Minister of Mines

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

For the Year ended 31st December

1947

VICTORIA, B.C.:
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BRITISH COLUMBIA DEPARTMENT OF MINES

VICTORIA, B.C.

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John F. Walker, *Deputy Minister.*

James Strang, *Chief Inspector of Mines.*

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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 1947 is herewith respectfully submitted.

R. C. MACDONALD,
Minister of Mines.

Minister of Mines' Office,
June, 1948.

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Review of the Mining Industry.

By Hartley Sargent.

The value of British Columbia mineral production in 1947 was more than $113,000,000, a record which far exceeds the value of production in any preceding year. Many factors contributed toward the record value, but by far the most important was the high price for most products. The price of gold was lower than for any year since 1937, the price of silver, although high, was somewhat lower than the 1946 price, but the price for copper was the highest for any year since 1918, the price for lead exceeded substantially the price in any preceding year, and the price for zinc was much higher than for any year except 1915 and 1916.

The quantity of coal mined, 1,717,000 tons, was greater than that mined in 1945 or 1946, and ranks with the better years since 1930. The price, $5 per long ton, for all grades of coal, from all mines, is higher than previously. The value of coal mined exceeded $8,500,000. Miscellaneous metals recovered as by-products in mining and smelting contributed a total of $2,400,000, an increase of 50 per cent. over the 1946 value. Sulphur, also a by-product of the metal-mining industry, was valued at $1,500,000, an increase of 20 per cent. over the 1946 value. Tungsten recovered in concentrates was valued at $680,000. The value of gypsum and gypsum products in 1947 was $523,000, compared with $318,000 in 1946. Clay, clay products, and other structural materials, contributed a total of $5,897,000, compared with $5,200,000 in 1946.

Placer-gold output declined to less than 7,000 oz., slightly less than the 1929 quantity, and the lowest quantity for any year since production was begun in 1858. The slump in placer-gold output stems principally from the decline in production from Spruce Creek in the Atlin Mining Division, where two important operations were suspended because of conditions related to ownership and to company policy rather than to the quality of the deposits or general economic conditions. The dredge of Swift River Dredging Company was operated successfully in the Cariboo, beginning in April, 1947, and was not shut down for the winter until January, 1948. In November, 1947, operation of a dredge on the Similkameen River, near Princeton, was begun by Atkinson Dredging Company. The Lowhee Mining Company had an unprofitable year, and little ground remains unmined ahead of the face. It is reported that the company will not resume operations. This hydraulic placer mine has been operated since about the beginning of the century. Notwithstanding the fact that economic conditions were unfavourable for gold-mining, there was much interest in dredging possibilities, which may well lead to increased output of placer gold in the Stikine, Omineca, and Cariboo Mining Divisions.

Lode-gold output exceeded that of the three preceding years. Production of the Polaris-Taku mine, which had its first full year of production since 1941, contributed to the increase in lode-gold output. Increased rates of wages paid at gold mines and the increased prices for supplies and equipment were accompanied by a price for gold 10 per cent. lower than had been obtained from late in 1939 until midsummer, 1946.

Copper production was materially greater than in 1946, as the mines operated without interruption, and at the higher price the 1947 output had a value between three and four times the 1946 value.

The quantities of silver and lead declined moderately, and the quantity of zinc was slightly lower than the 1946 output. Decreased price, coupled with decreased quantity, gave a value of 1947 silver production about 23 per cent. less than the 1946 value; but because of increased prices, the value of the 1947 lead and zinc output increased very greatly over the 1946 value. The combined value of 1947 lead and zinc production is $72,000,000. This value is greater than the value of all metals for any preceding year and is greater than the total value of all mineral products for any of the preceding years except 1937, 1940, 1941, and 1942.

Strip-mining of coal was resumed at Corbin, and strip-mining was started at Michel. The output of these operations, 232,000 tons, was about a fifth of the output of the Crowsnest Pass field. Bringing into production of No. 3 mine, a new mine at Coal Creek, in the Crowsnest Pass field, preparation for strip-mining at the Black mine near Princeton, and development of a new mine at Tsable River, south of Courtenay, on Vancouver Island, are worthy of note in the record of the coal-mining industry.

Developments in lode metal-mining are reviewed on pages 59 to 61. The following few paragraphs record more general observations regarding metal-mining and the industrial mineral industry.

Gold-mining has been confronted by unfavourable conditions for several years. This branch of the mining industry suffered the greatest disadvantages in obtaining labour during the recent war and more recently finds it difficult to compete with base-metal mining. At midsummer, 1946, the price paid for gold mined in Canada was reduced 10 per cent., but costs have continued to increase. The situation became more acute in 1947, principally in that the rates paid to labour and the cost of supplies advanced further. It is still too early to be definite about the working of the Dominion Government's proposal to bonus the production of gold and what the effects will be. A preliminary calculation suggests that the assistance, when received, may little more than equal the increase in costs which has become effective since the middle of 1947.

Despite several years in which conditions have been unfavourable for gold-mining, interest in lode-gold deposits has been maintained; real effort has been made to find ore, and the results obtained must be regarded as encouraging. Important discoveries of additional ore have been made in several of the established mines, and although no new gold camp has been brought in, several discoveries of more than passing interest have been made.

A great deal of interest has been shown in silver-lead-zinc areas, particularly in the Beaverdell and in the Slocan-Ainsworth areas, where detailed geological studies have been undertaken in addition to bulldozer stripping and underground exploration. Interest has also been shown in ground adjoining the Sullivan property, where Hollinger Consolidated Gold Mines and Conwest Exploration Company carried on magnetometer surveys. Diamond-drilling was also done by Conwest. It is expected that the Toric silver property at Alice Arm will be brought into production in 1948. A programme has been started designed to bring into production the Reeves-Macdonald silver-lead-zinc property south of Nelson, and changes are proposed in the Silbak Premier mill to increase the recovery of lead and zinc.

Increased use is being made of careful geological mapping and of geophysical mapping in exploratory work. Geophysical surveys have received little favour in British Columbia, although they have been made from time to time in the past twenty-five years. However, the increase in geophysical work has been noteworthy in the past two or three years. Magnetometer surveys at Kimberley have been mentioned earlier. Campaigns of geophysical surveying, including magnetometer and potentiometer readings, were carried on by Rossland Mines, Limited, and by Valley Mining Company at Rossland in 1947. The potentiometer was found to be the more suitable in that area. In the Cariboo area, on Lightning Creek, in 1946 and 1947 geophysical surveys have been made to determine the depth of bed-rock. Such surveys may be of great value in indicating whether or not it is desirable to do further testing by drilling or other means.

Items in some of the many branches of the mining industry touched upon in introductory notes, or dealt with more fully elsewhere in this Report, indicate that the industry is alert to changing techniques and is active in the search for additional mineral deposits. The facts that a strike has already cut off coal production for a considerable period, that the gold-mining sky is not unclouded, and that prices obtained for most of our mineral products are controlled by world markets must qualify any attempt at this date to predict the 1948 production of British Columbia mineral industry. The present indications are that 1948 will be an active one for the British Columbia mining industry and will be a year of large production.

The quantity of ore* mined at lode mines in 1947 was 5,081,910 tons, the quantity of coal mined was 1,717,476 tons, the average number employed in all branches of the mining industry in 1947 was 14,899, salaries and wages totalled $32,160,338, expenditures for fuel and electricity amounted to $5,319,470, and for process supplies amounted to $13,068,948; Dominion taxes amounted to $16,150,849, Provincial taxes to $3,576,605, and municipal and other taxes to $573,818; levies—Workmen's Compensation, silicosis, unemployment insurance, and other—amounted to $1,210,614; dividends paid in 1947 amounted to $27,940,213.

* Including tungsten ore, and siliceous flux from lode 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 42.

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, 1946; the average price for the year was approximately $36.75; the equivalent average price per crude ounce was $30.22. The price per fine ounce in 1947 was $35 and the equivalent price per crude ounce was $28.78.

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 to 1946 the price used has been $4.25 per long ton. For 1947 the price used was $5 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, 1946 and 1947.

	Quantity, 1946.	Quantity, 1947.	Value, 1946.†	Value, 1947.†	Per Cent. Increase (+) or Decrease (—). Quantity.	Value.
Metallics.			$	$		
Antimony			96,322	384,255		+298.9
Bismuth			327,628	560,183		+71.0
Cadmium			771,698	941,266		+21.9
Copper* ... lb.	17,500,538	41,783,921	2,240,070	8,519,741	+138.7	+280.3
Gold, lode* ... fine, oz.	117,612	243,282	4,322,241	8,514,870	+106.8	+97.0
Gold, placer* ... crude, oz.	15,729	6,969	475,361	200,585	—55.7	—57.8
Lead* ... lb.	347,990,146	306,400,709	23,489,335	41,884,977	—11.8	+78.3
Platinum				59		
Silver ... oz.	6,365,761	5,707,691	5,324,959	4,109,538	—10.3	—22.8
Tin ... lb.			480,802	517,794		+7.7
Tungsten concentrates				680,792		
Zinc* ... lb.	270,718,128	268,450,926	21,143,086	30,147,039	—0.8	+42.6
Totals			58,671,502	96,461,099		+64.4
Fuel.						
Coal (2,240 lb.) ... tons	1,463,640	1,717,476	6,220,470	8,587,380	+17.3	+38.1
Non-metallics.						
Barites, diatomite, and mica			43,447	52,362		+20.5
Fluxes—limestone, quartz ... tons	55,732	102,918	71,531	174,655	+84.6	+144.2
Granules—slate and rock, talc ... tons	1,116	1,156	19,917	19,686	+3.5	—1.2
Gypsum and gypsum products			318,500	523,298		+64.3
Iron oxides			2,135	464		—78.3
Sodium carbonate ... tons	210	163	2,310	1,793	—22.4	—22.4
Sulphur‡ ... tons	126,622	157,161	1,258,576	1,503,714	+24.1	+19.5
Totals			1,716,416	2,275,972		+32.6
Clay Products and other Structural Materials.						
Clay Products.						
Brick—						
Common ... No.	3,300,000	4,318,000	94,000	122,660	+30.8	+30.5
Face, paving, sewer-brick ... No.	2,077,683	1,232,812	84,353	64,849	—40.6	—23.1
Fire-bricks, blocks			283,317	389,899		+37.6
Fire-clay ... tons			8,241	9,675		+17.4
Structural tile—hollow blocks			105,194	158,276		+50.5
Drain-tile, sewer-pipe ... No.	2,068,424	1,962,583	263,864	361,975	—5.4	+37.2
Pottery—glazed or unglazed			2,811	3,476		+23.6
Other clay products: bentonite			3,611	9,332		+158.4
Totals			845,391	1,120,142		+32.5
Other Structural Materials.						
Cement			1,739,966	1,896,772		+9.0
Lime ... tons	159,493	151,671	642,912	714,126	—4.9	+11.1
Sand and gravel			1,713,138	1,828,919		+6.7
Stone ... tons	4,354	19,835	99,710	119,971	355.5	+20.3
Rubble, riprap, crushed rock ... tons	154,164	222,044	158,446	216,873	+44.0	+36.8
Totals			4,354,172	4,776,661		+9.7
Total value			71,807,951	113,221,254		+57.7

* For information on evaluation of gold, silver, copper, lead, and zinc in 1947, 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 ,,
1947	**35.00**	**72.000** ,,	**20.39** ,,	**13.67** ,,	**11.23** ,,
Average, 1943–47 (inc.)	37.45	58.180 ,,	13.858 ,,	6.734 ,,	6.756 ,,

* Prices are in Canadian funds. Until price control was initiated in the World War (1939–45), the average prices used in evaluating British Columbia metal production were those computed by the Dominion Bureau of Statistics and used 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 11). 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 those set by the Canadian Metals Controller. In 1945 the controls were largely removed from sales but not from prices. Control of metal prices ended on June 6th, 1947. For 1945 and subsequent years the prices are those computed by the Dominion Bureau of Statistics, using information supplied by the principal Canadian refiners of silver and the base metals.

In 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 and 1947 are weighted averages, taking into consideration sales in Canada at the ceiling prices and sales abroad at New York prices converted into Canadian funds. 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 1946, $36.75 per ounce, is the average of the two. In British Columbia most of the 1946 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 1947, $515,614; 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 1947.

Gold, placer	$92,973,897
Gold, lode	345,745,249
Silver	169,782,205
Copper	349,005,172
Lead	423,411,969
Zinc	292,553,500
Coal and coke	444,566,745
Structural materials	107,859,244
Miscellaneous metals, minerals, and materials	56,595,868
Total	$2,282,493,849

TABLE IV.—PRODUCTION FOR EACH YEAR FROM 1852 TO 1947, 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	1947	113,221,254
1921	28,066,641	Total	$2,282,493,849

TABLE V.—Quantities and Value of Mine Products for 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, and 1947.

Description.	1938.		1939.		1940.		1941.		1942.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer ..... oz.	57,759	$1,671,015	49,746	$1,478,492	39,067	$1,236,928	43,775	$1,385,962	32,904	$1,041,772
Gold, lode ..... oz.	557,522	19,613,624	587,180	21,221,272	583,416	22,461,516	571,026	21,984,501	444,518	17,113,943
Silver ..... oz.	10,861,578	4,722,288	10,771,585	4,361,199	12,327,944	4,715,315	12,175,700	4,658,545	9,677,881	4,080,775
Copper ..... lb.	65,769,906	6,558,575	73,254,679	7,392,862	77,980,223	7,865,085	66,435,583	6,700,693	50,097,716	5,052,856
Lead ..... lb.	412,979,182	13,810,024	378,743,763	12,002,390	485,364,420	16,317,952	490,185,657	16,480,042	463,269,005	15,575,104
Zinc ..... lb.	298,497,295	9,172,822	278,409,102	8,544,375	310,767,251	10,600,271	363,302,195	12,392,238	396,857,260	13,536,801
Coal ..... tons, 2,240 lb.	1,309,428	5,565,069	1,477,872	6,280,956	1,667,827	7,088,265	1,802,353	7,660,000	1,938,158	8,237,172
Structural materials	.....	1,975,249	.....	1,832,434	.....	2,534,840	.....	2,845,262	.....	3,143,382
Miscellaneous metals, minerals, and materials	.....	1,396,885	.....	2,567,567	.....	2,880,983	.....	4,372,476	.....	7,769,288
Totals	.....	$64,485,551	.....	$65,681,547	.....	$75,701,155	.....	$78,479,719	.....	$75,551,093

Description.	1943.		1944.		1945.		1946.		1947.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer ..... oz.	14,600	$462,270	11,433	$361,977	12,589	$398,591	15,729	$475,361	6,969	$200,585
Gold, lode ..... oz.	224,403	8,639,516	186,632	7,185,332	175,373	6,751,860	117,612	4,322,241	243,282	8,514,870
Silver ..... oz.	8,526,310	3,858,496	5,705,334	2,453,293	6,157,307	2,893,934	6,365,761	5,324,959	5,707,691	4,109,538
Copper ..... lb.	42,307,510	4,971,132	36,300,589	4,356,070	25,852,366	3,244,472	17,500,538	2,240,070	41,783,921	8,519,741
Lead ..... lb.	405,285,476	15,214,417	294,797,469	13,265,886	353,497,689	17,674,884	347,990,146	23,489,335	306,400,709	41,884,977
Zinc ..... lb.	335,137,014	13,405,481	280,356,477	12,055,328	301,737,902	19,431,921	270,718,128	21,143,086	268,450,926	30,147,039
Coal ..... tons, 2,240 lb.	1,821,654	7,742,030	1,933,639	8,217,966	1,518,673	6,454,360	1,463,640	6,220,470	1,717,476	8,587,380
Structural materials	.....	3,039,148	.....	3,025,445	.....	3,401,229	.....	5,199,563	.....	5,896,803
Miscellaneous metals, minerals, and materials	.....	8,559,905	.....	4,002,506	.....	3,092,698	.....	3,392,866	.....	5,360,321
Totals	.....	$65,892,395	.....	$54,923,803	.....	$63,343,949	.....	$71,807,951	.....	$113,221,254

TABLE VI.—Production of Lode Gold, Silver, Copper, Lead, and Zinc.

