 per cent. in No. 1 fan return airway to 0.92 per cent. in the main East return.

One hundred and fifty samples of dust were gathered from the various roadways, all of which were above the minimum standard of incombustible content as set by the Coal-dust Regulations. One hundred and thirty-nine tons of limestone-dust was used during the year. The greater portion of this was used in treating 20,000 feet of roadway and the balance for tamping purposes in blasting operations. One hundred accidents were reported and investigated. Two of these were fatal, and the remainder were classed as being of a minor nature. Searches for matches, etc., were made frequently during the year, but no articles of a prohibited nature were found.

Production in 1946 amounted to 100,582 long tons over a working period of 256 days, with an average crew of 200 men underground and 25 on the surface.

Tsable River Prospect Mine.—(49° 124° N.W.) J. A. Quinn, District Superintendent; W. Herd, Fireboss. This prospect was started in February, 1945, and the following development-work has been done up to the end of 1946: Main slope, 400 feet; Counter slope, 150 feet; No. 1 Right level, 260 feet; and No. 2 Right level, 150 feet. Lacking adequate means of transportation, practically all of the coal mined had to be dumped on the surface. The erection of a 50-ton bunker and construction of a road from the railway track down to the mine has made it possible for the output to be hauled 12 miles by truck to the company's plant at Union Bay. Side-dump cars are in use at the present time and are hauled up the slope in trips of three by a Western Fuel Company hoist powered by a 90-horsepower Chrysler industrial gasoline-engine. Power for pumping, drilling, and two auxiliary fans is provided by two portable compressors. One is a Schramm compressor driven by a 90-horsepower industrial engine, capable of delivering 200 cubic feet of air a minute, and the other is a Sullivan portable with a capacity of 300 cubic feet of air a minute.

Provision is now being made for the introduction of electric power, and a right-of-way for the power-lines has already been slashed from Union Bay to the mine, a distance of 5 miles in a direct line. The power will be transmitted from the company's own hydro-electric plant at Puntledge at 13,500 volts and transformed down to suit all requirements at the mine. Seven men are engaged and are accommodated in a comfortable bunk-house on the property. At the end of the year a new and larger bunk-house and dining-room was practically completed to accommodate twelve additional men. It is the intention of the management to push ahead vigorously with the development-work pending the installation of the power-lines and the construction of a new highway to connect the mine with the town of Cumberland. When this road is ready for traffic, the men will be carried by bus a distance of 12 miles daily to their work. General working conditions have always been found satisfactory in the course of inspection. Two accidents, both of a minor nature, were reported and investigated. Thirty-one accidents of a minor nature were reported from the various surface departments connected with the colliery, all of which were duly investigated.

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 mine have been examined frequently and, as a rule, entries have been found fairly well up to date.

NICOLA-PRINCETON INSPECTION DISTRICT.

By E. R. Hughes.

There were only three producing collieries operating in this district during 1946, as follows: The Tulameen Collieries, Limited, at Princeton; the Taylor Burson Coal Company, Limited, at Princeton; and the Coldwater Coal Mines, at Merritt. A small amount of prospect-work was done on the Hayes and Vittoni coal claim, near Blakeburn.

Coal production from the district was the lowest in thirty-eight years, although a brisk demand was maintained through most of the year. Due to the shortage of labour the output of coal in this district fell below market requirements.

No fatal accidents occurred in the coal mines of this district during the year. Thirteen compensatable accidents were reported, and of these only one was designated as serious. This was caused by a large block of coal breaking from a concealed face slip and striking a miner who suffered body injuries and broken ribs.

There were no prosecutions under the "Coal-mines Regulation Act" during the year, nor were there any dangerous occurrences to report.

In addition to the regular mine-rescue training and first-aid courses undertaken by workmen during the year, the Similkameen Valley Mine Safety Association held its annual field-day competitions at the Athletic Park, Princeton, on Saturday, June 15th. The events in both mine-rescue and first aid were keenly contested, and an excellent standard of work was exhibited under ideal weather conditions. Four teams competed in the mine-rescue event, which was won by the Copper Mountain No. 1 team, captained by Ed. Pickard.

PRINCETON (49° 120° S.W.).

Tulameen Collieries, Ltd.—Head office, 716 Hall Building, Vancouver. Thomas M. Wilson, Manager; Thomas Cunliffe, Overman; Thomas Bryden, Arthur Hilton, Frank Bond, David M. Francis, Firebosses.

Tulameen No. 3 Mine.—This mine is about 2 miles west of Princeton, the tipple being on a short siding-spur of the Kettle Valley Railway. The ground worked at this mine comprised approximately 24 acres, which had been left from the former operation of the abandoned Nos. 1 and 2 mines and consisted of pillars left above the water-line of No. 2 mine and some solid ground. All the coal in this area was successfully extracted, stoppings were erected in the main intake and return airways, and the mine was abandoned in June.

Pleasant Valley No. 4 Mine.—This new mine is operated by Tulameen Collieries, Limited, on the opposite side of the Tulameen River valley from the Tulameen No. 3 mine. The main Princeton seam has been reached in the cross-measure rock slope, driven 700 feet on a pitch of 25 degrees from the south end of the old Pleasant Valley Colliery tipple. Since reaching the seam, a return airway has been driven to the surface and levels have been advanced to the east and west. The seam has an average pitch of 14 degrees south-eastward. To the west of the new workings is the abandoned Pleasant Valley No. 2 mine, now filled with water, and 480 feet above, in the Upper seam, are the workings of the abandoned Pleasant Valley No. 1 mine. To the south and east lies an unworked area that, barring undue disturbances, appears capable of being developed into a major operation.

Under the proposed system of working, the mine is to be developed by the formation of suitably sized panels having a minimum number of openings, so that when the coal inside a panel has been exhausted, the whole area can be quickly and effectively sealed. The ease with which this coal takes fire necessitates the speedy isolation of areas affected by heating.

A progressive thinning of the seam became evident as the West level advanced, and the management decided to discontinue development in this area. At the time the level was stopped, the face had reached a point 820 feet from the Main slope and the cross-section of the seam measured 4 feet 5 inches, including four bony partings totalling 2¾ inches in thickness. At the end of the year a start had been made on taking out pillars from the inby end of the West level. Some of the rooms and cross-cuts above the level were in better coal and advance was being continued. However, the uppermost room, No. 4 Left, had reached a point 230 feet from the inundated workings of the abandoned Pleasant Valley No. 2 mine, and very little further advance could be permitted in this direction.

Two levels, known as Nos. 1 and 2 East, have been turned off the Main slope at points 800 feet and 950 feet respectively down the slope from the portal. At the end of the year No. 1 East level had reached a point 580 feet from the Main slope and No. 2 East level had advanced approximately the same distance. Two raises are being driven from near the face of No. 1 East level, which, when completed, will connect with two levels driven from the main return airway. The raises will pass underneath the cross-measure main slope, from which they are separated by about 170 feet of strata, thus forming a natural overcast return airway for the east side of the mine.

On five occasions during the year the writer was able to detect methane on the testing-flame of a safety-lamp, the caps indicating concentrations varying from 0.8 to 1.5 per cent. On one occasion it was necessary to prohibit blasting temporarily because of the presence of 1 to 1.5 per cent. of methane in the general body of the air in a working-place, and because of inadequate treatment with inert dust. During the early part of the year, before the completion of the return airway, some difficulty was experienced in maintaining adequate ventilation. After the return airway had been completed, a surface fan was installed, and the general ventilation of the mine has since been satisfactory. An anemometer reading taken in the main return airway during the December inspection showed that 21,600 cubic feet of air per minute was passing; this for the use of thirty-two men. No visible gas-caps were found in any of the safety-lamp tests made during the December inspection.

A considerable amount of the coal from this operation, particularly the smaller sizes, was shipped to the Granby Company's steam-electric plant near Princeton. Towards the end of 1946 the mine had developed to the point where production averaged about 200 tons per day, with the employment of seventy-one men underground and thirteen on the surface.

Taylor Burson Coal Co., Ltd.

Taylor No. 1 Mine.—Manager, James Taylor, Princeton. On obtaining a coal licence under the provisions of the "Coal Act," James Taylor commenced to prospect for coal on the North Half of Lot 88 in the Yale Division of Yale District, 4 miles west of Princeton. This half-section of coal land adjoins the property held by the British Lands, Limited, and on which their presently inactive Jackson No. 1 mine is situated. Prospecting resulted in the discovery of a seam believed to be the larger of the two seams found at the Jackson mine. Following the discovery, underground operations were started for the purpose of proving the seam. Later on in the year the Taylor Burson Coal Company, Limited, was formed and development of the Taylor No. 1 mine was continued.

The mine is excellently located for development, being about 1 mile from the Tulameen River valley and 800 feet above it. Near the outcrop the seam pitches 55 degrees south-eastward, and the strike is north-easterly. A slope is being driven in in the seam on a dip of 25 degrees and at the end of the year was down a distance of 450 feet from the portal. No. 1 level has been driven out to the surface to provide ventilation and will also serve as a service level. The slope is being driven north-easterly, and as it becomes sufficiently advanced, it is intended to drive other levels out to the surface.

The height of the workings above the valley-floor and the presence of a series of natural benches between the mine and the valley will provide efficient drainage and ventilation outlets, as well as service and haulage levels when the workings are deepened. At the present stage of development the surface has about the same dip as the Main slope, with the result that very little cover has been gained. However, as north-easterly advance continues, the surface flattens and greater cover will be gained, until the Tulameen River valley is reached.

A cross-section of the seam taken at a point about 150 feet down the Main slope was as follows: Top coal, 3 feet; dirty coal, 1 foot 6 inches; bony coal, 2 feet 6 inches; shale, 6 inches; bottom coal, 4 feet. Because of the impurities between the top and bottom coals, it was decided to work only the bottom part of the seam for the time being, and if the grade of the intermediate coal improved, then the whole seam could again be mined.

The coal is hauled up the slope by a small gasoline-hoist. A tipple has been erected and a shaker screen installed. Coal is mined by hand; no underground machinery has yet been installed, but the introduction of a puncher-type coal-cutting machine is being considered. Conditions were found to be generally satisfactory during inspections. Four men were employed.

Coalmont (49° 120° S.W.).

Hayes and Vittoni Prospect.

J. Delprato, Fireboss. This prospect operation is between Blakeburn and Coalmont, near the No. 7 tower of the abandoned aerial tramway formerly operated by the Coalmont Collieries, Limited. Work done during the year consisted of prospecting for new seams and further proving of seams already found. No output of coal was reported.

Six seams have been discovered, three of which have been partly developed by underground work, and the other three uncovered by surface trenching and open-cut work. The seams dip about 40 degrees southward. The best showing is in the No. 1 tunnel, where the following cross-section was measured: Top coal, 5 feet 6 inches; bone and rock, 12 inches; bottom coal, 2 feet 8 inches. A 4-foot seam is exposed at the face of No. 2 tunnel, and a 3-foot seam and two smaller seams near by are exposed in the Main level and crosscut of No. 3 tunnel. The three seams exposed by surface trenching and open-cut work have widths of 3 feet 9 inches, 4 feet, and 3 feet respectively. The total length of underground tunnels is approximately 160 feet.

Apart from proving the existence of seams, no appreciable tonnage of coal has been developed. The overburden in this area has proven an obstacle in tracing the seams, although if prospecting were on a larger scale, a bulldozer might be successfully employed. The prospect is about 1¼ miles from the nearest underground workings of the abandoned Coalmont Colliery, and is on the opposite rim of the basin. Thus, should there be no major faulting, volcanic intrusions, or washouts, the new showings may prove continuous to the old workings.

Merritt (50° 120° S.W.).

Coldwater Coal Mines.

C. E. Thomas, Merritt, Operator; A. D. Allan, Overman; Robert Murray, Fireboss. Formerly operated by A. D. Allan and partners, and before that by the Middlesboro Collieries, Limited, this property has been taken over by C. E. Thomas. Present activity is confined to Coldwater Hill, about half a mile east of the old Middlesboro Colliery office, where work has been done on three seams, namely, Coldwater Nos. 2, 3, and 6. At the time of the December inspection ten men were employed underground and six on the surface.

Coldwater No. 2 Mine.—Pillar-extraction was completed in the old Main level, and the old Main slope was rehabilitated down to water-level. Unwatering of the lower workings was commenced in November, and at the end of the year the water had been lowered by 110 feet, slope measurement. Pillars off the Main slope workings are being split in an effort to maintain an output while the lower workings are being pumped out and put into shape. Surface track has been laid from the portal to the old No. 2 mine tipple, which has been reconditioned for loading railway-cars. A steam-boiler was installed to provide power for pumping and hoisting.

Coldwater No. 3 Mine.—The No. 3 seam, which is operated at this mine, underlies the No. 2 seam. The original No. 3 mine was abandoned in July, 1914, although a small amount of prospecting-work was done from the outcrop by the Middlesboro Collieries, Limited, during the autumn of 1941, when a connection was made through the old workings.

In 1944 A. D. Allan and partners extracted a small amount of pillar coal from near the surface, but this was found to be discoloured and unsuitable for sale. The seam is 28 to 30 inches in thickness, has a hard sandstone roof, pitches 22 degrees in a south-easterly direction, and under deeper cover is found to be of good quality. Coal mined formerly from this seam was hauled through a cross-measure tunnel to No. 2 mine Main level, and thence to the surface.

New work has been started, and during December a new level and slope were being driven. The new level is being advanced parallel to the original Main level, but at a lower elevation. At the end of the year the slope was down 30 feet, and the level was in 60 feet, with a connection through to the old Main level. The entrance to the new slope and level converge at the surface, and the portal is at the same elevation as the No. 2 mine tipple, to which point the coal is taken for disposal.

Coldwater No. 6 Mine.—The seam at this mine, known as the No. 6 seam, which underlies the Nos. 2 and 3 seams, was discovered by A. D. Allan and partners by surface trenching in 1945. The only underground development consists of an adit-level driven into the hillside for a distance of 75 feet. The coal is, as yet, discoloured and probably will not improve until more cover is gained. A small amount of coal was mined from this seam during October for use under the colliery boiler.

EAST KOOTENAY INSPECTION DISTRICT.

By R. B. Bonar.

Crow's Nest Pass Coal Co., Ltd.—H. P. Wilson, President, Fernie; Thomas H. Wilson, General Manager, Fernie; William C. Whittaker, General Superintendent, Fernie; Harold A. White, Chief Engineer, Fernie; B. L. Montgomery, Mining Engineer, Fernie. This company operates the Elk River and Michel Collieries.

ELK RIVER COLLIERY.—(49° 114° S.W.) James Littler, Manager. Underground operations are under the direct supervision of three overmen, two shiftbosses, and nine firebosses. Snow-sheds, of steel construction, were erected at the top of the outside supply incline. They connect with the newly erected sheds, also of steel construction, at the entrance to No. 9 mine. The cribbing at the entrance to No. 9 mine was extended out and to the east, to allow the dumping of mine rock.

No. 1 East Mine.—Carmichael McNay, Overman; Thomas Reid and Edward Caufield, Firebosses. The operation at this mine consists entirely of the extraction of pillars by the orthodox method. The coal being fairly soft allows pneumatic picks to be used to advantage by the miners. Horses are used to haul the coal from the faces to the main partings, where trips are made up. From the partings the trips are hauled by a compressed-air hoist to the head of the endless-rope system, now only about 450 feet from the mine portal, which lowers them on the surface incline to the level of the old Coal Creek tipple. From there the coal is hauled by a steam-locomotive to the Elk River preparation plant, about 4,000 feet away.

This mine is still the largest producer at the Elk River Colliery, and it is estimated that this operation will continue for approximately a year before the present working area is exhausted.

Although there were several bumps of a minor nature in this mine during the year, there was only one severe enough to cause extensive material damage. This bump occurred on December 17th and centred in the No. 6 East section, where Nos. 1 and 2 rooms were subjected to considerable heaving, accompanied by the displacement of set timbers and rib sloughing.

Very little methane is given off by the pillars during their extraction, and the ventilation in general throughout the year was good, although at times considerable coal-dust was held in suspension in the air in the Nos. 5 and 6 East sections, due to the low velocity of the ventilating-current and numerous old roads encountered in the normal extraction of the pillars. The total volume of air passed by the fan amounts to 91,900 cubic feet per minute, of which 62,900 cubic feet are supplied to the actual working-places for a total working force of seventy-five men and twenty horses, and 29,000 cubic feet is circulating through the abandoned workings. The west return airway from the active workings carried 0.86 per cent. methane, and the east side return from the abandoned workings 0.45 per cent.

No. 4 Mine.—Daniel Chester, Overman; James Bushell, Shiftboss. This mine is now on the retreat: all the production of the single shift employed comes from the splitting and slabbing of pillars, of which about 50 per cent. is extracted.

The Main level development was stopped owing to the very disturbed nature of the ground and the high ash content of the coal. This coal was badly crushed and gave off considerable amounts of methane and fine coal-dust. The operation at present is confined to the pillars on the high side of the Main level, pneumatic picks and Meco shaker-conveyers being used to advantage. No blasting is necessary. From the loading-points on the level the coal is hauled by horses to the mine portal, which is only a very short distance from the tipple rotary dump.

The ventilation, supplied by a double-inlet Sirocco fan 5 feet in diameter, was found to be adequate throughout the year, except for a few instances due, in the main, to excessive leakage, when inflammable mixtures were found.

No. 9 Mine.—Daniel Chester, Overman; Ralph Larner, William Waller, and James Corrigan, Firebosses. Because of the faulting of the seam onto the high side of the Main level, the workings are now reduced to two intakes and two returns. A pair of inclines are to be started near the face of the Main level for the purpose of prospecting the seam to the rise. This programme will allow the Main haulage-level to be driven with rapid progress to the inner part of the field, where better mining conditions are expected.

The coal is mined by radial punching-machines and then blasted down, where it is loaded into Meco shaker-conveyers, which convey it to the loading-points on the level. Horses haul the trips of coal to the mine portal, at which point it is dumped onto a belt which carries it to the outside retarding conveyer.

The ventilation, in general, throughout the year was found to be good. The very friable coal, together with the method of mining, has necessitated the use of large amounts of inert dust to successfully combat the coal-dust hazard.

No. 10 Mine.—Daniel Chester, Overman; Samuel Fowler, Shiftboss; John Eckersley, John Sweeney, and Albert Littler, Firebosses. This mine has grown during the year and has now reached the stage where pillar-extraction is well under way in the No. 2 Raise section. Although the above extraction is carried out under considerable difficulty, owing to the immediate coal and rock overburden, approximately 80 per cent. recovery is being made. Rooms are driven off the raise on level course at 50-foot centres, and the pillar coal recovered on the retreat by driving splits from each room to the room above with a 6-foot pillar between splits, this pillar being recovered after the split has holed through into the room above.

The Main haulage-level and counter are being driven through to the west outcrop. Parts of the Main level previously driven in the lower bench of the seam are being brushed to the main shale roof to form a permanent roadway, with the view of introducing modern car-haulage on this level in the near future.

In the pillar-work the seam is mined in the lower 9 feet, and in the development-work the seam is now being mined in the top 11 feet, next to the shale roof, although considerable rashings have to be handled. This latter method will eliminate the necessity of future top-brushing. The coal is mined by pneumatic picks in most places, although radial punching-machines are in use in some of the harder development places in the No. 6 Incline section. The coal is loaded into Meco shaker-conveyers, which transfer it to the mother chain conveyers, thence to the main belt system that carries it to the top of the retarding conveyer situated at the surface.

This mine and No. 9 mine are ventilated by the same fan, an 8-foot reversible Jeffrey with steel casing. Throughout the year the ventilation was found to be good, and although gas was found on a few occasions, it could invariably be attributed to a local disarrangement of the brattice.

No. 3 Mine.—John Caufield, Overman. After the No. 3 seam was prospected and located by drill-hole during the summer, the main adit was started in September, about 750 feet west of the No. 4 mine portal. It progressed through 120 feet of glacial drift before the No. 3 seam was reached on November 4th.

The seam averages about 14 to 15 feet in thickness, has a fairly low ash content, and to date has a good roof showing. The Main level, after progressing about 150 feet, has been stopped until the return airway, driven from the inside and above the Main level, has reached the surface and the new fan installed. This fan, which has arrived at the colliery, is of the aerodyne type, with blades adjustable to eight different positions, and it is rated at 100,000 cubic feet per minute against a 2-inch water-gauge.

During 1946, 1,250 lb. of Polar CXL-ite, 17,550 lb. of Polar Monobel No. 4, and 19,750 electric detonators were used at the colliery in coal- and rock-blasting operations. Six misfired shots were reported.

To neutralize the coal-dust hazard, 336 tons of limestone-dust were applied to the underground workings and the tamping of shots. As a check on the efficiency of the above applications, samples of mine-dust were collected regularly in each mine every month and analysed—all of which were well above the minimum requirements of incombustible content as set by the Coal-dust Regulations.

Monthly inspections were made by the Miners' Inspection Committee, and copies of the inspection reports were received 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. Underground operations are under the immediate supervision of three overmen, two shiftbosses, and twenty-one firebosses. There were four mines active at the colliery during the year: "A" East and "A" South, which operated in "A" seam, and "B" East and "B" South, which operated in "B" seam.

"A" East Mine.—Walter McKay, Overman; F. Simister, R. Barass, Sr., H. Beard, T. Taylor, R. Taylor, H. Sanders, and H. Corrigan, Firebosses. This mine, operating on the Michel side of the syncline, was the largest producer during 1946. The sections to the rise of the main East level are more or less mechanized: the coal in the development places—that is, the rooms and splits—being cut by short-wall machines and loaded out by duck-bill loaders, which deliver the coal to main-room belts. The room belts deliver the coal to the Main Incline belt, which loads it directly into mine-cars on the main East level. The pillar coal formed by the rooms and splits is recovered by Meco shaker-conveyers using a swivel-pan, which allows the conveyer to angle into the pillar, forming a retreating face. The coal from the pillars is transported by the conveyer system mentioned above. The coal in the narrow places is fairly hard and requires blasting, but in the pillar-work pneumatic picks are used, only an occasional shot being required. The bad roof encountered in this mine is a handicap to mechanization and

requires the closest attention and supervision of all concerned to enable the coal to be mined with efficiency and safety.

The slope is now down below No. 4 Left room, and although the coal is of a favourable height and low ash content, the roof conditions such as have been experienced in the other parts of the mine have also been encountered, together with local ground disturbances.

Although mechanization has proved advantageous in this seam, it has also aggravated the coal-dust situation, which now presents a problem requiring a new and different approach to combat it with continued success. The coal, being very friable, is crushed in the pillar-extraction areas, where considerable amounts of fine dust are liberated into the ventilating-current due to coal sloughing at the faces; also, the transporting conveyers, belts, and loading-points contribute largely to this hazard. Although liberal and frequent treatments with inert dust is the method used at present to keep this hazard to a minimum, the ultimate solution to the problem would seem to be in augmenting the above method by damping the coal-dust at the source—that is, the coal-faces—either by spray or by water infusion of the coal pillars.

The No. 8 Incline section has been depleted and is now sealed off; the No. 6 Incline section will soon be exhausted, leaving only the No. 10 Incline section to the rise of the main entry and the slope to the dip.

"A" South Mine.—William Gregory, Overman; H. Batchelor, R. Pasiaud, and D. Bobchak, Firebosses. This mine is operating on the Sparwood limb of the syncline, where the inclination is rather steep, being 30 degrees and more. In the No. 4 Raise section, where the bulk of the coal was produced during the year, duck-bill loaders are being experimented with. Rooms, on the strike, are driven to the right and left off the raise by means of the duck-bills, and the 23 feet of intervening pillar between rooms is blasted down and recovered on the retreat. To facilitate the blasting, narrow crosscuts are driven through the pillars at suitable intervals outby the retreating duck-bills. Although experimentation is still being carried on, a fairly high output per man has been attained.

The coal is transported by the duck-bill conveyers to the Main Raise chute, which in turn delivers it to a flight retarding conveyer. The flight conveyer delivers it to a belt conveyer, which loads it directly into mine-cars on the main entry.

Due to the ravages of dry-rot all haulage was stopped on No. 10 Incline in October, and the incline put under intensive repairs. This work is still being carried on, as well as repairs to No. 8 Left room, which is also suffering greatly from dry-rot.

The ventilation, in general, throughout the year was good, the few instances of gas found on inspections being due to local disarrangements of the brattice.

On May 2nd fairly dense smoke and fog were discovered on No. 8 Left room off No. 10 Incline, coming from an abandoned area immediately below No. 8 Left room. It was subsequently discovered that the fire-zone was located in a pillar-extracted area between No. 6 Left and No. 8 Left rooms. It was decided to seal off the fire area with temporary stoppings, seven in number, and to erect permanent seals immediately after the completion of these temporary seals. By 5 p.m. on May 3rd the temporary seals were completed and all men were withdrawn from the mine. On May 4th and 5th the seals were examined by the District Inspector and company officials and, as the seals were in order and the fire appeared to be quiescent, it was decided to erect the permanent seals, immediately behind the temporary seals, starting on May 6th with a force of seventy-five men, which was split into three shifts, each shift under the direction of an overman and a fireboss. Every precaution was taken to safeguard the men by the constant use of canaries and detector to discover the possibility of carbon-monoxide gas leaking through the temporary seals; also, by using brattice, the available fresh air was deflected into each working-place, so that the men engaged in erecting the stoppings, both in the case of the temporary and permanent stoppings, were always in fresh air. The permanent seals were rushed to completion without undue incident, and to date the fire area seems to have been satisfactorily dealt with as the stoppings are performing their duty efficiently.

"A" West Mine.—William Gregory, Overman. This mine remained idle throughout 1946, except for necessary repairs to the main West level and to No. 4 Incline. A loading-point has been established at the bottom of No. 4 Incline and a belt is being installed up No. 4 Incline, preparatory to active production being commenced in the near future.

" B " South Mine.—Irving Morgan, Overman; T. Slee, J. Whittaker, F. McVeigh, H. Eberts, J. Robson, and S. Hughes, Firebosses. This mine operates on the Sparwood side of the syncline, where inclinations of 30 degrees and more are encountered. The coal is of good quality, with a fairly strong roof in most sections where machinery is being used to advantage.