Year.	Gold.		Silver.		Copper.		Lead.		Zinc.		Total Value.
	Ounces.	Value.	Ounces.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
		$		$		$		$		$	$
1887	......	......	17,690	17,331	......	......	204,800	9,216	......	......	26,547
1888	......	......	79,780	75,000	......	......	674,500	29,813	......	......	104,813
1889	......	......	53,192	47,873	......	......	165,100	6,498	......	......	54,371
1890	......	......	70,427	73,948	......	......	......	......	......	......	73,948
1891	......	......	4,500	4,000	......	......	......	......	......	......	4,000
1892	......	......	77,160	66,935	......	......	808,420	33,064	......	......	99,999
1893	1,170	23,404	227,000	195,000	......	......	2,135,023	78,996	......	......	297,400
1894	6,252	125,014	746,379	470,219	324,680	16,234	5,662,523	169,875	......	......	781,342
1895	39,270	785,400	1,496,522	977,229	952,840	47,642	16,475,464	532,255	......	......	2,342,526
1896	62,259	1,244,180	3,135,343	2,100,689	3,818,556	190,926	24,199,977	721,384	......	......	4,257,179
1897	106,141	2,122,820	5,472,971	3,272,836	5,325,180	266,258	38,841,135	1,390,517	......	......	7,052,431
1898	110,061	2,201,217	4,292,401	2,375,841	7,271,678	874,781	31,693,559	1,077,581	......	......	6,529,420
1899	138,315	2,857,573	2,939,413	1,663,708	7,722,591	1,351,453	21,862,436	878,870	......	......	6,751,604
1900	167,153	3,453,381	3,958,175	2,309,200	9,997,080	1,615,289	63,358,621	2,691,887	......	......	10,069,757
1901	210,384	4,348,605	4,396,447	2,462,008	27,603,746	4,446,963	51,582,906	2,010,260	......	......	13,267,836
1902	236,491	4,888,269	3,917,917	1,941,328	29,636,057	3,446,673	22,536,381	824,832	......	......	11,101,102
1903	232,831	4,812,616	2,996,204	1,521,472	34,359,921	4,547,535	18,089,283	689,744	......	......	11,571,367
1904	222,042	4,589,608	3,222,481	1,719,516	35,710,128	4,578,037	36,646,244	1,421,874	......	......	12,309,035
1905	238,660	4,933,102	3,439,417	1,971,818	37,692,251	5,876,222	56,580,703	2,399,022	......	......	15,180,164
1906	224,027	4,630,639	2,990,262	1,897,320	42,990,488	8,288,565	52,408,217	2,667,578	......	......	17,484,102
1907	196,179	4,055,020	2,745,448	1,703,825	40,832,720	8,166,544	47,738,703	2,291,458	......	......	16,216,847
1908	255,582	5,282,880	2,631,389	1,321,483	47,274,614	6,240,249	43,195,733	1,632,799	......	......	14,477,411
1909	238,224	4,924,090	2,532,742	1,239,270	45,597,245	5,918,522	44,396,346	1,709,259	8,500,000	400,000	14,191,141
1910	267,701	5,533,380	2,450,241	1,245,016	38,243,934	4,871,512	34,658,746	1,386,350	4,184,192	192,473	13,228,781
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	1,626,855	56,737,651	3,540,429	19,750,498
1920	120,048	2,481,392	3,377,849	3,235,980	44,887,676	7,832,899	39,331,218	2,816,115	47,208,268	3,077,979	19,444,365
1921	135,663	2,804,154	2,673,389	1,591,201	39,036,993	4,879,624	41,402,288	1,693,354	49,419,372	1,952,065	12,920,398
1922	197,856	4,089,684	7,101,311	4,554,781	32,359,896	4,329,754	67,447,985	3,480,316	57,146,548	2,777,322	19,231,857
1923	179,245	3,704,994	6,032,986	3,718,129	57,720,290	8,323,266	96,663,152	6,321,770	58,343,462	3,278,903	25,347,062

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

Year.	Gold.		Silver.		Copper.		Lead.		Zinc.		Total Value.
	Ounces.	Value.	Ounces.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
		$		$		$		$		$	$
1924	247,716	5,120,535	8,341,768	5,292,184	64,845,393	8,442,870	170,384,481	12,415,917	79,130,970	4,266,741	35,538,247
1925	209,719	4,335,269	7,654,844	5,286,818	72,306,432	10,153,269	237,899,199	18,670,329	98,257,099	7,754,450	46,200,135
1926	201,427	4,163,859	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	22,535,573
1932	181,564	4,261,307	7,130,838	2,258,453	49,841,009	3,179,956	254,488,952	5,378,878	192,120,091	4,621,641	19,700,235
1933	223,529	6,392,929	7,006,406	2,650,720	42,608,002	3,176,341	271,606,071	6,495,731	195,963,751	6,291,416	25,007,137
1934	297,130	10,250,985	8,572,916	4,068,792	48,084,658	3,567,401	347,366,967	8,461,859	247,926,844	7,546,893	33,895,930
1935	365,244	12,852,936	9,251,544	5,994,075	38,791,127	3,023,768	344,268,444	10,785,930	256,239,446	7,940,860	40,597,569
1936	404,472	14,168,654	9,521,015	4,296,548	20,806,672	1,971,848	377,971,618	14,790,029	254,581,393	8,439,373	43,666,452
1937	460,781	16,122,727	11,308,685	5,075,451	46,057,584	6,023,411	419,118,371	21,416,949	291,192,278	14,274,245	62,912,783
1938	557,522	19,613,624	10,861,578	4,722,288	65,769,906	6,558,575	412,979,182	13,810,024	298,497,295	9,172,822	53,877,333
1939	587,180	21,221,272	10,771,585	4,361,199	73,254,679	7,392,862	378,743,763	12,002,390	278,409,102	8,544,375	53,522,098
1940	583,416	22,461,516	12,327,944	4,715,315	77,980,223	7,865,085	485,364,420	16,317,952	310,767,251	10,600,271	61,960,139
1941	571,026	21,984,501	12,175,700	4,658,545	66,435,583	6,700,693	490,185,657	16,480,042	363,302,195	12,392,238	62,216,019
1942	444,518	17,113,943	9,677,881	4,080,775	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
1947	243,282	8,514,870	5,707,691	4,109,538	41,783,921	8,519,741	306,400,709	41,884,977	268,450,926	30,147,039	93,176,165
Totals	12,595,457	345,745,249	319,313,786	169,782,205	2,466,635,752	349,005,172	9,325,515,538	423,411,969	6,254,896,754	292,553,500	1,580,498,095

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	580,680	$9,871,634	....	....	$9,871,634
1863–1867	957,860	16,283,592	....	....	16,283,592
1868–1872	582,080	9,895,318	....	....	9,895,318
1873–1877	530,540	9,019,201	....	....	9,019,201
1878–1882	328,230	5,579,911	....	....	5,579,911
1883–1887	225,970	3,841,515	....	....	3,841,515
1888–1892	148,550	2,525,426	....	....	2,525,426
1893	20,950	356,131	1,170	$23,404	379,535
1894	23,850	405,516	6,252	125,014	530,530
1895	28,330	481,683	39,270	785,400	1,267,083
1896	32,000	544,026	62,259	1,244,180	1,788,206
1897	30,210	513,520	106,141	2,122,820	2,636,340
1898	37,840	643,346	110,061	2,201,217	2,844,563
1899	79,110	1,344,900	138,315	2,857,573	4,202,473
1900	75,220	1,278,724	167,153	3,453,381	4,732,105
1901	57,060	970,100	210,384	4,348,605	5,318,705
1902	63,130	1,073,140	236,491	4,888,269	5,961,409
1903	62,380	1,060,420	232,831	4,812,616	5,873,036
1904	65,610	1,115,300	222,042	4,589,608	5,704,908
1905	*57,020*	*969,300*	*238,660*	*4,933,102*	*5,902,402*
1906	55,790	948,400	224,027	4,630,639	5,579,039
1907	48,710	828,000	196,179	4,055,020	4,883,020
1908	38,060	647,000	255,582	5,282,880	5,929,880
1909	28,060	477,000	238,224	4,924,090	5,401,090
1910	31,760	540,000	267,701	5,533,380	6,073,380
1911	25,060	426,000	228,617	4,725,513	5,151,513
1912	32,680	555,500	257,496	5,322,442	5,877,942
1913	30,000	510,000	272,254	5,627,490	6,137,490
1914	33,240	565,000	247,170	5,109,004	5,674,004
1915	45,290	770,000	250,021	5,167,934	5,937,934
1916	34,150	580,500	221,932	4,587,334	5,167,834
1917	29,180	496,000	114,523	2,367,190	2,863,190
1918	18,820	320,000	164,674	3,403,812	3,723,812
1919	16,850	286,500	152,426	3,150,645	3,437,145
1920	13,040	221,600	120,048	2,481,392	2,702,992
1921	13,720	233,200	135,663	2,804,154	3,037,354
1922	21,690	368,800	197,856	4,089,684	4,458,484
1923	24,710	420,000	179,245	3,704,994	4,124,994
1924	24,750	420,750	247,716	5,120,535	5,541,285
1925	16,476	280,092	209,719	4,335,269	4,615,361
1926	20,912	355,503	201,427	4,163,859	4,519,362
1927	9,191	156,247	178,001	3,679,601	3,835,848
1928	8,424	143,208	188,087	3,888,097	4,031,305
1929	6,983	118,711	145,339	3,004,419	3,123,130
1930	8,955	152,235	160,778	3,323,576	3,475,811
1931	17,176	291,992	146,039	3,018,894	3,310,886
1932	20,400	395,542	181,564	4,261,307	4,656,849
1933	*23,928*	*562,787*	*223,529*	*6,392,929*	*6,955,716*
1934	25,181	714,431	297,130	10,250,985	10,965,416
1935	30,929	895,058	365,244	12,852,936	13,747,994
1936	43,389	1,249,940	404,472	14,168,654	15,418,594
1937	54,153	1,558,245	460,781	16,122,727	17,680,972
1938	57,759	1,671,015	557,522	19,613,624	21,284,639
1939	49,746	1,478,492	587,180	21,221,272	22,699,764
1940	39,067	1,236,928	583,416	22,461,516	23,698,444
1941	43,775	1,385,962	571,026	21,984,501	23,370,463
1942	32,904	1,041,772	444,518	17,113,943	18,155,715
1943	14,600	462,270	224,403	8,639,516	9,101,786
1944	11,433	361,977	186,632	7,185,332	7,547,309
1945	12,589	398,591	175,373	6,751,860	7,150,451
1946	15,729	475,361	117,612	4,322,241	4,797,602
1947	6,969	200,585	243,282	8,514,870	8,715,455
Totals	5,122,848	$92,973,897	12,595,457	$345,745,249	$438,719,146

TABLE VIII.—VALUE OF MINE PRODUCTION BY DIVISIONS, 1942, 1943, 1944, 1945, 1946, AND 1947.

Mining Division.	1942.	1943.	1944.	1945.	1946.	1947.
	$	$	$	$	$	$
Ainsworth	25,270	49,405	277,435	254,429	77,057	242,020
Alberni	1,647,140	527,401	9,725	6,194	112,613	503,699
Ashcroft	59,598	9,964	14,809	1,893	10,119	11,371
Atlin	1,401,357	314,005	255,539	321,227	459,965	868,658
Cariboo	2,465,413	1,161,053	979,899	1,033,181	988,815	1,486,961
Clinton	8,602	5,679	1,803	3,368	2,310	7,124
Fort Steele	38,256,908	36,305,963	31,668,064	42,910,466	54,256,000	80,933,067
Golden	528,800	438,726	324,525	825,803	290,143	279,206
Greenwood	511,553	361,396	275,571	191,767	484,670	593,539
Kamloops	183,406	161,320	124,130	135,791	300,758	566,001
Lardeau	1,031	95	1,288	....	....	1,731
Lillooet	5,093,991	3,312,574	3,072,599	2,412,843	1,394,343	2,962,585
Nanaimo	3,418,984	3,435,235	3,353,930	2,981,253	3,038,045	3,368,234
Nelson	2,682,612	892,159	544,663	516,283	372,005	1,137,752
New Westminster	654,719	607,133	597,569	677,220	1,028,101	1,229,047
Nicola	122,930	155,606	83,032	27,099	6,967	15,094
Omineca	3,273,590	5,357,775	1,409,984	142,315	70,216	99,622
Osoyoos	2,429,785	1,490,888	1,837,959	2,069,351	1,057,802	1,767,818
Peace River	13,910	59,354	58,251	32,342	14,586	32,934
Portland Canal	1,796,684	1,100,439	732,087	736,125	410,892	786,837
Quesnel	77,082	20,360	13,804	14,533	43,731	16,078
Revelstoke	30,997	29,031	19,664	35,904	39,658	40,420
Similkameen	4,111,591	3,497,570	3,242,076	2,205,091	1,634,831	4,898,314
Skeena	430,090	58,309	32,211	87,443	58,841	47,032
Slocan	884,623	1,089,433	1,193,092	954,479	628,445	1,300,194
Stikine	16,211	2,311	1,520	348	5,954	2,650
Trail Creek	1,325,301	1,374,132	1,111,591	1,247,960	1,274,603	2,139,817
Vancouver	2,596,739	2,607,391	2,233,911	2,124,478	1,668,492	5,343,934
Vernon	10,409	2,177	3,225	1,338	3,049	46,795
Victoria	1,491,767	1,465,011	1,450,347	1,443,925	2,074,940	2,492,720
Totals	75,551,093	65,892,395	54,923,803	63,343,949	71,807,951	113,221,254

TABLE IXA (1946 AND 1947).—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	1946	8,885					10,680	8,934			679,725	45,881	182,992	14,292
	1947	29,291			25	875	38,768	27,913			1,012,927	138,467	665,761	74,765
Alberni	1946	6,319			2,673	98,233	1,505	1,259						
	1947	19,623			13,231	463,085	5,670	4,083	20	4	310	42		
Ashcroft	1946		18	544										
	1947		35	1,007										
Atlin	1946	25,824	11,055	334,104	3,356	123,333	197	165						
	1947	92,039	2,500	71,956	22,724	795,340	1,510	1,087						
Cariboo	1946	62,725	2,165	65,430	22,890	841,208	2,372	1,984						
	1947	100,797	2,877	82,807	37,587	1,315,545	3,975	2,862						
Clinton	1946													
	1947		10	288										
Fort Steele	1946	2,307,532	24	725			5,690,700	4,760,270			344,393,000	23,246,528	260,872,000	20,374,103
	1947	2,252,729	27	777			4,514,300	3,250,296			300,864,000	41,128,109	251,460,000	28,238,958
Golden	1946	15,678					12,088	10,112			847,240	57,189	2,470,512	192,947
	1947	9,387			4	140	10,201	7,345			332,760	45,488	1,638,523	184,006
Greenwood	1946	2,939			597	21,940	416,251	348,194			196,581	13,269	247,904	19,361
	1947	7,045			406	14,210	596,954	429,807			298,899	40,860	329,423	36,994
Kamloops	1946		4	121										
	1947		30	864										
Lardeau	1946													
	1947	7					311	224			2,887	395	1,893	213
Lillooet	1946	76,709	72	2,176	37,328	1,371,804	9,579	8,013						
	1947	174,351	90	2,590	83,986	2,939,510	20,838	15,003						
Nanaimo	1946													
	1947													
Nelson	1946	23,228	8	242	8,321	305,797	6,123	5,122			45,556	3,075	47,062	3,676
	1947	34,439	3	86	9,541	333,935	8,562	6,165			142,481	19,477	180,026	20,217
New Westminster	1946		19	574										
	1947	4	22	633			156	112			281	38	592	66
Nicola	1946	4			1	37	2	2			33	2	12	1
	1947	197			4	140	270	194	13,671	2,787	11,819	1,616	484	54
Omineca	1946		683	20,642										
	1947	1	762	21,932			52	38			769	105	168	19
Osoyoos	1946	78,988			27,543	1,012,205	3,281	2,745	69,989	8,959				
	1947	131,748			47,325	1,656,375	4,374	3,149	33,482	6,827				
Peace River	1946		9	272										
	1947		33	950										
Portland Canal	1946	34,804			8,163	299,990	38,066	31,842			1,171,261	79,060		
	1947	59,422			12,236	428,260	71,647	51,586			2,215,302	302,832	26,126	2,934
Quesnel	1946		1,413	42,704										
	1947	4	483	13,902	8	280	40	29	82	17				
Revelstoke	1946		10	302										
	1947		1	29										
Similkameen	1946	577,671	2	60	1,679	61,703	72,310	60,487	10,427,972	1,334,781				
	1947	1,292,342	5	144	5,141	179,935	149,497	107,638	21,323,366	4,347,834				
Skeena	1946		11	332										
	1947		5	144										
Slocan	1946	47,701			27	992	74,422	62,254			396,434	26,759	6,894,245	538,440
	1947	8,079			30	1,050	116,844	84,128			624,032	85,305	9,983,897	1,121,192
Stikine	1946		197	5,954										
	1947		66	1,900										
Trail Creek	1946	372			234	8,599	1,054	882			7,104	480	3,247	254
	1947	3,295			326	11,410	80,858	58,218	3,532,837	720,345	521,403	71,276		
Vancouver	1946	435,982			4,800	176,400	27,104	22,672	7,002,577	896,330	252,975	17,076		
	1947	794,974			10,201	357,035	66,986	48,229	16,706,511	3,406,458	362,227	49,516	3,627,038	407,816
Vernon	1946	14	39	1,179			27	22			237	16	154	12
	1947		20	576										
Victoria	1946													
	1947	8,295			507	17,745	15,878	11,432	173,952	35,469	10,612	1,451	536,995	60,305
Totals	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
	1947	5,018,069	6,969	200,585	243,282	8,514,870	5,707,691	4,109,538	41,783,921	8,519,741	306,400,709	41,884,877	268,450,926	30,147,039

TABLE IXB.—PRODUCTION VALUE OF PLACER GOLD, LODE GOLD, SILVER, COPPER, LEAD, AND ZINC IN 1942, 1943, 1944, 1945, 1946, AND 1947.