The slope section was not producing during the latter part of the year, only the No. 3 Raise section being active in the production of coal. Rooms are driven off this raise, on a slight inclination, on the necessary centres to form 300-foot long-walls, which are cut by long-wall cutters and mined on the retreat. The coal slides down the face-lines to the battery at the bottom, where it is loaded onto shaker-conveyers which in turn deliver it to belts for conveyance to the main chute on No. 3 Raise. From the main chute it is delivered onto a cross-belt which in turn delivers it onto the main belt system, three belts in series, for delivery into mine-cars on the Main haulage entry. The rooms are driven wide, with duck-bill loaders and short-wall coal-cutters. The rooms are connected by splits driven on the full pitch of the seam, the coal in the splits being cut by radial punching-machines and then blasted down. It is loaded by hand into chutes, which deliver it to the room conveyers. The retreating long-walls take out the pillars between the rooms for a distance of about 100 feet, sometimes more, depending on roof conditions, and then a small barrier is left and the wall continued outby. The splits are driven at intervals necessary to accomplish this type of pillar-extraction.

Very little methane is given off by the coal in No. 3 Raise section, due probably to its proximity to the outcrop. The ventilation throughout 1946 was found to be good and is accomplished by means of a 4-foot single-inlet Sirocco fan assisted materially by natural ventilation through the several openings driven to the surface.

" B " East Mine.—Thomas Heyes, Overman; Abel Hampton, Shiftboss; F. Nash, T. Holley, D. Thewlis, J. McGinnis, and J. Hamer, Jr., Firebosses. Production from this mine is from barrier and sacrifice pillars left during the first working and is attended by the usual difficulties accompanying such work. The output per man is high owing to the ease in mining, caused by the crushing of the pillars, but the heaving of the floor, requiring regular brushing, accompanied by vagaries of the ventilation are constant sources of perplexity. The pillars are usually first split and then recovered on the retreat by the use of a swivel-pan attached to a Meco shaker-conveyer. It is not unusual in the splitting of the pillars for the coal to be subjected to what is known locally as small bumps, which release abnormal volumes of methane. This gas and the considerable amount of fine coal-dust liberated in mining the crushed pillars are hazards which are overcome only by the utmost care and constant vigilance on the part of the officials in charge.

Pneumatic picks are used successfully in mining the coal, and the coal is loaded into Meco shaker-conveyers, which load it directly into mine-cars on the haulage-levels.

In 1946 explosives amounting to 2,500 lb. of Polar CXL-ite and 34,350 lb. of Monobel No. 4 were used at the colliery in a total of 61,473 shots, with but one misfire shot reported.

Considerable trenching was done in 1946 about 1½ miles east of Michel on a coal-seam outcrop on the east side of the valley, with the view of opening up a stripping operation. Data obtained by trenching and otherwise proved the plan to be feasible, and work to that end, both at the outcrop and at the colliery, is going ahead with all possible speed. Production of coal from this mine is expected to commence early in 1947.

The company safety department, organized in September, 1945, with E. Chappell as safety supervisor and T. Owens as safety inspector at Michel Colliery, is doing excellent work in directing the safety programme at both collieries. Monthly meetings are held at each colliery to discuss the previous month's accidents individually, with the idea of finding the reason for each and ways of preventing similar accidents. The safety programme inaugurated at the collieries is proving its worth, as is manifested in a gradually decreasing number of accidents per month, fewer shifts lost per accident, and a lower severity rate.

Coal Mountain Mine, Corbin. (49° 114° N.W.) Thomas M. McGuckie, Calgary, Alta., Operator. This mine commenced production in October, 1946, and is a stripping operation on the east limb of the east syncline at the old Corbin Colliery. The coal produced to date is from the outcrop of old No. 6 mine, close to the hanging wall of the seam. The coal proved to be of inferior quality, so that the operation has been transferred to that part of the seam next to the foot-wall, where coal of much better quality is evident. The very inclement weather experienced in this district since October has seriously curtailed production at this mine to date.

NORTHERN INSPECTION DISTRICT.

By Charles Graham.

TELKWA (54° 127° N.E.).

There was no improvement in market conditions during the year. The market for Telkwa coal is confined to the area along the line of the Canadian National Railways between Prince George and Prince Rupert. The Telkoal mine remained idle during the year.

Bulkley Valley Collieries, Ltd. A. H. Dockrill, Overman; Hugh Bankhead and David Gourley, Firebosses. The property is on Goat Creek, about 7 miles from Telkwa. Coal is hauled to the railroad by truck. Some minor faulting was met in the slope and in the level to the left of the slope. Some diamond-drilling was done on the property under the direction of Dr. Victor Dolmage. Three holes were drilled ahead of the workings, the present seam being located in each of the holes. Only the No. 2 hole was drilled below the present seam. It was put down to 417 feet, but only the one seam was struck. Drilling was suspended at the end of October because of the lack of water on the bench. The drilling equipment was left at the mine, being set up on the location of hole No. 4. No gas was observed in the mine and general conditions were satisfactory.

BOWRON RIVER (53° 121° N.W.).

Bowron River Coal Co., Ltd. D. Wells, Manager. The property is about 40 miles east of Prince George and 20 miles south of Hansard. Bowron (Bear) River flows through the field in a north-westerly direction. Coal-measures consisting of sandstone and shales dipping 43 degrees south-westward are exposed on the west bank of Bowron River. Three coal-seams are known to occur, but it was possible to examine only the upper seam; the other two were covered with slough from the bank.

A drift has been driven, on the approximate strike of the upper seam, north 60 degrees west for a distance of 34 feet. Two crosscuts are turned off near the face of the drift. The one to the right runs 15 feet in measures above the roof, and the other, 7 feet to the left, exposes the floor of the seams.

A section of the seam at the face shows: Roof, shale; coal, 1 foot 1 inch; soft shale, 1 inch; coal, 2 feet; soft shale, ½ inch; coal, 1 foot 8 inches; soft shale, ½ inch; coal, 9½ inches; sandstone, 2½ inches; coal, 7½ inches; shale, 1½ inches; coal, 10 inches; sandstone, 8 inches; coal, 6 inches; sandstone, 8 inches; coal, 9½ inches; sandstone, 1½ inches; coal, 9 inches; floor, shale. The upper 7 feet of this section shows a workable seam reasonably free from rock-bands and impurities. The lower part of the seam, between the first 8-inch sandstone bed to the floor, would not be considered mineable. The top 7 feet of the upper seam is a bright clean coal, and from analysis would be classed as high volatile bituminous. It appears to burn readily and clearly with little ash.

The analyses of an air-dried sample of the upper 7 feet is: Moisture (105° C.), 5 per cent.; volatile combustible matter, 34 per cent.; fixed carbon, 46.7 per cent.; ash, 14.3 per cent.; sulphur, 1.6 per cent.; British thermal units, 10,989; loss on air drying at room temperature, 2.81 per cent.

Work has been started on building a truck-road to the property from Hansard, a distance of about 20 miles.

[Reference: *Geol. Surv., Canada,* Mem. 69, pp. 303–305.]

Hudson Hope (55° 122° N.E.).

Peace River Coal Mines, Ltd. Lloyd Gething, Managing Director; A. D. Chapple, Fireboss (under permit). The property is on Larry Creek, on the west slope of Portage Mountain, at the upper end of Peace River Canyon, about 18 miles from Hudson Hope. Nothing was done in the main slope during the year. Operations were confined to driving a pair of entries to the south-east. These are the only places working. Only development-work on these levels is permitted for the present. An average of four men was employed. No gas was observed and general conditions were satisfactory.

King Gething Mines. King Gething, Owner and Operator; Nick Schneider, Fireboss (under permit). The property is on the east slope of Portage Mountain, about 12 miles by road from Hudson Hope. The main entry was driven in the north bench of King Creek a distance of approximately 540 feet. The rooms driven to the rise encountered glacial drift at progressively shorter distances in each room.

A fault was struck in the face of the entry and in the last two rooms. Owing to the flow of water from the fault, very little was done during the winter of 1945–46. Permission was granted to abandon the area and extract the pillars. This is now being done.

Preparations are being made to reach the seam at a lower elevation by means of a slope. This will start at a point close to the entry portal.

Packwood Mines. (56° 122° S.E.) John Reschke, Fireboss (under permit). The property is on a southern spur of Butler Range, about 23 miles from Hudson Hope. The original mine ran into a section of seam that was faulted and badly crushed. The new mine is opened on what appears to be the same seam, about half a mile north of the old openings. An entry has been started on the strike of the seam, about due north; the seam pitches about 43 degrees. It is 5 feet thick, with two thin rock-bands, each about 1 inch thick, in the top 6 inches of the coal-seam. Three rooms have been turned off, but owing to shortage of miners only one has been worked. A coal-bunker was built and the vibratory screen for fine coal transferred from the old plant. An incline was built up to the portal of the tunnel from the tipple. No gas was observed and general conditions were satisfactory.

HASLER CREEK (55° 121° N.W.).

Hasler Creek Coal Co., Ltd.

J. Gordon Wilson, Manager. This property is on Hasler Creek, about 8 miles up-stream from its junction with Pine River and 96 miles from Dawson Creek. The mine did not work during the year. The company expects to start as soon as the bridge across the Pine River at East Pine is completed. This will provide an all-year road to Dawson Creek.

REPORT ON THE MERRITT COALFIELD.

By W. H. White and Staff of the Mineralogical Branch, Department of Mines.

CONTENTS.

ILLUSTRATIONS.

INTRODUCTION.

From December, 1945, to August, 1946, six prospect holes totalling 4,508 feet were drilled in the Merritt coalfield at the expense of the Provincial Government. Before drilling commenced, the field was examined by engineers of the Department of Mines, who gained additional information from local residents familiar with past mining operations. Further investigations were made during the course of the drilling. The results of this drilling programme are presented in the following pages. This report also includes records of earlier drilling published in the Annual Report for 1904 of the Geological Survey, Canada, long since out of print, and some data from other sources.

PRODUCTION.

The earliest reference to coal in the Nicola River valley near the present town of Merritt is contained in a report of the Geological Survey, Canada, for the year 1877–78. Subsequently, for many years coal was mined by ranchers for their own use from outcrops on the Coldwater River and Coal Gully Hill. Regular production from the Middlesboro Collieries on Coal Gully Hill began in 1906.

The total production of the Merritt coalfield to the end of 1945 was 2,699,682 tons. Middlesboro Collieries, Limited, produced 80 per cent. of this total from their mines on Coal Gully Hill, about 1 mile south-west of Merritt, and from their No. 2 mine on the north-west side of Coldwater Hill. This company ceased operation in 1944. The combined production of several mines west of the Middlesboro mines, which have been closed for many years, amounted to 486,704 tons. The Pacific Coast Colliery Company mined 3,024 tons of coal from a shaft and slope on the flats immediately north of Coal Gully.

Diamond Vale Collieries, Limited, produced 41,536 tons, principally from their Nos. 3 and 4 mines, 1½ miles east of Merritt. After many years of inactivity, No. 4 mine was reopened in 1943 by Merritt Coal Mines, Limited. Operations ceased in 1945, after mining 4,862 tons.

Two prospects, the Sunshine mine on the northern edge of the coalfield and the Normandale mine near the eastern limit of the field, yielded 247 tons and 730 tons respectively.

Current production, about 150 tons per month, sufficient for local needs, is obtained from pillars near the entry of No. 2 mine on Coldwater Hill. At the time of writing, the main slope of this mine is being reconditioned and the workings unwatered in preparation for further development.

GEOLOGY.

The surface geology of the Merritt coalfield is shown on Fig. 20. Tertiary coal-measures occupy a depression in Triassic greenstone, roughly 7 miles long in a north-easterly direction, with a maximum width of 3 miles. Except for a very few exposures, bed-rock within this area is concealed by thick overburden, most of which is glacial debris. Consequently neither the limits of the coal-bearing strata nor the structure of the measures as a whole are known with certainty.

Conglomerate, sandstone, and shale are the rock-types comprising the coal-measures, but textural variations and gradations from one type to another prevent the definite identification of strata cut in one drill-hole or shaft with those cut even in near-by drill-holes. This difficulty is further complicated by faulting and folding, which have affected the strata. The lack of uniformity in texture and rock-type in any one bed likewise renders it impossible to work out the nature of the folds and faults unless underground workings or closely spaced drill-holes give much more complete information than is now available for any considerable area in the field. For these reasons any correlations must, at best, be tentative, and none will be offered here.

A prominent bench in the eastern part of the coalfield is capped by a basaltic lava-flow of unknown thickness. Numerous hollow, rounded masses of basaltic rock, ejectamenta from a volcanic vent, are strewn near by on the surface of thick glacial moraine.

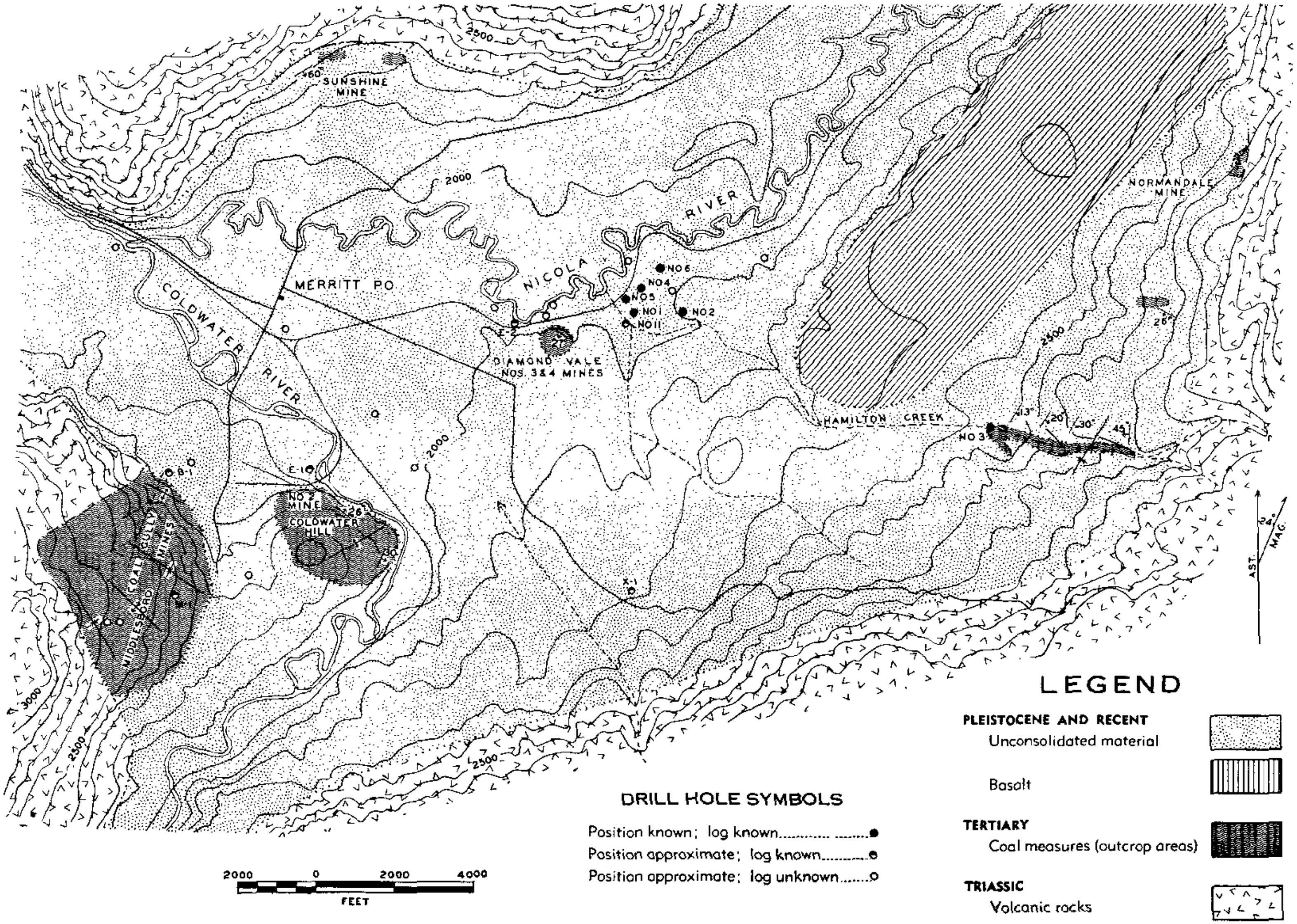


Fig. 20. Geology of Merritt coalfield.

Many of these masses, roughly globular and several feet in diameter, are mere shells of rock from 2 to 6 inches thick. Apparently the hollow interiors never have been filled with glacial drift. Some of the rock shells are broken, but all the fragments lie within a few feet of one another. The evidence indicates vulcanism of Recent age. The close spacial relationship of the lava-flow and the ejectamenta and the similarity of the rock in hand specimen suggest that both belong to the same general period of volcanic activity. The lava-flow may rest, therefore, upon unconsolidated material.

Some information concerning the strata and coal-seams in local areas, including incomplete stratigraphic sections of the Coldwater Hill, Diamond Vale, and Hamilton Creek areas, has been obtained from examination of outcrops, mine-workings, and old records. These data are discussed briefly in the following paragraphs. The areas referred to are shown in Fig. 20.

Coal Gully Area.

In this area, near the edge of the field, the coal-measures occupy a sharp embayment of the underlying volcanic rocks. The general structure is a series of folds diverging from the apex of this embayment. The fold axes trend south-easterly and easterly, plunging at various angles in the same directions. Numerous large and small flexures are superimposed on the main structure. Several faults are represented on mine plans by unmined zones of crushed and dirty coal.

Little is known about the stratigraphic section. An incomplete set of plans of the Middlesboro mines indicates that at least five and possibly eight coal-seams were contained in 750 feet of measures. Five seams outcrop in Coal Gully in about the same total thickness of strata. The log of Middlesboro Drill-hole No. 1 (*see* page 261) shows seven coal-seams in 770 feet of strata. This hole is indicated as M-1 on Fig. 20. No record remains of seams mined many years ago west of Coal Gully near the volcanic contact.

According to an old drawing, a shaft, known as the Blair shaft, sunk on the flats immediately north of Coal Gully Hill, cut a 15-foot coal-seam at a depth of 128 feet. Apparently this seam dipped north-eastward at 20 to 30 degrees. A hole drilled from the bottom of this shaft encountered volcanic rock 52 feet below the coal-seam. This shaft and drill-hole are indicated as B-1 on Fig. 20. Their log is given on page 262.

Nothing is known of the continuation of the Middlesboro seams eastward beneath Coldwater Hill because none of the Middlesboro workings extend far beyond the base of Coal Gully Hill. Middlesboro Collieries drilled a hole in the saddle between Coal Gully Hill and Coldwater Hill, but its log is unknown. Consequently there is little possibility of correlating seams in the two areas.

Coldwater Hill Area.

The general structure of the coal-measures in this area is a broad anticline, the axis of which strikes about north 60 degrees east and plunges at about 20 degrees in that direction. On the north-west limb of the structure the strata strike north 45 degrees west and dip 26 degrees north-eastward. Some flattening down the dip is suggested by old mine plans, which, however, do not show elevations. The structure is modified slightly by local flexures and several faults of small displacement.

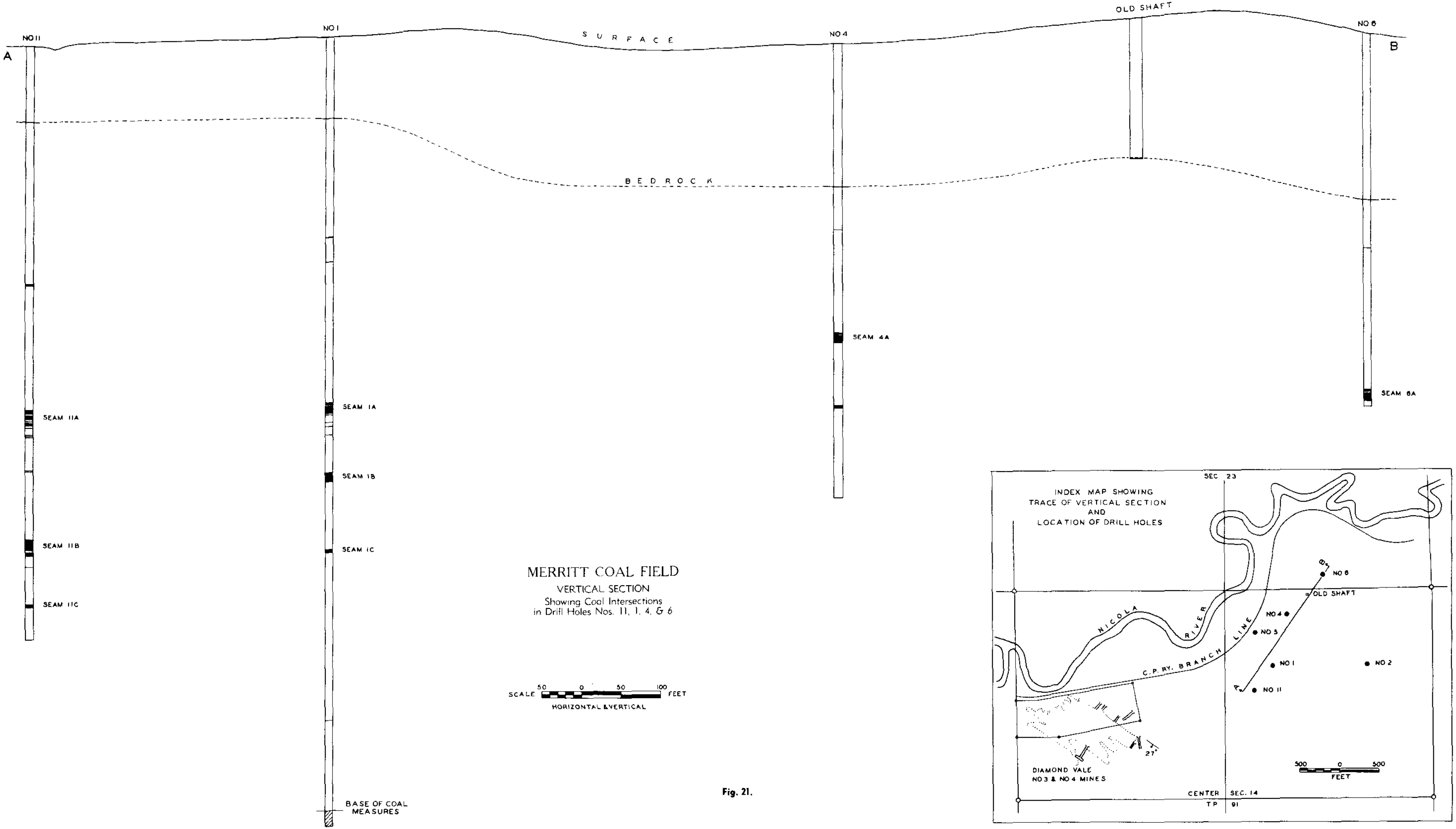
Six coal-seams are contained in about 450 feet of strata. The stratigraphic section, which was measured along the north side of Coldwater Hill and in workings near the entry of Middlesboro No. 2 mine, is given below. Where the nature of the strata is unknown, they are referred to as "measures."

Stratigraphic Section.

	Ft.	In.	Thickness. Ft.	Thickness. In.
Measures (principally coarse sandstone), at least			50	0
Coal-seam (No. 2 mine)—	Ft.	In.		
Nodular shale roof	—	—		
Shale and bony coal	0	8		
Coal	3	8		
Sandstone	0	4		
Coal	1	3		
Shale and bony coal	0	9		
Shale floor	—	—		
			6	**8**
Shale—dark, with coal marks and 2-inch coal-seam			5	2
Coal-seam—somewhat bony			**0**	**10**
Shale—grey, compact			18	0
Sandstone—fine-grained, numerous shaly streaks			4	10
Sandstone—medium to coarse-grained, thick-bedded			5	8
Sandstone—fine-grained, shaly streaks			1	6
Shale—grey, sandy, showing some small drag-folds			19	2
Coal-seam—somewhat bony			**0**	**10**
Shale—dark, sandy, few coal-streaks			3	5
Sandstone—coarse-grained, thick-bedded			8	7
Shale—grey, sandy, with numerous sand-filled channels			2	0
Shale—grey, compact			4	2
Shale—grey, with numerous coal-streaks			4	3
Sandstone—coarse-grained, thick-bedded			5	5
Shale—grey, sandy, with few coal-streaks			6	10
Sandstone—coarse-grained, poorly sorted, much cross-bedding			43	4
Coal-seam (No. 3 mine)—	Ft.	In.		
Sandstone roof	—	—		
Shale and bony coal	0	8		
Coal	2	3		
Shale	0	9		
Coal	0	2		
Shale	2	0		
Coal	0	4		
			6	**2**
Measures			100	0
Coal-seams (outcrop), with numerous bony partings			**4**	**2**
Measures			150	0
Coal-seam (outcrop), numerous shale and bony partings			**2**	**2**
Measures			—	—
Total, section			454	0

A hole drilled in 1891 on the west bank of the Coldwater River, some 600 feet north of the hill, explored this same section. The main seam mined in Middlesboro No. 2 mine may be correlated reasonably with one cut in this drill-hole at a depth of 190 feet, and the remainder of the section is in general agreement. The approximate position of this hole is marked E-1 on Fig. 20, and its log is given on page 262.

Little is known of these seams east of the Coldwater River. Many years ago Diamond Vale Collieries, Limited, drilled several holes on the flats east of the river, but



MERRITT COAL FIELD
VERTICAL SECTION
Showing Coal Intersections
in Drill Holes Nos. 11, 1, 4, & 6

Fig. 21.

the results are unknown. A shaft sunk by this company near the east bank of the river is reported to have reached a coal-seam at a depth of 68 feet.* Some coal was mined. It is unlikely that this was the continuation of the main seam of Middlesboro No. 2 mine, but rather an upper seam not known elsewhere.

A copy of the unsigned log of a drill-hole, dated 1906, described only as being on the Indian reserve, is given on page 263. The most probable position of this hole, indicated as X-1 on Fig. 20, is about 6,000 feet east of Coldwater Hill.

Diamond Vale Area.

Five known seams in this area, two of which have been mined in Diamond Vale No. 3 and No. 4 mines, are contained in about 310 feet of measures. The structure is monoclinal, the strike being about north 55 degrees west. The dip is 27 degrees southwestward in the mine entries, but mine plans indicate some steepening down the dip.

Stratigraphic Section of Diamond Vale Mines.

Measured on the surface and in accessible mine workings.

			Thickness.	
			Ft.	In.
Coal-seam (Browitt entry)—	Ft.	In.		
Sandstone roof	—	—		
Coal, bony	1	0		
Coal	1	5		
Shale	0	4		
Coal, bony	0	4		
Shale	0	2		
Coal, bony	0	9		
			4	**0**
Measures			130	0
Coal-seam (No. 3 mine)—	Ft.	In.		
Shale roof	—	—		
Coal, bony	0	10		
Shale	0	5		
Coal	1	8		
Shale	0	5		
Coal	0	1		
Shale	0	1		
Coal	1	1		
			4	**7**
Measures			115	0
Coal-seam (No. 4 mine)—	Ft.	In.		
Shale roof	—	—		
Coal	0	11		
Shale	0	3		
Coal	0	11		
Coal, bony	0	5		
Shale	0	2		
Coal, bony	0	7		
Shale	0	1		
Coal	2	5		
			5	**9**

* From copy of a private report to Diamond Vale Collieries, Limited, by Frank C. Green, dated October 10th, 1913.

	Thickness. Ft.	In.
Measures	14	0
Coal-seam (outcrop), with several bony partings	1	4
Measures	30	0
Coal-seam (outcrop), with several shaly partings	2	4
Total, section	307	0

It may be noted that this stratigraphic section differs from that of Coldwater Hill both in general spacing of coal-seams and in the detailed structure of individual seams. No data are available whereby the seams in these two areas may be correlated.

Additional information about the coal-measures in the vicinity of the Diamond Vale mines has been obtained from holes drilled at various times.

A short distance west of the mine-workings a hole drilled in 1893 cut a 4-foot coal-seam at a depth of 140 feet. This is probably one of the five known seams. The approximate position of this hole is marked E-2 on Fig. 20, and its log is given on page 264.

East and north-east of the Diamond Vale workings several holes were drilled many years ago, but only for the hole known as No. 11 has the log been found. An old drill-site about 1,800 feet east of the mine-workings is thought to be the collar of No. 11 hole. In addition, five of the six holes drilled in 1946 at the expense of the Provincial Government—namely, Nos. 1, 2, 4, 5, and 6—are located in the same general area. The positions of these holes and of No. 11 are shown on Fig. 20 and on the inset map of Fig. 21. A cross-section through Nos. 11, 1, 4, and 6 holes, showing the coal intersections, is given on Fig. 21. On this cross-section and in the discussion to follow the principal seams are labelled for descriptive purposes only and no correlation is implied. The detailed logs of Nos. 11, 1, 2, 4, 5, and 6 holes are given on pages 265 to 274.

In the following "sections," or condensed logs, and in Fig. 21 the strata between coal-seams are referred to as "measures" for the sake of brevity.

Section No. 11 Hole.—The log of No. 11 hole shows three main seams in about 241 feet of strata, the uppermost being 460 feet below the surface.

No. 11 Hole.

	Ft.	In.	Thickness. Ft.	In.	Depth. Ft.	In.
Overburden			96	11	96	11
Measures			363	10	460	9
Coal-seam 11A—						
Coal	4	0				
Shale	2	10				
Coal	4	6				
Shale	2	3				
Coal	0	9				
Shale	1	10				
Coal	0	6½				
Shale	0	7½				
Coal	1	6				
			18	10	479	7
Measures			145	6	625	1

	Ft.	In.	Thickness. Ft.	In.	Depth. Ft.	In.
Coal-seam 11B—						
Coal	6	5				
Bony parting	0	6				
Coal	6	3				
			13	2	638	3
Measures			68	4	706	7
Coal-seam 11C—	Ft.	In.				
Coal	1	10				
Bony parting	0	2				
Coal	0	9				
			2	9	709	4
Measures			41	3	750	7

Section No. 1 Hole.—No. 11 hole was the hub around which the drilling programme was planned. The three seams shown in the log of No. 11 hole were thought to represent a lower series approximately 1,000 feet stratigraphically below the seams in the Diamond Vale mines. It was considered further that the strata were rising north-eastward; consequently that drilling north and east of No. 11 hole should encounter the lower series of seams nearer the surface. Accordingly No. 1 hole was spotted 378 feet north 35 degrees east from No. 11 hole. The section of this hole summarized below shows three main seams contained in 181 feet of strata. Contrary to expectations, the uppermost seam was not encountered until a depth of 460 feet was reached, approximately the same elevation as the uppermost seam in No. 11 hole. The thickness, structure, and spacing of the seams in No. 1 hole differ markedly from those in No. 11 hole, less than 400 feet away. Beds cut in No. 1 hole could not be identified in the log of No. 11. Caving between Seams 1A and 1B, which necessitated casing, implied the presence of a fault or faults of unknown attitude and magnitude. A feature of stratigraphic significance in No. 1 hole is the fact that Seam 1C, the lowest seam, lies 323 feet above the base of the coal-bearing strata.

Hole No. 1.

	Ft.	In.	Thickness. Ft.	In.	Depth. Ft.	In.
Overburden			102	0	102	0
Measures			359	5½	461	5½
Coal-seam 1A—	Ft.	In.				
Coal	3	3½				
Shale	1	7½				
Coal	1	10½				
Shale	0	3				
Coal	5	10				
			12	10½	474	4
Measures			76	2	550	6
Coal-seam 1B—	Ft.	In.				
Coal	4	10				
Shale	1	2				
Coal	4	6				
			10	6	561	0
Measures			85	6	646	6
Coal-seam 1C—	Ft.	In.				
Coal	4	0				
Shale	1	6				
Coal	0	10				
			6	4	652	10
Measures (to base of the coal-bearing strata)			323	2	976	0

Section No. 2 Hole.—No. 2 hole was collared 1,233 feet north 88 degrees east from No. 1 hole. The results of this hole were disappointing. Only one coal-seam was found—at a depth of 650 feet and 269 feet above the underlying volcanic rocks. From the section given below it will be seen that this is dissimilar to any of the seams cut in No. 1 hole. Conceivably it could represent the lowest of the seams cut in No. 1 hole; but if this were so, the question arises: What became of the two upper seams? Disturbed ground was encountered at two points in this hole, so the possibility of complications due to faults must be recognized. The rapid and irregular change in the nature of the strata found in No. 1 hole is equally characteristic of the strata in No. 2 hole, and no beds in one hole could be recognized in the other.

Hole No. 2.

			Thickness.		Depth.	
			Ft.	In.	Ft.	In.
Overburden			203	0	203	0
Measures			448	4	651	4
Coal-seam 2A—	Ft.	In.				
Coal	3	0				
Shale	0	3				
Coal	0	3				
Shale	0	1				
Coal	0	3				
Shale	0	2				
Coal	1	8				
Shale	0	9				
Coal	2	2				
			8	7	569	11
Measures (to the base of the coal-bearing strata)			269	1	929	0

Sections Nos. 4, 5, and 6 Holes.—Three more holes were drilled in the area north of No. 1 hole. One seam was found in each of these holes, and in Nos. 4 and 5 holes indications of coal were found about 80 feet below the main seams. In general the coal contained more bony partings than that found in No. 1 hole. The sections of these holes are summarized below. Correlation between these seams or with seams in the other holes could not be established.

Hole No. 4.

			Thickness.		Depth.	
			Ft.	In.	Ft.	In.
Overburden			181	0	181	0
Measures			185	3	366	3
Coal-seam 4A—	Ft.	In.				
Coal	1	0				
Shale	1	4				
Coal	3	3				
Shale	0	3				
Coal	0	3				
Shale	0	2				
Coal, shaly partings	4	6				
			10	9	377	0
Measures			80	0	457	0
Coal-seam 4B—coal and shale, 3 ft. 10 in.			3	10	460	10
Measures			111	2	572	0

Hole No. 5.

	Thickness. Ft.	In.	Depth. Ft.	In.
Overburden	178	0	178	0
Measures	235	6	413	6
Coal-seam 5A—coal, with eleven bony partings totalling 12 in., 7 ft. 6 in.*	7	6	421	0
Measures	60	0	481	0
Coal-seam 5B—shale and coal, 9 ft.†	9	0	490	0
Measures	65	0	555	0

Hole No. 6.

	Ft.	In.	Thickness. Ft.	In.	Depth. Ft.	In.
Overburden			210	0	210	0
Measures			243	0	453	0
Coal-seam 6A—						
Coal	2	0				
Shale	1	0				
Coal, with thirteen bony partings totalling 16 in.	5	6				
			8	6	461	6
Measures			7	6	469	0

* 2 ft. 9 in. of this section was lost in drilling, and the nature of the seam is therefore not fully known.
† 7 ft. of this section lost in drilling probably included some coal.

These holes serve to emphasize the fact that the strata were deposited in an unstable and changing environment characterized by rapid vertical and lateral variation in the thickness and nature of individual beds, including coal-seams. The original complex stratigraphy was further complicated by folding and faulting of unknown severity and extent.

Sunshine Mine Area.

The measures lie in a shallow embayment less than 150 feet from the underlying volcanics. The bedding-planes strike north-easterly to easterly, approximately parallel to the volcanic contact, and dip steeply and unevenly south-eastward to southward. Many of the beds are severely sheared. Much of the coal-seam exposed in two prospect-workings is crumpled and squeezed; the coal is friable and dirty.

Normandale Mine Area and Hamilton Creek Area.

The Normandale mine is near the eastern edge of the coalfield, about 3½ miles north-easterly from the Diamond Vale mines. The workings are caved, but a coal-seam is partly exposed in a near-by open-cut. Although much decomposed and obscured, the seam appears to be about 4 feet thick. It strikes northerly and apparently stands nearly vertical. The underlying volcanic rocks outcrop in bluffs less than 100 feet east of the coal-seam.

A small section of sandstone outcrops about 4,000 feet southerly from the Normandale mine. Several small prospect-workings have been made here, but no coal was found. The bedding strikes about north 60 degrees west and dips 26 degrees south-westward.

Sedimentary rocks, mainly thick- and thin-bedded sandstones with a few shale-beds, are exposed for 4,000 feet in a ravine on the upper course of Hamilton Creek. The structure is an open syncline, the axis of which trends south-westerly. On the north-west limb of the fold the strata are undisturbed and dip gently south-eastward. Crumpling of the beds occurs near the axis and on the south-east limb, where dips are irregular and in places steep. These strata, representing a stratigraphic thickness of about 800 feet, are barren of coal. A concealed interval of 2,000 feet separates these outcrops from the first outcrop of volcanic rock.

Section No. 3 Hole.—Provincial Government No. 3 hole was collared on bed-rock at the base of this section. It was hoped that this hole would cut the continuation of the Normandale seam or other seams lying near the base of the coal-bearing strata. However, after penetrating 1,270 feet of predominantly sandy strata without cutting any coal-seams, the hole was abandoned before reaching the base of the coal-measures.

This hole and the outcrops above indicate a thickness of at least 2,000 feet of sandy beds barren of coal, a section unknown elsewhere in the valley.

ANALYSES OF COALS.

Analyses of split samples of coal from the more important intersections in Drill-holes Nos. 1, 2, 4, and 5 are given in the following table. It is pointed out that these *samples exclude shaly partings and coal which was lost in drilling, and cannot be* considered representative of mine-run coal. The free-swelling indices of several composite samples were determined by the Research Council of Alberta. The second table, included for purposes of comparison, gives the analysis of other Merritt coals from Bulletin 14, Analyses of British Columbia Coals, 1941, British Columbia Department of Mines.

ANALYSES OF COAL FROM HOLES NOS. 1, 2, 4, AND 5, DRILLED IN 1946.

Seam No.	Depth.	Proximate Analysis.†					B.T.U.	Specific Gravity.	Free-swelling Index.
		Moist.	V.C.M.	F.C.	Ash.	S.			
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.			
1A	461′ 5½″ to 462′ 10½″	2.6	33.1	55.0	9.3	0.40	13,347	......	
1A	463′ 0″ to 464′ 9″	2.6	34.1	58.0	5.3	0.55	13,740	......	3½
1A	466′ 4½″ to 468′ 3″	2.0	35.5	49.3	13.2	0.34	13,600	......	
1A	469′ 6″ to 474′ 4″	2.3	33.2	54.3	10.2	0.34	12,910	1.26	4½
1B	550′ 6″ to 555′ 4″	2.4	31.2	51.9	14.5	0.48	12,330	1.32	3
1B	559′ 0″ to 561′ 0″	2.5	32.2	52.2	12.8	0.34	12,685	......	
1C	646′ 2″ to 650′ 6″	2.1	29.6	47.4	20.9	1.19	11,330	......	4
1C	652′ 0″ to 653′ 6″	2.3	26.0	40.8	30.9	0.66	9,756	......	......
2A*	651′ 4″ to 654′ 4″	2.5	33.5	53.9	10.1	0.35	13,118	......	
2A*	655′ 4″ to 657′ 0″	2.4	31.2	47.5	19.0	0.37	11,617	......	2½
2A	657′ 9″ to 659′ 11″	2.5	25.3	36.3	36.9	0.40	8,545	......	
4A	368′ 7″ to 371′ 10″	2.9	34.3	51.6	11.2	0.35	12,670	1.29	2
4A	372′ 10″ to 377′ 0″	3.0	33.3	50.6	13.1	0.30	12,690	1.29	
5A	413′ 6″ to 421′ 0″	2.3	30.2	38.9	28.6	0.60	9,651	......	......

* Analyses are averages of two samples.
† Analyses are on basis of samples dried at room temperature.
Analyst: G. C. B. Cave, British Columbia Department of Mines.

ANALYSES OF MERRITT COALS.*

Description.	Proximate Analysis.					B.T.U.	Coking Quality.	Moisture-loss after Four Days.
	Moist.	V.C.M.	F.C.	Ash.	S.			
Middlesboro Collieries—	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.			
No. 1 seam†	3.30	30.00	56.10	10.6	0.7	12,090	Fair	2.00
No. 2 seam†	5.30	29.40	56.60	8.7	0.6	12,090	Poor	6.00
No. 4 East seam†	3.40	32.00	58.10	6.5	0.6	12,710	Fair	3.00
No. 5 seam†	4.90	31.30	56.80	4.0	0.7	12,555	Fair	4.00
No. 6 seam†	4.10	30.10	51.50	14.3	0.4	11,160	Non-coking	2.50
Coldwater Hill, 6-ft. seam†	2.13	27.99	59.66	10.22	....	....	Good	....
No. 2 South mine (mine run) §	3.8	31.2	56.7	8.3	0.55	12,400	....	0.26
No. 2 North mine (mine run) §	5.0	23.0	51.4	20.6	0.93	10,190	....	0.38
Sunshine Coal Co.†	2.80	37.50	55.10	4.6	0.40	13,175	Good	....
Diamond Vale Collieries (lump) ‡	2.66	37.84	55.14	4.36	....	....	....	....

* Dickson, James (1941): Analyses of British Columbia Coals—*B.C. Dept. of Mines*, Bull. 14.
† Table III.—Analyses of British Columbia Coals, 1926.
‡ Table I.—Analyses of British Columbia Coals, Samples taken prior to 1910.
§ Table IV.—Analyses of British Columbia Coals, 1941.

LOGS OF DRILL-HOLES.

The following logs of diamond-drill holes and of the strata cut by the Blair shaft represent all the records of such work in the Merritt coalfield obtainable in 1945 and 1946. Logs of Holes 1 to 6, drilled in 1945 and 1946, were prepared by engineers of the British Columbia Department of Mines. Logs of some of the earlier holes were published in the Annual Report, 1904, Geological Survey, Canada, which publication is no longer available for distribution. Logs of other drill-holes and the log of the Blair shaft were obtained from various sources. Signed original records are not available, except for the six holes drilled in 1945 and 1946. The accuracy of logs of some holes and of positions where some holes were reputed to have been drilled cannot be taken as beyond question. However, it is considered desirable to include along with established data as complete a collection as possible of other data now obtainable which may reasonably be assumed to be substantially accurate. The source of each record is shown for the guidance of the reader. Each log has a symbol by which the site or assumed site of the hole can be found on Fig. 20.

LOG OF MIDDLESBORO DIAMOND-DRILL HOLE NO. 1.

Drilled at angle of 50 degrees from vertical.

Location: M-1. Source: Unsigned pictorial log found in abandoned office of Middlesboro Collieries, Limited.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
UNCONSOLIDATED MATERIAL.				
Soil	7	0	7	0
Sandstone and boulders	16	0	23	0
Clay and boulders	5	0	28	0
Boulders	5	0	33	0
Clay, shattered boulder, and small rock	15	0	48	0
BED-ROCK.				
Shale and sandstone	15	0	63	0
Grey shale	1	0	64	0
COAL	2	0	66	0
Grey shale	6	0	72	0
COAL	2	0	74	0
Grey shale	4	1	78	1
COAL	0	11	79	0
Shale and sandstone	21	0	100	0
Dark shale	37	0	137	0
COAL	2	0	139	0
Sandstone	3	0	142	0
Dark shale	26	8	168	8
COAL	3	2	171	10
Dark shale	5	2	177	0
Sandstone	32	0	209	0
Dark shale	9	0	218	0
Sandstone	34	0	252	0
Dark shale	29	0	281	0
COAL	0	3	281	3
Grey shale	0	9	282	0
Dark shale	8	0	290	0
Sandstone	41	0	331	0

Log of Old Hole on the Coldwater River—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
COAL	0	6	456	6
Sandstone—fine, grey	1	6	458	0
Shale—dark	3	0	461	0
Sandstone—grey	17	0	478	0
Sandstone and shale—dark	11	0	489	0
Sandstone—dark and grey	15	0	504	0
Sandstone—dark	3	0	507	0
Sandstone—grey	2	0	509	0
Sandstone—dark	8	0	517	0
Sandstone and shale—dark	2	0	519	0
Sandstone—soft, grey	15	0	534	0
Sandstone and shale—grey	46	0	580	0
Shale, carbon streaks—dark	8	8	588	8
COAL and shale	1	7	590	3
Sandstone and shale—dark	9	9	600	0

Begun January, 1891; finished March 17th (?), 1891.
Signed, G. L. Davis.

Log of Bore-hole No. 1, Indian Reserve.

Vancouver, B.C., April 25th, 1906.

Location: X-1. Source: Unsigned copy of log in possession of G. Murray, Merritt, B.C.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Unconsolidated Material.				
Overburden	119	0	119	0
Bed-rock.				
Shale—dark	9	0	128	0
Coarse sand congd.	7	0	135	0
Shale	2	0	137	0
Sandstone	9	0	146	0
Conglomerate	7	0	153	0
Sandstone	5	0	158	0
Sandstone	1	6	159	6
COAL Al., 1½′	1	6	161	0
Shale—dark	3	0	164	0
Sandstone—light	2	0	166	0
Sandy shale	3	6	169	6
Sandy shale	3	0	172	6
Sandy shale	7	6	180	0
Sandstone—light	1	0	181	0
Sandy shale	14	0	195	0
Sandstone—coarse, grey	10	0	205	0
Conglomerate	4	0	209	0
Shale—dark brown	5	0	214	0
Shaly sandstone	7	0	221	0
Shale—dark	1	0	222	0
Sandy shale	3	0	225	0
Dark shale	1	0	226	0
Coarse grey sandstone	7	0	233	0
Shale—dark, with coal showings	2	0	235	0
Grey sandstone	1	0	236	0
Dark shale with small coal-seams	1	0	237	0
Coarse sandstone	3	0	240	0
Sandy shale	11	0	251	0
Dark shale, ¼″ coal	4	0	255	0
Shaly sandstone	3	0	258	0
Coarse sandstone	4	0	262	0
Dark sandy shale	3	0	265	0
Shale	3	0	268	0
Coarse grey sandstone	2	0	270	0
Hard shale	0	6	270	6
COAL—dark, hard	0	6	271	0
Shale—dark	1	0	272	0
Fire-clay	1	0	273	0
Sandy shale	6	0	279	0
Sandstone—grey	7	0	286	0
COAL—powdered	1	0	287	0
Shale—dark	1	0	288	0
Shale—sandy	6	0	294	0
Sandstone—grey	3	0	297	0
Sandstone—grey	1	0	298	0
Sandstone—shaly	2	0	300	0
Sandstone—grey	4	0	304	0
Sandstone—shaly	4	0	308	0
Fire-clay	4	0	312	0
Fine grey sandstone	6	0	318	0
Coarse grey sandstone	11	0	329	0
Shaly grey sandstone	3	0	332	0
Coarse grey sandstone	5	0	337	0
Shaly grey sandstone	2	0	339	0
Grey sandstone	6	0	345	0
Shale—dark	5	0	350	0
Light shaly fire-clay	2	0	352	0
Grey sandstone	1	0	353	0
Sandy shale	2	0	355	0
Dark shale	2	0	357	0
Shale—sandy	5	0	362	0
Grey sandstone	8	0	370	0
Shaly sandstone	3	0	373	0
Shale—dark	4	0	377	0
Sandy shale	1	0	378	0
Fire-clay—soft like talc	1	0	379	0
Shale—dark	1	0	380	0
Shale—sandy	2	0	382	0
Sandstone	7	0	389	0
Shaly sandstone	7	0	396	0
Coarse sandstone	15	0	411	0
Shale—sandy	3	0	414	0
Sandstone	3	0	417	0
Shale—dark	2	0	419	0
Sandstone	3	0	422	0
Shale—dark	4	0	426	0
Coarse sandstone	6	0	432	0
Coarse sandstone	3	0	435	0
Shaly sandstone	4	0	439	0
Shale—dark	2	0	441	0
Coarse sandstone	2	6	443	6
Shale—dark, with coal	0	3	443	9
Shaly sandstone	1	3	445	0
Coarse sandstone	6	0	451	0
Coarse sandstone	4	0	455	0
Shale—dark	8	6	463	6
Coarse sandstone	20	6	484	0
Shaly sandstone	4	0	488	0

Log of Bore-hole No. 1, Indian Reserve—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Coarse sandstone	8	0	496	0
Shaly sandstone	10	0	506	0
Coarse sandstone	*15*	*0*	521	0
Sandy shale	16	0	537	0
Shale—dark	1	6	538	6
Shale—dark, with one-third coal	1	6	540	0
COAL	1	9	541	9
Bone	0	11	542	8
COAL	1	4	544	0
Brown shale and coal	0	9	544	9
Brown shale and coal	0	7	545	4
Sandstone	4	2	549	6
COAL	1	0	550	6
Shaly sandstone	4	6	555	0
Shale—dark	3	0	558	0
Shale—sandy	11	0	569	0
Shale—dark	1	0	570	0
Shale—light, sandy	6	0	576	0
Shale—light, sandy	7	6	583	6
Shale—dark, with coal	1	6	585	0
Shale—sandy	21	0	606	0
Sandstone	5	0	611	0
Shale—dark	3	0	614	0
Sandstone	2	6	616	6
Shale—dark	*3*	*6*	620	0
Shale and sandstone mixed	6	0	626	0
Shale—sandy	7	0	633	0
Shale—dark, with seams of calcite	10	0	643	0
Shale—sandy	9	0	652	0
Shale—dark, with coal-seam	1	0	653	0
Shale—dark	4	0	657	0
Sandstone	1	0	658	0
Shale—dark	1	0	659	0
Sandstone—shaly	5	0	664	0
Sandstone—shaly	5	0	669	0
Dark shale	2	0	671	0
Sandstone	3	0	674	0
Shale	3	0	677	0
Sandstone	9	0	686	0
Shale	3	0	689	0
Sandstone	9	0	698	0
Shale—dark	6	0	704	0
Sandstone	5	0	709	0
Shale—dark	1	0	710	0

Log of Old Hole on the Nicola River.

Record of boring No. 2, Nicola Valley, 1893, Nicola Valley Co.

Location: E-2. Source: Annual Report, 1904, *Geol. Surv., Canada*, p. 71A.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
UNCONSOLIDATED MATERIAL.				
Clay and sand	80	0	80	0
BED-ROCK.				
Sandstone—coarse, grey	29	0	109	0
Shale—dark	4	0	113	0
Sandstone—grey	6	0	119	0
Shale—dark	3	0	122	0
Sandstone—grey	7	0	129	0
Shale—dark	8	6	137	6
COAL	0	8	138	2
Shale—dark	1	1	139	3
COAL	0	6	139	9
Slate—dark	0	4	140	1
COAL	4	4	144	5
Shale—dark	3	7	148	0
Sandstone—grey	10	0	158	0
Shale—dark	5	0	163	0
Sandstone—grey	2	0	165	0
Shale—dark	1	6	166	6
COAL	1	11	168	5
Sandstone and shale—grey and dark	21	7	190	0
Sandstone—coarse, grey	13	0	203	0
Conglomerate—grey	12	0	215	0
Shale, carbon streaks—black	4	0	219	0
COAL	0	5	219	5
Slate—black	0	7	220	0
Sandstone, shale partings—grey	15	0	235	0
Shale, carbon streaks—dark	10	0	245	0
Sandstone—grey	6	0	251	0
Sandstone—coarse, grey	4	0	255	0
Conglomerate, carbon streaks, grey	25	0	280	0
Shale—dark	5	0	285	0
Shale, carbon streaks—black	7	0	292	0
Shale—dark	3	0	295	0
Conglomerate—grey	2	0	297	0
Shale—black	3	0	300	0
Sandstone, carbon streaks—black	34	5	334	5
COAL	0	7	335	0
Sandstone and shale—dark	16	0	351	0
Conglomerate—dark	7	0	358	0
Sandstone and shale—grey, dark	65	0	423	0
Conglomerate—grey	3	0	426	0
Sandstone, carbon streaks—grey	4	0	430	0
Conglomerate—grey	37	0	467	0
Sandstone and shale—dark	31	0	498	0
Conglomerate—grey	39	0	537	0
Shale—dark	11	0	548	0
Sandstone—grey	14	0	562	0

On North-west Quarter of Section 14, Township 91, property of J. Garcia. Certified by G. L. Davis.

Log of No. 11 Hole, Diamond Vale Collieries.

Location near centre of North-west Quarter of Section 14, Township 91; elevation of surface, 1,976.47 feet. Started March 30th.