Divisions.	1942.	1943	1944.	1945.	1946.	1947.
	$	$	$	$	$	$
Ainsworth	3,870	45,455	272,678	248,479	69,107	242,020
Alberni	1,610,534	521,595	5,631	63	99,492	467,214
Ashcroft	7,535	855	1,203	1,172	544	1,007
Atlin	1,393,567	310,734	253,242	318,147	457,602	868,383
Cariboo	2,415,991	1,104,703	947,593	950,292	908,622	1,401,214
Clinton	6,554	982	1,330	222	....	288
Fort Steele	30,921,250	30,328,407	25,549,264	37,656,140	48,381,626	72,618,140
Golden	497,178	402,738	267,048	763,883	260,248	236,979
Greenwood	458,573	224,385	183,763	142,489	402,764	521,871
Kamloops	5,713	1,551	1,007	190	121	864
Lardeau	....	95	1,288	....	....	832
Lillooet	5,075,552	3,286,891	3,068,573	2,407,569	1,381,993	2,957,103
Nanaimo	1,102	....	190	....	....	....
Nelson	2,633,021	837,919	276,616	425,304	317,912	379,880
New Westminster	3,758	380	728	317	574	849
Nicola	....	....	760	....	42	4,791
Omineca	62,397	31,789	30,141	19,250	20,642	22,094
Osoyoos	2,122,417	1,414,337	1,793,878	2,001,678	1,023,909	1,666,351
Peace River	760	....	....	538	272	950
Portland Canal	1,796,684	1,089,525	732,087	736,125	410,892	785,612
Quesnel	74,625	20,232	13,614	13,171	42,704	14,228
Revelstoke	1,108	253	1,361	823	302	29
Similkameen	3,621,198	3,010,155	2,949,189	1,967,074	1,457,031	4,635,551
Skeena	354,257	982	601	380	332	144
Slocan	884,623	1,089,433	1,193,092	954,479	628,445	1,291,675
Stikine	16,211	2,311	1,520	348	5,954	1,900
Trail Creek	193,658	348,821	13,772	5,715	10,215	861,249
Vancouver	2,245,915	2,387,899	1,959,227	1,781,529	1,112,478	4,268,554
Vernon	7,473	831	398	285	1,229	576
Victoria	380	73,354	158,092	....	....	126,402
Totals	56,415,904	46,536,612	39,677,886	50,395,662	56,995,052	93,376,750

TABLE IXc.—Production and Value of Placer Gold, Lode Gold, Silver, Copper, Lead, and Zinc, 1900–1947.

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	3,900	114,085	6,606,317	3,982,739	10,175	1,201	125,514,077	6,273,942	42,988,142	1,518,820	11,896,477
Alberni	1,581	32,157	287,636	10,796,724	154,333	72,345	2,225,968	333,377	108,632	3,721			11,238,324
Ashcroft	11,070	255,546	8,476	289,680	16,804	9,513	633,775	155,721	99	4			710,464
Atlin*	663,506	15,272,039	133,353	4,651,273	58,662	35,321	83,161	11,949	109,945	7,036			19,977,618
Cariboo†	1,916,990	39,162,116	598,606	21,981,019	65,546	30,753			656	30	492	16	61,173,934
Clinton	9,994	238,032	23,388	827,260	31,564	14,214	57,548	5,905	193	7			1,085,418
Fort Steele	*17,141*	*396,933*	*2,532*	*56,964*	*156,912,856*	*77,479,950*	*28,592*	*6,193*	*8,513,518,404*	*387,541,615*	*5,597,297,816*	*260,258,612*	*725,740,267*
Golden	467	11,213	74	1,587	1,414,796	841,585	57,378	10,590	98,848,378	3,707,360	119,529,943	4,631,669	9,204,004
Greenwood	4,038	94,634	1,086,044	23,412,188	23,775,219	12,146,709	441,171,575	70,493,191	9,875,284	427,741	9,964,044	375,163	106,949,626
Kamloops	3,340	83,628	39,376	1,318,141	281,229	167,209	5,767,133	1,021,694	368,662	20,737	409,170	26,063	2,637,472
Lardeau	1,769	38,136	24,889	652,366	2,805,427	1,120,084	5,594	785	9,572,318	382,893	449,032	20,606	2,214,870
Lillooet‡	90,685	1,859,186	1,919,805	66,997,390	507,440	236,190	400	41	62,463	2,542			69,095,349
Nanaimo	596	13,711	67,890	1,426,275	518,645	298,523	20,223,405	3,201,703					4,940,212
Nelson	3,187	80,017	1,256,324	39,303,459	4,180,180	2,253,984	5,685,261	889,008	53,739,700	2,364,054	24,942,004	1,489,527	46,380,049
New Westminster	11,354	236,424	4,311	110,307	13,529	6,072	26,489	6,379	28,425	1,119	12,755	481	360,782
Nicola	230	4,652	8,525	234,914	267,098	126,317	549,975	106,230	2,235,137	90,469	320,486	10,566	573,148
Omineca	48,289	1,276,526	8,638	197,545	2,350,522	1,454,237	6,126,209	1,345,688	6,240,382	345,914	3,960,186	248,673	4,868,583
Osoyoos	190	4,142	1,225,441	35,333,686	521,397	331,438	2,203,756	251,580	252,418	7,475	5,209	163	35,928,484
Peace River	4,116	94,977											94,977
Portland Canal	201	4,260	1,931,090	48,542,164	49,178,327	27,356,773	649,677,707	96,796,399	35,868,126	1,764,195	1,893,790	113,188	174,576,979
Quesnel§	623,314	12,976,528	206	7,436	311	139	82	17					12,984,120
Revelstoke	4,077	88,674	12	335	50,097	31,309	683	124	939,741	55,882	8,093	469	176,793
Similkameen	7,080	160,441	107,119	3,612,425	2,624,830	1,263,420	367,700,854	45,472,736	238,577	9,006	64,377	2,616	50,520,644
Skeena	3,919	86,924	414,794	9,979,046	265,198	182,759	7,671,642	1,215,720	39,539	1,287	15,277	490	11,466,226
Slocan	150	3,596	6,439	158,585	40,683,920	24,581,771	219,318	42,287	299,320,767	14,370,376	270,541,695	16,429,090	55,585,705
Stikine	32,979	772,960	114	4,120	20	8							777,088
Trail Creek¶	848	24,176	2,604,960	55,595,221	3,388,237	1,902,812	120,378,556	18,094,747	17,508,816	761,279	157,920,611	5,292,655	81,670,890
Vancouver	182	5,306	320,043	9,789,192	3,749,758	2,031,260	758,000,562	103,684,430	8,556,854	344,643	21,608,810	971,304	116,826,135
Vernon	2,150	56,690	5,212	175,639	7,701	3,815	614	89	6,611	309	2,974	161	236,703
Victoria	612	15,223	37,081	795,590	780,932	424,088	21,208,627	3,148,167	139,900	6,932	2,961,848	163,158	4,553,158
Provincial totals	3,464,267	73,354,537	12,126,278	336,364,616	301,210,895	158,385,337	2,409,715,039	346,295,951	9,183,094,104	418,490,568	6,254,896,754	291,553,490	1,624,444,499

* 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, 1946 and 1947.

Divisions.	Year.	Cement.	Lime and Limestone.	Building-stone.	Rubble, Riprap, and Crushed Rock.	Sand and Gravel.	Brick (Common).	Face, Paving, and Sewer Brick.	Firebrick, Blocks.	Fireclay.	Structural Tile (Hollow Blocks), Roof-tile, Floor-tile.	Drain-tile and Sewer-pipe.	Pottery, Glazed or Unglazed.	Other Clay Products.	Division Totals.
		$	$	$	$	$	$	$	$	$	$	$	$	$	$
Atlin and Stikine	1946	......	......	......	90	2,273	......	......	......	......	......	......	......	......	2,363
	1947	......	......	......	......	1,025	......	......	......	......	......	......	......	......	1,025
Portland Canal and Skeena	1946	......	19,007	......	20,848	18,654	......	......	......	......	......	......	......	......	58,509
	1947	......	26,000	......	657	13,132	......	......	......	......	......	......	......	8,324	48,113
Cariboo and Quesnel	1946	......	......	......	675	56,098	......	......	......	......	......	......	......	......	56,773
	1947	......	......	......	2,454	59,431	......	......	......	......	......	......	......	......	61,885
Omineca and Peace River	1946	......	......	......	......	8,599	......	......	......	......	......	......	......	......	8,599
	1947	......	......	......	3,083	31,454	......	......	......	......	......	......	......	......	34,537
Nicola, Vernon, and Kamloops	1946	......	......	748	2,196	36,117	......	......	......	......	......	......	......	......	39,061
	1947	......	......	450	5,655	82,166	......	......	......	......	......	......	......	......	88,271
Greenwood, Osoyoos, and Similkameen	1946	......	946	......	6,698	54,866	......	......	......	......	......	......	......	......	62,510
	1947	......	625	......	3,509	60,175	16,140	......	......	......	......	......	......	......	80,449
Fort Steele and Golden	1946	......	......	......	6,300	481,176	......	......	......	......	......	......	......	......	487,476
	1947	......	......	......	3,472	114,173	......	......	......	......	......	......	......	......	117,645
Ainsworth, Slocan, and Nelson	1946	......	......	8,787	8,630	44,626	......	......	......	......	......	......	......	......	62,043
	1947	......	......	10,717	1,861	70,252	......	......	......	......	......	......	......	......	82,830
Trail Creek, Revelstoke, and Lardeau	1946	......	......	......	30,522	45,222	......	......	......	......	......	......	......	......	75,744
	1947	......	......	......	22,290	65,438	......	......	......	......	......	......	......	......	87,728
Alberni, Nanaimo, and Victoria	1946	1,739,966	615,417	......	2,064	256,832	94,000	......	......	......	40,255	22,385	2,811	......	2,773,730
	1947	1,896,772	685,881	17,500	1,753	451,433	106,520	1,014	......	......	36,274	41,278	3,476	......	3,241,901
Ashcroft, Lillooet, and Clinton	1946	......	......	......	268	21,657	......	......	......	......	......	......	......	......	21,925
	1947	......	......	......	205	20,684	......	......	......	......	......	......	......	......	20,889
Vancouver and New Westminster	1946	......	7,542	90,175	80,155	687,018	......	84,353	283,317	8,241	64,939	241,479	......	3,611	1,550,830
	1947	......	1,620	91,304	171,934	859,556	......	63,835	389,899	9,675	122,002	320,697	......	1,008	2,031,530
Totals	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
	1947	1,896,772	714,126	119,971	216,873	1,828,919	122,660	64,849	389,899	9,675	158,276	361,975	3,476	9,332	5,896,803

TABLE XI.—Production in Detail of Miscellaneous Metals, Minerals, and Materials, 1946 and 1947.

Division.	Year.	Antimony.	Barite.	Bismuth.	Cadmium.	Diatomite, Mica.	Flux (Limestone and Quartz).	Gypsum Products.	Iron Oxides.	Platinum.	Slate and Rock Granules.	Sodium Carbonate.	Sulphur.	Tin.	Tungsten Concentrates.	Division Total.
		$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Cariboo and Omineca	1946					23,420										23,420
	1947					24,240										24,240
Peace River and Quesnel	1946					1,027										1,027
	1947					1,472										1,472
Kamloops and Greenwood	1946						65,373	263,500								328,873
	1947						33,843	523,298								557,141
Osoyoos and Similkameen	1946						438									438
	1947						101,352			59						101,411
Fort Steele, Golden, and Lardeau	1946	96,322*	19,000	327,628*	771,698*			55,000						480,802†		1,750,450
	1947	384,255*	26,650	560,183*	938,497*									517,794†		2,427,379
Ainsworth, Nelson, and Revelstoke	1946															
	1947														680,792	680,792
Trail Creek and Slocan	1946												1,228,000†			1,228,000
	1947				2,769								1,232,130†			1,234,899
Ashcroft and Clinton	1946											2,310				2,310
	1947											1,793				1,793
Lillooet and Nanaimo	1946						5,600									5,600
	1947						39,400									39,400
Vancouver and Victoria	1946						120		2,135		19,917		30,576			52,748
	1947						60		464		19,686		271,584			291,794
Totals	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
	1947	384,255	26,650	560,183	941,266	25,712	174,655	523,298	464	59	19,686	1,793	1,503,714	517,794	680,792	5,360,321

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

† Recovered from Sullivan mine, Fort Steele Mining Division.

TABLE XII.—British Columbia Mine Production, 1895–1947.

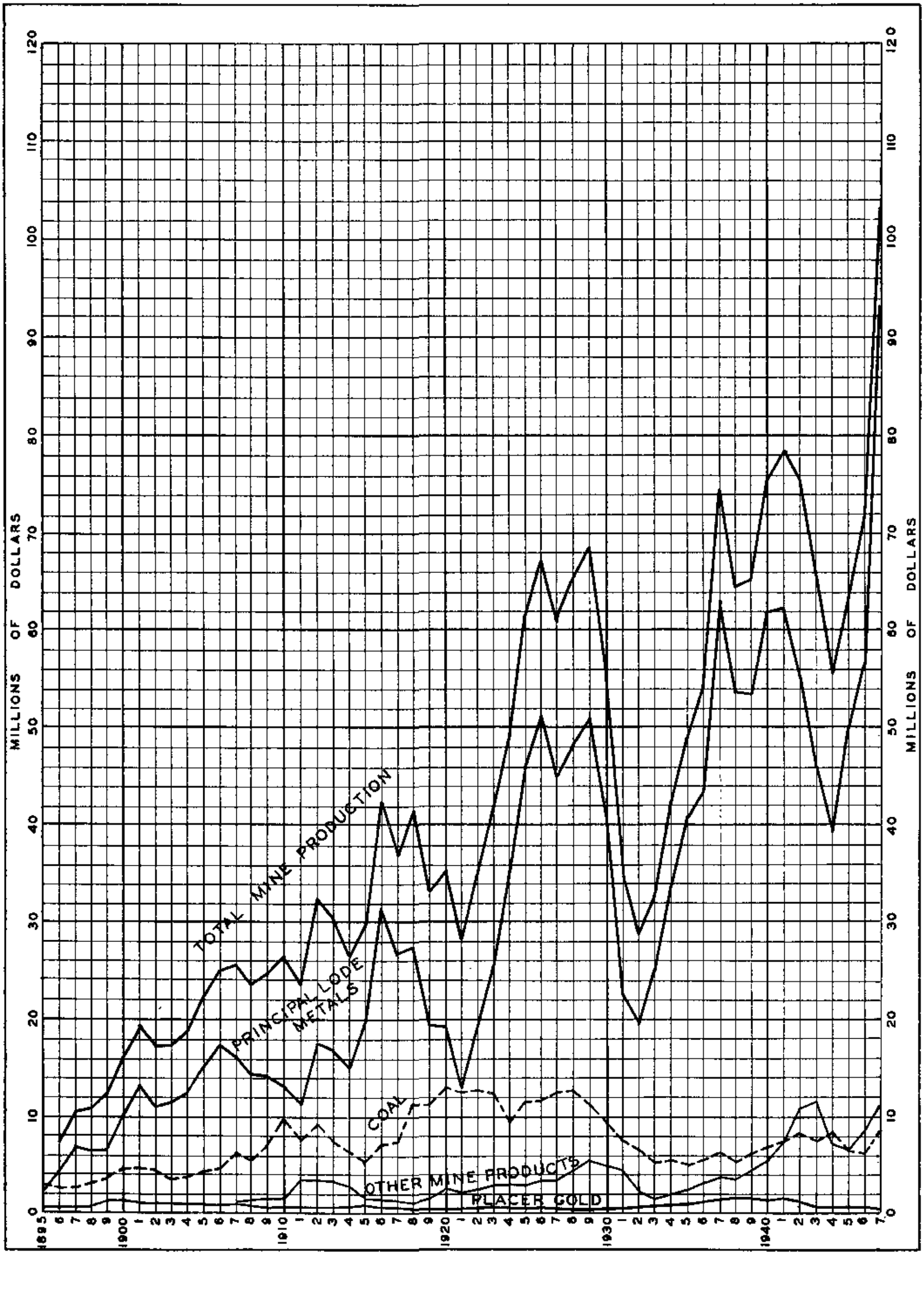


TABLE XIII.—BRITISH COLUMBIA LODE MINES PRODUCTION, 1913–1947.

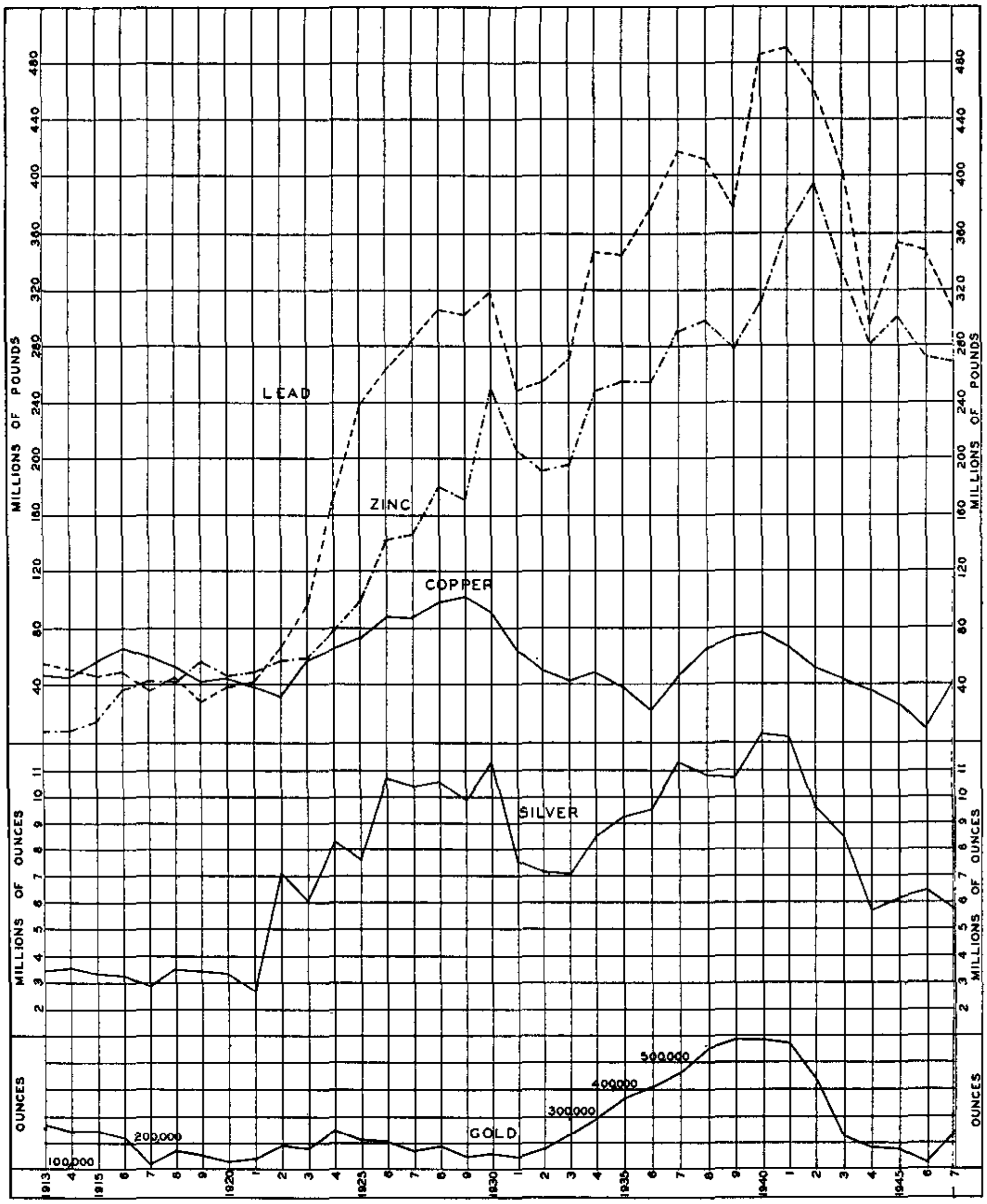


TABLE XIV.—Coal Production per Year to Date.*

	Tons. (2,240 lb.)	Value.		Tons. (2,240 lb.)	Value.
1836–1885	**3,029,011**	**$9,468,557**	1918	2,302,245	$11,511,225
1886	326,636	979,908	1919	2,267,541	11,337,705
1887	413,360	1,240,080	1920	2,595,125	12,975,625
1888	489,301	1,467,903	1921	2,483,995	12,419,975
1889	579,830	1,739,490	1922	2,511,843	12,559,215
1890	678,140	2,034,420	1923	2,453,223	12,266,115
1891	1,029,097	3,087,291	1924	1,939,526	9,697,630
1892	826,335	2,479,005	1925	2,328,522	11,642,610
1893	978,294	2,934,882	1926	2,330,036	11,650,180
1894	1,012,953	3,038,859	1927	2,453,827	12,269,135
1895	939,654	2,818,962	1928	2,526,702	12,633,510
1896	896,222	2,688,666	1929	2,251,252	11,256,260
1897	882,854	2,648,562	1930	1,887,130	9,435,650
1898	1,135,865	3,407,595	1931	1,707,590	7,684,155
1899	1,306,324	3,918,972	1932	1,534,975	6,523,644
1900	1,439,595	4,318,785	1933	1,264,746	5,375,171
1901	1,460,331	4,380,993	1934	1,347,090	5,725,133
1902	1,397,394	4,192,182	1935	1,187,968	5,048,864
1903	1,168,194	3,504,582	1936	1,346,471	5,722,502
1904	1,253,628	3,760,884	1937	1,444,687	6,139,920
1905	1,384,312	4,152,936	1938	1,309,428	5,565,069
1906	1,517,303	4,551,909	1939	1,477,872	6,280,956
1907	1,800,067	6,300,235	1940	1,667,827	7,088,265
1908	1,677,849	5,872,472	1941	1,802,353	7,660,000
1909	2,006,476	7,022,666	1942	1,938,158	8,237,172
1910	2,800,046	9,800,161	1943	1,821,654	7,742,030
1911	2,193,062	7,675,717	1944	1,933,639	8,217,966
1912	2,628,804	9,200,814	1945	1,518,673	6,454,360
1913	2,137,483	7,481,190	1946	1,463,640	6,220,470
1914	1,810,967	6,338,385	1947	1,717,476	8,587,880
1915	1,611,129	5,638,952			
1916	2,084,093	7,294,325	Totals	103,859,798	$418,898,145
1917	2,149,975	7,524,913			

* 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, 1946 and 1947.

Description.	1946.		1947.	
	Quantity.	Value.	Quantity.	Value.
Coal used in making coke, long tons	224,959	$1,441,415	253,656	$1,682,602
Coke made in bee-hive ovens, long tons	18,344	$178,556	39,754	$427,330
Coke made in by-product ovens, long tons	44,780	416,267	49,323	527,810
Coke made in gas plants, long tons	73,132	619,266	67,561	557,754
Total coke made, long tons	136,256	$1,214,089	156,638	$1,512,894
Gas sold and used	....	3,079,009	....	3,390,713
Tar produced	....	88,947	....	124,885
Other by-products	....	88,886	....	50,965
Total production value of coke industry	....	$4,470,931	....	$5,079,457

TABLE XVII.—Dividends paid by Mining Companies, 1897–1947.

*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	†668,595
Goodenough (leasers)	Ymir	Gold	13,731
Hedley Mascot Gold Mines, Ltd.	Hedley	Gold	1,290,553
Island Mountain Mines, Ltd.	Wells	Gold	1,266,102
I.X.L.	Rossland	Gold	134,025
Jewel-Denero	Greenwood	Gold	11,751
Kelowna Exploration, Ltd. (Nickel Plate)	Hedley	Gold	1,740,000
Kootenay Belle Gold Mines, Ltd.	Sheep Creek	Gold	357,856
Le Roi Mining Co.	Rossland	Gold-copper	1,475,000
Le Roi No. 2, Ltd.	Rossland	Gold-copper	1,574,640
Lorne (later Bralorne)	Bridge River	Gold	20,450
Motherlode	Sheep Creek	Gold	163,500
Mount Zeballos Gold Mines, Ltd.	Zeballos	Gold	165,000
Nickel Plate (Hedley Gold Mining Co., Ltd.)	Hedley	Gold	3,423,191
Pioneer Gold Mines of B.C., Ltd.	Bridge River	Gold	9,299,393
Poorman	Nelson	Gold	25,000
Premier Gold Mining Co., Ltd.	Premier	Gold	‡18,858,075
Privateer Mine, Ltd.	Zeballos	Gold	1,914,183
Queen	Sheep Creek	Gold	85,000
Relief Arlington Mines, Ltd. (Second Relief)	Erie	Gold	†308,000
Reno Gold Mines, Ltd.	Sheep Creek	Gold	†1,433,640
Sheep Creek Gold Mines, Ltd.	Sheep Creek	Gold	2,765,625
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			$70,897,141

* 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, 1897–1947—*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	†174,774,859
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	724,707
Horn Silver	Similkameen	Silver-lead-zinc	6,000
Idaho-Alamo	Sandon	Silver-lead-zinc	400,000
Iron Mountain (Emerald)	Salmo	Silver-lead-zinc	20,000
Jackson	Retallack	Silver-lead-zinc	20,000
Last Chance	Three Forks	Silver-lead-zinc	213,000
Lone Bachelor	Sandon	Silver-lead-zinc	50,000
Lucky Jim	Three Forks	Silver-lead-zinc	80,000
Mercury	Sandon	Silver-lead-zinc	6,000
Meteor	Slocan City	Silver-lead-zinc	10,257
Monitor and Ajax	Three Forks	Silver-lead-zinc	70,500
Mountain Con	Cody	Silver-lead-zinc	71,387
McAllister	Three Forks	Silver-lead-zinc	45,088
Noble Five	Cody	Silver-lead-zinc	72,859
North Star	Kimberley	Silver-lead-zinc	497,901
No. One	Sandon	Silver-lead-zinc	6,754
Ottawa	Slocan City	Silver-lead-zinc	110,429
Payne	Sandon	Silver-lead-zinc	1,438,000
Providence	Greenwood	Silver-lead-zinc	‡142,328
Queen Bess	Alamo	Silver-lead-zinc	25,000
Rambler-Cariboo	Rambler	Silver-lead-zinc	467,250
Reco	Cody	Silver-lead-zinc	334,992
Ruth Mines, Ltd.	Sandon	Silver-lead-zinc	125,490
St. Eugene	Moyie	Silver-lead-zinc	566,000
Silversmith and Slocan Star§	Sandon	Silver-lead-zinc	1,267,600
Spokane-Trinket	Ainsworth	Silver-lead-zinc	10,365
Standard Silver Lead	Silverton	Silver-lead-zinc	2,734,688
Sunset and Trade Dollar	Retallack	Silver-lead-zinc	88,000
Utica	Kaslo	Silver-lead-zinc	64,000
Wallace Mines, Ltd. (Sally)	Beaverdell	Silver-lead-zinc	135,000
Washington	Rambler Station	Silver-lead-zinc	20,000
Whitewater	Retallack	Silver-lead-zinc	592,515
Miscellaneous mines		Silver-lead-zinc	70,239
Total, silver-lead-zinc mines			$186,578,980

* "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, 1897–1947—*Continued.*

Copper Mines.

Company or Mine.	Locality.	Class.	Amount paid.
Britannia M. & S. Co.*	Britannia Beach	Copper	$12,231,887
Canada Copper Corporation	Greenwood	Copper	615,399
Cornell	Texada Island	Copper	8,500
Granby Cons. M.S. & P. Co.†	Copper Mountain	Copper	26,913,366
Marble Bay	Texada Island	Copper	175,000
Hall Mines	Nelson	Copper	233,280
Miscellaneous mines		Copper	261,470
Total, copper mines			$40,438,902

* 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	13,799,788
Total	$29,799,788

Miscellaneous, Structural, and Placer Gold.

Various	$3,326,599

Aggregate of all Classes.

Lode-gold mining	$70,897,141
Silver-lead-zinc mining and smelting	186,578,980
Copper-mining	40,438,902
Coal-mining	29,799,788
Miscellaneous, structural, and placer gold	3,326,599
Total	$331,041,410

TABLE XVII.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1947—*Continued.*

Dividends paid Yearly, 1917–1947, inclusive.

Year.	Amount paid.	Year.	Amount paid.
1917	$3,269,494	1934	$4,745,905
1918	2,704,469	1935	7,386,070
1919	2,494,283	1936	10,513,705
1920	1,870,296	1937	15,085,293
1921	736,629	1938	12,068,875
1922	3,174,756	1939	11,865,698
1923	2,983,570	1940	14,595,530
1924	2,977,276	1941	16,598,110
1925	5,853,419	1942	13,627,104
1926	8,011,137	1943	11,860,159
1927	8,816,681	1944	11,367,732
1928	9,572,536	1945	10,487,395
1929	11,263,118	1946	15,566,047
1930	10,543,500	1947	27,940,213
1931	4,650,857		
1932	2,786,958	Total	$267,888,550
1933	2,471,735		

Dividends paid during 1946 and 1947.

	1946.	1947.
Base Metals Mining Corp., Ltd.	*$466,143	
Bralorne Mines, Ltd.	498,800	
Britannia Mining and Smelting Co., Ltd.		720,438
The Consolidated Mining and Smelting Co. of Canada, Ltd.	13,922,502	26,207,219
The Crow's Nest Pass Coal Co., Ltd.	186,354	186,354
Granby Consolidated Mining, Smelting and Power Co., Ltd.		270,139
Highland Bell, Ltd.		78,293
Island Mountain Mines, Ltd.	73,550	84,057
Kelowna Exploration, Ltd. (Nickel Plate)		180,000
Sheep Creek Gold Mines, Ltd.	178,125	
Silbak Premier Mines, Ltd.	25,000	
Others	215,573	213,713
Totals	$15,566,047	$27,940,213

* Distribution of capital.

TABLE XVIII.—SALARIES AND WAGES, FUEL AND ELECTRICITY, AND PROCESS SUPPLIES, 1947.

Class.	Salaries and Wages.	Fuel and Electricity.	Process Supplies.
Lode-mining	$23,280,623	$3,622,346	$9,419,772
Placer-mining	100,114	5,701	36,122
Coal-mining	5,273,600	485,129	506,942
Miscellaneous metals, minerals, and materials	1,445,515	198,650	2,712,057
Structural materials industry	2,060,486	1,007,644	394,055
Totals, 1947	**$32,160,338**	**$5,319,470**	**$13,068,948**
Grand totals, 1946	$26,190,200	$5,427,458	$8,367,705
Grand totals, 1945	22,620,975	7,239,726	5,756,628
Grand totals, 1944	23,131,874	5,788,671	6,138,084
Grand totals, 1943	26,051,467	7,432,585	6,572,317
Grand totals, 1942	26,913,160	7,066,109	6,863,398
Grand totals, 1941	26,050,491	3,776,747	7,260,441
Grand totals, 1940	23,391,330	3,474,721	6,962,162
Grand totals, 1939	22,357,035	*3,266,000	6,714,347
Grand totals, 1938	22,765,711	3,396,106	6,544,500
Grand totals, 1937	21,349,690	3,066,311	6,845,330
Grand totals, 1936	17,887,619	2,724,144	4,434,501
Grand totals, 1935	16,753,367	2,619,639	4,552,730
Grand totals, 1935–47	307,623,257	*60,597,687	90,081,091

* 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, 1901–1947.

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
1947	**4,953,030**	**75**	**33**	**81,033,093**	**4,722,010**	**76,311,087**	**93,176,165**

* 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, 1901–1947.

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	531	2,436	2,241	853	3,094	376	269	408	11,369
1934	1,122	2,796	1,729	4,525	631	2,890	2,050	843	2,893	377	187	360	12,985
1935	1,291	2,740	1,497	4,237	907	2,771	2,145	826	2,971	536	270	754	13,737
1936	1,124	2,959	1,840	4,799	720	2,678	2,015	799	2,814	931	288	825	14,179
1937	1,371	3,603	1,818	5,421	1,168	3,027	2,286	867	3,153	724	327	938	16,129
1938	1,303	3,849	2,266	6,115	919	3,158	2,088	874	2,962	900	295	369	16,021
1939	1,252	3,905	2,050	5,955	996	3,187	2,167	809	2,976	652	311	561	15,890
1940	1,004	3,923	2,104	6,027	1,048	2,944	2,175	699	2,874	827	334	647	15,705
1941	939	3,901	1,823	5,724	1,025	3,072	2,229	494	2,723	766	418	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
1947	**360**	**3,024**	**2,238**	**5,262**	**960**	**3,461**	**1,694**	**731**	**2,425**	**977**	**585**	**869**	**14,899**

* 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 1947.*

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.
Highland	Ainsworth	Ainsworth	George L. Green, Ainsworth		Silver, lead, zinc.
King Solomon	Woodbury Creek	Ainsworth	L. D. Besecker, Kaslo		Silver, lead, zinc.
Utica	Kaslo	Ainsworth	Utika Mines (1947), Ltd., Vancouver		Silver, lead, zinc.
Whitewater	Retallack	Ainsworth	Retallack Mines, Ltd., Vancouver	Flotation	Silver, lead, zinc.
Buccaneer	Bedwell River	Alberni	S. Craig, Tofino		Gold, silver.
Central Zeballos	Zeballos	Alberni	Controlled by Reno Gold Mines, Ltd., Vancouver	Amalgamation, flotation	Gold.
Black Panther	Port Alberni	Alberni	Nitinat Gold Mines, Ltd., Vancouver		Gold, silver, copper.
Privateer	Zeballos	Alberni	Privateer Mine, Ltd., Vancouver	Amalgamation, cyanidation	Gold, silver.
Polaris-Taku	Tulsequah Creek	Atlin	Polaris-Taku Mining Co., Ltd., Vancouver	Flotation	Gold, silver.
Cariboo Gold Quartz	Wells	Cariboo	Cariboo Gold Quartz Mining Co., Ltd., Vancouver	Cyanidation	Gold, silver.
Island Mountain	Wells	Cariboo	Island Mountain Mine, Ltd., Wells	Cyanidation	Gold, silver.
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	Flotation	Silver, lead, zinc.
Silver Giant	Spillimacheen	Golden	Silver Giant Mines, Ltd., Vancouver		Silver, lead, zinc.
Dentonia	Greenwood	Greenwood	Dentonia Mines, Ltd., Vancouver	Flotation	Gold, silver.
Dynamo	Greenwood	Greenwood	Dynamo Mining Syndicate, Greenwood		Silver, lead, zinc.
Elkhorn	Greenwood	Greenwood	W. E. McArthur, Greenwood		Silver, lead, zinc.
E.P.U.	Greenwood	Greenwood	W. E. McArthur, Greenwood		Gold, silver, lead, zinc.
Highland Bell	Greenwood	Greenwood	Highland Bell, Ltd., Vancouver		Silver, gold, lead, zinc.
Silver Bounty	Greenwood	Greenwood	Silver Bounty Mines, Ltd., Vancouver		Silver, lead, zinc.
Union	Granby River	Greenwood	C. E. and J. E. Small, Grand Forks		Gold, silver.
Zamora	Greenwood	Greenwood	George E. White, Box 30, Oliver		Silver, lead, zinc.
Silver Pass	Beaton	Lardeau	Silver Pass Development Syndicate, Beaton		Silver, lead, zinc.
Bralorne	Bridge River	Lillooet	Bralorne Mines, Ltd., Vancouver	Amalgamation, flotation	Gold, silver.
Pioneer	Bridge River	Lillooet	Pioneer Gold Mines of B.C., Ltd., Vancouver	Cyanidation	Gold, silver.
Alpine	Sitkum Creek	Nelson	Alpine Gold, Ltd., Nelson	Flotation	Gold, silver, lead, zinc.
Arlington	Erie Creek	Nelson	B. and K. Golac *et al.*, Nelson		Gold, silver, lead, zinc.
Bayonne	Tye	Nelson	Bayonne Consolidated Mines, Ltd., Vancouver	Cyanidation	Gold, silver, lead, zinc.
California	Nelson	Nelson	L. Bobier, Nelson		Gold, silver, lead, zinc.
Centre Star (Wesko)	Ymir	Nelson	Barclay & Anderson, Ymir		Gold, silver, lead, zinc.
Crawford F.	Creston	Nelson	F. Crawford, Creston		Silver, lead.
Durango	Ymir	Nelson	O. W. Gowing, Ymir		Gold, silver, lead, zinc.
Kenville (Granite-Poorman)	Taghum	Nelson	Kenville Gold Mines, Ltd., Toronto	Cyanidation	Gold, silver.
Kootenay Belle	Sheep Creek	Nelson	J. R. Thompson, Sheep Creek		Gold, silver.
Lakeview	Sanca	Nelson	E. G. Timmons, Sanca		Silver, lead, zinc.
Michaely (Red Rock)	Pend d'Oreille	Nelson	M. Michaely and W. C. Holland, Trail		Silver, lead, zinc.
Nugget	Salmo	Nelson	A. Endersby, Sr. and Jr., Fruitvale		Gold, silver.
Protection (Goodenough)	Ymir	Nelson	J. Turk and Ed. Mayer, Ymir		Silver, lead, zinc.
Reno	Sheep Creek	Nelson	Clean-up; C. Anderson *et al.*, Ymir		Gold, silver.
Sheep Creek (Queen)	Sheep Creek	Nelson	Sheep Creek Gold Mines, Ltd., Vancouver	Cyanidation	Gold, silver.