Location: 11. Source: Copy in possession of G. Murray, Merritt, B.C.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Unconsolidated Material.				
Sand and clay	16	0	16	0
Coarse gravel with clay and sand	10	7	26	7
Sand	1	0	27	0
Coarse gravel	4	4	31	11
Clay and gravel	64	2	96	11
Bed-rock.				
Conglomerate	5	4	101	5
Sandy shale	4	0	105	5
Coarse sandstone	8	3	113	8
Conglomerate	1	2	114	8
Light sandy shale	7	8	122	4
Dark sandy shale	3	10	126	2
Light sandy shale	10	0	136	2
Conglomerate	1	0	137	2
Light sandy shale	1	0	138	2
Dark sandy shale	5	6	143	8
Conglomerate	0	11	144	7
Sandstone	1	7	146	2
Sandy shale	5	2	151	2
Conglomerate	5	2	156	0
Light sandy shale	2	0	158	0
Conglomerate	1	10	160	0
Dark-brown shale with coal markings	1	3	161	3
Sandy shale	3	0	164	0
Sandstone	2	0	166	0
Sandy shale	1	9	168	0
Conglomerate	2	3	170	3
Sandy shale	5	6	175	9
Sandstone	1	0	176	9
Sandy shale, dip 20°	1	0	177	0
Conglomerate	3	0	180	0
Dark sandy shale	5	0	185	0
Conglomerate	1	6		
Sandy shale	0	6		
Conglomerate	1	0		
Dark sandy shale with coal marks	3	0	191	9
Sandstone	1	0		
Dark sandy shale	1	0		
Conglomerate	1	0		
Dark sandy shale	1	0		
Conglomerate	1	0	196	9
Dark sandy shale	3	0		
Sandstone, dip 47°	1	0		
Sandy shale	5	4	206	1
Dark sandy shale with coal marks	2	0	208	1
Sandy shale	6	0		
Dark sandy shale	14	4	228	5
Sandstone	1	0		
Dark sandy shale	5	0	234	5
Light sandy shale	3	0		
Dark sandy shale	2	0		
Sandstone, dip 38°	2	0	241	5
Light sandy shale, dip 30°	3	3	244	8
Dark sandy shale	2	0		
Sandy shale	8	0	254	8
Dark sandy shale	3	0		
Light sandy shale	5	0	262	8
Sandstone, dip 22°	8	0	270	8
Dark sandy shale	9	6	280	2
Sandstone, dip 14°	9	0		
Light sandy shale, dip 14°	8	0		
Dark sandy shale	5	0	302	2
COAL	1	9	303	11
Dark-brown shale	2	5		
Dark sandy shale	13	0	319	4
Sandstone	1	0		
Sandy shale	2	0		
Sandstone, dip 15°	8	0	330	0
Dark sandy shale	13	6		
Sandstone	1	6		
Sandy shale	2	0		
Sandstone	1	0		
Dark sandy shale	5	0	353	4
Sandstone	2	0		
Sandy shale	4	0		
Dark sandy shale	6	0		
Sandstone	1	6		
Dark sandy shale	1	3		
Sandstone	4	0	372	1
Conglomerate	2	0		
Sandy shale	4	0		
Conglomerate	2	3		
Sandstone	11	9	392	1
Conglomerate	2	0		
Sandstone	2	0		
Light sandy shale	6	0		
Sandstone	2	0		
Coarse conglomerate	16	0	419	1
Dark sandy shale, dip 15°	8	8	427	9
Sandstone	2	0		
Dark sandy shale, dip 27°–38°	6	0		
Sandstone, dip 33°–20°	11	0	446	9
Light sandy shale	3	0		
Dark sandy shale	7	0		
Conglomerate	1	0		
Dark shale with coal marks	3	0		
COAL	4	0	464	9
Dark sandy shale	2	10		
COAL	1	4½		
COAL—bony	0	3		
COAL	2	4½		
COAL—bony	0	2		
11A COAL	0	4	472	1
Dark-brown sandy shale	2	3		
COAL	0	9		
Dark-brown shale	1	10		
COAL	0	6½		
Dark-brown shale	0	7½		
COAL	1	6	479	7
Dark-brown shale, coal markings	3	4	482	11
COAL	0	7		
Dark-brown shale, occasional coal streaks	9	3		
COAL	0	2		
Dark-brown shale	0	4		
COAL	0	4		
Brown shale	0	2		
COAL	0	6		
Brown shale	0	6		
Light sandy shale, dip 20°	14	3		
Sandstone	9	0		
Light sandy shale	8	10		
COAL	0	8		
Sandy shale	1	0		

Log of No. 11 Hole, Diamond Vale Collieries—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
COAL	0	3		
Light sandy shale	38	9	568	0
Sandstone	11	0		
Light sandy shale	5	0		
Sandstone, dip 25°	18	0		
Light sandy shale, dip 18°	0	9	610	4
11B { COAL, 6' 5"; COAL—bony, 6"; COAL, 6' 3" }	13	2	638	3
Dark-brown shale	3	6		
COAL	3	8		
Dark-brown shale	7	0		
Light sandy shale	2	0		
Sandstone	1	0		
Light sandy shale	2	6		
COAL	0	10	658	9
Light sandy shale	8	4		
Dark sandy shale	2	0		
Sandstone	32	6		
Dark sandy shale	5	0		
11C { COAL, 1' 10"; COAL—bony, 2"; COAL, 9" }	2	9	709	4
Dark sandy shale	6	9		
Light sandy shale	9	0		
Sandstone	5	0		
Light sandy shale	2	0		
Sandstone	3	0		
Light sandy shale	11	6		
Sandstone	2	0		
Light sandy shale	3	0	750	7

Original log apparently signed by Alfred T. Wall, Benjamin Browitt, and N. L. Wimmler.

NOTE.—Discrepancies are apparent in the original copy of this log, which is reproduced without alteration.

Log of Drill-hole No. 1

Located on North-west Quarter of Section 14, Township 91, 378 feet north 35 degrees east from Diamond Vale Hole No. 11; elevation, 1,986 feet.

Location: 1. Source: Signed original on file at British Columbia Department of Mines.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
UNCONSOLIDATED MATERIAL.				
Boulder clay	102	0	102	0
BED-ROCK.				
Sandstone—grey, medium to coarse grain, with shaly streaks	14	0	116	0
Shale—dark, sandy	6	6	122	6
Sandstone—very coarse, poorly sorted, shaly streaks	5	0	127	6
Shale—grey, sandy	3	6	131	0
Sandstone—grey, coarse, coal marks	2	10	133	10
COAL—bony	0	10	134	8
Shale—dark, fissile, coal marks	1	6	136	2
Sandstone—grey, coarse, some fine sand and shaly streaks	11	0	147	2
Shale—black, leaf moulds, few sandy streaks	9	0	156	2
Sandstone—shaly, finely bedded	2	6	158	8
Shale—dark to black, coal marks	3	0	161	8
Shale—dark, sandy	1	0	162	8
Sandstone—medium grain, with few shaly streaks	4	8	167	4
Shale—sandy, grey	2	6	169	10
Sandstone—medium grain, shaly streaks, coal marks	3	2	173	0
Shale—black, coal marks, much fractured	7	0	180	0
Sandstone—light grey, coarse	3	8	183	8
Shale—grey, sandy	5	6	189	2
Sandstone—grey, coarse, poorly sorted	10	10	200	0
Shale—dark grey, slightly sandy, dip 25°	9	0	209	0
Sandstone—shaly, dip 15°	4	6	213	6
Shale—dark grey, sandy, fractured	6	6	220	0
Sandstone—medium to coarse, poorly sorted, few fine-sand and shaly streaks	19	0	239	0
Shale—black, compact, leaf moulds	13	6	252	6
COAL	0	8	253	2
Shale—black, much fractured	8	10	262	0
Sandstone—fine grain, shaly, dip 14°	4	0	266	0
Sandstone—very coarse, poorly sorted, with some irregular fine conglomerate bands; abrupt contact below	14	0	280	0
Shale—black, fractured	3	1½	283	1½
COAL	0	4½	283	6
Shale—black, fissile, leaf moulds	9	0	292	6
Sandstone—medium- to fine-grained, somewhat shaly	8	0	300	6
Shale—dark, fractured	4	0	304	6
Sandstone—grey, shaly, coal marks	3	0	307	6
Shale—grey to black, fractured, ¼" coal-seam	6	6	314	0
Sandstone—shaly, dark grey	4	6	318	6
Sandstone—light grey, coarse, poorly sorted, irregular conglomerate streaks	12	0	330	6
Conglomerate—fine	0	9	331	3
Sandstone—light grey, coarse, friable, poorly sorted	27	0	358	3
Shale—dark, sandy, with fine-sand streaks, dip 14°	5	9	364	0
Sandstone—grey, medium-grained, shaly streaks	4	6	368	6
Conglomerate—fine, with coarse-sand streaks and 2" streak of sandy shale	5	0	373	6
Sandstone—fine-grained	1	6	375	0
Conglomerate—fine	0	8	375	8
Sandstone—fine-grained	1	0	376	8

Log of Drill-hole No. 1—*Continued.*

Seam	Description.	Thickness Ft.	Thickness In.	Depth Ft.	Depth In.
	Shale—light grey, sandy	2	0	378	8
	Sandstone — light grey, coarse, few shaly streaks	71	4	450	0
	Shale—dark grey, sandy, sand streaks, coal marks	11	5½	461	5½
1A	COAL, with 1½" shale parting	3	3½	464	9
1A	Shale—dark grey, coal streaks	1	7½	466	4½
1A	COAL	1	10½	468	3
1A	Shale	0	3	468	6
1A	COAL, with 2" shale parting	5	10	474	4
	Shale—black	0	9	475	1
	COAL	0	3	475	4
	Shale—black	0	4	475	8
	COAL	0	9	476	5
	Shale—black	0	1½	476	6½
	COAL	0	2½	476	9
	Shale—black, coal marks and several ¼" coal-seams	9	1	485	10
	COAL	0	10	486	8
	Shale—black, coal marks	1	6	488	2
	COAL—bony	1	6	489	8
	Shale—black, coal streaks	1	0	490	8
	COAL	0	8	491	4
	Shale—black, fissile, leaf moulds, coal marks	10	8	502	0
	COAL	0	6	502	6
	Shale—grey, somewhat sandy	4	6	507	0
	Sandstone—coarse, poorly sorted	1	0	508	0
	Shale—dark grey to black, fractured and sheared	7	0	515	0
	Sandstone—grey, medium-grained with shaly and fine-sand streaks, dip 18°	32	6	547	6
	Shale—black, coal marks	3	0	550	6
1B	COAL	4	10	555	4
1B	Shale—black	1	2	556	6
1B	COAL—some bony streaks	4	6	561	0
	Shale—black, fissile, coal marks, leaf moulds	6	0	567	0
	Sandstone—shaly	6	0	573	0
	Sandstone—light grey, medium-grained with a few coarse streaks, carbonized twigs	70	0	643	0
	Shale—black, compact, coal marks	3	6	646	6
1C	COAL—in part bony	4	0	650	6
1C	Shale—black, coal streaks	1	6	652	0
1C	COAL—bony	0	10	652	10
	Shale—dark grey, sandy, fractured	3	2	656	0
	Sandstone—dark grey, shaly	1	6	657	6
	Shale—grey, sandy, with many sand lenses, much fractured, and high core loss	9	6	667	0
	Sandstone—coarse, poorly sorted	2	0	669	0
	Shale—dark grey, sandy, fractured	19	0	688	0
	Sandstone—grey, shaly, dip 10°	10	0	698	0
	Sandstone—grey, coarse	10	0	708	0
	Sandstone — medium- to fine-grained with shaly streaks	3	10	711	10
	Shale—dark grey, with sandy streak	6	2	718	0
	Sandstone—shaly streaks, dip 8°	3	8	721	8
	Shale—black, fractured	2	6	724	2
	Shale—grey, sandy, cross-bedded sandstone streaks	2	6	726	8
	Shale—black, compact	1	4	728	0
	Shale—grey, sandy, with sand-lenses	18	6	746	6
	Sandstone—shaly, shale streaks dipping at high angles, vertical channeling	19	6	766	0
	Shale—sandy, with sand streaks	7	0	773	0
	Sandstone—grey, poorly sized, with shaly streaks, dipping at high angles	29	0	802	0
	Shale—grey, sandy	2	8	804	8
	Sandstone—shaly streaks at high angles	6	4	811	0
	Sandstone—light grey, coarse, poorly sorted	2	9	813	9
	Shale—grey, sandy	6	3	820	0
	Sandstone—light grey, coarse	3	0	823	0
	Conglomerate—medium to coarse, with few sand-lenses	26	0	849	0
	Sandstone—grey, coarse, cross-bedded	8	0	857	0
	Shale—black, coal marks	2	0	859	0
	Shale — black, coal marks and soft black mud	4	0		
	COAL	0	6	862	6
	Shale—dark, grey compact	16	6	879	0
	Shale—grey, sandy	4	0	883	0
	Shale—dark grey, compact	5	0	888	0
	Shale—grey, sandy, with sand streaks	2	0	890	0
	Sandstone—coarse, cross-bedded, shaly streaks	3	0	893	0
	Shale—dark grey, fractured	7	0	900	0
	Shale — dark, soft, slickensided partings, carbonate stringers; abrupt irregular contact	10	0	910	0
	Sandstone—light, coarse-grained	0	4	910	4
	Shale—dark, finely cross-bedded	0	1	910	5
	Sandstone—light grey, coarse, cross-bedded; cross-bedding dips 70°	0	5	910	10
	Shale—dark, with intercalated seams of fine sand	1	0	911	10
	Sandstone—light grey, coarse (about 1 mm.), with some grains of shale; abrupt contact	2	0	913	10
	Shale—black, with a few fine-grained sand streaks interbedded	1	2	915	0
	Shale—black, compact, wavy bedding with average dip 45°	3	5	918	5
	COAL—bony, bright partings, friable	0	1½	918	6½
	Shale—black, much fractured, slickensided fragments	1	3½	919	10
	Shale—black, with a few sandy streaks and wavy bedding dipping about 45°	4	2	924	0
	Shale—grey, badly fractured; abrupt, irregular contact, dip 35°	3	4	927	4
	Sandstone—grey, fine even-grained	0	8	928	0
	Sandstone — grey, fine even-grained; scattered grains of sulphide	4	0	932	0
	Shale—grey, compact, somewhat sandy	0	11	932	11
	Sandstone — grey, fine even-grained, dip 29°	0	1	933	0
	Shale—grey, compact, sandy	3	10	936	10
	Shale — grey, compact, sandy; fine-sand streaks; dip 23°; seam of carbonate	1	2	938	0
	Shale—grey, compact, sandy	0	11	938	11
	Sandstone—coarse, poorly sorted	0	1	939	0
	Shale—grey, compact, sandy; fine-sand seams, dip 31°	3	0	942	0
	Shale—grey, compact, numerous sand seams, dip 29°	7	6	949	6
	Shale—dark, badly fractured	2	6	952	0
	Shale—black, coal marks, badly sheared	1	10	953	10
	Mud or gouge seam, containing fragments of shale and a ¼" seam of crushed COAL	0	5	954	3

Log of Drill-hole No. 1—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Breccia, coarse fragments, sand cement	2	9	957	0
Mud or gouge seam, containing fragments of breccia and fine flakes of shale	1	0		
COAL, about 1" of bony fragments and some coal mud recovered	0	6	958	6
Mud or gouge seam, as above	1	6	960	0
Shale, ground up, containing some coal fines	0	10	960	10
Diorite—medium coarse grained, containing biotite and hornblende; sheared contact with shale dips 45°	0	8	961	6
Shale—dark, badly sheared	0	6	962	0
Conglomerate — poorly sorted, with coarse-sand lenses	2	0	964	0
Breccia—fragments of shale and volcanics	4	0	968	0
Conglomerate—soft, muddy, coaly shale streaks	1	8	969	8
Breccia—large volcanic fragments with muddy cement; rock soft and friable	6	4	976	0
Felsite—light grey, fine-grained	2	0	978	0
Greenstone—fine-grained, dark green, chloritic	7	0	985	0
Greenstone — fine-grained, somewhat brecciated	3	6	988	6
Shale—compact, indurated	1	0	989	6
Greenstone—pillowed, somewhat porphyritic	5	6	995	0
End of hole.				

Hole started December, 1945. Hole finished February 20th, 1946.

Log of Drill-hole No. 2.

Located on North-east Quarter of Section 14, Township 91, 1,233 feet north 88 degrees east from Hole No. 1; elevation, 2,022 feet. Hole started February 27th, 1946.

Location: 2. Source: Signed original on file at British Columbia Department of Mines.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Unconsolidated Material.				
Boulder clay, with some sand and gravel beds	150	0	150	0
Sand—loose, coarse, undecomposed	14	0	164	0
Gravel, with very little interstitial sand	14	0	178	0
Sand — loose, coarse, with layers of coarse gravel	15	0	193	0
Sand—fine, with few large boulders	10	0	203	0
Bed-rock.				
Sandstone—weathered and broken	8	0	211	0
Sandstone—grey, compact, poorly sorted, medium- to coarse-grained, with a few thin shaly streaks, dip 14°	4	9	215	9
Conglomerate—fine-grained; abrupt contact	0	6	216	3
Shale—black, fissile, coaly streaks, becoming sandy at the bottom	2	0	218	3
Sandstone—grey, variable texture from fine to very coarse; irregular bedding	2	6	220	9
Conglomerate—fine-grained; abrupt contact	1	3	222	0
Shale—light grey, sandy, coaly twigs	1	7	223	7
Sandstone—grey, fine even grain, massive	1	3	224	10
Sandstone — dark grey, fine-grained, thin-bedded, with dark laminæ dipping irregularly from 8° to 18°	4	0	228	10
Sandstone — light grey, medium to coarse, massive	2	5	231	3
Shale—grey, sandy	0	5	231	8
Shale—black, coal marks	1	4	233	0
Sandstone—light grey, coarse, friable	4	4	237	4
Conglomerate—fine-grained, poorly sorted	2	0	239	4
Sandstone—light grey, coarse, friable	3	8	243	0
Sandstone — grey, medium- to fine-grained	1	2	244	2
Shale—grey, sandy	0	10	245	0
Sandstone—dark grey, medium- to fine-grained, thin-bedded, showing cross-bedding and channelling	6	2	251	2
Sandstone—light grey, coarse, massive-bedded, friable, containing two ⅛" coal-seams, and grading downwards into conglomerate	8	10	260	0
Conglomerate — fine-grained, scattered coaly material	9	0	269	0
Sandstone — fine-grained, few shaly streaks	1	0	270	0
Shale—grey, compact	4	8	274	8
Shale—black, compact, many coal streaks, dip 22°	1	5	276	1
Sandstone — dark grey, fine-grained, shaly	3	11	280	0
Shale—grey, sandy	0	9	280	9
Shale—black, fissile, coal marks and coal streaks, dip 14°	3	3	284	0
Shale—black, fissile, coal marks and coal streaks, dip 18°	2	6	286	6
Sandstone—dark grey, micaceous, shaly, dip 19°	3	0	289	6
Shale—grey, sandy	2	0	291	6
Sandstone—dark grey, shaly	1	2	292	8
Shale—dark grey, coal marks, broken	1	4	294	0
Shale—grey, compact, becoming sandy	4	0	298	0
Sandstone — dark grey, fine-grained, thin-bedded, somewhat shaly, dip variable 5° to 20°	5	2	303	2
Sandstone — light grey, medium to coarse, massive	2	10	306	0
Sandstone — light grey, medium to coarse, massive	6	0	312	0
Shale—black, compact, few coal streaks	0	9	312	9
Shale—jet black, compact, with numerous coal streaks making up to 25% of the core, dip 14°	2	1	314	10
Shale—black, compact, few coal streaks	1	2	316	[illegible]

LOG OF DRILL-HOLE NO. 2—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Shale—grey, sandy	0	8	316	8
Sandstone—dark grey to grey, fine-grained, thin-bedded with thin shaly partings; some cross-bedding; dip and strike variable	22	0	338	8
Shale—dark, compact, coal marks	1	3	339	11
Sandstone—light grey, coarse	0	5	340	4
Shale—dark to black, compact, coal marks and few streaks, dip 18°	6	8	347	0
Shale—grey, sandy	1	0	348	0
Sandstone—dark grey, shaly bands	3	6	351	6
Sandstone — light grey, medium- to coarse-grained, massive-bedded	19	2	370	8
Shale—dark grey, sandy, dip 8°	1	4	372	0
Sandstone—dark grey, shaly	1	0	373	0
Shale—dark grey, sandy	2	6	375	6
Sandstone—dark grey, thin-bedded, with shaly streaks	2	3	377	9
Shale—dark, compact	3	3	381	0
Shale—grey, sandy	1	0	382	0
Sandstone—dark grey, shaly bands and streaks, dip 15°	4	0	386	0
Sandstone—dark grey, shaly	1	0	387	0
Sandstone — grey, medium-grained; faulted contact with underlying shale dips 45°	7	0	394	0
Shale—grey, sandy, broken	1	0	395	0
Shale—grey; numerous talcose shear-planes and gouge-filled fault-planes dipping about 45°	5	0	400	0
Shale—grey, broken in all directions by many curved talcose shear-planes	7	0	407	0
Shale—grey; very broken, in part finely comminuted; abrupt faulted contact with sandy shale below	3	6	410	6
Shale—grey, sandy, compact	1	0	411	6
Sandstone — grey, fine-grained, thin-bedded, with few shaly partings, dip 9°	10	0	421	6
Sandstone—light grey, medium-grained, massive	6	0	427	6
Shale—grey, somewhat broken but not sheared; one fault-plane dipping 45°	7	6	435	0
Sandstone — dark grey, fine-grained, some shaly streaks	2	1	437	1
Shale—dark grey, sandy	2	8	439	9
Sandstone—dark grey, shaly	2	8	442	5
Shale—dark grey, sandy	1	0	443	5
Sandstone—dark grey, shaly	1	0	444	5
Shale—dark, somewhat sandy	1	10	446	3
Sandstone—dark grey, shaly streaks, dip 10°	2	6	448	9
Sandstone — grey, few shaly bands; irregular bedding	9	6	458	3
Shale—dark, slightly sandy, very compact	10	0	468	3
Shale—finely crushed in fault-zone	1	0	469	3
Shale—grey, sandy, compact	0	7	469	10
Sandstone—light grey, medium-grained	0	5	470	3
Shale—dark, slightly sandy; few streaks of sand	4	4	474	7
Sandstone — dark grey, fine-grained, shaly	1	5	476	0
Sandstone — dark grey, fine-grained, shaly	2	6	478	6
Shale—dark-grey, slightly sandy, many coal streaks, dip 8°	2	4	480	10
Sandstone — light grey, medium- to coarse-grained	5	6	486	4
Shale—grey, sandy, few coal streaks	4	6	490	10
Sandstone—grey, variable texture from fine to coarse irregular cross-bedding; abrupt contact with underlying shale	10	0	500	10
Shale—dark grey, slightly sandy, compact	12	2	513	0
Sandstone—dark grey, shaly, dip 5°	1	0	514	0
Sandstone—grey, medium-grained	2	1	516	1
Shale—black, fissile, few coal streaks, dip 9°	0	11	517	0
Sandstone—dark grey, shaly	2	0	519	0
Sandstone — light grey, coarse, cross-bedded	2	0	521	0
Sandstone—dark grey, shaly	1	0	522	0
Shale—black fissile, leaf impressions, coal streaks	4	1	526	1
Shale—grey, sandy, few coal streaks	2	0	528	1
Shale—dark grey, finely sheared in part, few coal streaks	3	9	531	10
Sandstone—dark grey, shaly	2	2	534	0
Shale—dark, sandy, few coal streaks	2	0	536	0
Sandstone—dark, very shaly, several coal streaks	2	6	538	6
Shale—dark, sandy streaks, coal marks, dip 10°	7	8	546	2
Sandstone—grey, medium grain, few shaly partings	7	4	553	6
Sandstone—light grey, coarse to very coarse, friable (border-line of fine conglomerate)	9	9	563	3
Shale—grey, sandy	1	6	564	9
Sandstone—dark grey, medium- to fine-grained, with numerous shaly bedding-planes	15	2	579	11
Sandstone—light grey, coarse	0	10	580	9
Sandstone—dark grey, fine grain, shaly partings	1	0	581	9
Conglomerate—fine-grained, friable, with indistinct bands of coarse sandstone and two 1" shale bands, and several coal streaks which vary in dip from 0° to 10°	11	3	593	0
Sandstone—light grey, coarse, few coal streaks, dip 10°	34	0	627	0
Conglomerate—fine	3	0	630	0
Sandstone—light grey, very coarse, friable	2	0	632	0
Sandstone—light grey, coarse to very coarse, with irregular conglomerate beds	11	3	643	3
Sandstone—dark grey, shaly	0	9	644	0
Shale—dark grey, sandy, compact	4	6	648	6
Shale—black, containing two ½" coal-seams and several thinner coal streaks	2	0	650	6
COAL—bony	0	3	650	9
Shale—grey, sandy, with coal marks	0	7	651	4

Log of Drill-hole No. 2—*Continued.*

	Description.	Thickness. Ft.	In.	Depth. Ft.	In.
	COAL—bright, hard, with two-way cleat	2	8	654	0
	COAL	0	4	654	4
	Shale	0	3	654	7
	COAL	0	3	654	10
	Shale	0	1	654	11
2A	COAL	0	3	655	2
	Shale	0	2	655	4
	COAL—bright, hard, narrow streaks of bone	1	8	657	0
	Shale—grey, sandy	0	9	657	9
	COAL—bony, with numerous thin streaks of shale	2	2	659	11
	Shale—dark grey, sandy	1	8	661	7
	Sandstone—light grey, very coarse	2	8	664	3
	Conglomerate—fine, with indistinct beds of coarse sandstone and scattered larger pebbles	3	9	668	0
	Sandstone—light grey, very coarse	2	0	670	0
	Conglomerate—fine- to medium-grained	1	0	671	0
	Sandstone—light grey, very coarse	2	0	673	0
	Conglomerate—fine- to medium-grained, with a few scattered pebbles up to 2" and with indistinct beds of coarse sandstone	4	0	677	0
	Sandstone—light grey, coarse	2	0	679	0
	Conglomerate—medium-grained	0	6	679	6
	Sandstone—light grey, coarse, with few large pebbles	9	0	688	6
	Conglomerate—medium- to coarse-grained, several coal streaks	5	6	694	0
	Shale—grey, sandy, compact, few coal marks	4	0	698	0
	Sandstone—dark grey, shaly	2	0	700	0
	Sandstone—grey, fine- to medium-grained	20	0	720	0
	Shale—grey, sandy, few coal streaks, dip 3°	1	8	721	8
	Shale—grey, sandy, with irregular steep bedding	4	2	725	10
	COAL—hard, bright	0	2	726	0
	Shale—grey, sandy, one ¼" coal-seam	0	6	726	6
	Sandstone—dark, shaly, irregular bedding	1	10	728	4
	Sandstone—grey, fine even grain	4	6	732	10
	Sandstone—light grey, coarse to very coarse; rude bedding dips from 10° to 35°	16	2	749	0
	Conglomerate—fine-grained	3	6	752	6
	Conglomerate—medium-grained	1	0	753	6
	Shale—light grey, few coal streaks, dip 37°	2	2	755	8
	Sandstone—dark grey, shaly streaks; shows irregular cross-bedding	5	4	761	0
	Sandstone—dark grey, shaly; numerous intercalated bands of sandy shale; dip variable, 0° to 20°	11	6	772	6
	Sandstone—almost white in colour, thin-bedded, mostly fine-grained, with thin dark bedding-planes having variable dips at low angles	20	6	793	0
	Sandstone—dark grey, shaly	8	0	801	0
	Shale—dark grey, broken, in part finely sheared; many carbonate stringers	5	0	806	0
	Shale—dark grey, sandy	1	8	807	8
	Sandstone—dark grey, shaly	3	4	811	0

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Shale—dark grey, sandy, few coal streaks	0	6	811	6
Sandstone—dark grey, shaly	1	4	812	10
Shale—grey, sandy, with sand-filled mud cracks; few coal streaks	9	2	822	0
Sandstone—dark grey, shaly	0	8	822	8
Shale—dark to black, compact, indurated, having a false cleavage at 45°; few carbonate seams	8	4	831	0
Shale—grey, sandy with sand-lenses, few coal streaks	3	0	834	0
Sandstone—light grey, medium even grain	4	6	838	6
Sandstone—grey to dark grey, fine-grained, thin-bedded, shaly with several shale-bands (dip 23°, fairly regular)	14	6	853	0
Sandstone—finely crushed, with more gouge in fault-zone	4	0	857	0
Shale—black, many coal streaks, dip 38°	1	0	858	0
Sandstone—grey, fine-grained, somewhat broken	9	0	867	0
Sandstone—grey, shaly, crushed and faulted zone	3	0	870	0
Sandstone—light grey, fine-grained, compact except in narrow crushed zone at 875'; calcite stringers	6	3	876	3
Sandstone—grey, fine-grained, shaly bedding-planes; variable dip at low angles	1	9	878	0
Shale—grey, sandy, few coal streaks	1	0	879	0
Shale—dark grey, few coal streaks, dip 15°	0	11	879	11
COAL—very bony (nearly half black shale), sheared	1	0	880	11
Shale—grey, sandy, few coal streaks; in part finely crushed	4	1	885	0
Shale—black, few coal streaks; finely crushed	0	8	885	8
Shale—grey, compact, few coal streaks, dip 45°	1	0	886	8
Shale—black, numerous coal streaks up to ¼" thick comprise nearly half the core; coal streaks dip about 50°, and shearing evident parallel to the bedding	0	10	887	6
Shale—black, several coal streaks up to ½" thick; severely sheared, in part finely comminuted	2	9	890	3
COAL—very bony (nearly half black shale); severely sheared, in part finely comminuted	1	7	891	10
Shale—grey, sandy, compact	1	2	893	0
Sandstone—dark grey, shaly	1	5	894	5
Sandstone—grey, medium-grained, shaly streaks, dip 31°	4	0	898	5
Sandstone—light grey, medium- to coarse-grained; few carbonate stringers	8	7	907	0
Shale—grey, sandy	1	1	908	1
Shale—dark, sheared, few coal streaks	2	9	910	10
Shale—black, sheared, many coal streaks, dip 32°	1	5	912	3
Shale—dark, compact	1	0	913	3
Tuff—light-coloured, fine-grained, coal marks	1	6	914	9

Log of Drill-hole No. 2—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Conglomerate — volcanic fragments, medium- to coarse-grained, dip 25°	11	7	926	4
Shale—dark, compact, coal marks	0	5	926	9
Breccia—medium- to fine-grained, volcanic fragments	2	3	929	0
Volcanics — probably basalt, finely porphyritic	3	6	932	6
Volcanics—greenstone, fine-grained, dark green, in part brecciated or pillowed	8	6	941	0
Sandstone—metamorphosed, with biotite and feldspar developed	3	0	944	0
End of hole.				

Hole started February 27th, 1946. Hole finished April 17th, 1946.

Log of Drill-hole No. 4.

Located on North-east Quarter of Section 14, 675 feet bearing north 18 degrees east from Hole No. 1; elevation, 1,975 feet.

Location: 4. Source: Signed original on file at British Columbia Department of Mines.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
UNCONSOLIDATED MATERIAL.				
Boulder clay and gravel	181	0	181	0
BED-ROCK.				
Sandstone — medium- to fine-grained, cross-bedded with dark laminæ, three thin beds of conglomerate, dip 18°	5	0	186	0
Sandstone — medium- to fine-grained, with dark laminæ, shaly towards base and 4″ of friable coal and mud, probably some coal that is missing, dip 10°	5	9	191	9
Sandstone—coarse	3	3	195	0
Shale — dark grey, shattered, getting more sandy to base, dip 14°	6	0	201	0
Sandstone—medium-grained, dark-grey with darker laminæ, has one near vertical slip of about ½″, another dip about 45°, breccia and gouge about 2″ thick, calcite stringer	6	0	207	0
Shale—dark-grey, micaceous, near base, sandy, dip 7°	10	0	217	0
Shale—dark, sandy, micaceous, at base two seams ⅛″ and ½″ of bony coal	5	6	222	6
Sandstone—medium-grained, light grey with dark laminæ; dip 5°–18°, several strike fractures; dip 30°–60° N., with calcite	4	6	227	0
Sandstone—coarse, light-coloured, micaceous, massive; contact with shale below dips 30°	4	0	231	0
Shale—dark grey, fractured at contact	4	0	235	0
COAL	0	6	235	6
Shale—dark grey, sandy, fractured coal partings, 2″ to 3″ broken coal at base	4	6	240	0
Sandstone—grey, medium-grained, fractured, shaly toward base; at 242′ black shale	5	0	245	0
Shale—dark grey, some coal partings, some sandy and micaceous beds, dip 30°	3	0	248	0
Sandstone — with dark laminæ, some cross-bedding; medium grain to 250′ 3″; coarse massive to 258′ 3″, with few conglomerate beds, coal fragments	10	3	258	3
Sandstone—brown, medium grain, compact, with very many angular coal fragments up to 1″ across oriented parallel to bedding which dips 20°	0	9	259	0
Sandstone—coarse with conglomerate	3	10	262	10
Shale—dark grey, numerous coal partings, some mud seams, dip 20°	10	2	273	0
Shale—dark grey	4	0	277	0
Shale—dark grey	2	0	279	0
Sandstone—medium-grained, light and dark grey, dip 10°	1	9	280	9
Shale—dark, with coal partings	2	0	282	9
Sandstone—medium- to coarse-grained	2	0	284	9
Shale—dark	1	3	286	0
Shale—dark grey, coal partings	1	8	287	8
Sandstone — dark, compact, becoming coarser at base, dip 11°	5	7	293	3
Shale—dark to black, coal partings, broken	3	9	297	0
Sandstone—medium-grained, some dark laminæ, dip 20°	2	0	299	0
Shale—dark fissile, coal partings	2	0	301	0
Sandstone—medium-grained, dark laminæ, dip 12°	1	6	302	6
Shale—dark with coal partings	3	6	306	0
Sandstone—medium-grained, getting coarser downwards, at base massive; some cross-bedding	13	0	319	0
Conglomerate—fine, few sandy beds, coal fragments 331′ 9″	21	3	340	3
Sandstone—medium-grained, dark laminæ; dip 13° at base, massive, light-coloured, irregular	10	9	351	0
Sandstone—medium-grained, with dark laminæ, getting shaly towards base	10	0	361	0
Sandstone—dark and light; few coarse beds	3	3	364	3
Shale—dark, with coal partings	2	0	366	3
COAL	1	0	367	3
Shale—dark, with coal partings	1	4	368	7
COAL	3	3	371	10
4A Shale—bony	0	3	372	1
COAL	0	3	372	4
Shale—bony	0	2	372	6
COAL—four shaly partings, totaling 6″	4	6	377	0

Log of Drill-hole No. 4—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Shale—dark, sandy, coal partings, mud seam	3	0	380	0
Sandstone—dark, compact, shaly, dip 10°–18°	5	0	385	0
Sandstone — medium grain, dark and light, some coal partings	1	6	386	6
Conglomerate—dark, fairly coarse to 1″, few coal fragments	8	6	395	0
Conglomerate—light coloured, with few coaly streaks	10	0	405	0
Conglomerate	5	0	410	0
Conglomerate—some coarse sandy beds, coal fragments at 413′, at 420′ 6″ very coarse, pebbles to 2″ closely packed	11	0	421	0
Sandstone—medium-grained, thin, dark and light, beds dip 15°–18°, some mica, towards base beds thicker and coarser	10	0	431	0
Sandstone—coarse, light, with few dark fine beds, some coal fragments, disturbed	5	0	436	0
Sandstone—medium-grained, dark and light beds, some coarser beds, dip 8°–12°–14°, getting shaly at base	7	0	443	0
Shale—sandy, with coal marks	4	0	447	0
Shale — sandy, black, with abundant coal partings	2	6	449	6
Sandstone—brown, fine-grained	0	4	449	10
Shale—black, much broken	5	2	455	0
Shale—black, fissile, broken	2	0	457	0
COAL and bony shale—5″ coal	2	0	459	0
COAL and shale—4″ coal; 8″ shale	1	10	460	10
Sandstone—shaly, dip 18°, some irregular bedding	3	2	464	0
Sandstone—shaly	4	0	468	0
Sandstone — dark and light, fine to medium grain	4	0	472	0
Sandstone—medium-grained, light, with dark laminæ, dips 10°–12°	9	0	481	0
Sandstone — medium- to fine-grained, some shaly beds	4	9	485	9
Shale — dark, dip 13°, some calcite-filled fractures	2	3	488	0
Sandstone—medium and coarse grain, some silty beds	3	0	491	0
Sandstone — light, massive, medium grain, few coal partings, at 500′ coarser	10	0	501	0
Sandstone — massive, medium grain, coarse 504′–08′	10	0	511	0
Sandstone—massive	2	9	513	9
Conglomerate—fine and sandy at top	5	0	518	9
Sandstone—medium to fine grain, dark grey, dip 5°	1	3	520	0
Sandstone — grading down to shaly sandstone	3	0	523	0
Sandstone — massive, light, medium grain, dip 17°, some silty beds dip 5°	7	0	530	0
Sandstone—light, medium grain, few silty beds, dip 4°–8°, somewhat coarser at 535′ and few coal fragments there	7	0	537	0
Sandstone—light, medium grain, mostly massive, few silty beds, dip 5°, coaly partings 538′	9	0	546	0
Sandstone—massive, light-coloured	5	0	551	0
Sandstone—thin-bedded, silty, dip 5°	2	0	553	0
Sandstone—massive, light, medium to fine grain, few silty beds, coaly partings 557′, 560′, dip 5°, few irregular dips	8	0	561	0
Sandstone—massive, calcite stringer at base	8	0	569	0
Sandstone—light and dark, thin-bedded, shaly	3	0	572	0
End of hole.				

Hole started June 20th, 1946. Hole finished July 4th, 1946.

Log of Drill-hole No. 5.

Elevation, 1,975 feet; approximately 471 feet bearing north 28 degrees west from Hole No. 1.

Location: 5. Source: Signed original on file at British Columbia Department of Mines.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
UNCONSOLIDATED MATERIAL.				
Clay and boulders			178	0
BED-ROCK.				
Sandstone — light, medium to coarse grain, dip 10°, few shaly beds	4	0	182	0
Sandstone — light, medium to coarse, massive, getting shaly towards base	8	0	190	0
Shale — dark, many coal partings, some pyrite, 9″; COAL, 4″	2	0	192	0
Shale, with many coal partings	0	6	192	6
COAL, with little shale	0	6	193	0
Shale, with many coal partings	0	4	193	4
Shale—dark grey, with few coal partings	6	8	200	0
Shale, mud, and coal partings	2	0	202	0
Shale—dark grey, few coal partings, few sandy beds, dip 5°–10°	5	0	207	0
Shale—dark grey	2	3	209	3
Sandstone—light, medium to fine grain, massive, shaly at 212′	7	9	217	0
Sandstone—light, medium grain	9	0	226	0
Sandstone—light, massive, medium to coarse	10	2	236	2
Shale—dark grey, few coal partings, sandy towards base	4	10	241	0
Sandstone—light, medium-grained, few shale beds	3	0	244	0
Shale—dark grey	2	0	246	0
Shale—dark grey mud seam 249′ 6″	4	6	250	6

Log of Drill-hole No. 5—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Sandstone—light grey, fine to medium grain, massive	5	6	256	0
Sandstone—light and dark, few shale beds, dip 10°	5	6	261	6
Shale — dark and medium grey, few sandy beds, dip 0°–20°	14	6	276	0
Shale—dark, broken at 277′	2	6	278	6
Mud, shale, coal	1	0	279	6
Shale—dark	3	6	283	0
Shale—medium to dark grey, fractured	6	0	289	0
Sandstone—dark and light, medium to fine grain, dip 25°	4	9	293	9
Shale—dark	1	3	295	0
Sandstone—medium grain, thin-bedded	3	6	298	6
Sandstone—coarse, massive	4	0	302	6
Sandstone—grey, medium to fine grain, broken at 303′ 6″, dip 30°	3	6	306	0
Shale—dark grey, some sandy beds, coal partings at 306′ 6″	4	6	310	6
Shale—grey	2	0	312	6
Shale—grey, broken, little mud	3	6	316	0
Shale—sandy, coal partings at 317′	1	0	317	0
Sandstone—shaly, fine grain, dip 5°–10°, few coal partings	12	6	329	6
Sandstone—light, medium-grained	7	0	336	6
Sandstone—shaly, dip 15°	4	0	340	6
Sandstone—light and dark, medium and fine grain, dip 12°	2	0	342	6
Shale—sandy, coal partings at 344′	2	6	345	0
Sandstone—fine and medium	1	6	346	6
Sandstone—light, massive, coarse, very coarse 352′–56′	10	6	357	0
Shale—sandy, dip 10°	5	0	362	0
Sandstone—few shaly beds, fine-grained	2	0	364	0
Sandstone — coarse, lowest 6″ fine-grained	3	6	367	6
Sandstone—light, coarse, massive, dip 13°	27	0	394	6
Sandstone—light, coarse, massive	8	6	403	0
Sandstone—shaly	2	0	405	0
Sandstone — shaly, poorly sorted, few coal partings	7	0	412	0
Shale—with abundant coal partings	1	6	413	6
5A COAL (2½″ bone, two seams), dip 13°	1	6	415	0
5A COAL (5″ bone, five seams)	2	0	417	0
5A COAL (1″ bone, one seam)	2	0	419	0
5A COAL (4″ bone, three seams)	2	0	421	0
Shale, with abundant coal partings, 2″ coal	2	0	423	0
Sandstone—shaly, dip 10°	1	0	424	0
Conglomerate — few sandy beds, very coarse at base	17	9	441	9
Shale—black, fissile, broken, few coal partings	1	3	443	0
Shale—sandy, few coal partings, dip 5°	8	0	451	0
Sandstone — light and dark, medium and fine grain, few shaly beds, dip 5°–20°	19	0	470	0
Shale—sandy, many leaf impressions, dip 18°	6	0	476	0
Shale — few sandy beds, many coal partings, two 1″ seams of coal, broken and slickensided	5	0	481	0
Shale and coal broken, probably loss of coal 5′–6′	9	0	490	0
Sandstone — medium grain, few shale beds	3	0	493	0
Shale—sandy, much broken	2	6	495	6
Sandstone—fine-grained, broken	3	0	498	6
Shale—dark	1	0	499	6
Sandstone—dark and light, fine-grained, thin-bedded, broken, dips to 35°	4	6	504	0
Sandstone — grey, massive, medium-grained	4	6	508	6
Sandstone — thin-bedded, fine-grained, dip 25°	4	6	513	0
Shale—sandy	2	6	515	6
Sandstone — dark, fine-grained, some shale-beds, broken	4	6	520	0
Sandstone—dark and light, thin-bedded, upper part broken, dip 30°	10	0	530	0
Sandstone—light and dark, broken, dip 25°–30°	5	0	535	0
Sandstone—light, coarse, massive, fine at 540′, conglomerate at 543′, dip 35°	15	0	550	0
Sandstone—coarse, broken	5	0	555	0
End of hole.				

Hole started July 18th, 1946. Hole finished July 30th, 1946.

Log of Drill-hole No. 6.

Located approximately 680 feet bearing north 42½ degrees east from Hole No. 4; elevation, approximately 1,985 feet.

Location: 6. Source: Signed original on file at British Columbia Department of Mines.

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
UNCONSOLIDATED MATERIAL.				
Overburden	210	6	210	6
BED-ROCK.				
Shale—sandy	2	6	213	0
Shale and sandstone	2	0	215	0
Sandstone—grey, fine-grained, few shaly beds	4	6	219	6
Shale—sandy, grey	5	6	225	0
Sandstone—light, fine-grained, dip 15°–20°	9	0	234	0
Shale—grey, sandy	4	0	238	0
Sandstone—light, fine-grained, massive	5	9	243	9
Sandstone and shale—interbedded, dip 5°–10°	5	3	249	0
Sandstone — massive, few shaly beds 254′–255′, grading to very coarse at base	7	0	256	0
Shale—grey, sandy, with sandy inter-beds	4	0	260	0
Shale—dark, few sandy beds	10	0	270	0
COAL	0	6	270	6

Log of Drill-hole No. 6—*Continued.*

Description.	Thickness. Ft.	Thickness. In.	Depth. Ft.	Depth. In.
Shale—sandy	1	6	272	0
Sandstone — grey, massive, few shaly beds	3	0	275	0
Sandstone, grading down to shale	5	0	280	0
Sandstone—fine at top, grading down to coarse and massive at base	9	0	289	0
Conglomerate	1	0	290	0
Sandstone—light, massive, medium to coarse, with conglomerate beds	24	0	314	0
Shale—dark, some sandy beds, abundant coal partings at 325′	12	0	326	0
Shale, with many sandy interbeds	5	0	331	0
Coaly partings	0	6	331	6
Sandstone — grey, thin-bedded, fine-grained, dips 5°–10°	2	6	334	0
Coal partings	1	0	335	0
Shale—grey, sandy	2	0	337	0
Shale—broken and slickensided, some coal partings	6	0	343	0
Shale—dark, with coal partings	8	0	351	0
Shale—grey, and getting very sandy at base	5	0	356	0
Shale—grey	2	0	358	0
Shale—dark, with coal partings	1	3	359	3
Sandstone—light, medium-grained, few coal streaks	7	9	367	0
Conglomerate—light, mostly fine grain, some medium to fairly coarse at 370′–371′, 375′–376′, 404′–405′	68	0	435	0
Sandstone—light, medium grain, few coal partings	10	9	445	9
Sandstone—light, fine grain	1	3	447	0
Shale—dark, few coal partings	1	6	448	6
COAL and shale	1	6	450	0
Shale—dark, broken	2	0	452	0
Shale—grey, with coal partings	1	0	453	0
6A { COAL, 4″ bone in two seams	2	0	455	0
6A { Shale, with 4″ coal	1	0	456	0
6A { COAL, with 7″ bone in six seams	3	0	459	0
6A { COAL, with 9″ bone in seven seams, dip 10°	2	6	461	6
Shale, with abundant coal partings	3	6	465	0
Shale—grey	4	0	469	0

Hole drilled in August, 1946. Core examined October 4th, 1946.

Log of Drill-hole No. 3.

Approximate position, 760 feet bearing north 30 degrees west from the south-east corner of Lot 120; approximate elevation, 2,420 feet.

Location: 3. Source: Signed original on file at British Columbia Department of Mines.

Description.	Thickness. Ft.	Thickness. In.	Depth. Ft.	Depth. In.
Unconsolidated Material.				
Stream gravel	7	0	7	0
Bed-rock.				
Bedrock—very decomposed, apparently sandy shale	33	0	40	0
Shale—grey, sandy, coal marks, soft, decomposed	1	0	41	0
Sandstone—grey, shaly with coal marks, soft, decomposed, dip 15°–22°	1	7	42	7
Sandstone—light grey, coarse, friable	0	9	43	4
Clay—probably ground-up decomposed shaly sandstone	6	8	50	0
Shale—light grey, sandy, soft and clayey	5	2	55	2
Shale—dark, with leaf moulds and coal streaks	1	4	56	6
Shale—black, sheared, in part finely pulverized, containing carbonaceous material	0	3	56	9
Shale—dark, soft	0	4	57	1
Shale—black, sheared, in part finely pulverized, containing carbonaceous material	0	8	57	9
Shale—light grey, sandy, soft	1	0	58	9
Sandstone—dary grey, shaly, soft and clayey	1	6	60	3
Sandstone — light grey, medium to coarse, poorly sorted, very friable	4	0	64	3
Shale — grey, compact, but soft and clayey	6	9	71	0
Shale — light grey, sandy, soft and clayey	7	0	78	0
Sandstone—light grey, medium-grained, very soft and muddy	2	0	80	0
Shale—dark, finely brecciated, containing carbonaceous matrix	0	3	80	3
Shale—dark, soft	1	0	81	3
Sandstone — dark grey, shaly, thin-bedded, soft and clayey, dip variable but averages about 12°	3	7	84	10
Shale—dark, soft	5	2	90	0
Sandstone — grey, shaley, thin-bedded, friable	5	0	95	0
Sandstone—light grey, medium-grained, friable, containing nodules of coal up to ½″ across	5	0	100	0
Sandstone — light grey, very coarse, poorly sorted; contains indistinct beds of conglomerate with several ¼″ coal streaks	19	0	119	0
Shale—dark, soft, few coal streaks	1	6	120	6
Sandstone—dark grey, shaly, irregular bedding	2	2	122	8
Shale—black, fissile, leaf moulds, few coal streaks	0	10	123	6
Sandstone—grey, shaly	2	4	125	10
Sandstone — light grey, coarse-grained, poorly sorted, friable	11	8	137	6
Shale—dark, with few coal streaks	0	10	138	4
Sandstone — grey, mostly thin-bedded and shaly, but with irregular channelling of coarser material; few irregular coal streaks; average dip 12°	6	8	145	0
Shale, dark, soft	1	0	146	0
Sandstone—grey, shaly, thin-bedded	1	7	147	7

LOG OF DRILL-HOLE NO. 3—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
COAL — hard, clean, dull conchoidal fracture	0	1	147	8
Sandstone—light grey, medium grain, some cross-bedding; contains ¼" streak of hard coal	3	2	150	10
Conglomerate—medium- to fine-grained	1	0	151	10
Sandstone—light grey, variable coarse grain	1	8	153	6
Sandstone—dark grey, shaly; fine even grain; soft	3	6	157	0
Shale—grey, compact, soft	0	11	157	11
Sandstone—dark grey, shaly; fine even grain; soft	3	1	161	0
Shale—dark, fissile, leaf moulds; soft and muddy	2	4	163	4
Sandstone—dark grey, shaly	1	8	165	0
Sandstone — light grey, medium- to coarse-grained	1	8	166	8
Sandstone — grey, thin-bedded, shaly bands, dip 9°	5	0	171	8
Conglomerate — fine grain; few coal streaks	4	4	176	0
Sandstone — grey, thin-bedded, shaly bands	1	0	177	0
Conglomerate — fine-grained, with few larger pebbles; one streak of hard coal near base	5	0	182	0
Shale — grey, sandy, few thin coal streaks; soft	4	0	186	0
Sandstone—dark grey, shaly	2	9	188	9
Conglomerate—fine-grained	1	0	189	9
Sandstone—grey, thin-bedded, showing cross-bedding	1	9	191	6
Shale — grey, sandy, with irregular sand-lenses	3	0	194	6
Shale—dark, fissile, thin coal streaks and leaf moulds, dip 9°	2	4	196	10
Sandstone — dark, shaly, fine-grained, compact	5	2	202	0
Sandstone—dark grey, shaly, with narrow shale bands; fine-grained, with irregular cross-bedding	4	6	206	6
Shale—dark, compact, leaf moulds and few coal streaks	1	9	208	3
Shale—grey, soft and muddy; many carbonized twigs	3	9	212	0
Sandstone — grey, thin-bedded, shaly, with complete leaf moulds on bedding, dip 12°	2	2	214	2
Shale—dark, with few coal streaks	1	2	215	4
Sandstone — grey, thin-bedded, shaly; shows cross-bedding and channelling	2	10	218	2
Conglomerate—fine, friable	3	10	222	0
Sandstone—light grey, very coarse, friable	11	0	233	0
Conglomerate — fine, with indistinct bands of coarse sand; friable	7	0	240	0
Sandstone—dark grey, shaly, with shale bands; much irregular cross-bedding	4	0	244	0
Shale—grey, compact, few coal streaks	1	0	245	0
Sandstone — grey, thin-bedded, with shaly bands containing thin coal streaks	8	6	253	6
Shale—dark, with few coal streaks	1	6	255	0
Sandstone — grey, thin-bedded, shaly, soft	1	4	256	4
Shale—dark, with few coal streaks	0	10	257	2
Sandstone—light grey, medium-grained	6	8	263	10
Shale—dark to black, sandy lenses	1	7	265	5
Sandstone — dark grey, fine-grained, shaly; irregular bedding	1	10	267	3
Shale — dark; many very thin coal streaks	1	4	268	7
Sandstone—light grey to grey; medium to fine grain; shaly bedding in places; dip 16°	10	0	278	7
Shale—grey, sandy	1	9	280	4
Sandstone — light grey, very coarse; friable	16	8	297	0
Sandstone—grey, fine-grained, compact	2	1	299	1
Shale—grey, with few coal streaks	2	0	301	1
Sandstone — dark grey, thin-bedded, shaly	5	11	307	0
Shale — dark, with many carbonized twigs	1	0	308	0
Sandstone — dark grey, thin-bedded, shaly, with beds of coarser sand; dip variable 12° to 18°	10	0	318	0
Sandstone — light grey, medium to coarse grain; friable	2	6	320	6
Shale—dark to black, fissile, with leaf moulds, dip 12°	0	10	321	4
Sandstone — light grey, medium- to coarse-grained	2	7	323	11
Sandstone—dark grey, shaly, irregular bedding	0	8	324	7
Shale—grey, few coal streaks	1	10	326	5
Sandstone—light grey, fine to medium grain, thin-bedded, dip 10°	10	11	337	4
Shale—grey, few coal streaks, grading to sandy shale	1	5	338	9
Sandstone—grey, thin-bedded and cross-bedded	3	5	342	2
Sandstone—light grey, medium grain, cross-bedded	1	4	343	6
Sandstone — grey; fine, even grain; massive	1	6	345	0
Shale—dark, with few coal streaks	2	0	347	0
Sandstone—grey, medium to fine grain, in part thin-bedded	4	6	351	6
Shale—dark, grading to sandy; contains 6" mud-seam	1	6	353	0
Sandstone—grey, medium to fine grain, in part thin-bedded	2	0	355	0
Sandstone—light grey, medium to fine grain, compact	2	6	357	6
Sandstone — grey, medium- to fine-grained, in part thin-bedded; two narrow shale bands; dip variable, but about 15°	18	0	375	6
Sandstone—light grey, medium-grained, ¼" coal-seam	1	0	376	6
Conglomerate — medium grain; many red granite pebbles	0	6	377	0
Sandstone — light grey, medium to coarse, with conglomerate bands of unknown thickness	22	0	399	0
Conglomerate—medium-grained, arkosic, with red pebbles	2	6	401	6
Sandstone — dark grey, shaly, thin-bedded, hard and compact; contains many carbonized twigs	4	6	405	0
Sandstone — grey; fine, even grain; compact and massive	8	6	413	6