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

TABLE XXI.—METALLIFEROUS MINES SHIPPING IN 1947*—*Continued.*

Mine or Group.	Location of Mine.	Mining Division.	Owner or Agent.	Process.	Character of Ore.
Emerald	Salmo	Nelson	Canadian Exploration, Ltd.	Gravity, flotation	Tungsten.
Silver Dollar	Salmo	Nelson	Silver Dollar Mines, Ltd., Salmo		Silver, lead, zinc.
Silver King	Nelson	Nelson	Peter Rolick, Nelson		Silver, lead, zinc.
Yankee Girl	Ymir	Nelson	C. Anderson *et al.*, Ymir		Gold, silver, lead, zinc.
Invermay	Hope	New Westminster	J. F. Bailey, Hope		Silver, lead, zinc.
Copperado	Nicola	Nicola	Guichon Mine, Ltd., Vancouver		Gold, silver, copper.
Lucky Todd	Merritt	Nicola	G. G. Hunter, Merritt		Silver, lead, zinc.
Duthie	Hudson Bay Mountain	Omineca	B. McClay, 711 Hall Bldg., Vancouver		Silver, lead, zinc.
Hedley Mascot	*Hedley*	*Osoyoos*	*Hedley Mascot Mines, Ltd., Vancouver*	*Flotation, cyanidation*	*Gold, silver.*
Good Hope	Hedley	Osoyoos	Hedley Mascot Gold Mines, Ltd.		Gold.
Nickel Plate	Hedley	Osoyoos	Kelowna Exploration Co., Hedley	Cyanidation, flotation	Gold, silver.
Fairview and Morning Star	Oliver	Osoyoos	Cons. Mining & Smelting Co. of Canada, Ltd., Trail		Silica-flux, gold.
Big Four	Stewart	Portland Canal	Big Four Silver Mines, Ltd., Vancouver		Silver, lead, zinc.
Bingo	Bitter Creek	Portland Canal	L. Robichaud and A. Cameron, Stewart		Silver, lead, zinc.
Indian	Cascade River	Portland Canal	Crawford Transfer Co., Ltd., Stewart		Silver, lead, zinc.
Silbak Premier	Premier	Portland Canal	Silbak Premier Mines, Ltd., Premier	Flotation	Gold, silver, lead.
El Toro	Likely	Quesnel	El Toro B.C. Mines, Ltd., Toronto		Gold, silver, copper.
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.
Galena Farm	Silverton	Slocan	F. Mills and W. Postlethwaite, Silverton		Silver, lead, zinc.
Hewitt	Silverton	Slocan	Granby Cons. M.S. & P. Co., Ltd., Vancouver		Silver, lead, zinc.
Joan (Dianne)	Slocan City	Slocan	H. and W. Parker, Slocan City		Gold, silver.
L.T.	Slocan City	Slocan	D. B. O'Neail, Slocan City		Silver, lead, zinc.
Mabou	*Silverton*	*Slocan*	*Terley Mining, Milling & Smelting Co., Silverton*		*Silver, lead, zinc.*
Miner Boy (Jo Jo)	Three Forks	Slocan	Miner Boy, Inc., Nelson		Silver, lead, zinc.
McAllister	Three Forks	Slocan	Allen, M. and L., Co., Ltd., Nelson		Silver, lead, zinc.
Ottawa	Springer Creek	Slocan	Ottawa Silver M. & M. Co., and J. S. Klemans and J. J. McDonell, Slocan City		Silver.
Silver Leaf	Slocan City	Slocan	J. S. Klemans and J. J. McDonell, Slocan City		Silver, lead, zinc.
Silversmith	Sandon	Slocan	E. H. Petersen, Sandon		Silver, lead, zinc.
Van Roi	Silverton	Slocan	Van Roi Mines, Ltd., Silverton		Silver, lead, zinc.
Victor	Sandon	Slocan	E. Doney, Sr., New Denver		Silver, lead, zinc.
Standard, Mammoth, and Enterprise	Silverton	Slocan	Western Exploration Co., Ltd., Silverton	Flotation	Silver, lead, zinc.
White Hope	Slocan City	Slocan	C. Tipping, Slocan City		Silver, lead, zinc.
Zincton (Lucky Jim)	Zincton	Slocan	Zincton Mines, Ltd., Vancouver	Flotation	Silver, lead, zinc.
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.
Britannia	Britannia Beach	Vancouver	Britannia Mining & Smelting Co., Ltd., Britannia Beach	Flotation	Copper, gold, silver.
Twin J	Mount Sicker	Victoria	Twin J Mines, Ltd., Duncan	Flotation	Copper, gold, silver.

* 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 1947.*

Shipping Mines.

Name of Mine or Company.	Days Operating.		Tons.		Average Number Employed.	
	Mine.	Mill.	Mined.	Milled.	Mine.	Mill.
Ainsmore Consolidated Mines, Ltd.	300	300	19,398	19,398	22	5
Whitewater (Retallack Mines, Ltd.)	107	92	15,111	9,711	5	5
Central Zeballos (Reno Gold Mines, Ltd.)	90	90	7,137	5,353	9	1
Privateer Mine, Ltd.	309	365	23,244	14,201	91	10
Polaris-Taku Mining Co., Ltd.	309	336	92,039	92,039	143	9
Cariboo Gold Quartz Mining Co., Ltd.	365	365	88,623	88,623	223	13
Island Mountain Mines Co., Ltd.	307	365	41,197	41,197	90	10
Sullivan (Cons. M. & S. Co. of Canada, Ltd.)	274	293	2,252,729	2,252,729	1,613	319
Base Metals Mining Corp., Ltd.	110	100	8,004	8,004	27	2
Dentonia Mines, Ltd.	365	54	1,678	1,678	27	1
Highland Bell, Ltd.	276	......	5,147	....	39	......
Bralorne Mines, Ltd.	365	365	136,838	133,047	376	23
Pioneer Gold Mines of B.C., Ltd.	365	338	44,696	41,304	192	10
Alpine Gold, Ltd.	300	24	200	200	15	1
Kenville Gold Mines, Ltd.	365	31	4,404	2,886	68	2
Sheep Creek Gold Mines, Ltd. (Queen mine)	306	200	29,821	29,821	72	7
Canadian Exploration, Ltd. (Emerald)	204	202	33,525	33,525	107	28
Hedley Mascot Gold Mines, Ltd.	307	202	29,151	29,151	79	22
Good Hope (Hedley Mascot Gold Mines, Ltd.)	......	......	....	....	......	......
Kelowna Exploration Co., Ltd.	281	362	102,597	102,597	109	73
Fairview and Morning Star (Cons. M. & S. Co. of Can., Ltd.)	334	......	24,716	....	15	......
Silbak Premier Mines, Ltd.	305	265	59,343	59,343	223	15
Copper Mountain (Granby Cons. M.S. & P. Co., Ltd.)	316	317	1,333,474	1,292,342	413	186
Bosun (Santiago Mines, Ltd.)	286	......	291	....	20	......
Western Exploration Co., Ltd. (Standard, Mammoth, Enterprise)	279	74	9,201	7,124	44	10
Zincton mine (Sheep Creek Gold Mines, Ltd.)	307	262	83,112	83,112	65	10
Britannia Mining & Smelting Co., Ltd.	258	258	794,974	794,974	486	178
Twin J Mines, Ltd.	158	158	....	8,295†	37	7

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.
Pellaire Mines, Ltd.	......	......	....	....	13	......
B.R.X. Consolidated Mines, Ltd.	......	......	....	....	14	......
Pacific Eastern Gold Mines, Ltd.	......	......	....	....	22	......
Vananda Mining Co.	......	......	....	....	39	......
Gold Belt Mining Co., Ltd.	......	......	....	....	14	......
Reeves-Macdonald Mines, Ltd.	......	......	....	....	11	......
Silver Standard Mines, Ltd.	......	......	....	....	16	......
Nicholson Creek Mining Corp., Ltd.	......	......	....	....	10	......
Morris Summit Mines, Ltd.	......	......	....	....	27	......
Big Four Silver Mines, Ltd.	......	......	....	....	11	......
Torbrit Silver Mines, Ltd.	......	......	....	....	73	......
Surf Inlet Consolidated Gold Mines, Ltd.	......	......	....	....	14	......
Silver Ridge Mining Co., Ltd.	......	......	....	....	11	......
Ruth-Hope, Sandon (Kelowna Exploration Co., Ltd.)	......	......	....	....	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.

† 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 and concerning the ownership and standing of claims and leases in any division may be obtained from the Mining Recorder for the mining division in which the property is situated and from the Central Records Offices. Sub-mining Recorders, who act as forwarding agents, are appointed at various places throughout the Province. They are authorized to accept documents and fees, and forward them to the office of the Mining Recorder for the correct mining division. Officials and their offices in various parts of the Province are listed in the table on pages 43 and 44.

Copies of the various Acts, upon payment of the prices listed on page 294, 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.

STIKINE MINING DIVISION.

The Government Agent at Telegraph Creek, who acts as Gold Commissioner for the Stikine Mining Division, is being transferred, effective June 28th, 1948. A Sub-mining Recorder will be appointed at Telegraph Creek. Other sub-mining recording offices for the Stikine Mining Division are at Dease Lake, Lower Post, Burns Lake, Fort St. James, Fort St. John, and Pouce Coupe. Agency duties will be performed by the Provincial Police representative at Telegraph Creek. Because the agency is being transferred and because completion of the road from the Canadian Alaska Highway to McDame Creek lessens the difficulties of travelling and of transporting mail to the active mining area in this mining division, the office of the Gold Commissioner will be established at Victoria, B.C., effective June 28th, 1948.

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*
1947	107	3,502	28.00
Totals	10,479	$303,661	....

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

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

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

Mining Division.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-recorder.
Ainsworth	Kaslo	C. MacDonald	B. F. Palmer	
Sub-office	Poplar			A. Robb.
Alberni	Alberni	T. H. Harding	T. H. Harding	R. MacGregor.
Sub-office	Nanaimo			W. H. Cochrane.
Sub-office	Quatsino			Axel Hansen.
Sub-office	Tofino			Ian McLorie.
Sub-office	Zeballos			H. M. B. Sutton.
Ashcroft	Ashcroft	D. Dalgleish (Kamloops)	D. H. Bruce	
Sub-office	Lytton			J. Blakiston-Gray.
Atlin	Atlin	A. E. Roddis	A. E. Roddis	
Sub-office	Lower Post			J. W. Stewart.
Sub-office	Pouce Coupe			M. S. Morrell.
Sub-office	Squaw Creek			Mrs. F. Muncaster.
Sub-office	Telegraph Creek			Mary C. Allen.
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	S. M. Carling	S. M. Carling	
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			A. J. Dillabough.
Sub-office	Cumberland			A. G. Freeze.
Sub-office	Quatsino			Axel Hansen.
Sub-office	Stuart Island			J. B. Willcock.
Sub-office	Vananda			Henry Carter.
Nelson	Nelson	S. Hamilton	S. Hamilton	Miss W. M. Palethorpe.
Sub-office	Creston			B. J. H. Ryley.
Sub-office	Salmo			M. C. Donaldson.
New Westminster	New Westminster	A. B. Gray	J. F. McDonald	
Sub-office	Chilliwack			E. L. Anderson.
Sub-office	Hope			J. H. Richmond.
Sub-office	Lytton			J. Blakiston-Gray.
Nicola	Merritt	D. Dalgleish (Kamloops)	R. G. Couper	
Omineca	Smithers	K. D. McRae	K. D. McRae	
Sub-office	Bella Coola			E. Bradley.
Sub-office	Burns Lake			John Brown.
Sub-office	Copper River			L. G. Skinner.
Sub-office	Doreen			W. E. Horwill.
Sub-office	Fort Fraser			A. Fisher.
Sub-office	Fort St. James			Norman Henry.

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

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

* Effective June 28th, 1948, Telegraph Creek will become a sub-recording office, and Mary C. Allen will act as Sub-mining Recorder. The office of the Gold Commissioner will be at Victoria, effective June 28th, 1948. K. B. Blakey has been appointed Gold Commissioner.

Gold Commissioners' and Mining Recorders' Office Statistics, 1947.

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	107	4	2	1	125	159	12	....	16	....	....	....	....	$1,082.75	$3,181.25	$4,264.00
Alberni	158	6	3	....	161	580	125	28	49	....	1	4	....	1,275.50	5,731.75	7,007.25
Ashcroft	103	1	....	....	58	13	14	....	....	3	49	3	22	534.25	1,292.00	1,826.25
Atlin	174	4	....	....	53	51	6	6	2	12	36	295	70	1,179.75	9,906.30	11,086.05
Cariboo	437	18	3	....	209	551	28	5	....	10	115	588	95	3,590.75	28,190.75	31,781.50
Clinton	53	1	1	3	91	317	27	....	2	3	10	16	28	341.75	2,985.75	3,327.50
Fort Steele	220	....	2	3	90	141	38	....	9	2	36	28	41	903.75	4,219.25	5,123.00
Golden	62	4	2	3	107	68	84	....	4	1	3	1	1	589.75	1,893.75	2,483.50
Greenwood	109	3	1	1	89	178	29	3	12	1	2	7	1	767.25	4,614.50	5,381.75
Kamloops	186	....	8	19	118	110	13	....	5	8	3	....	....	929.00	1,821.25	2,750.25
Lardeau	36	1	2	....	41	188	24	....	....	1	....	....	....	250.25	698.50	948.75
Lillooet	305	13	1	6	263	836	147	4	10	1	32	33	49	2,573.25	6,594.65	9,167.90
Nanaimo	117	....	....	....	115	164	13	....	32	....	....	....	....	513.00	2,163.25	2,676.25
Nelson	315	11	6	9	261	701	61	24	18	14	4	14	....	2,516.25	6,581.25	9,097.50
New Westminster	180	1	1	13	171	223	42	1	7	2	45	19	14	893.00	8,628.75	9,521.75
Nicola	41	....	....	....	201	61	14	....	....	....	....	....	....	159.50	2,060.40	2,219.90
Omineca	354	2	1	....	564	777	130	4	9	4	30	104	46	1,865.25	10,872.50	12,737.75
Osoyoos	111	....	3	1	126	299	54	13	2	....	....	....	....	604.75	2,029.50	2,634.25
Peace River	95	....	....	....	....	....	....	....	....	....	....	....	....	442.00	....	442.00
Portland Canal	91	5	2	....	115	680	54	3	....	....	....	....	....	972.50	2,591.40	3,563.90
Quesnel	486	13	4	21	113	275	38	....	....	13	67	216	68	2,962.75	15,115.75	18,078.50
Revelstoke	44	1	1	....	25	95	44	1	21	....	4	13	7	325.75	5,851.25	6,177.00
Similkameen	212	4	4	3	132	157	32	....	5	....	19	62	43	1,442.50	5,577.25	7,019.75
Skeena	152	....	3	....	92	57	14	....	35	....	1	....	....	697.50	3,368.25	4,065.75
Slocan	91	1	1	....	101	180	44	....	....	....	....	....	....	548.25	2,072.25	2,620.50
Stikine	134	....	2	....	126	85	16	....	....	....	28	38	33	652.75	5,564.25	6,217.00
Trail Creek	111	1	....	1	104	93	26	....	4	1	....	....	....	601.50	764.75	1,366.25
Vancouver	1,420	96	23	46	184	185	17	....	4	....	....	6	....	14,782.75	4,915.25	19,698.00
Vernon	141	2	....	21	180	69	28	4	....	....	4	21	6	807.25	2,402.00	3,211.25
Victoria	208	11	5	14	68	21	3	....	11	....	3	15	....	1,825.00	4,450.17	6,275.17
Totals, 1947	6,253	203	81	165	4,083	7,314	1,177	96	257	76	492	1,483	524	$46,630.25	$156,137.92	$202,768.17
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

CHEMICAL LABORATORIES.