LOG OF DRILL-HOLE NO. 3—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Sandstone—light grey, medium grain, massive	2	3	415	9
Conglomerate—fine to medium grain; numerous pebbles of red granite	7	3	423	0
Sandstone—grey; fine, even grain; variable dip 0°–5°	7	2	430	2
Sandstone—light grey, coarse grain, few large pebbles	0	10	431	0
Shale—dark, sandy, with coarse sand grains, few coal streaks	0	9	431	9
Sandstone—dark grey, shaly, many carbonized twigs	1	0	432	9
Sandstone—light grey, medium- to coarse-grained; poorly sorted, with few larger pebbles	7	3	440	0
Conglomerate—medium-grained, with red granite pebbles	9	0	449	0
Sandstone—grey, thin-bedded, with carbonaceous partings; dip 7°	7	0	456	0
Sandstone—light grey, medium to coarse	3	0	459	0
Shale—dark grey to black, carbonaceous, silty, slickensided in part	0	8	459	8
Shale—grey, sandy, carbonized wood fragments	4	4	464	0
Shale—dark, carbonaceous, silty, carbonized wood	5	0	469	0
Shale—grey, silty, with thin coaly partings	0	8	469	8
Shale—dark, carbonaceous, coaly streak at base	1	8	471	4
Shale—grey, sandy, carbonized in part	2	4	473	8
Sandstone—light-coloured, fine-grained, micaceous	0	10	474	6
Shale—sandy, alternating fine-grained sandstone and grey sandy shale, carbonized in part	4	6	479	0
Sandstone—light-coloured, coarse-grained, cross-bedded, arkosic, fragments of carbonized wood	0	4	479	4
Sandstone—light grey, fine-grained, with dark carbonaceous silty partings, cross-bedded	9	8	489	0
Sandstone—medium- to coarse-grained, pebbles of quartz and greenstone (some reddish quartz pebbles)	10	0	499	0
Sandstone—as above	0	9	499	9
COAL—slightly crushed, dip 20°	0	3	500	0
Sandstone—as above, with thin irregular lenses of coal	0	5	500	5
Shale—dark brown, silty, coaly specks	1	7	502	0
Shale—almost black, carbonaceous, silty, sheared in places, dip 0°	2	6	504	6
Sandstone and shale—alternating thinly and irregularly bedded laminæ of fine-grained light-grey sandstone and dark-grey silty shale; specks of coal, plant fragments	7	6	512	0
Sandstone and shale—as above, some cross-bedding	1	0	513	0
Sandstone—light grey, medium-grained	4	0	517	0
Shale—dark grey to black, silty, carbonaceous in part, with occasional thin stringers of coal	4	0	521	0
Sandstone—light grey, fine- to medium-grained, with irregular dark silty laminæ, occasional plant fragments	5	0	526	0
Shale—dark grey to black, silty, carbonaceous plant fragments	3	0	529	0
Shale—as above, sheared places	1	0	530	0
Sandstone—fine-grained, light grey (grading into sandy shale in part), coal markings	8	0	538	0
Sandstone—light grey, fine- to medium-grained	1	0	539	0
Sandstone and shale—alternating bands of fine- to medium-grained light-grey sandstone and dark silty shale, dip 15°	10	0	549	0
Sandstone and shale—as above, occasional coaly partings	1	6	550	6
Conglomerate—light grey, fine-grained, 3" band of brown shale with coal-lenses at centre	10	6	561	0
Conglomerate—coarse-grained, pebbles 1"–3"	0	4	561	4
Sandstone—light grey, fine-grained, with occasional dark-grey shale-bands carrying coaly fragments	6	8	568	0
Shale—dark grey, silty, coaly partings	3	0	571	0
Sandstone—light grey, fine-grained, alternating with thin dark-grey silty (carbonaceous in part) bands up to 3" thick, grading at base into 3" of fine-grained conglomerate	11	0	582	0
Shale—dark (almost black), silty, carbonaceous, with a few coal markings	0	11	582	11
Sandstone—light grey, medium-grained	1	1	584	0
Conglomerate—light grey, fine-grained, slight porosity (pebbles are quartz, feldspar, greenstone, occasional red granite)	2	2	586	2
Sandstone—light grey, fine-grained, cut by thin irregular dark silty bands	5	10	592	0
Sandstone—light grey, fine- to medium-grained	6	0	598	0
Sandstone—light grey, medium- to coarse-grained	5	0	603	0
Sandstone—as above	0	4	603	4
Sandstone—light grey, fine-grained, with dark irregular silty laminæ	10	8	614	0
Sandstone—light grey, coarse-grained, grading into fine-grained conglomerate in part	10	0	624	0
Sandstone—light grey, coarse-grained, as above	3	6	627	6
Shale—greenish grey, silty, with occasional dark wavy laminæ, 1" band of coarse conglomerate at base	5	6	633	0
Sandstone—light grey, medium- to coarse-grained	10	0	643	0
Shale—black, carbonaceous	0	2	643	2
Sandstone—light grey, fine-grained, interbedded with greenish-grey silty shale	1	5	644	7
Shale—dark grey, sandy in part, carbonaceous, fragments of carbonized wood	4	0	648	7
Sandstone—light grey, fine-grained, with irregular dark silty laminæ	4	5	653	0
Sandstone—light grey, medium- to coarse-grained	4	10	657	10
Sandstone—light grey, fine-grained	3	2	661	0
Sandstone—as above	8	0	669	0

Log of Drill-hole No. 3—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Sandstone—alternating bands of fine- and medium-grained light-grey sandstone with a few brownish-grey silty bands	2	0	671	0
Sandstone — alternating irregularly bedded laminæ of light-grey fine-grained sandstone and dark carbonaceous silty shale with coal partings	5	10	676	10
Shale—black, silty, carbonaceous	4	2	681	0
Shale—black, silty, as above	1	0	682	0
Sandstone—light grey, fine-grained, with wavy irregular dark silty carbonized bands	4	8	686	8
Shale—dark grey, soft, friable	1	4	688	0
Shale—dark grey, soft, friable	1	0	689	0
Sandstone—light grey, fine-grained, irregularly bedded	4	0	693	0
Sandstone — light grey, medium- to coarse-grained, conglomeratic in basal 3"	5	0	698	0
Sandstone—light grey, medium-grained	2	0	700	0
Sandstone—light grey, fine-grained, with irregular dark silty laminæ, grading to shale at base	2	0	702	0
Shale—dark grey to black, silty, carbonaceous	6	0	708	0
Shale — dark grey to black, sandy in part, carbonaceous	6	0	714	0
Shale—light grey, fine-grained, sandy	2	7	716	7
Sandstone—light grey, fine- to medium-grained	1	5	718	0
Sandstone—light grey, medium-grained, interbedded with thin dark carbonized laminæ	5	0	723	0
Shale — dark grey to black, silty to sandy, with a few thin fine-grained grey sandy bands	2	0	725	0
Shale—almost black, silty, a few spores	4	6	729	6
Sandstone — light grey, fine-grained, with occasional thin carbonaceous laminæ, dip 15°	2	6	732	0
Shale—dark grey, sandy in part, carbonized in part	3	0	735	0
Shale — dark grey to black, carbonaceous	0	9	735	9
Shale—light grey, sandy	2	3	738	0
Sandstone—medium- to coarse-grained, light grey	7	0	745	0
Sandstone—as above	2	2	747	2
Sandstone — light grey, fine-grained, shaly, interbedded with thin black wavy carbonized laminæ	0	7	747	9
Conglomerate—light grey, fine-grained	9	3	757	0
Conglomerate—light grey, fine-grained	10	0	767	0
Shale—light grey, fine-grained, silty	1	4	768	4
Sandstone — light grey, fine-grained, shaly in part, numerous thin carbonized laminæ	5	4	773	8
Sandstone—light grey, medium-grained, compact	3	4	777	0
Sandstone—fine- to medium-grained, as above	2	0	779	0
Shale—dark grey, carbonized in part, wood fragments, specks of coal	3	10	782	10
Shale — black, carbonized with a few thin crushed coal bands	1	2	784	0
Shale — dark grey, carbonized wood fragments	0	5	784	5
Sandstone — light grey, coarse-grained, conglomeratic in part	4	7	789	0
Sandstone—as above	0	8	789	8
Sandstone — light grey, fine-grained, with thin dark silty laminæ	1	1	790	9
Shale—dark grey to black, carbonized in part	4	5	795	2
Sandstone—light grey, medium-grained, compact	4	10	800	0
Sandstone—light grey, fine-grained, with a 3" band of shale	10	0	810	0
Sandstone — light grey, medium- to coarse-grained, with a few thin irregular crushed coal-lenses	2	0	812	0
Sandstone — alternating bands (4" to 6") of fine- and medium-grained light grey, shaly in part	3	4	815	4
Shale—chocolate brown to black, carbonaceous, with coaly partings and lenses at base	1	0	816	4
Sandstone — light grey, fine-grained, with thin irregular silty laminæ	1	3	817	7
Shale—dark grey to black, sandy in part, carbonaceous, with several seams of crushed coal from 1" to 3" thick; a few thin carbonate stringers	2	5	820	0
Sandstone — light grey, fine-grained micromicaceous, shaly at base	1	0	821	0
Shale—dark grey, sheared, with gouge, possible fault	0	4	821	4
Sandstone — light grey, fine-grained, with interbedded black silty shale-bands	8	8	830	0
Sandstone—as above	1	4	831	4
Shale—black, silty, carbonaceous, coal partings, leaf moulds	3	8	835	0
Sandstone — light grey, fine-grained, shaly	0	10	835	10
Shale — black, silty, carbonaceous, as above	2	2	838	0
COAL—badly crushed	0	6	838	6
Shale—dark grey, sandy, shaly in part, coal specks	1	6	840	0
Shale—dark grey, sandy in part, carbonaceous in part, occasional plant fragments and coaly partings (several fractures dipping at 75°)	2	9	842	9
Shale — light grey, sandy, irregularly bedded, grades into coarse-grained sandstone in part (3" brown shale band with coaly fragments at centre)	5	0	847	9
Shale—dark grey to black, carbonaceous (carbonized plant fragments and coaly lenses)	2	3	850	0
Shale — grey to dark grey, silty to sandy, carbonaceous in a few short sections, sheared in upper 2' dipping at 75°, scour and fill structure at one point 2" of coarse-grained sandstone with shaly matrix at base	10	0	860	0
Shale—pale greenish grey	1	1	861	1
Sandstone—light grey, very fine-grained, shaly in part	2	0	863	1

LOG OF DRILL-HOLE NO. 3—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Conglomerate—light grey, fairly coarse, with a few thin bands of sandy shale	2	2	865	3
Shale—grey, sandy, irregular bedding	1	4	866	7
Shale—black, carbonaceous, with 1" of crushed coal	0	5	867	0
Shale — grey, sandy, occasional coal markings, grading into fine-grained light-grey sandstone in part	3	0	870	0
Shale — dark grey to black, carbonaceous, coaly partings, carbonized plant fragments	2	5	872	5
Conglomerate—light grey, fairly coarse-grained	8	7	881	0
Sandstone — light grey, coarse-grained, few coal lenses (⅛") sheared at 45°	1	0	882	0
Sandstone—light grey, very fine-grained, shaly, dip 10°–15°	2	0	884	0
Shale—dark grey to black, carbonaceous, sandy in part, coaly partings	4	5	888	5
Sandstone—light grey, medium-grained	2	7	891	0
Sandstone — light grey, medium- to coarse-grained	1	0	892	0
Shale—dark grey to black, carbonaceous, sandy in part, coaly partings	1	7	893	7
Sandstone—light grey, very fine-grained, shaly	3	5	897	0
Sandstone—light grey, fine-grained, carries a little finely divided pyrite	4	0	901	0
Sandstone—light grey, fine-grained, with a few irregular coal-lenses	3	0	904	0
Conglomerate—light grey, rather coarse in part	8	0	912	0
Conglomerate—rather coarse, as above	2	3	914	3
Shale—dark grey, coaly partings	0	9	915	0
Sandstone—light grey, medium-grained, with thin irregular bands of dark-grey silty shale	3	0	918	0
Sandstone — grey, very fine-grained, shaly, occasional thin coal-lenses	4	0	922	0
Sandstone—light grey, fine-grained, with thin grey silty bands	12	0	934	0
Sandstone—grey, medium-grained	1	6	935	6
Sandstone — light grey, fine-grained, interbedded with dark-grey to black sandy shale	1	6	937	0
Shale—dark brown to black, carbonaceous, coaly partings (several shears at 55°)	2	0	939	0
Shale—dark grey, sandy	1	8	940	8
Sandstone—grey, fine-grained, with dark irregular silty bands	1	4	942	0
Sandstone — fine- to medium-grained, salt and pepper, a few carbonaceous fragments coarser at top	4	0	946	0
Sandstone—light grey, fine-grained	0	5	946	5
Shale—dark grey, sandy, carbonaceous in part, grading into fine-grained sandstone in part	4	0	950	5
Sandstone—light-coloured, fine-grained, compact	2	7	953	0
Shale—dark grey to black, sandy in part, carbonaceous at base with plant fragments	3	0	956	0
Shale—dark grey, sandy	1	0	957	0
Shale—dark grey to black, carbonaceous, becoming sandy at base	2	6	959	6
Sandstone — light grey, fine-grained, interbedded with dark irregular silty shale laminæ	3	6	963	0
Shale—black, carbonaceous, coaly partings, friable	1	0	964	0
Sandstone — light grey, fine-grained, shaly at top, with dark irregular silty bands	2	0	966	0
Shale—dark grey, sandy, irregularly bedded with thin (1"–2") bands of grey medium-grained sandstone, a few coaly partings	11	0	977	0
Sandstone—light grey, fine-grained, with thin irregular carbonaceous or coaly laminæ, dip 10°	10	0	987	0
Conglomerate—quite coarse in part, pebbles of greenstone, quartz, and red granite	6	0	993	0
Shale—black, carbonaceous, with plant fragments	0	8	993	8
Sandstone—grey, fine-grained, shaly at top	2	7	996	3
Sandstone—grey, medium- to coarse-grained, a few thin coaly lenses	5	9	1002	0
Sandstone—grey, coarse-grained, with a few thin irregular coal-lenses	1	0	1003	0
Conglomerate—light grey, fine-grained	0	8	1003	8
Sandstone—grey, coarse-grained, with 1" of coarse-grained conglomerate at base	3	2	1006	10
Shale—dark grey to black, with carbonaceous partings, thinly bedded, dip 10°–15°	2	0	1008	10
Conglomerate—rather coarse	5	2	1014	0
Shale—dark grey to black, carbonaceous, becoming sandy at base	2	3	1016	3
Conglomerate—fine-grained	7	9	1024	0
Sandstone—light grey, medium-grained, compact (coarse-grained at top), dip 15°–10°	6	0	1030	0
Conglomerate—fine-grained	4	0	1034	0
Sandstone—grey, very coarse-grained	4	6	1038	6
Shale—dark brown to black, silty, carbonaceous	1	0	1039	6
Shale—dark grey to black, sandy, micaceous	2	6	1042	0
Sandstone — grey, very fine-grained, shaly at top, micaceous	3	0	1045	0
Sandstone—grey, as above, coal markings	0	7	1045	7
Conglomerate—grey, fine-grained at top	3	10	1049	5
Shale—dark grey, brown to black, carbonaceous, with a few thin (⅛") coal laminæ	3	0	1052	5
Sandstone—grey, medium- to coarse-grained, compact	2	7	1055	0
Shale—dark grey to black, carbonaceous, with coal partings	1	2	1057	2
Sandstone—grey, medium-grained, compact, with a few thin dark carbonaceous shale laminæ	5	3	1062	5
Shale—brownish black, silty, carbonaceous, with occasional coaly partings	0	7	1063	0
Shale—dark grey to black, carbonaceous, coaly partings	1	0	1064	0

LOG OF DRILL-HOLE NO. 3—*Continued.*

Description.	Thickness. Ft.	In.	Depth. Ft.	In.
Sandstone—grey, medium- to coarse-grained, with a few thin dark silty shale-bands	3	9	1067	9
Shale—dark grey to black, carbonaceous, with carbonized plant fragments, specks of resin	3	3	1071	0
Sandstone — grey, fine-grained, shaly, with numerous carbonized plant fragments, specks of coal	2	0	1073	0
Shale—dark grey, carbonaceous in part, plant fragments	0	7	1073	7
Sandstone—grey, medium-grained, occasional coal markings	1	8	1075	3
Shale—dark grey, carbonaceous in part, sandy in part, carbonized plant fragments	3	0	1078	3
Sandstone—grey, medium-grained, compact	2	9	1081	0
Sandstone — grey, fine-grained, interbedded with thin bands of dark-grey carbonaceous shale	8	1	1089	1
Sandstone — grey, fine-grained, shaly, with sections	4	6	1093	7
Sandstone—grey, coarse-grained	5	5	1099	0
Sandstone — grey, fine-grained, with dark-grey silty shale-bands	3	6	1102	6
Sandstone — grey, medium- to coarse-grained, grading into fine-grained conglomerate in part	1	1	1103	7
Sandstone—grey, medium- to coarse-grained, with short fine-grained conglomerate sections; a few thin lenses of coal; slight porosity in 6" section	4	5	1108	0
Sandstone — light grey, medium- to coarse-grained, dip 10°	2	5	1110	5
Sandstone — light grey, fine-grained, shaly at base, carbonaceous streaks	1	3	1111	8
Shale—dark grey to black, carbonaceous, coaly partings	2	4	1114	0
Sandstone—dark grey, coarse-grained, with occasional carbonaceous or coaly streak	9	0	1123	0
Conglomerate—grey, fine-grained	2	7	1125	7
Shale—dark grey to black, carbonaceous, coal partings	2	0	1127	7
Sandstone — grey, fine-grained, with thinly bedded dark-grey silty shale	2	5	1130	0
Sandstone—grey, medium-grained, compact, occasional silty bands	5	0	1135	0
Sandstone—grey, coarse-grained, compact	5	0	1140	0
Sandstone—grey, coarse-grained, compact, shaly at top	1	8	1141	8
Shale—dark grey to black, carbonaceous, sandy in part, few coaly partings	5	7	1147	3
Sandstone — light grey, medium- to coarse-grained	2	9	1150	0
Shale—light grey, crushed and slickensided, occasional thin lenses of coal (⅛")	4	0	1154	0
Shale—dark grey to black, carbonaceous, coaly partings, sandy at top and bottom	4	4	1158	4
Sandstone—grey, coarse-grained	0	8	1159	0
Shale—dark grey to black, carbonaceous, coaly partings	1	5	1160	5
Sandstone—grey, fine-grained, with thin irregular dark silty shale-bands	4	7	1165	0
Sandstone—grey, fine-grained, as above	0	4	1165	4
Conglomerate — compact, with short coarse-grained sandstone sections	3	8	1169	0
Sandstone—grey, grading from coarse-grained at top to fine-grained at bottom, shear-plane at 45° at centre	6	0	1175	0
Shale—grey to black, sandy in part, carbonaceous in part, coaly partings	5	0	1180	0
Sandstone—grey, fine-grained, with thin dark silty laminæ	2	5	1182	5
Sandstone—grey, medium-grained, compact (coarse-grained in part), with fragments of carbonized wood	3	7	1186	0
Sandstone—grey, coarse-grained	4	7	1190	7
Sandstone—light grey, fine-grained	1	5	1192	0
Sandstone—grey, medium- to coarse-grained, occasional thin carbon-lenses	5	0	1197	0
Sandstone—as above	0	8	1197	8
Shale—dark grey, carbonaceous in part, sandy	8	4	1206	0
Shale—dark grey, silty to sandy, carbon in part	5	0	1211	0
Sandstone—light grey, with thin silty shale laminæ	2	0	1213	0
Shale—brown to black, silty, carbonaceous, plant fragments, coaly partings	3	0	1216	0
Sandstone — grey, fine-grained, shaly, carbonaceous in part	1	9	1217	9
Sandstone—light grey, medium-grained, compact	2	9	1220	6
Shale—dark grey, silty in part, compact (carbon in top 3")	3	6	1224	0
Shale — dark grey to black, carbon, coaly partings	0	8	1224	8
COAL—bony, crushed	1	4	1226	0
Shale—dark grey, sandy at base	1	0	1227	0
Sandstone—light grey, coarse-grained (fine-grained at top)	3	3	1230	2
Shale—dark grey to black, carbonaceous (¾" bony coal at centre)	5	10	1236	0
Shale—dark grey, sandy, grading into fine-grained sandstone at base	5	5	1241	5
Sandstone—light and grey, fine- to medium-grained, with thin irregular dark (carbonized) laminæ, specks of coal	3	4	1244	9
Sandstone—light grey, coarse-grained	1	3	1246	0
Sandstone — light grey, medium to coarse grain	4	0	1250	0
Conglomerate—fine-grained	4	0	1254	0
Sandstone—light grey, fine grain, micaceous	4	0	1258	0
Sandstone—light grey, medium-grained, with shaly laminæ at base and 1½" coaly shale in middle	2	6	1260	6
Shale—dark, silty	0	6	1261	0
Sandstone—light grey, medium grain, with dark laminæ and 12" dark-grey shale with coaly laminæ	4	0	1265	0
Sandstone—dark, fine- and medium-grained, dip 15°–18°	5	0	1270	0

End of hole.

Hole started April 30th, 1946. Hole finished June 18th, 1946.

Inspection of Electrical Equipme and Installations at Mines and Quarries.

By L. Wardman.

In April, 1946, the position of Inspector of Electrical Installations and Equipment at, and in connection with, mines and quarries was created. The Electrical Inspector of Mines is authorized to inspect coal mines, metalliferous mines, placer mines, quarries, and any incidental operations within the provisions of the "Coal-mines Regulation Act" and the "Metalliferous Mines Regulation Act."

CONTENTS.

From April 23rd, 1946, to December 31st, 1946, the electrical installations at thirty-three properties were inspected, and nine properties were visited at which it was planned at some future date to install new electrical equipment or reconstruct old. In addition, two properties were visited which were closed down indefinitely.

The approximate total electrical horse-power used at metal mines and quarries in the Province is 84,000 horse-power. Of this power slightly less than two-thirds is produced by power plants owned by the mining companies, the remainder being purchased from local electric power companies.

The approximate total electrical horse-power used at coal mines is 17,475 horse-power, and of this power 40 per cent. is produced by plants owned by mining companies, while the remainder is purchased.

The power produced by plants owned by mining companies can be broken down as follows:—

	Horse-power.
Hydro-electric	30,500
Steam turbo-alternators	30,000
Diesel-electric	11,900

The following is a summary of the conditions that were observed:—

Transformer-stations.

The faults found were: Unlocked enclosures, at three properties; no enclosure to prevent entry of unauthorized persons, where transformers were not isolated by elevation, at two properties; no sump to catch oil in case of leakage from transformers containing an inflammable dielectric oil, at five properties; poor installation, at one property.

Electrical Wiring and Switch Gear.

At seven properties there was exposed wiring where leads leave conduit to enter motors or circuit-breakers. This practice, though once permitted, does not now conform with the regulations.

At five properties the rubber-covered cables used on transportable machines were damaged by falling rock from blasting or being run over. Such cables, when used underground, should be hung up in such a manner as to afford the greatest protection for them. In quarries as much of the cable as it is feasible to cover should have a protective covering laid over it.

At one property the cleats holding a cable in the shaft were not satisfactory. Cleats suitable for carrying the weight of the cable, or approved-strain clamps, should be used.

At three properties the armour of the armoured cables was damaged. There were also a number of cases of poorly maintained light wiring underground.

At six properties electrical equipment unsuitable for the conditions was in use underground. This included switch gear mounted in locations where water could drip over it; unsuitable type of switch and control gear for damp locations; ordinary rubber-covered cable used in wet locations.

When electrical power cables are carried down shafts for the purpose of feeding various levels, it is advisable to bring the cables into a proper distribution-station near the shaft at these levels, then the switch gear can be installed so as to be kept dry. The practice of installing switch gear on shaft-timbers is not always satisfactory.

Switch and control gear, when used underground, should be of a type suitable for saturated-air conditions.

Ordinary rubber-covered cables, such as used in dry locations on the surface, are not suitable for underground use. The following is quoted from the Electrical Engineers' Handbook, by Pender, pages 2–25:—

" *Water Absorption.*—Rubber contains proteins which, when the rubber is immersed in water, act as membranes to carry the water into the rubber. There are natural electrolytes in the rubber, such as quebrachitol, which go into solution in the absorbed water, the rate of absorption depending on the osmotic pressures. Water absorption may be detected by increase of capacitance and conductance while the rubber is immersed in water."

Grounding and Bonding.

Eight installations were not adequately grounded and bonded throughout, and at one installation a 220-volt single-phase three-wire lighting system had the neutral fused and grounded, whereas it should be solidly grounded and not fused.

Locomotives.

Owing to the number of accidents and near accidents that have occurred from runaway locomotives, it has been considered necessary to install "dead-man controls" to prevent the operator from moving the locomotive if he was not in his proper position in the cab, or which automatically shut off the power if he becomes incapacitated. At present several ideas are being tried out at various mines. Some companies are experimenting with home-made equipment, while others have purchased manufactured equipment. On the whole the equipment being used is giving satisfactory results.

The following sections give a brief general description of the electrical installations at the various mines, list the main units, and quote the approximate connected loads.

PLACER MINES.

Atlin (59° 133° N.W.).

Northern Resources, Ltd., Pine Creek.

Northern Resources, Limited, is at present the only company in British Columbia using electrical power to any extent for placer-mine operations. At their Pine Creek mine an 800-horsepower turbine, operating on a 132-foot head, drives a 600-horsepower 4,600-volt 60-cycle 3-phase alternator to supply power for mining operations and lighting. A 75-horsepower 440-volt electric-motor-powered shovel was in operation during 1946. A transportable transformer-station, consisting of a bank of three 100-kva. 4,600/440-volt transformers, supplies power to the shovel motor at 440 volts. A washer, powered with electric motors, is on the property but was not in use during 1946.

LODE MINES.

Taku River (56° 133° N.W.).

Polaris-Taku, Taku River Gold Mines, Ltd.

Reconstruction of the complete electrical installation at this mine was commenced in 1946 and is expected to be completed in 1947. Power for mining and milling operations is produced by the company at the property. The power plant consists of the following units: One hydro-electric unit—625-kva. 480-volt generator; one Fairbanks-Morse Diesel engine driving a 375-kva. 480-volt generator; two Crossley Diesel engines, each driving a 250-kva. 480-volt generator.