During 1947 the chemical laboratory in Victoria issued reports on 2,330 rock samples and specimens from prospectors and Departmental engineers. A laboratory examination of a prospector's sample generally consists of the following: (1) A mineralogical determination of visible minerals and a classification of the type of rock; (2) a spectrographic analysis to determine if any base metals are present in interesting percentages; (3) assays for precious metals, and for base metals shown by the spectrographic analysis to be present in interesting percentages; (4) test for radioactivity. The laboratory reports were distributed in the following manner amongst bona-fide prospectors, bona-fide prospectors who were grantees under the "Prospectors' Grub-stake Act," and Departmental engineers:—

	Samples and Specimens.	Mineralogical Determinations.	Spectrographic Analysis.	Assays.
Bona-fide prospectors	795	760	726	1,481
Bona-fide prospectors (grantees)	469	384	374	924
Departmental engineers	1,066	21	156	2,674
Totals	2,330	1,165	1,256	5,079

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

Six samples of agricultural materials were analysed for the Department of Agriculture. Eighteen analyses of a miscellaneous nature were made for various departments.

For the Attorney-General's Department, forty-three cases of a chemico-legal nature were undertaken, involving a study of 177 exhibits of a very varied nature. These cases included ten analyses of viscera for poison, eight analyses of blood for alcohol, and three examinations of liquids and solids for poison content. The remaining cases were too varied in nature to mention individually.

At the request of the Live Stock Branch of the Department of Agriculture, this laboratory co-operated in an important live-stock investigation involving dietary deficiencies in cows. Analyses were made for calcium, magnesium, and phosphorus on six samples of blood; for cobalt on nine samples of kidney and liver; and for Vitamin A on eight samples of hay.

For the Department of Finance, an investigation was undertaken on the methods of dyeing gasoline, in connection with the "Coloured Gasoline Tax Act." Scoops were designed for measuring the correct amounts of dye to be added to a fixed volume of gasoline. A routine method was developed for detecting "marked" gasoline alone and in mixtures with other gasolines; this was in preparation for routine analyses on seized samples of coloured gasoline which the Provincial Police expect to submit during 1948.

During the year a Geiger-Müller counter of the most modern type was installed, so that even a very minute degree of radioactivity may be detected and accurately measured. Rock and mineral samples received by this laboratory are now subjected to this test for radioactivity.

An investigation was commenced, in co-operation with the Mineralogical Branch, to study possible methods of correlating coal-seams. The ash from each of many coal samples was analysed spectrochemically, and the concentrations of the "trace" metals determined, in an effort to find if the concentrations of certain "trace" metals were characteristic of a particular coal-seam. The investigation will continue into 1948.

A total of 107 lots of placer gold, amounting to 124.9989 oz., and representing purchases from individual placer-miners, was received from Gold Commissioners.

Provincial Government examinations for certificates of competency and licence to practise assaying in British Columbia were held in Victoria, Trail, and Chapman Camp in May, and in Victoria and Trail in December. Four candidates sat for the entire examination; three of them failed, and the fourth was granted a supplemental in wet assaying. Five candidates sat for supplemental examinations previously granted them, and all passed. Two applications for licences to practise assaying under section 11, subsection (2), of the "Department of Mines Act" were received; both were rejected.

INSPECTION BRANCH.

Organization and Staff.

Inspectors of Mines, June 1st, 1948.

James Strang, Chief Inspector	Victoria.
Hamilton C. Hughes, Senior Inspector of Metalliferous Mines	Victoria.
L. Wardman, Electrical Inspector	Victoria.
J. E. Merrett, Inspector of Mines	Victoria.
John MacDonald	Nanaimo.
J. W. Peck	Lillooet.
E. R. Hughes	Princeton.
James A. Mitchell	Nelson.
Robert B. Bonar	Fernie.
F. J. Hemsworth	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, June 1st, 1948.

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.

Fred Hemsworth, who was appointed Inspector of Mines on October 1st, 1947, is now stationed at Prince Rupert in place of Charles Graham, who retired on May 31st, 1948.

John Merrett was appointed Inspector on April 1st, 1948, and is at present stationed at Victoria.

Charles Graham.—Charles Graham, Inspector of Mines and Resident Engineer at Prince Rupert, retired on May 31st, 1948.

He was born in Scotland, came to the United States in 1903 and to Canada in 1904. He was foreman at Nanaimo Colliery (Western Fuel Company) from 1904 to 1909, and from 1909 to 1932 held the position of superintendent at several of the large mines in British Columbia and Alberta. He joined the staff of the Mines Department as Inspector in 1932, being stationed at Prince Rupert.

He is a member of the Canadian Institute of Mining and Metallurgy, member of the Association of Professional Engineers, holder of a first-class colliery manager's certificate and coal-mine surveyor's certificate for British Columbia and a colliery manager's first-class certificate for Alberta. He took a keen interest in his work, and his long and varied experience in mining made him a valued member of the Mines Department staff. He made many friends among the mining fraternity in both British Columbia and Alberta.

Reports.

Reports on the inspection of metalliferous mines and quarries (pages 225 to 233), coal-mining (pages 235 to 265), and the inspection of electrical equipment (pages 267 to 279) are contributed by the Inspection Branch. Much of the material contained in the sections " Metal-mining," " Placer-mining," and " Structural Materials and Industrial Minerals " is contributed by officers of the Inspection Branch.

MINERALOGICAL BRANCH.

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 edited, and is compiled in part, by the Mineralogical Branch. The activities of the Branch include identification of rock and mineral specimens submitted by prospectors and others, and the examination of all samples submitted by prospectors to the Analytical Branch. The Mineralogical Branch also supplies information regarding mineral deposits and the mineral industry in response to inquiries received in great number.

Eight officers of the Mineralogical Branch were engaged in field-work during the 1947 field season; one field party was led by a geologist employed for the season, and two supervisors of grub-staked prospectors were employed for the months of July and August.

J. M. Black, stationed at Prince Rupert, made detailed examination of lode properties in the McDame Creek, Taku River, Portland Canal, Alice Arm, and Smithers areas, and also examined some placer properties in the McDame Creek area.

J. M. Cummings, stationed in Vancouver, made studies of clay deposits in the lower Fraser Valley and near Prince George and Vanderhoof. He also examined limestone and marl deposits in the Fraser Valley and on the Pacific Great Eastern Railway to assist in the search for a supply of cheap agricultural limestone.

M. S. Hedley, with three assistants, continued the detailed geological mapping of an area extending westerly and south-westerly from Sandon.

Stuart S. Holland, with one assistant, spent the field season in the Cariboo area. He collected data concerning present and former placer operations, made preliminary examinations of some lode properties, and made more detailed studies of the Cariboo-Hudson property and of the Sugar Creek area. Reports on this work appear later in this publication. A bulletin based on the detailed mapping of an area drained by Slough Creek and Lightning Creek is being prepared for printing.

W. J. Lynott, with two assistants, completed geological mapping in the Warn Bay-Tranquil Creek area, near Tofino on Vancouver Island.

W. H. Mathews continued on leave of absence throughout 1947.

C. B. Newmarch continued detailed geological work on the coal-measures at Coal Creek and near Michel in the Crowsnest Pass area.

B. T. O'Grady supervised the road and trail and the grub-stake programmes, and assisted the Securities Commission in administering the " Securities Act."

John S. Stevenson, with two assistants, continued detailed geological mapping of the properties in the Bridge River area. At the end of the field season he went on leave of absence for nine months, to undertake special studies at United States universities as a Guggenheim Research Fellow.

W. H. White, with one assistant, made an examination of the Silbak Premier mine in the Portland Canal area, in collaboration with J. M. Black. Mr. White also examined gold prospects in the Sustut-Aiken-McConnell Lake area, and examined properties at Hedley and at Olalla. At the end of the field season he left the services of the Department of Mines to accept an appointment as associate professor in the Department of Geology at the University of British Columbia.

G. B. Leech was engaged for the field season as a party chief and, with two assistants, did geological mapping in an area on upper Yalakom River.

N. G. Freshwater and D. H. Rae were engaged for the months of July and August as supervisors of grub-staked prospectors.

J. W. McCammon, with one assistant, made an examination of an area on Silver Creek, near Hope, in the month of August.

B. T. O'Grady.

On April 30th, 1948, B. T. O'Grady, M.C., P.Eng., M.C.I.M., retired from the permanent staff of the Department of Mines. He had joined the staff in Revelstoke in 1920, having been locating engineer there for the Department of Public Works since his discharge from the army in May, 1919. Mr. O'Grady served the Department of Mines as Assistant Resident Engineer at Revelstoke and as Resident Engineer at Nelson and Vancouver, and in 1938 was transferred to Victoria.

He had served with the Imperial Army in the Boer War and with the Canadian and Imperial Armies in the First World War, retiring with the rank of captain in April, 1919. In February, 1942, he returned to the service of the army and was attached to the Headquarters, Pacific Command, as Field Supervisor, Northern British Columbia Coast, organizing the Pacific Coast Militia Rangers.

On transferring to the Victoria offices of the Department in 1938, Mr. O'Grady assisted the Superintendent of Brokers in administering the " Securities Act," and also supervised the road and trail programme of the Department of Mines. In this work he employed advantageously the fund of information which he had acquired in the preceding eighteen years in the service of the Department. On his return to the Department in 1943, in addition to his former duties, he assumed those of supervising the Department's programme of grub-staking prospectors, which was begun that year. Mr. O'Grady is continuing these duties for the 1948 field season.

In his service with the Department, extending over a period of twenty-eight years, Mr. O'Grady acquired an unusually complete knowledge of many aspects of the mining industry, and the efficient performance of his duties won the respect of his colleagues in the Government service and in the mining industry. The good wishes of the staff of the Department of Mines, and of his associates in other departments, go with Mr. and Mrs. O'Grady.

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; for each of the fiscal years 1944–45, 1945–46, and 1946–47, $50,000 was appropriated, and for 1947–48, $40,000 was appropriated.

STATISTICS.

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

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.

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 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 made by two holders of grub-stakes in 1946 have also aroused interest.

In 1947 two grub-staked prospectors discovered, and explored in a preliminary way, a gold-bearing zone which they located as the Gerle Gold property on McConnell Creek, some 25 miles north of Goldway Peak. Two others discovered a silver-lead-zinc prospect of some merit on a northerly flowing tributary of Osilinka River, about 5 miles east of Wasi Lake. Another of the grub-staked prospectors has brought in interesting specimens of copper mineralization which he reports were obtained from a large mineralized zone in the Finlay River area.

The grub-stake programme has been organized and supervised by B. T. O'Grady. In 1947 he was assisted by D. H. Rae and N. G. Freshwater.

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 282.

PUBLICATIONS.

Annual Reports of the Minister of Mines, bulletins, and other publications of the Department, with prices charged for them, are listed on pages 280 to 282.

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 283 and 284.

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

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

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

GEOLOGICAL SURVEY OF CANADA.

By an arrangement made at the time the Province of British Columbia entered Confederation, geological investigations and mapping in the Province are carried on by the Geological Survey of Canada. 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, and has proved of great benefit to the mining industry of the Province.

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.

One of the principal branches of the Dominion Government Department of Mines and Resources is that of Mines, Forests, and Scientific Services, with sub-branches known as the Bureau of Mines, Geological Survey, and Surveys and Mapping Bureau. The Topographical Survey comes under the Surveys and Mapping Bureau. During the 1947 season the following officers were employed on geological and topographical field-work in British Columbia:—

Geological Parties.

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

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

A. G. Jones completed geological mapping of the Salmon Arm area; longitude 119°–120°, latitude 50°–51°.

J. W. Hoadley commenced geological mapping of the Zeballos area, Vancouver Island; longitude 126° 30′–127°, latitude 49° 45′–50°.

K. C. McTaggart was engaged in surveying and mapping the geology of the South Torrent and Wardner dam-sites on Kootenay River for the Dominion Water and Power Bureau.

A. F. Buckham, assisted by B. A. Latour, completed present field investigations of the coalfields of South-eastern Vancouver Island.

H. W. Little commenced geological mapping of the Ymir area; longitude 117°–117° 15′, latitude 49° 15′–49° 30′.

V. J. Okulitch investigated the stratigraphy of late Precambrian and early Palæozoic formations in the Salmon Arm and Pend d'Oreille River areas.

W. E. Cockfield assisted the Dominion Water and Power Bureau on its investigations of the Columbia River drainage system, visited several mining properties, and examined several limestone deposits with the object of finding a cheap source of this rock for agricultural purposes in the lower Fraser Valley.

E. B. Owen was engaged in field and laboratory studies of conditions at the Gibraltar and Torrent dam-sites on Kootenay River.

L. D. Burling made fossil collections from Cambrian formations within a triangular area outlined by Cranbrook on the south-west, Golden on the north-west, and Banff on the north-east.

Topographical Parties.

H. A. S. West commenced photo-topographic mapping of the Whitesail Lake area; longitude 126°–128°, latitude 53°–54°.

B. L. Anderson and R. F. Brooks commenced photo-topographic mapping of the Jennings River area; longitude 130°–132°, latitude 59°–60°.

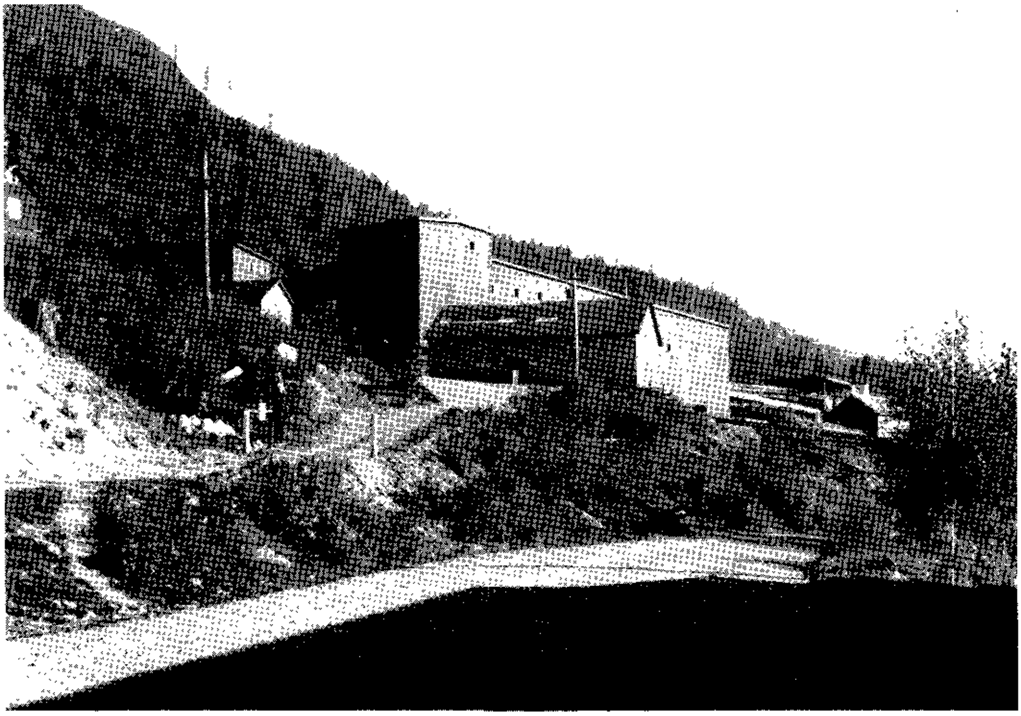
D. A. MacLean commenced and completed air-photograph control for the Dawson Creek area; longitude 120°–122°, latitude 55° 30′–57°.

PLATE I.

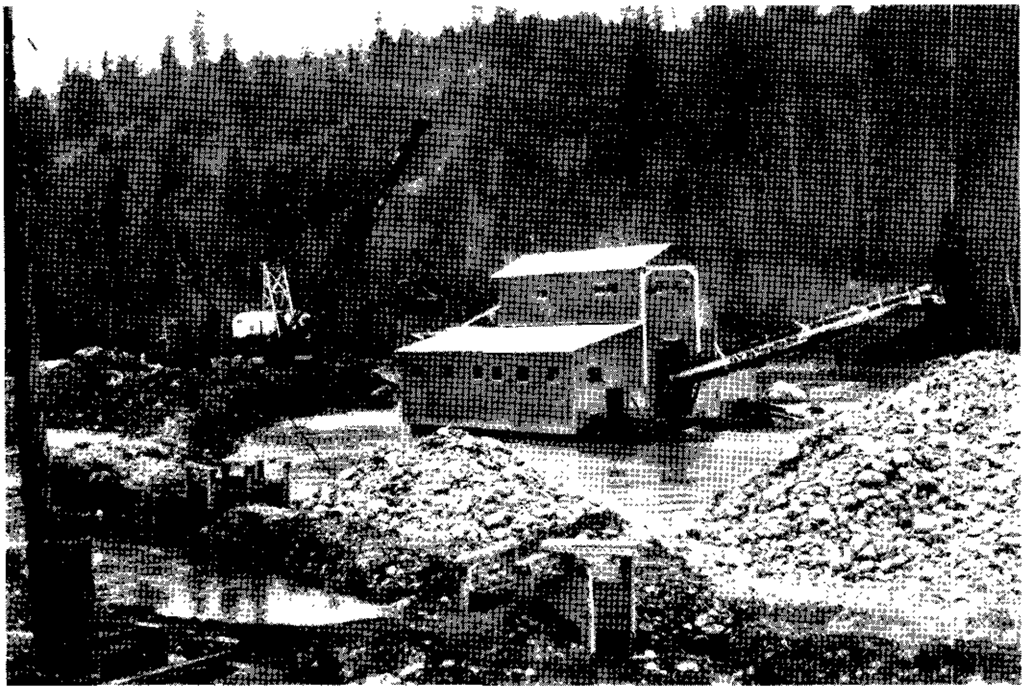
A. West side of Asitka Valley, showing cirques and horns.