The connected load is as follows:—

	Horse-power.
Two air-compressors, total load	250
Mill load	500
Underground hoist	125
Underground pumps	115
Underground fans and battery-charger	30
Miscellaneous	80
Total loads	1,100

The capacity of the crusher plant and mill is to be increased, and two new 150-horsepower pumps and several fans are to be installed underground. These additions will increase the connected load to approximately 1,800 horse-power. To ensure having adequate power at all times, an auxiliary Diesel engine may be installed to supplement the turbine during low-water periods, thus providing continuous operation of the hydro-electric alternator. Tramming is done by small battery locomotives.

PORTLAND CANAL (56° 130° S.E.).

Silbak Premier Mines, Ltd. This company operates a power plant at the property to produce power for milling and mining operations. This plant consists of the following units: Three 630-horsepower Fairbanks-Morse 6-cylinder Diesel engines, each direct-connected to a 563-kva. 2,300-volt 300-r.p.m. Westinghouse 60-cycle 3-phase alternator; one Pelton wheel direct-connected to a 475-kva. 2,300-volt 360-r.p.m. 60-cycle 3-phase General Electric alternator; one Pelton wheel direct-connected to a 400-kva. 2,300-volt 200-r.p.m. 60-cycle 3-phase General Electric generator.

The connected load is as follows:—

	Horse-power.
Two air-compressors, each requiring	150
One air-compressor requiring	400
Mill load	1,068
Tram-running motor	75
Tram-starting motor	50
Underground hoist	100

Lighting constitutes the remainder of the load.

Power at 440 volts potential is carried to the underground hoist and three lighting transformers by means of 450 feet of 3-conductor No. 000 lead-covered armoured cable. Haulage on the main level is done by 4-ton locomotives and on the lower levels by 1-ton locomotives.

SMITHERS (54° 127° N.E.).

Duthie Mines (1946), Ltd. This mine, closed for many years, is being reopened. An extensive reconstruction programme, which includes a complete overhaul of power plant, transmission-line, mill and hoisting equipment, is in progress. Power is to be produced at the property by the company's steam-turbine direct-connected to a 3,600-r.p.m. 500-kva. 2,300-volt General Electric Schenectady alternator. The transmission-line between the power plant and the transformer-station at the mill is 4,700 feet long and consists of three No. 1 gauge solid conductors.

The transformer sub-station at the mill consists of three 220-kva. 2,300/440-volt transformers. All the mill motors operate at 440 volts potential. The air-compressor motor operates at 2,200 volts potential.

The connected load is:—

	Horse-power.
Air-compressor	300
Mill	245
Power-house	50
Lighting and miscellaneous	10
Underground hoist	60

Power is supplied to the motors at the power-house at 440 volts potential through a bank of three 20-kva. 2,300/440-volt transformers.

Princess Royal Island (53° 128° S.W.).

Pugsley Mine, Surf Inlet Gold Mines, Ltd. Electric power is produced by two Pelton wheels driving two Westinghouse 468-kva. 440-volt 3-phase 60-cycle generators. A bank of three 300-kva. 440/13,200-volt single-phase 60-cycle Westinghouse transformers steps up the potential for transmission to the mine. At the mine there is a bank of three 300-kva. 13,200/440-volt single-phase 60-cycle Westinghouse step-down transformers.

A 3-conductor rubber-insulated, lead-sheathed armoured cable carries power underground.

The connected load is as follows:—

	Horse-power.
Air-compressors	350
Mill and crushing plant	250
Underground hoist and pumps	90
Lighting	200
Miscellaneous	300

Cariboo (53° 121° S.W.).

Cariboo Gold Quartz Mining Co., Ltd. This company produces power for mining and milling operations, and also supplies some power to the town of Wells. Details of the power plant are as follows: Diesel engines—one Ruston-Hornsby 8 V.G.R. 490-horsepower at site, two Ruston-Hornsby 7 V.G.R. 430-horsepower at site, one Ruston-Hornsby 6 V.G.R. 370-horsepower at site, one Ruston-Hornsby 6 V.G.R. 158-horsepower at site; generators—one English Electric 438-kva. 460-volt 400-r.p.m., two English Electric 375-kva. 460-volt 400 r.p.m., one English Electric 312-kva. 460-volt 400-r.p.m., one English Electric 156-kva. 460-volt 600-r.p.m.

The connected load is:—

	Horse-power.
Crushing and milling	700
Air-compressors, hoists, and pumps	980
Shops, power-house, miscellaneous	314
Town of Wells	127

The electrical distribution system is linked with that of the Island Mountain Mining Company, and, in event of a power failure at either power plant, a small amount of power can be transferred from the operating one to prevent a complete shut-down of essential equipment.

A bank of three 75-kva. 440/2,300-volt step-up transformers adjacent to the mine portal feeds two of the underground hoists through a No. 4 gauge 3-conductor paper-insulated, lead-covered armoured cable. Near each of the two hoisting-stations a bank of three 37½-kva. 2,300/440-volt step-down transformers serves each hoist. The third hoist, which is near the portal, is supplied with power from the surface at 440 volts through a 600-volt No. 00 gauge 3-conductor rubber-insulated armoured cable.

Underground lighting is supplied through rubber-insulated aluminium-armoured cable. Battery locomotives are used for haulage on the main levels.

Island Mountain Mines Co., Ltd. This company owns and operates a Diesel-engine-driven electric generating plant to produce power for mining and milling operations. It consists of the following units: Two 187½-kva. 60-cycle 3-phase 480-volt generators, one 312-kva. 60-cycle 3-phase 480-volt generator, one 250-kva. 60-cycle 3-phase 480-volt generator. All units are direct-connected to Diesel engines.

The connected load is:—

	Horse-power.
Two air-compressors	200
Mill and crushing plant	205
Power-house, shops, miscellaneous	36
Underground hoist and pumps	270

A bank of three 440/2,300-volt transformers steps up the potential for underground service. Fifteen hundred feet of 2,300-volt lead-covered, steel-tape armoured cable from the portal to the 4000 level feeds a bank of three 50-kva. 2,300/440-volt transformers. This bank of transformers serves the 125-horsepower English Electric hoist motor and some of the underground pumps. A 2,300-volt lead-covered, steel-tape armoured cable from the 4000 level feeds three 37½-kva. 2,300/440-volt transformers on the 3000 level. This bank serves the pumps on the lower levels. One 2-kva. transformer at each of the two transformer-stations feeds the lighting circuits. Haulage on the main level is done by battery locomotives.

Bridge River (50° 122° N.W.).

Pioneer Gold Mines of B.C., Ltd. This company produces power for mining and milling operations, but is also linked with the British Columbia Electric Power Company in case of a shut-down of part of their plant. The power plant consists of four hydro-electric units, situated at three different sites. Details of this plant are as follows:—

Unit.	Turbine.			Generator.				
	Make.	H.P.	R.P.M.	Make.	Kva.	Voltage.	R.P.M.	Site.
No. 1	Gilkes	780	360	A.S.E.A.	600	6,600	360	Hurley River.
No. 2	Pelton	800	257	Westinghouse	625	6,600	257	Hurley River.
No. 3	Allis-Chalmers	1,000	720	C.G.E.	675	6,600	720	Hurley River.
No. 4	Gilkes	380	510	C.G.E.	300	440	300	Mill.

The connected load is as follows:—

	Horse-power.
Compressors	460
Mill and crushing plant	950
Underground pump and hoists	630

During 1946 a new underground primary electric-power cable and transformer-station was installed. The cable is a 3-conductor No. 6 A.W.G. stranded copper, insulated with varnished cambric, belted and lead-sheathed with jute bedding and No. 10 gauge wire armour. This 660-volt cable feeds the original 460-volt distribution system through a 150-kva. 6,900/460-volt 60-cycle 3-phase askarel-filled transformer. The junction boxes are askarel-filled. The pothead-type cable entrances are compound-filled. The secondary distribution system consists mainly of 600-volt 3-conductor paper-insulated, lead-covered armoured cable. This system was originally fed at 460 volts from the surface, but low voltage at the motors necessitated the new addition. Haulage is done by Greenbat battery locomotives.

Bralorne Mines, Ltd. This company produces some of the power required for mining and milling operations, while the remainder is purchased from the British Columbia Electric Power Company. The power plant consists of the following units: Two Fargo impulse turbine units, one direct-connected to an English Electric 500-kva. 440-volt generator and the other direct-connected to a Crompton-Parkinson 420-kva. 440-volt generator. There are two transformer-stations, one of six General Electric single-phase units and the other of three Maloney single-phase units, making a total of 2,250 kva. for transforming the British Columbia Electric power from 66,000 to 2,300 volts.

The connected load is as follows:—

	Horse-power.
Air-compressors	1,115
Mill and crusher plant	750
Underground hoists	600
Underground pumps	100
Underground fans	250
Lighting	200
Electric boiler and heaters	900

Power is carried to the four underground transformer banks by means of four armoured cables, as follows:—

Crown shaft: 3,500 feet of 3-conductor No. 0 gauge paper-insulated wire-armoured cable.

Empire shaft: 350 feet of 3-conductor No. 4 gauge paper-insulated, lead-covered, steel-tape armoured cable.

Empire adit: 350 feet of 3-conductor No. 0 gauge paper-insulated, lead-covered, steel-tape armoured cable.

Empire, 2000 level: 2,500 feet of 3-conductor No. 2 gauge varnished cambric-insulated, lead-covered, wire-armoured cable.

The underground transformer stations are as follows:—

Empire shaft, 200 level: Three 50-kva. 2,300/440-volt single-phase 60-cycle Ferranti transformers.

Empire shaft, 2000 level: Two 150-kva. 2,300/440-volt single-phase 60-cycle English Electric transformers.

Crown shaft, 800 level: Three 50-kva. 2,300/440-volt single-phase 60-cycle English Electric transformers.

Crown shaft, 1400 level: Three 75-kva. 2,300/440-volt single-phase 60-cycle English Electric transformers.

Plans were made to install an electric-trolley system on the main haulage level, using one large trolley locomotive. This installation may be made in 1947.

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

Power is purchased from the British Columbia Electric Power Company to operate an air-compressor and hoist, and to provide lighting. The air-compressor is an Ingersoll-Rand, powered with a 75-horsepower 2,300-volt 3-phase 60-cycle English Electric motor. The hoist, an Ingersoll-Rand, is driven by a 100-horsepower 440-volt 3-phase 60-cycle motor. A bank of three 25-kva. 2,300/460-volt single-phase 60-cycle transformers serve the hoist motor. Electric lights in the shaft are fed from a 3-conductor armoured cable.

Pacific (Eastern) Gold Mines, Ltd.

This company purchases power from the British Columbia Electric Power Company. In 1946 a 100-kw. 2,200-volt 3-phase 60-cycle Canadian Westinghouse generator was installed as a stand-by unit. This generator is driven by a Polar Atlas Diesel engine. The connected load underground is one Ingersoll-Rand hoist, driven by a 100-horsepower 440-volt 3-phase 60-cycle motor, fed from a bank of three 100-kva. 2,300/460-volt single-phase 60-cycle transformers; three pumps, two driven by 60-horsepower 440-volt English Electric motors and one by a 40-horsepower 440-volt English Electric motor; one fan, driven by a 50-horsepower Westinghouse Electric motor. On the surface an Ingersoll-Rand air-compressor is driven by a 200-horsepower 2,200-volt 360-r.p.m. Canadian General Electric synchronous motor.

Congress Gold Mines, Ltd.—This company purchases power from the British Columbia Electric Power Company to operate an air-compressor driven by a 100-horsepower 2,300-volt 3-phase 60-cycle motor. A small pump and a small amount of lighting comprises the remainder of the electrical installations.

Wayside Mine. During 1946 the electrical power plant and distribution system were reconstructed in order to have power to operate air-compressors for development-work. The hydro-electric plant, which is across the river from the mine, develops 312 kva. at 2,300 volts, 3-phase, 60 cycles. There is an overhead power-transmission line from the plant to the transformer-station at the mill-site, near the portal of the main tunnel. This station consists of three Canadian General Electric 50-kva. 2,300/440-volt single-phase 60-cycle transformers, one 30-kva. 2,300/110-volt single-phase 60-cycle Westinghouse transformer, and one 5-kva. 2,300/110-volt single-phase 60-cycle Canadian General Electric transformer.

The air-compressor is driven by a 100-horsepower 440-volt 3-phase 60-cycle 1,160-r.p.m. Westinghouse motor. Provision is being made to install an electric hoist and lighting underground.

COPPER MOUNTAIN (49° 120° S.W.).

Granby Consolidated Mining, Smelting, and Power Co., Ltd.—This company owns and operates a steam-power plant near Princeton to produce power for mining and milling operations. There are four steam turbo-alternators, as listed below:—

Unit.	Steam-turbine.			3-phase 60-cycle Direct-connected Alternator.		
	Make.	R.P.M.	H.P.	Make.	Kva.	Voltage.
No. 1	Allis-Chalmers	3,600	669	Allis-Chalmers	500	460
No. 2	Fraser-Chambers	3,600	2,680	Siemans	2,000	6,600
No. 3	Allis-Chalmers	3,600	6,690	Allis-Chalmers	5,000	4,600
No. 4	Allis-Chalmers	1,800	13,450	General Electric	10,000	13,800

In case of an emergency shut-down the electrical distribution system can be linked in with the West Kootenay Power and Light Company's distribution system.

The connected load is as follows:—

	Horse-power.
Air-compressors	1,575
Mill at Allenby	8,051
Crushing plant	910
Mine-hoists	750
Mine scraper-hoists	500
Underground pumps	20
Mine-fans	200
Lighting	800
Power plant	1,200
Miscellaneous	1,620

For underground electrical equipment, power is carried from the surface to the 5 level switch-room via No. 1 shaft through a 2,300-volt 3-conductor 250,000-c.m. paper-insulated, lead-sheathed, double steel-tape armoured cable. Alternating current distribution from the main switch-room to the various underground electrical motors is at 2,300 volts potential through a network of thirty-five 3-conductor cables. About 50 per cent. of these cables were installed in the past four years. There are also three 250-volt direct current circuits. Most of the underground fan motors operate at a potential of 2,300 volts. The voltage is stepped down to 220 volts for the scraper-hoists.

The control gear for these hoists is located in protected places, usually the transformer-room, and is operated through a pilot circuit by a push-button switch at the hoist. Trolley locomotives are used for underground haulage.

HEDLEY (49° 120° S.E.).

Hedley Mascot Gold Mines, Ltd. Power is purchased from the West Kootenay Power and Light Company, at 220 volts, 3-phase, 60 cycles, for operation of the electrical equipment at the mine and mill. The main sub-station consists of five 250-kva. 6,600/440-volt step-down transformers. One mine sub-station consists of three 150-kva. 6,600/440-volt step-down transformers and the other of two 50-kva. 2,200/440-volt step-down transformers. At the 2700 level there are two stations —one of three 100-kva. 6,600/2,200-volt step-down transformers and the other of three 25-kva. 2,200/440-volt step-down transformers. All transformers are single-phase 60-cycle Westinghouse units.

The connected load is:—

	Horse-power.
Air-compressors	500
Mill and crushing plant	902
Mine fans and hoists	180
Lighting	60

Power is carried underground by means of 3-conductor paper-insulated, lead-sheathed, steel-tape armoured cables. Two 3½-ton Atlas and one 1-ton Mancha battery locomotives are used for haulage.

Nickel Plate Mine, Kelowna Exploration Co., Ltd. Power is purchased from the West Kootenay Power and Light Company, Limited, at 2,300 volts, 3-phase, 60 cycles, and reduced to 440 volts for mill and mine motors. Transmission to underground transformer stations at 2,300 volts is by 3-conductor rubber-insulated, lead-sheathed, steel-tape armoured cable. Cab tire cable is used to transmit power to the various scraper-hoists at 440 volts potential. Haulage underground is done by battery locomotives and on the surface by trolley locomotives.

The connected load is as follows:—

	Horse-power.
Air-compressors	1,040
Mill and crushing plant	1,175
Mine-hoists	250
Scraper-hoists	90
Pumps and fans	30
Lighting and miscellaneous	505

NELSON (40° 117° S.E.).

Kenville Gold Mines, Ltd. Complete reorganization of the electrical and other equipment was begun in 1945 and is still in progress. Power is purchased from the West Kootenay Power and Light Company at 2,200 volts potential. The main load is three 2,200-volt motors of 100, 200, and 300 horse-power respectively. The remainder of the load, consisting mainly of small 440-volt motors, totals approximately 80 horse-power. Two small fans are in use underground. Tramming is done by two ½-ton Mancha little trammers.

Euphrates Mine. Power is purchased from the West Kootenay Power and Light Company. The Euphrates sub-station consists of a Canadian General Electric 3-phase 60-cycle 300-kva. 60,000/480-volt transformer. During 1946 only the air-compressor was operated. This unit, a Canadian Rand, is belt-connected to a 200-horsepower 440-volt 585-r.p.m. General Electric motor. Aside from the above-mentioned load, about 3 kilowatts was used for lighting. The potential mill load is 130 horse-power.

Sheep Creek (49° 117° S.E.).

Gold Belt Mining Co., Ltd. Power is purchased from the West Kootenay Power and Light Company. A bank of three English Electric 75-kva. 6,600/440-volt single-phase 60-cycle transformers steps the power down for use at the 600 level. At the portal of the 600 level there is a Sullivan angle compound air-compressor driven by a 200-horsepower 440-volt Fort Wayne Electrical Works motor. During December, 1946, a 3-conductor No. 6 gauge paper-insulated, lead-covered, double-tape armoured cable was installed on the 600 level to transmit power to a 35-horsepower underground hoist and locomotive-battery charging-station. A small battery locomotive is used for tramming. At the mill-site there is an Ingersoll-Rand air-compressor driven by a 200-horsepower 220-volt General Electric synchronous motor. The potential mill load is approximately 300 horse-power. The electrical equipment in the mill is nearly all of English Electric manufacture. The mill was not operated in 1946.

Sheep Creek Gold Mines, Ltd. Power is purchased from the West Kootenay Power and Light Company, at 2,200 volts, for mining and milling operations. Two 2,200/110–220-volt transformers—one 10 kva., the other 15 kva.—supply power for lighting the plant and camp respectively. Three 50-kva. and two 75-kva. 2,200/440-volt transformers supply power to the mill and mine. All are Canadian General Electric transformers.

The connected load is as follows:—

	Horse-power.
Air-compressors	385
Mill and crushing plant	370
Mine-hoist	150
Mine pumps and fans	90
Lighting	20
Miscellaneous	20

Electrical power is carried underground through a 3-conductor No. 4 gauge rubber-insulated, lead-sheathed armoured cable. Two battery locomotives are used for underground haulage.

Sitkum Creek (49° 117° N.E.).

Alpine Mine. This company operates a small Diesel-electric plant at the mill-site to produce power for milling. This power plant consists of one 150-horsepower 2-cylinder Fairbanks Diesel engine, direct-connected to a 93-kva. 440-volt 3-phase 60-cycle generator.

The connected load is as follows:—

Crushing plant	h.p.	25
Mill	h.p.	96
Lighting and water-heater (approximately)	k.w.	10

Ainsworth (49° 116° N.W.).

Ainsmore Consolidated Mines, Ltd. Kootenay Florence. Power for milling and mining operations is bought from the City of Nelson. The main transformer bank steps the power down from 20,000 volts to 2,200 volts. A second bank of transformers steps down from 2,200 to 440 volts. The two compressor motors—one of 100 horse-power, the other of 150 horse-power—operate on 2,200 volts potential. All the mill motors are 440-volt motors. The mill load is 270 horse-power. Tramming is done by one battery locomotive.

KASLO-THREE FORKS (50° 117° S.E.).

Whitewater, Retallack Mines, Ltd.—This property was not operated in 1946. The electrical installation is as follows: Power plant—one hydro-electric unit of 240 kva., 220 volts, 3-phase, 60 cycles. The main power plant was destroyed by fire in May, 1945. The mill load is 378 horse-power. About one-half of the motors constituting this load operate at 220 volts potential, the remainder require 440 volts potential. The voltage is stepped up to 2,300 volts for transmission to the townsite. No power is used underground.

Zincton Mines, Ltd.—This company operates a Diesel engine power plant to produce power for mining and milling operations. This power plant consists of the following units:—

Unit.	Diesel Engine.			Direct-connected to 3-phase 50-cycle Generator.		
	Make.	H.P.	R.P.M.	Make.	Kva.	Voltage.
No. 1	Petters	250	277	Westinghouse	200	480
No. 2	Petters	250	277	Westinghouse	200	480
No. 3	Fairbanks	225	300	Fairbanks	185	480
No. 6	Fairbanks	450	300	Fairbanks	175	480

Units No. 1 and No. 2 are not in use.

In addition to the above, there are two Fairbanks Diesel engines driving air-compressors. Details of these Diesel engines are as follows: No. 4—Fairbanks 2-cylinder, 120 horse-power, 275 r.p.m.; No. 5—Fairbanks 6-cylinder, 90 horse-power, 800 r.p.m.

The connected load is as follows:—

	Horse-power.
Mill and crushing plant	457.0
Mine hoist and pump	27.5
Lighting	35.0
Miscellaneous	33.0

Tramming is done by battery locomotives.

SANDON (49° 117° N.E.).

Ruth Hope and Coronation, Kelowna Exploration Co., Ltd.—Development-work was started on this mine in 1946. In order to have electrical power for lighting and battery-charging, a transmission-line was built from the Silversmith hydro-electric plant to the mine-portal. A small battery locomotive is used for tramming.

SILVERTON-NEW DENVER (49° 117° N.E.).

Standard, Mammoth, and Enterprise, Western Exploration Co.—Power for milling operations is developed at the property by means of a Nelson Iron Works water-wheel driving a 400-kva. 480-volt 300-r.p.m. generator. Two Pelton wheels, developing a total of 300 horse-power, drive air-compressors. The connected load is as follows:—

	Horse-power.
Crushing plant	85
Mill	334
Lighting	25
Miscellaneous	145

No electrical power is used underground. A small battery locomotive is used at the Standard mine.

KIMBERLEY (49° 115° N.W.).

Sullivan, Consolidated Mining and Smelting Co. of Canada, Ltd.

Of the power consumed at the mine and concentrator, about 69 per cent. is obtained from the East Kootenay Power and Light Company and about 31 per cent. is produced by the mine steam-power plant, consisting of three Westinghouse turbo-generators capable of producing a total of 6,000 horse-power. Each generator produces 1,850 kva. at 575 volts and 3,600 r.p.m. The connected load, excluding the miscellaneous and lighting load, is as follows:—

	Horse-power.
Mine Underground.	
Hoists	800
Pumps	315
Fans	105
Scrapers	550
Crusher	150
Motor-generator sets	1,269
Mine Surface.	
Air-compressors	3,272
Motor-generator sets	755
Pumps	160
Concentrator.	
Ball-mills	350
Flotation	1,777
Crushing plant	450
Pumps	600
Classifiers	170

A new 800-horsepower electric hoist is being installed on the surface, and a new tunnel is being driven in order that the ore may be hauled directly to the concentrator by trolley locomotives. Three mercury arc rectifiers will deliver 250 volts D.C. to the trolley-wires. One of these rectifiers will be installed underground. A 3-conductor No. 4 gauge paper-insulated, lead-covered, steel-wire armoured cable will supply the underground rectifier at 6,600 volts. This cable will be supported from the roof of the tunnel by means of a 3/8-inch galvanized-steel messenger cable.

Electric-trolley locomotives, varying in size from 6 tons to 12½ tons, are used on the various underground haulage routes. Armoured cable is used to carry power to the various underground motors and motor-generator sets.

HOWE SOUND (49° 123° N.E.).

Britannia Mining and Smelting Co., Ltd.

To produce power for mining and milling operations, this company operates a hydro-electric plant consisting of three 3,750-horsepower 720-r.p.m. Pelton wheels driving three direct-connected 2,500-kva. 6,600-volt 3-phase 60-cycle Canadian Westinghouse generators and one 300-horsepower 600-r.p.m. Pelton wheel driving a direct-connected 150-kva. 250-volt 3-phase 60-cycle Crocker-Wheeler generator. A tie-in with the British Columbia Electric Power Company's lines through three 2,200-kva. 18,000Y/6,600-volt transformers can be effected if an exchange of power either way is required. There are seven transformer-stations serving the surface installations, as follows:—

Station.	Units.	Make.	Kva.	Voltage.	Purpose.
2. Auxiliary	3	Allis-Chalmers	150	6,600/220	Power-house auxiliary and shops.
3. No. 1 Mill	3	Canadian Westinghouse	1,000	6,600/440	Step-down.
4. No. 2 Mill	3	Canadian Westinghouse	1,000	6,600/440	Step-down.
5. Foundry	3	Canadian Westinghouse	400	6,600/220	Electric furnace.
6. Incline	3	Canadian Westinghouse	50	6,600/440	Hoists and shops.
7. Outside, 2200 level	2	Westinghouse	50	6,600/220	Power-house and shops.
8. Outside, 2200 level	2	General Electric	100	6,600/440	Shops.

Underground there are nine transformer stations, as follows:—

Station.	Units.	Make.	Kva.	Voltage.	Purpose.
9. No. 1 hoist	3	Westinghouse	150	6,600/440	Hoist.
10. No. 3 hoist	2	General Electric	100	6,600/440	Hoist.
11. No. 5 hoist	2	Westinghouse	100	6,600/440	Hoist.
12. No. 7 hoist	3	General Electric	100	6,600/440	Hoist.
13. No. 8 hoist	3	Canadian Westinghouse	200	6,600/2200	Hoist.
No. 8 hoist (Victoria)	3	Canadian Westinghouse	25	6,600/440	Auxiliaries.
14. Hoist	3	Maloney	150	6,600/440	Hoist.
15. 4500 level	2	General Electric	75	6,600/440	Battery-charging and fans.
16. 4100 level	3	General Electric	75	6,600/440	Crusher and fans.
17. 2700 level	2	General Electric	200	6,600/440	Crusher.

Power is transmitted to these underground sub-stations through 3-conductor, paper or varnished-cambric insulated, lead-covered, wire or double steel-tape armoured cable.

The connected load is as follows:—

	Horse-power.
Air-compressors	2,000
Mill	4,000
Crushing plant	2,060
Mine-hoists	1,700
Mine scraper-hoists	140
Mine-pumps	30
Mine-fans	290
Lighting	670
Miscellaneous	4,800

The miscellaneous load includes the foundry, electric furnace, power-house, shops, and various other items. Haulage underground and on the surface is done by twenty-two trolley locomotives, of sizes from 3½ to 20 tons, and five battery locomotives, of sizes from 1½ to 8 tons.

TEXADA ISLAND (49° 124° N.W.).