B. Diamond-drill camp, No. 3 level, Rambler mine.

PLATE II.

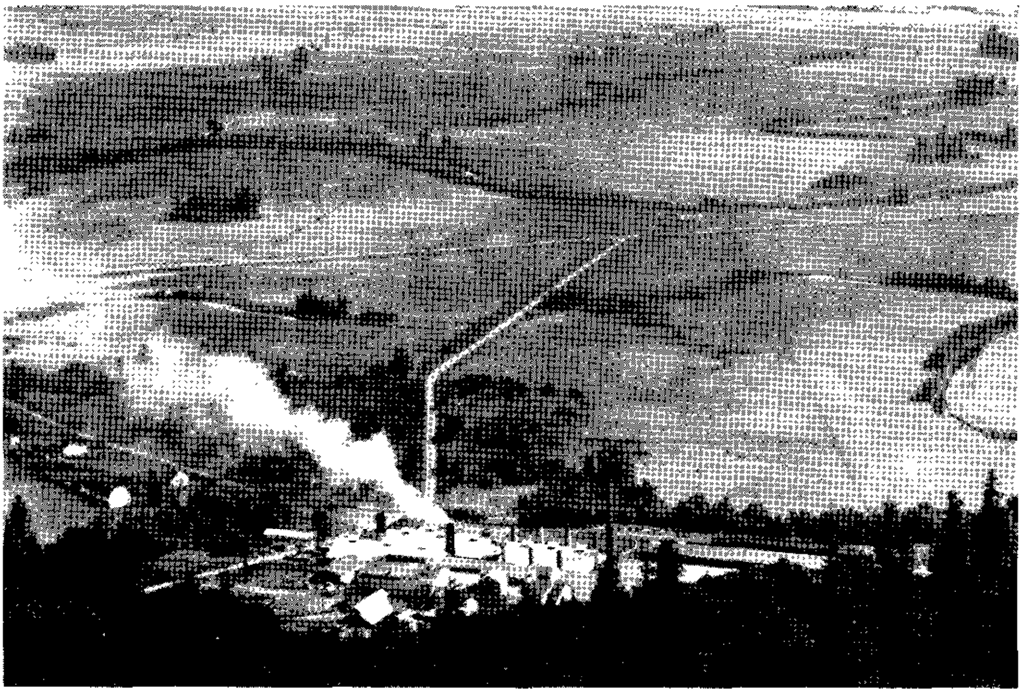


A. Emerald mill, near Salmo.



B. Power-lift shovel and floating washing-plant of the Atkinson Dredging Company, Limited, on the Similkameen River, near Princeton.

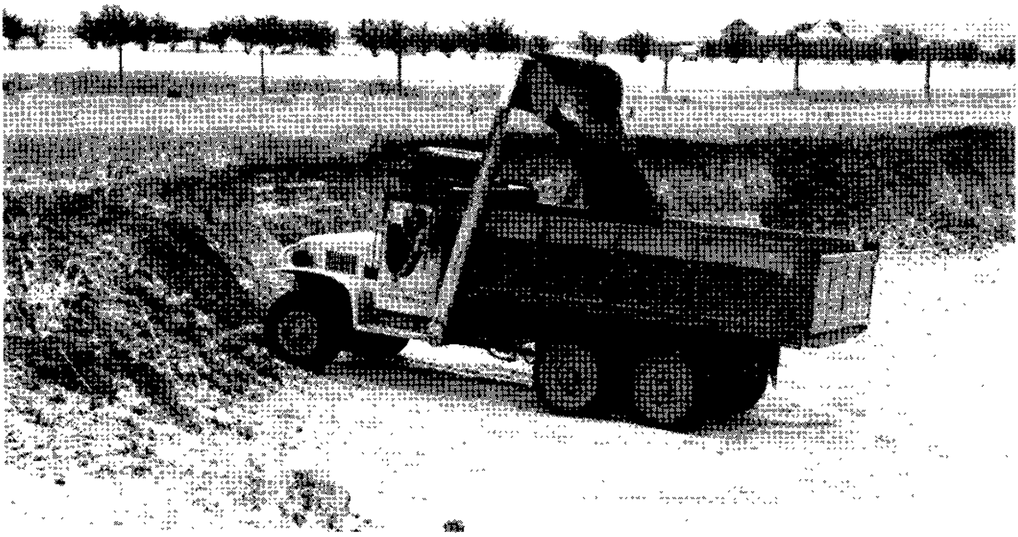
PLATE III.



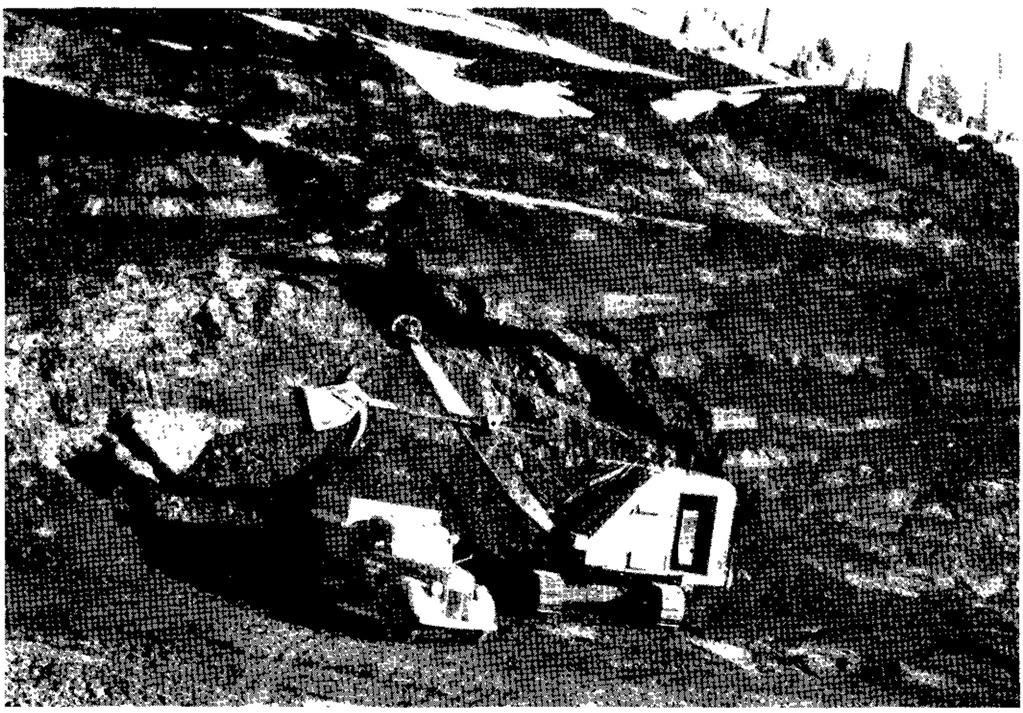
A. Plant of Clayburn Company, Limited, taken from Sumas Mountain, looking southerly over Sumas Prairie.

B. Outcrop of fireclay-seam and portals of underground workings of Richmix Clay Company, near Kilgard.

PLATE IV.



A. Dozer-loader attached to a 6-wheel drive General Motors truck, 7-yard capacity, excavating clay near Grand Forks.



B. Power-shovel loading coal at Michel strip mine.

METAL-MINING (LODE).

CONTENTS.

DRAWINGS.

GENERAL REVIEW.*

In 1947 lode metal-mining was not subject to serious interruptions, prospecting and exploratory work received a good deal of attention, and some major development programmes were in progress. The average number employed in the lode metal-mining industry,† including those underground and on surface at mines, those in mills and those in smelting-works, was 9,683 in 1947, compared with 7,220 in 1946. The quantities of ore mined† were: 1947, 5,018,169 tons; 1946, 3,705,395 tons.

The quantities of lode gold and of copper recovered materially exceeded the 1946 figures, but were considerably less than the averages for the past twenty years. The quantities of silver, lead, and zinc were somewhat less than the 1946 figures and were considerably less than the twenty-year averages. Prices for silver, copper, lead, and zinc were materially higher than long-time average prices; the price for lead was much higher than for any previous year. The combined value for the principal metals—gold, silver, copper, lead, and zinc—was $93,176,000. Antimony, bismuth, cadmium, tin, and tungsten had a combined value of $3,084,000, and sulphur, a by-product of metal-mining, had a value of $1,504,000. The total value for principal metals, minor metals, and sulphur was nearly $98,000,000, a figure much greater than the comparable one for any preceding year.

Although by the end of 1946 work had been resumed at metal mines affected by the strike in 1946, few of those mines were being worked at capacity and production had not yet been resumed at some of them. At most mines the number employed and the rate of production increased during 1947; however, scarcity of skilled miners was still noticeable at the close of the year, and some mines had been unable to obtain enough experienced men to carry on their full development programmes. The rates paid to employees at the copper and the silver-lead-zinc mines reflected the prices at which these metals have been sold recently. The rates paid at gold mines were increased materially when the strike was settled. A further increase of $1 per shift was made at most gold mines in the fall of 1947. Additional houses, or apartments in multiple-family dwellings, for employees with families and additional accommodation for single men were provided at several mines.

Mines in production during 1947 included twenty-six equipped with mills, of which eleven were operated for part of the year. The latter number includes the concentrator at the Emerald Tungsten property, where production was resumed in June, 1947, after being suspended in 1943. It also includes the Twin J (Mount Sicker), shut down in August; the new cyanide mill of Kenville Gold Mines, near Nelson; and the reconditioned and reorganized mill at the Dentonia mine, which began operating in November. Ore was trucked from two properties to mills controlled by the owner of the property. Ore from forty-seven other properties was shipped to smelters; shipments to smelters ranged from as little as 1 ton, produced by leasing-type operations, to 5,000 tons of silver ore shipped from the Highland Bell property, 1,380 tons of lead-silver ore shipped from the Silver Giant (Spillimacheen), and 24,710 tons of gold-bearing siliceous flux shipped from the Fairview-Morning Star at Oliver. Leasing-type operations are numerous in the Slocan-Ainsworth, Nelson, and Boundary areas.

The use of the diamond-drill for breaking ore was begun during the war years at the big mines and now is established practice. Diamond-drill blast-holes are used at the Copper Mountain mine in breaking all ore stoped. At the Sullivan mine all ore stoped below 3900 level and a good deal of the ore from recovering pillars above the 3900 level is broken by diamond-drill blast-holes. At Britannia a smaller but important tonnage is broken by the same means. Probably at least 50 per cent. of the ore mined in British Columbia in 1947 was stoped by blast-hole diamond-drilling.

* By Hartley Sargent.

† Excludes tungsten ore and flux.

Use of slusher hoists has become increasingly important, particularly at the larger mines where transfer of ore through slusher drifts has become an important part of the mining systems followed. Slushing has also become important in mining ore-bodies of low dip.

Improvements to plant were made at many of the producing and non-producing properties. At the Sullivan work was continued on the major programme which will provide a new main haulage-level, reducing the haul from the mine to the mill. This programme is coupled with development of lower levels, changes in the crushing and grinding departments of the mill, and installation of a " sink and float " plant to reject cherty waste before grinding. Rejects from the sink and float are to be returned to the stopes with a percentage of iron sulphide to cement the stope filling.

Preparations were made for mining ore below the main haulage-level at the Copper Mountain mine. The size of the main shaft at Cariboo Gold Quartz was increased to permit transfer of mechanical equipment and hoisting a greater tonnage of ore. Important changes in the crushing and flotation equipment of the Polaris-Taku mill, in the flotation section of the Silbak Premier mill, and installing additional equipment to increase the capacity of the Nickel Plate mill may be expected to have important effects on the production of these mines. Substitution of truck-haulage for the notably long aerial tramway at the Silbak Premier is proposed in 1948.

A road 18 miles long to serve the Toric silver property at Alice Arm was completed in 1947. Work has been started on building a mill and a new camp. Construction of a diversion-dam and power-house was completed. It is expected that the property will be brought into production by Torbrit Silver Mines in 1948.

A programme designed to bring the Reeves-McDonald silver-lead-zinc mine into production was announced in 1947. Road improvement and preliminary work at the property, including rehabilitating the camp and the plant, were done in 1947.

The Big Bull, a silver-lead-zinc property near Tulsequah; the Big Ledge, a zinc prospect on Upper Arrow Lake; and the Blue Bell at Riondel, Kootenay Lake, were further explored by the Consolidated Mining and Smelting Company. Silver-lead-zinc properties in the Slocan, Ainsworth, and Nelson Mining Divisions were explored by several companies. Completion of a tractor-road to the Crown Point silver-lead prospect on McMurdo Creek, in the Golden Mining Division, was reported.

Gold mines were further explored, and interesting results were obtained at several. The " 27 " vein at the Pioneer mine has been the object of much additional work, designed to delimit ore and to prepare for economical mining. It is now apparent that this vein will add years to the life of the mine. Discoveries of additional ore-bodies or of parts of the mines which are of great prospective interest have been made at the Polaris-Taku and at mines at Wells. Prospects near Tofino, on the west coast of Vancouver Island, have been explored, and it seems probable that a new producer may be brought in unless conditions develop unfavourably. At Vananda, on Texada Island, a revival of gold-copper mining is probable, although progress so far has been slower than was anticipated.

Non-producing gold properties were explored in the McDame Creek and Portland Canal areas. The development programme at the Salmon Gold (Morris Summit Gold Mines) property was continued, as was underground exploration at several properties in the Cariboo and Bridge River areas.

The discovery of gold-bearing veins in the Sustut Lake-McConnell Creek area made late in 1946 attracted a good deal of attention to that area in 1947. The results were less encouraging than 1946 reports indicated; however, an area of prospective interest has been indicated, and a prospect of considerable merit was discovered in the northern part of the area in 1947.

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. Information regarding companies has been obtained from the office of the Registrar of Companies. Statistics regarding development and production have been obtained from the Bureau of Economics and Statistics, through the courtesy of the property-owners. The figures given for metal production are "net," as calculated by the Bureau of Economics and Statistics by making the Bureau's usual deductions from the gross figures submitted by the property-owners.

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.

TAKU RIVER (58° 133° N.W.)*

Gold.

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

Company office, 1500 Royal Bank Building, Vancouver. W. F. James, managing director; F. H. MacPherson, manager; F. R. Jones, mine superintendent. Capital: 3,000,000 shares, no par value. This company owns all the issued shares of Polaris-Taku Mining Company, Limited. The property includes sixty-three claims and fractions extending across Tulsequah River valley and part way up its west slope.

The mine is 6 miles up-stream from the mouth of Tulsequah River, which enters the Taku River from the north 5 miles north-easterly from the British Columbia-Alaska Boundary. A road has been built from the mouth of Tulsequah River to the mine. Passengers and express are conveyed by aeroplane between the mine and Juneau, a distance of 40 miles. During the winter concentrates are stored, but during the summer six barges, four of 110 tons capacity and two of 90 tons capacity, carry them down Taku River to a freighter anchorage at the head of Taku Inlet. Return cargoes consist chiefly of oil and other supplies required in connection with mining operations during the ensuing year. Owing to shallow-water conditions in Taku River one barge at a time is pushed down-stream by tug to a point near the head of salt water. At high tide a second tug crosses the bar at the river-mouth and relays the barge to a deep-sea freighter.

Tulsequah River flows through a deep valley between mountains which rise to elevations of more than 5,000 feet. The valley-bottom is flat and wide, and the river follows a winding channel which has been eroded through recent sediments. The lower slopes are moderately steep, are covered with brush and trees, and are marked by narrow canyons cut by tributary streams. Except along these streams and on the steep and bare upper slopes, rock-exposures are few in number. The camp lies at the western edge of the level valley-bottom, and at a point where Whitewater Creek descends into the valley from the west.

Mineralization was first recognized in 1929 along the canyon of Whitewater Creek, and by 1933 trenching, drilling, and underground exploration had indicated a vein

* By J. M. Black.

system. Subsequent to 1935, parts of this system were developed on several levels, and in 1937 a mill was erected. Mining and milling were conducted from late in 1937 until 1942, when operations were discontinued owing to war-time restrictions. Operations were resumed in 1946, and at the end of 1947 the value of gold recovered from 450,000 tons of ore had amounted to $4,500,000.

The camp is self-contained, has accommodation for some 250 men, and in 1947 the working force was approximately 200. Approximately 700 electrical horse-power is generated by water from Whitewater Creek during the heavy run-off of the summer months. Additional power required during the summer, as well as all power required during the winter, is generated by diesel engines.

The upper part of the mine is developed by four adit levels—Canyon (elevation 580 feet above sea-level), B (elevation 364 feet), AJ (elevation 246 feet), and Polaris (elevation 136 feet). Between Canyon and B levels is C level—elevation 482 feet. From AJ level a vertical three-compartment shaft was sunk 900 feet, and from it five levels—namely, the 150, 300, 450, 600, and 750—have been driven at corresponding elevations of 14, 164, 314, 464, and 619 feet below sea-level. With the exception of the 600 and 750 levels, these levels are also connected by one or more raises.