Little Billie, Vananda Mining Co., Ltd. This company produces power at the property for mining operations. The power plant consists of the following units: One International Harvester 6-cylinder Diesel engine driving a direct-connected Palmer self-regulating 440-volt 66-ampere 3-phase 60-cycle alternator; one Allis-Chalmers 4-cylinder gasoline-engine which can be belt-connected to either a 4-cylinder air-compressor or a Canadian Westinghouse Electric 50-kva. 440-volt 3-phase A.C. generator; one 2-cylinder 160/170-B.H.P. 250-r.p.m. Vickers-Petters Diesel engine, driving a Sullivan angle compound air-compressor.

The Diesel-engine-driven electric plant produces power for lighting the camp and operating two underground pumps and a fan, making a load of approximately 45 horse-power.

Construction of a new power plant was commenced in 1946. One unit has been installed; it is a 5-cylinder 375-horsepower 360-r.p.m. Fairbanks-Morse Diesel engine, driving a direct-connected 312-kva. 2,400-volt 3-phase 60-cycle Fairbanks-Morse generator. Another similar unit is to be installed. Two Packard 100-kva. 2,300/115–230–460-volt transformers and most of the wiring are yet to be installed.

DUNCAN (48° 123° N.W.).

Twin J Mines, Ltd.—This company purchases power from the British Columbia Power Commission. The connected load is:—

	Horse-power.
Air-compressor	150
Crushing plant	110
Mill	228
Lighting and miscellaneous	152

ZEBALLOS (50° 126° S.W.).

Privateer Mine, Ltd. The power-house at this mine was destroyed by fire in May, 1946, but was rebuilt and put into operation again in November. One 156-horsepower Ruston-Hornsby 2-cylinder Diesel engine was salvaged and rebuilt for service as a stand-by unit to drive a belt-connected Westinghouse 125-kva. 550-volt 720-r.p.m. 3-phase 60-cycle generator. A Bellis-Morcom air-compressor, also salvaged, is driven by a 200-horsepower synchronous motor. Two 5-cylinder 375-horsepower 360-r.p.m. Fairbanks-Morse Diesel engines, each driving a direct-connected 312-kva. 550-volt 3-phase 60-cycle Fairbanks-Morse alternator, constitute the main power plant. A new compressor, belt-connected to a 150-horsepower induction motor, is being installed. The connected load is:—

	Horse-power.
Air-compressor	200
Mill and crushing plant	207
Mine-hoist	40
Mine-pump	10
Lighting	55
Miscellaneous	30

An 800-foot 3-conductor No. 4 gauge rubber-insulated, lead-sheathed, steel-tape armoured cable transmits power to the 40-horsepower hoist and underground lighting transformer.

Central Zeballos Gold Mines, Ltd. Power for mining and milling operations is produced at the property by a power plant consisting of a 165-horsepower 3-cylinder Fairbanks-Morse Diesel engine, belt-connected to a 2-stage 7.5-by-13-by-8 air-compressor and a 75-kilowatt 440-volt 3-phase 60-cycle Westinghouse alternator. The connected load is:—

	Horse power.
Crushing plant	12.0
Mill	55.5
Assay office	4.5
Lighting and miscellaneous	25.0

A 2-cylinder 70-horsepower Ruston-Hornsby Diesel engine, belt-connected to a 2-cylinder single-stage Broome & Wade compressor, produces compressed air for mining.

Spud Valley Gold Mines, Ltd. This mine was closed down in 1942, but development-work was resumed in 1946. A Diesel-engine-powered compressor produces compressed air for this work. The power plant, though not used, is kept in running order. It consists of two 6-cylinder 250-horsepower Fairbanks-Morse Diesel engines, each direct-connected to a 200-kva. 2,200-volt 3-phase 60-cycle alternator. Three 100-kva. and three 50-kva. 2,220/440-volt transformers step down the voltage for the 440-volt motors. The potential load for air-compressors, crushers, and mill is 425 horse-power. The potential lighting and miscellaneous load would consume the major part of the remaining 75 horse-power.

QUARRIES.

VANCOUVER ISLAND.

Bamberton Quarry and Cement Plant.—(48° 123° N.W.) This company purchases power from the British Columbia Electric Railway Company. There are two main sub-stations, containing the following units: No. 1 sub-station—three 1,000-kva. 60,000/550-volt single-phase 60-cycle transformers; No. 2 sub-station—three 750-kva. 60,000/2,300-volt single-phase 60-cycle transformers.

Power from No. 1 sub-station is distributed at 550 volts through a bank of Reyrolle circuit-breakers as follows:—

	Horse-power.
No. 1 breaker to packing plant	345
No. 2 breaker to wet tube-mills	600
No. 3 breaker to compressor-shops	320
No. 4 breaker to coal plant	450
Nos. 5 and 6, spares	......
No. 7 breaker to ball-mills and conveyers	380
No. 8 breaker to ball-mills, crushers, quarry, shovel, and miscellaneous	1,120

Power from No. 2 sub-station is distributed at 2,300 volts through a bank of circuit-breakers as follows: No. 1 breaker to two 600-kva. 2,300/550-volt single-phase transformers; No. 2 breaker to the village; Nos. 3 to 5 breakers, inclusive, to three 2,300-volt 300-horsepower synchronous motors driving dry tube-mills.

Power from the two 600-kva. 2,300/550-volt transformers is distributed through a bank of Reyrolle circuit-breakers as follows:—

	Horse-power.
No. 1 breaker to capacitators and kiln plant	600
Nos. 2 to 5 breakers, inclusive, four 160-horsepower dry ball-mills and one 200-horsepower ferrocrete mill	840
No. 6 breaker to coolers, conveyers, and mixers	160

The distribution cables are mainly lead-sheathed, double steel-tape armoured cable.

TEXADA ISLAND (49° 124° S.W.).

Texada Quarry, B.C. Cement Co. A Diesel engine power plant is operated at the quarry to produce power for loading and crushing the quarried rock. This plant consists of a 2-cylinder 150-horsepower Crossley horizontal Diesel engine driving a belt-connected 125-kva. 600-volt 900-r.p.m. 3-phase 60-cycle General Electric alternator, a 4-cylinder 300-horsepower (500-horsepower with supercharger) Crossley horizontal Diesel engine driving a direct-connected 438-kva. 600-volt 3-phase 60-cycle generator, a single-cylinder 21-horsepower Petters Diesel engine belt-connected to a 12½-kva. 250-volt single-phase 60-cycle generator. This latter unit is used only for lighting when the other two units are shut down.

The potential is stepped up for transmission to the quarry-shovel and air-compressor by two 50-kva. 550/2,300-volt single-phase transformers. At the quarry two 50-kva. 2,300/550-volt transformers step the power down. The shovel is powered with an 85-horsepower 550-volt induction motor. The air-compressor, a 300-cubic-foot Holman, is driven by a 75-horsepower 550-volt General Electric motor. The crushing plant load is approximately 300 horse-power.

Pacific Lime Co. This company installed a new power plant in 1946. It consists of two 5-cylinder 375-horsepower 300-r.p.m. Fairbanks-Morse Diesel engines. No. 1 Diesel engine is direct-connected to a 480-volt 375-kva., at 60-per-cent. power factor, Fairbanks-Morse A.C. generator, and No. 2 is directed-connected to a 480-volt 312-kva., at 80-per-cent. power factor, Fairbanks-Morse A.C. generator. There is a 6-cylinder Ruston-Lincoln Diesel engine direct-connected to a 156-kva. 480-volt General Electric generator, to be used as a stand-by.

COAL MINES.

CUMBERLAND (49° 125° N.E.).

Puntledge River Power Plant. This plant is owned and operated by the Canadian Collieries (Dunsmuir), Limited, to provide power for coal-mining operations in the Cumberland district. A small amount of power is sold to the towns of Cumberland, Courtenay, and Union Bay, and to the Vancouver Island Utilities. The plant consists of two hydro-electric units of 6,000 horse-power each, each direct-connected to a 4,400-kva. 13,200-volt 3-phase 25-cycle A.C. generator. The turbines were made by Escher Wyss and the generators by the Canadian General Electric Company. Power is transmitted at generated voltage to the sub-stations at No. 5 mine, No. 8 mine, and Union Bay.

No. 5 Mine, Canadian Collieries (D.), Ltd. This colliery uses the greatest amount of electrical power underground of any colliery in British Columbia. The underground installations are all in the intake airways and consist mainly of hoists, pumps, and transformer-stations. Power is transmitted underground at 2,200 volts through 3-conductor rubber-insulated, lead-covered armoured cables. Three transformer-stations, two of six 20-kva. 2,200/440-volt single-phase 25-cycle transformers and one of three 25-kva. 2,200/440-volt transformers, serve the 440-volt motors.

The underground motor installations are as follows:—

Hoists: Main, one 500-horsepower 2,200-volt motor; two intermediate, two each 75-horsepower 440-volt motors; lower, one 75-horsepower 440-volt motor; lower, one 30-horsepower 440-volt motor.

Pumps: Two 200-horsepower 2,200-volt motors; four 75-horsepower 2,200-volt motors; two 35-horsepower 440-volt motors.

All motors are 3-phase 25-cycle induction type. In addition to the above, there is a locomotive-battery charging-station. A 10-ton 8-horsepower Ironton locomotive hauls the cars from the top of the main slope to the shaft-bottom. The total connected underground load amounts to 1,708 horse-power.

The main sub-station consists of one 1,000-kva. 13,200/2,200-volt 3-phase 25-cycle transformer, together with distribution panels. The air-compressors and some of the underground electrical equipment are fed from a more recently installed sub-station, consisting of a 1,500-kva. 13,200/2,200-volt 3-phase 25-cycle transformer and distribution panels.

The connected load for surface installations is: Main surface hoist, one 300-horsepower motor; air-compressors, two 150-horsepower motors and one 500-horsepower motor; fans, two 350-horsepower motors; tipple, one 20-horsepower motor, one

30-horsepower motor, and one 10-horsepower motor. The total surface connected load is 1,860 horse-power, including lighting and miscellaneous load. A 500-kva. 3-phase 25-cycle transformer supplies the lighting.

No. 8 Mine, Canadian Collieries (D.), Ltd.—No. 8 sub-station, serving this mine, consists of the following units: One 1,500-kva. 13,200/2,200-volt 3-phase 25-cycle transformer, one 1,500-kva. 13,200/2,200-volt 3-phase 25-cycle transformer, and one 500-kva. 2,200/440-volt 3-phase 25-cycle transformer, together with distribution panels. The surface connected load consists of the following:—

	Horse-power.
Main surface hoist	1,260
Fan	500
One air-compressor	750
One air-compressor	500
One air-compressor	150
Four tipple motors	45

The tipple motors operate on 440 volts potential, the other motors operate on 2,200 volts potential.

The main surface hoist is a Siemens, driven with a 1,260-horsepower D.C. motor, fed from a motor-generator set. The controlled-field method is used for regulating the speed of the hoist.

A total of 342.5 horse-power is used underground and is distributed as follows:—

	Horse-power.
Slope haulage-hoists	82.5
Pumping	250.0
Battery-charging	10.0

The pump motors operate on 220 volts potential, the hoists 440 volts potential.

Electrical power is transmitted underground at 2,200 volts potential through a 3-conductor rubber-insulated, lead-covered armoured cable to a transformer-station at the main hoist-room. There are three 20-kva. 2,200/440-volt single-phase 25-cycle transformers in use at this station. A 10-ton 8-horsepower Ironton locomotive is used to haul to the bottom of the shaft.

South Wellington (49° 123° S.W.).

No. 10 Mine, Canadian Collieries (D.), Ltd.

Power is purchased from the British Columbia Power Commission at 2,200 volts, 3-phase, 60 cycles. There are three Canadian General Electric 100-kva. 2,300/440-volt single-phase 60-cycle transformers at the mine for power and two Canadian General Electric 5-kva. 2,300/220–110-volt transformers for lighting. At the tipple there are three Canadian General Electric 25-kva. 2,300/440-volt single-phase 60-cycle transformers for power, and one Packard 15-kva. 2,300/220–110-volt transformer for lighting. A total of 1,138 horse-power is used on the surface and is distributed as follows:—

	Horse-power.
Air-compressors (one 500-horsepower motor and one 150-horsepower motor)	650
Fan	125
Main hoist	200
Rock-disposal	50
Tipple	50
Miscellaneous	63

A total of 470 horse-power is used underground, as follows:—

	Horse-power.
Hoist	350
Pumps (two 60-horsepower motors)	120

Electrical power is carried underground by means of a 3-conductor No. 2 gauge rubber-insulated, lead-covered armoured cable, which passes through a drill-hole from the surface to the hoist-control gear room at the rear of the hoist-room. Hoist and pump motors operate on 2,200 volts potential.

NANAIMO (49° 123° S.W.).

White Rapids Mine, Canadian Collieries (D.), Ltd.—Electrical power is purchased from the British Columbia Power Commission at 2,200 volts, 3-phase, 60 cycles. The transformer-station consists of three Westinghouse 50-kva. 2,300/440-volt single-phase 60-cycle transformers for power and one Westinghouse 10-kva. 2,300/220–110-volt transformer for lighting. The total of 705 horse-power used on the surface is distributed as follows:—

	Horse-power.
Air-compressors (one 300-horsepower motor and one 150-horsepower motor)	450
Fan	30
Pump	20
Tipple	25
Main hoist	150
Miscellaneous	30

Underground the total of 135 horse-power is distributed as follows:—

	Horse-power.
Hoist	75
Pump	60

Electrical power is transmitted underground at 440 volts through a 3-conductor armoured cable down the main slope.

EAST KOOTENAY.

Elk River Colliery, Crow's Nest Pass Coal Co., Ltd. (49° 114° S.W.) This company buys power from the East Kootenay Power Company to operate surface electrical equipment. No electrical equipment is used underground. Compressed air for mining is produced by one Bellis & Morcom low-pressure compressor and two Ingersoll-Rand low-pressure compressors, each driven by a 600-horsepower 2,200-volt motor. There is also an Ingersoll-Rand high-pressure air-compressor driven by a 450-horsepower 2,200-volt motor, which is not in use. Four Sirocco fans are used for ventilating, details of which are as follows: No. 1 East fan, driven by a 300-horsepower 2,200-volt motor; No. 9 Mine fan, driven by a 100-horsepower 2,200-volt motor; No. 4 Mine fan, driven by a 20-horsepower 220-volt motor; No. 3 Mine fan, driven by a 10-horsepower 220-volt motor.

Details of the sub-stations supplying the various electrical installations are as follows:—

Station.	Units.	Kva.	Voltage.
Main sub-station	2	1,500	66,000/2,200
Cleaning plant	3	150	2,200/220
Tipple	3	50	2,200/220
No. 9 mine	3	25	2,200/220
Power-house	3	25	2,200/220
No. 3 mine	3	10	2,200/220
No. 4 mine	3	7½	2,200/220
1 East	2	5	2,200/220

All transformers are single-phase, 60 cycles.

The connected load is as follows:—

	Horse-power.
Air-compressors	2,250
Ventilating-fans	430
Surface incline hoist	100
Conveyer	150
Tipple and cleaning plant	1,044
Miscellaneous	287

Michel Colliery, Crow's Nest Pass Coal Co., Ltd.—(49° 114° N.W.) Power is bought from the East Kootenay Power Company to operate surface electrical equipment. No power is used underground. There is one main sub-station and seven secondary sub-stations. Details of these are as follows:—

Station.	Units.	Kva.	Voltage.
Main sub-station	6	300	66,000/2,200
Cleaning plant	3	200	2,200/220
By-products plant	6	50	2,200/220
Tipple	3	50	2,200/220
Power-house	3	15	2,200/550
Power-house	2	10	2,200/220
B Seam fan	2	25	2,200/220
Sawmill	3	15	2,200/220

All transformers are single-phase, 60 cycles. Two Bellis & Morcom low-pressure air-compressors, each driven by a 600-horsepower 2,200-volt General Electric motor, produce compressed air for mining.

Three fans are used for ventilating the mine. Two are driven by 100-horsepower 200-volt motors; the third is driven by a 30-horsepower 220-volt motor.

The connected load is as follows:—

	Horse-power.
Ventilating-fans	230
Haulage	645
Air-compressors	1,200
Tipple and washing plant	1,500
Miscellaneous	75

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 Departments' offices at Victoria, Vancouver, and Nelson.

PRICES.

Paper bound copies of Annual Reports of the Minister of Mines and of Bulletins are distributed free of charge, except that a charge may be made if the stock is low. If a charge is made, application for the Annual Report or Bulletin should be made to the office of the Department of Mines, Victoria, B.C.

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.

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1901	50c.	....	1928	Free	$1.00
1902–1906	....	....	1929	Free	....
1907	50c.	....	1930	Free	....
1908	50c.	....	1931	50c.	1.00
1909	50c.	....	1932	50c.	....
1910	50c.	....	1933	Free	....
1911	....	....	1934	Free	1.00
1912	....	....	1935	Free	1.00
1913	50c.	....	1936	Free*	1.00
1914	50c.	....	1937	Free*	1.00
1915	Free	....	1938	Free*	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.	....			

* Parts A to F, bound separately in paper, are available 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.

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.) 50 cents.

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.) 50 cents.

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. (Revised.) (By John S. Stevenson and Staff of Department of Mines.)

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.) (To be reprinted.)

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.) (To be reprinted.)

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.) (In the press.)

Bulletin No. 24: Geology and Coal Resources of the Carbon Creek-Mount Bickford Map Area. (By W. H. Mathews.)

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 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, Winnipeg, Manitoba.
- Public Library, Regina, Saskatchewan.
- 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 Bureau of Mines, Olympia, Washington.
- Idaho State Bureau of Mines, Boise, Idaho.

University Libraries—
- Columbia University, New York, N.Y.
- University of California, Berkeley, California.
- 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 in 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." All are under the administration of the Department of Lands and Forests, Victoria, B.C.

A mineral claim is a piece of land not exceeding in area fifty-one and sixty-five one-hundredths acres. 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 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."

The following provisions as to extent of the various classes of claims are made by the Act:—

" In ' creek diggings ' a claim shall be two hundred and fifty feet long, measured in the direction of the general course of the stream, and shall extend in width one thousand feet, measured from the general course of the stream five hundred feet on either side of the centre thereof:

" In ' bar diggings ' a claim shall be:—

"(*a*) A piece of land not exceeding two hundred and fifty feet square on any bar which is covered at high water; or

"(*b*) A strip of land two hundred and fifty feet long at high-water mark, and in width extending from high-water mark to extreme low-water mark:

" In ' dry diggings ' a claim shall be two hundred and fifty feet square."

The following provision is made for new discoveries of placer-mining ground:—

" If any free miner, or party of free miners, discovers a new locality for the prosecution of placer-mining and such discovery be established to the satisfaction of the Gold Commissioner, placer claims of the following sizes shall be allowed to such discoverers, namely:—

" To one discoverer, one claim .... 600 feet in length;

" To a party of two discoverers, two claims amounting together to .... 1,000 feet in length;

" And to each member of a party beyond two in number, a claim of the ordinary size only.

" The width of such claims shall be the same as ordinary placer claims of the same class: Provided that where a discovery claim has been established in any locality no further discovery shall be allowed within five miles therefrom, measured along the watercourses."

Every placer claim shall be as nearly as possible rectangular in form, and marked by four legal posts at the corners thereof, firmly fixed in the ground. On each of such posts shall be written the name of the locator, the number and date of issue of his free miner's certificate, the date of the location, and the name given to the claim. In timbered localities boundary-lines of a placer claim shall be blazed so that the posts can be distinctly seen, underbrush cut, and the locator shall also erect legal posts not more than 125 feet apart on all boundary-lines. In localities where there is no timber or underbrush, monuments of earth and rock, not less than 2 feet high and 2 feet in diameter at base, may be erected in lieu of the last-mentioned legal posts, but not in the case of the four legal posts marking the corners of the claim.

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. The application for such record shall be under oath and in the form set out in the

Schedule to the Act. A claim which shall not have been recorded within the prescribed period shall be deemed to have been abandoned.

To hold a placer claim for more than one year it must be rerecorded before the expiration of the record or rerecord.

A placer claim must be worked by the owner, or some one on his behalf, continuously, as far as practicable, during working-hours. If work is discontinued for a period of seven days, except during the close season, lay-over, leave of absence, sickness, or for some other reason to the satisfaction of the Gold Commissioner, the claim is deemed abandoned.

Lay-overs are declared by the Gold Commissioner upon proof being given to him that the supply of water is insufficient to work the claim. Under similar circumstances he has also the power to declare a close season, by notice in writing and published in the Gazette, for all or any claims in his district. Tunnel and drain licences are also granted by him on the person applying giving security for any damage that may arise. *Grants of right-of-way for the construction of tunnels or drains across other claims* are also granted on payment of a fee of $25, the owner of the claims crossed having the right for tolls, etc., on the tunnel or drain which may be constructed. These tolls, however, are, so far as the amount goes, under the discretion of the Gold Commissioner.

Placer-mining Leases.

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.

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:—

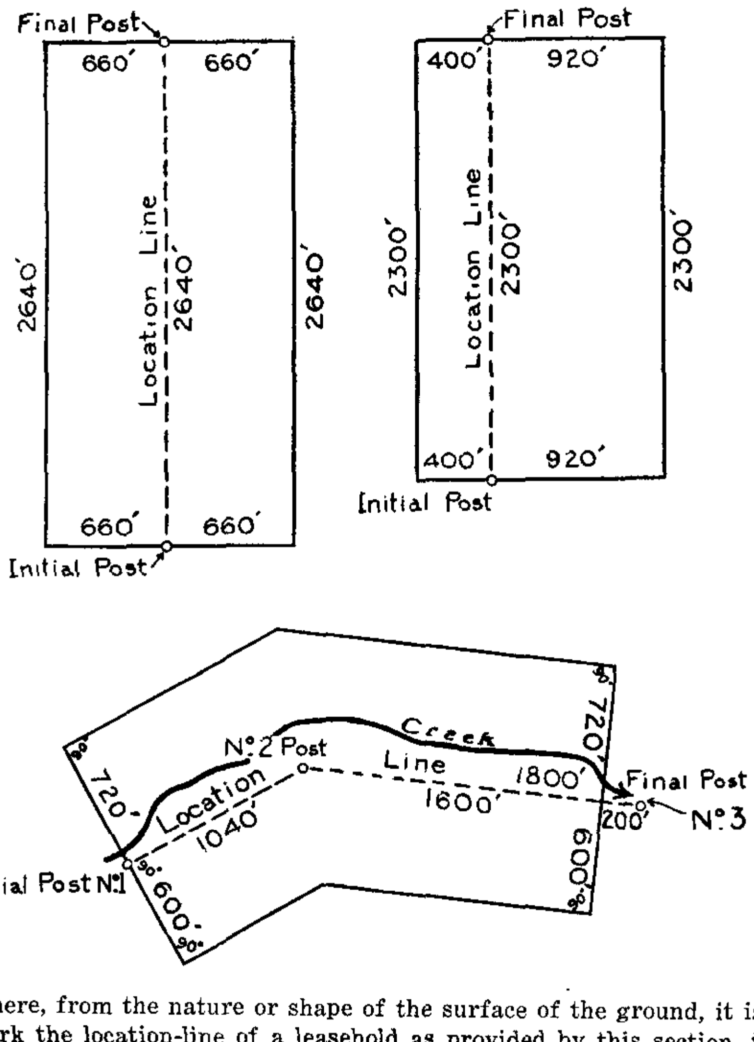
" *105. (1) For the purpose of locating a placer leasehold, a line to be known as* the ' location-line ' shall be marked on the ground by placing a legal post at each end, one post to be known as the ' Initial Post ' and the other as the ' Final Post.' The direction of the location-line may change at 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

METALLIFEROUS MINES REGULATION ACT.

This Act is designed to provide for the safe working of mines by practical regulations which govern the main phases of mining, such as hoisting installations, ropes, shaft and cage equipment, mine examination, transportation systems, electrical installations, use of explosives, approaching abandoned workings, and the connection of adjacent mines.

Shaft-hoists are required to be equipped with overwind devices and approved braking systems, and all hoistmen in charge must have an annual medical examination and certificate testifying their fitness to perform this work. Hoisting-ropes where men are hoisted must have a static factor of safety of at least 10 for depths of 1,000 feet, with an allowable decrease of one for each 500 feet additional depth with a minimum factor of safety of 6. The working-life of a hoisting-rope when men are hoisted or lowered is limited to two years.

Cages must be provided with safety-catches, properly designed covers, and safety-gates where men are hoisted. Safety-catches must be tested at stated intervals.

The manager of the mine or some qualified person appointed by him must make a daily examination of all places in the mine where persons are at work and report the conditions found in regard to safety in a book kept at the mine for that purpose.

All persons handling or using explosives must hold a certificate of competency for blasting. This certificate is issued by the district Inspector of Mines to miners who show by an oral examination that they are qualified to use explosives safely. This certificate may be cancelled for cause.

Where the workings of any mine are approaching any abandoned workings, whether belonging to that mine or to an adjacent mine, the manager of the present workings shall report the circumstance to the Inspector of Mines if the abandoned workings cannot be examined before the live workings are closer than 300 feet to the abandoned workings, and no work shall be done within this distance until a definite method of approach has been submitted to and approved by the Inspector.

Where it is considered necessary, the Minister of Mines may order a connection to be made and maintained between adjacent mines, and determine the conditions under which such a connection must be maintained.

All electrical installations must comply with the requirements of the "Electrical Energy Inspection Act" of British Columbia.

In addition to the Act and General Rules applicable to all mines, each mine which employs fifty or more men must have a code of Special Rules covering the details of operation at that mine. These Special Rules are drafted by the mining company and its employees and, when approved by the Minister of Mines, have the full force of law.

The Inspectors of Mines in the different districts have discretionary authority on a number of points that may arise in the course of mining operations.

COAL-MINES REGULATION ACT.

This Act, like the "Metalliferous Mines Regulation Act," is designed to provide for the safe working of mines by practical regulations. It is, however, broader in scope than the "Metalliferous Mines Regulation Act" in that it provides for the examination and licensing of coal-mine officials and miners.

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.)

"161. (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 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, interest, and penalties which remain due and unpaid on the mineral claim on the date of its forfeiture to the Crown, together with a sum equal to all taxes, interest, and penalties 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 a 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 penalties from the date of the lease to the date of 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.

All mines, other than coal, are subject to an output tax (payable quarterly) of 2 per cent. on gross value of mineral, less cost of transportation from mine to reduction-works and the cost of treating same at reduction-works or on the mining premises.

Any such mine, not realizing on ore shipments a market value of $5,000 in any one year, is entitled to a refund of the output tax paid.

For further particulars *see* the "Taxation 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 all Provincial Governments.

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.

	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	Free
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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