Although initial development was undertaken on the Canyon level, little work has since been done in that section. Production has been derived chiefly from upper levels extending down to, and including, the Polaris and lying for the most part to the north and west of the shaft. On the levels below the Polaris, development so far is south and east of the shaft.

Polaris is used as the main haulage-level to the portal and mill bins. To this level ore is passed by chutes from above and is also hoisted from levels below.

For the most part ore is mined by shrinkage stopes. One shoot on 300 level, where sloughing to slips would result in excessive dilution, is, however, mined by cut and fill. A raise driven in this shoot from the 300 reaches the surface near the portal of Polaris level, and development waste sent down this raise is used for back-filling.

The mill handles about 250 tons per day, with the ratio of concentration of from ten to thirteen to one. A new cone-crusher has been added, and all the ore is now crushed in one shift. In order to release the very fine arsenopyrite crystals that carry the gold, the ore must be ground to 70 per cent. minus 200 mesh. Recovery has been increased substantially by the addition of another bank of ten flotation cells in parallel with the original bank.

During 1947, 5,646 feet of drifting and crosscutting, 781 feet of raising, and 7,671 feet of diamond-drilling were done. An ore-pass to provide storage and to facilitate ore-handling from the 750 to the 300 level was completed to within 75 feet of the latter level.

Production: Ore milled, 93,039 tons. Net contents: Gold, 22,714 oz.

The vein-zones occur in a complex consisting of a green tuffaceous series cut by many basic intrusives. The general relationships are shown by the plans and sections included in Fig. 1. Underlying the igneous complex are sediments of which the upper member comprises a group of limestone-beds. This sedimentary series is exposed at a distance of a quarter of a mile to the west of the shaft, where grey quartz-mica schist with a poorly developed schistosity strikes north 30 degrees west and dips very steeply.

Just east of this schist is a belt of massive and thin-bedded limestone, for the most part white with some bluish and grey beds. The contact between this mass of limestone and the schist is parallel to the schistosity and to the bedding of the limestone. Exposures of massive white limestone are found to the north of Whitewater Creek, about a third of a mile to the north of the shaft. The bedding, where seen, strikes

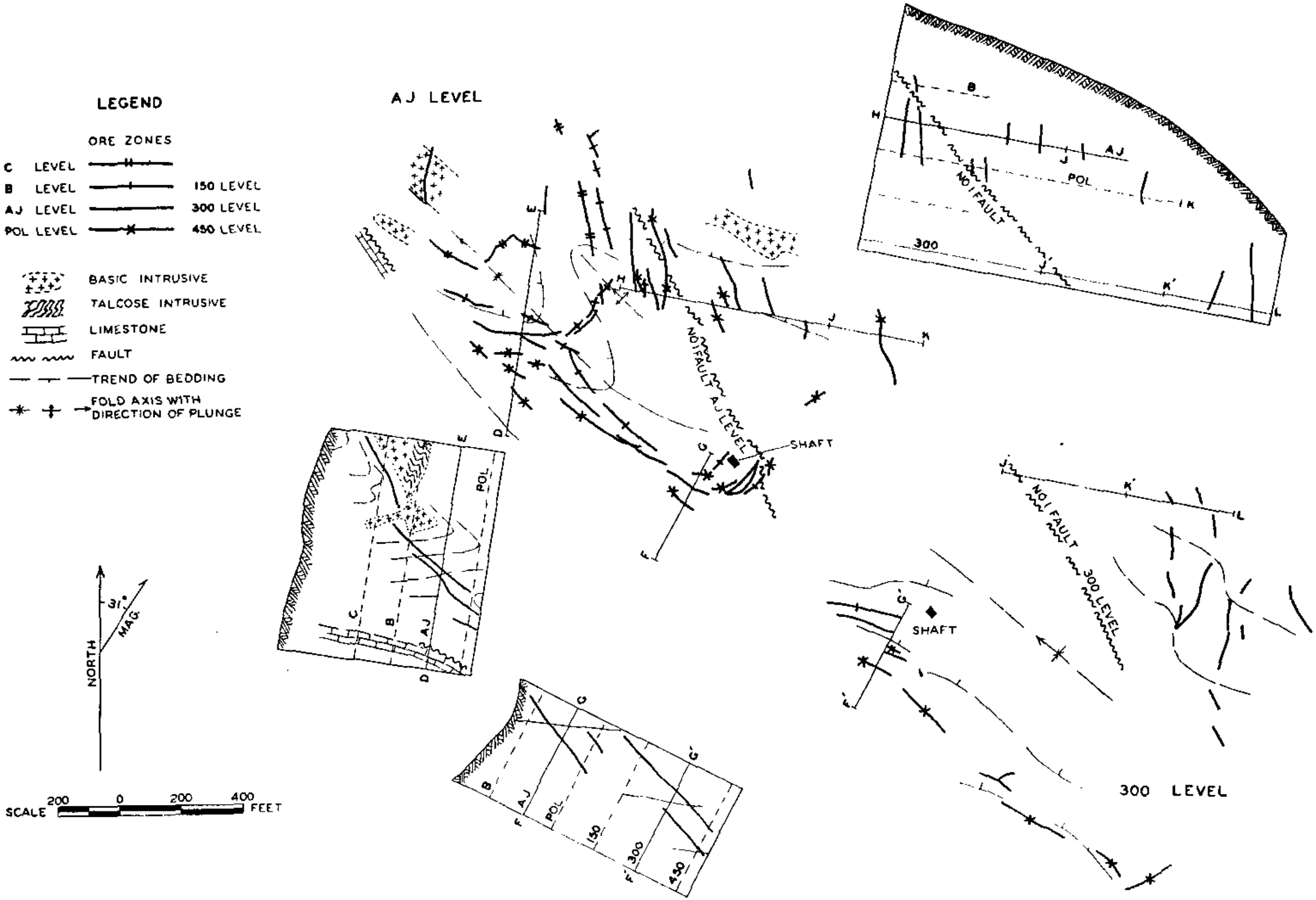


Fig. 1. Polaris-Taku mine—plan of AJ and 300 levels and three vertical sections, showing ore-zones and geology.

northerly and dips very steeply. According to Kerr*, all the above limestone is part of a widespread group of beds which rest on schistose sediments and are overlain by a volcanic series.

If, as it appears, the above relationship holds, all of these limestone outcrops represent a single limestone series. This means that the limestone and the underlying sediments are probably continuous under the tuffaceous series, and that the two surface exposures are on opposite limbs of a syncline. Map 45-30† indicates that sediments occur west and north-west of the tuffaceous series of the mine, and that these tuffs extend eastward. This may mean that the syncline is plunging south-easterly, depressing the sediments and limestone below the tuffs. The fact that additional massive white limestone exposed on AJ and Polaris levels strikes north-westerly and has a nearly vertical tip indicates that the south-western limb of the syncline along the 750 feet through which it can be traced from the surface is slightly overturned (*see* section DE, Fig. 1).

The tuffs overlying the limestone approach conformability with it, although at the contact there is a strike-fault with much gouge. These tuffs are mostly fine-grained and massive, with a few thin beds. A few beds may have been formed from coarse fragments, but they are now too schistose to be identified with certainty. These rocks are dominantly shades of green ranging almost to black. Some dark limy tuffs are found in the southern part of the 450 level near where the limestone may occur, but the lime content may indicate alteration of the tuffs rather than a gradation to limestone.

Carbonate alteration is intensive and widespread and, together with the development of much chlorite, has formed chlorite schists, which may possibly be of diverse origins. Some of these schists may have been flows, although none have been recognized. Some schists are at the contacts of small basic bodies intruded into the tuffs.

Most of these intrusives are so altered that, on the weathered surface, they can hardly be distinguished from the members of the bedded volcanic series. Of several intrusives exposed near and to the north of Whitewater Creek, a gabbro is the only one in which feldspar is now recognizable. The others, which appear to have been pyroxene-rich types, are now chlorite, actinolite, talc, and serpentine greenstones with much carbonate. These intrusives, which are many shades of green and grey to near black, are slightly schistose, and generally do not have a blocky fracture such as is typical of some of the tuffs.

Because of the similarity to the bedded members of the complex, the contacts of these intrusives are not readily found. They are transgressive bodies, the shapes of which have been partly controlled by the tuffs they intrude. They are most abundant in the north end of the upper workings indicated on Fig. 1; elsewhere they are small and are not shown.

The tuffs are in nearly closed folds that strike and plunge steeply north-westerly. The axial plane of one of these folds dips south-eastward—moderately on the upper levels and more steeply on the lower levels—and, on approaching the limestone, becomes more nearly parallel with it. Most of the beds dip steeply north-eastward, and there are few reversals of this attitude. It appears that this tuffaceous series was forced into a number of lesser folds within the major limestone syncline, and that possibly these lesser folds die out toward the limestone. The differential movement was taken up by slipping along the limestone-contact. In a few places the beds deviate from the general trend to become parallel with the contact of an intrusive.

Poorly developed schistosity noticeable throughout the complex is caused by the rough alignment of chlorite crystals. The schistosity has a fairly constant attitude,

* *Geol. Surv., Canada*, Sum. Rept., 1932, Pt. A II, p. 17.

† *Geol. Surv., Canada*, Prel. Paper 45-30.

with north-westerly strikes and steep dips, but deviates locally from this general attitude near faults, veins, and contacts with the intrusive bodies. For the most part the schistosity seems to be related to the bedding of the tuffs and to the contacts of the intrusives, some of which are also controlled by the bedding.

The ore-shoots occur in mineralized zones in "A" shear, and in a series of northerly striking vein-zones which are referred to here as the North veins. A vein-zone now being developed in the "A" shear is known as the "B" zone. All the North veins are numbered, although two of these, developed between the 300 level and the surface, are known as the "Y" veins. A few other ore-shoots occur in vein-zones and are intermediate in attitude and position between the two main vein systems. (Fig. 1 shows the vein pattern.)

The "A" shear-zone, although not well defined, has a general width of more than 100 feet, is itself cut by many shear-zones, and has an over-all strike of south 50 degrees east and a steep dip south-westward. In the north-west it is close to the limestone and nearly parallel to it, but to the south-east gradually swings away from the limestone.

Because the tuffs and the shear have about the same strike, and because no member of the tuff series is recognizable as a marker, the displacement along "A" shear is not known. It has been followed by the workings for half a mile and vertically for more than 1,000 feet. In addition to features noted above, the "A" shear-zone is marked by many mineralized and parallel zones and faults. Although in the entire length of the shear there is at least one recognized mineralized zone, neither this nor other possible zones are necessarily of ore grade. In general, a mineralized zone lying near the hanging wall in the west will, toward the east, strike toward the foot-wall and in some cases pass out of the "A" shear. Moreover, at the point where one zone may leave, another may appear near the hanging wall. Some of the zones that turn out into the foot-wall curve around toward the north, and these contain the intermediate type of ore-shoot. These zones may continue on as North veins, though the continuity is broken by No. 1 fault, which passes between most of the North veins and the "A" shear. A few short mineralized zones branch from the "A" shear into the hanging wall.

The ore-shoots within the mineral zones rake steeply to the south-east, and are widest (up to 50 feet) opposite the largest intrusive bodies. These great widths of mineralization may have resulted from a general shattering and reopening of the fractures within the shear, by the stresses caused directly by the intrusions or by the expansion resulting from their alteration. On "A" shear, ore-shoots have been found from the surface to the 450 level, which is the lowest developed on this structure. The largest and richest shoots have been encountered on the upper levels, and most of the ore mined from "A" shear has been from above Polaris.

Most of the mineral zones in the North veins are indicated on Fig 1, but the position of a few of the shorter ones, including those on Canyon level, have been omitted. Most of these zones strike within 20 degrees of north, have steep dips, and lie east of No. 1 fault. Those west of this fault swing to the west as they approach "A" shear. The ore-shoots in these shears are smaller and of higher grade than those in "A" shear and have produced less ore. They have been found over a vertical range of 1,000 feet, and on the 300 level the values are higher than on the upper levels. A long crosscut eastward on 600 level has exposed a northerly striking vein, 28 inches wide and well mineralized, 630 feet east of the shaft.

The ore-shoots between the "A" shear and the North veins are shorter than the other shoots, but otherwise are similar. They dip south-eastward, those near the shaft steeply and those in the west moderately. A small proportion of the ore mined has come from the above shoots.

The mineralized shears are found in all members of the igneous complex. They are widest and most continuous in the bedded blocky members, and tend to be narrow and less intensively mineralized in the schistose and serpentinized members, while some of the ore-shoots end at the contacts of these less blocky types. However, this condition does not always apply, an exception being found on B level where a mineralized zone of higher than average grade occurs in an altered intrusive composed of talc and carbonate. As yet this deposit has not been developed, since, if milled by the usual procedure, the talc content of the ore adversely affects gold-recovery. Most of the ore-shoots in question vary in width from 4 to 10 feet.

The ore in all shears is similar, and consists of white quartz and carbonate veins, and of lenses with fragments of wall-rock which are partly replaced by pyrite and arsenopyrite. The sulphide replacement extends into the walls, and because the arsenopyrite crystals are generally very small, it is difficult to determine the limits of mineralization. The only other sulphide seen in the ore-zones is stibnite, which usually occurs as coarse-bladed crystals in the quartz and carbonate veins. In its distribution it is not as consistent as the other sulphides, although it is found in all parts of the mine.

The widespread carbonate alteration is intensified near the ore-zones, and has caused a bleaching of the normal greens. Some of the chlorite in the zones is of a paler green, while the remainder of the rock varies in colour from a very light green to white. In places the result is a fresh-looking rock, apple-green in colour.

Most of the gold is associated with arsenopyrite, but although the presence of arsenopyrite is an indication of gold, the amount of gold is not proportional to that of arsenopyrite. In some instances the gold is associated with the stibnite, and a small proportion is free. Samples were taken from the levels below Polaris, where development and exploration are now concentrated. Of twelve samples, seven were taken from development-headings and five from stopes. The results of assays are as follows:—

Level.	Zone.	Width.	Gold.	Silver.	Arsenic.
		Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.
150	A	45	0.28	Trace	0.29
300	A	72	0.51	0.1	0.74
300	North	54*	0.10	*Nil*	0.70
		80†	0.26	Trace	0.99
300	North	18	0.44	0.2	0.91
300	North	54	0.18	*Nil*	0.42
300	North	36*	0.30	Trace	1.19
		48†	0.12	Trace	0.47
450	B	45*	0.30	Trace	0.63
		15†	0.90	Trace	0.51
450	B	36	0.19	Trace	0.65
600	North	28	0.85	Trace	1.32

* Foot-wall. † Hanging wall.

In addition to many slips in the shear-zones, there are many fault-zones. No. 1 fault strikes about north 25 degrees west and dips about 50 degrees eastward. It is a zone up to 20 feet wide, marked by many gouge-filled slips which lie nearly parallel to the zone itself. "A" shear has been found only west of this fault, and most of the North veins are east of it. The fault-displacement has not been determined, although the drag of bedding and schistosity near it suggest that it is a normal fault of considerable horizontal movement and that the east side has moved southward.

It is probable that the above represents the general direction of movement, since it is also the direction of displacement of several near-by parallel fault-zones which lie to the west of No. 1 fault. These strike nearly due north toward the North veins and dip eastward more steeply than No. 1 fault. Where they cut "A" shear, the horizontal displacement is to the right, and in one instance amounts to 150 feet. On the others it is less than this. Movement on these faults occurred both before and after mineralization.

Many other faults displace the mineral zones, and at the contacts of the basic intrusions there has also been some movement. These lesser faults have a great variety of attitudes.

Dyke material represents the youngest rocks which range in composition from basic to felsitic. The dykes have a northerly strike and steep dips, or parallel closely the bedding and schistosity. Some of them are in "A" shear, and in an ore-shoot they reduce the grade of ore. The most notable is a felsite dyke up to 30 feet wide, which strikes southerly and is exposed on the surface, on Polaris and 300 levels east of No. 1 fault, and on 600 level west of No. 1 fault.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1929, p. 142; 1936, pp. B 21–B 28. *Geol. Surv., Canada,* Sum. Rept., 1930, Pt. A, pp. 35, 36; Sum. Rept., 1932, Pt. A II, pp. 15–28; Paper 45-30, Preliminary Map.]

South Slope. This group of eight claims, held by G. Bacon, J. MacDonald, and C. H. Smith, was located in 1940. Mineralized shears were found in 1931, and the ground was located then as the Silver Bird group. In 1931–32 some of the shears were trenched and some of the results of this work can still be seen.

The showings lie at elevations ranging from 1,100 and 1,400 feet on the north slope of Wilms Creek valley, and about 4 miles by a poor trail from the Polaris-Taku mine road. A better trail about 5 miles long, which leaves the road south of Wilms Creek, is not used now because there is no bridge across the creek.

One shear-zone, exposed in Sulphide Creek, is in sericite schist which strikes north 80 degrees east and dips steeply southward, near a felsite dyke, with a south-easterly strike and a nearly vertical dip. This shear, which strikes northerly and dips about 45 degrees eastward, comprises a silicified zone which is mineralized with pyrite and arsenopyrite across a width of 8 inches. A picked sample of the mineralization assayed: Gold, 0.22 oz. per ton; silver, trace. It was reported by the owners that this shear had been traced by trenching for 150 feet.

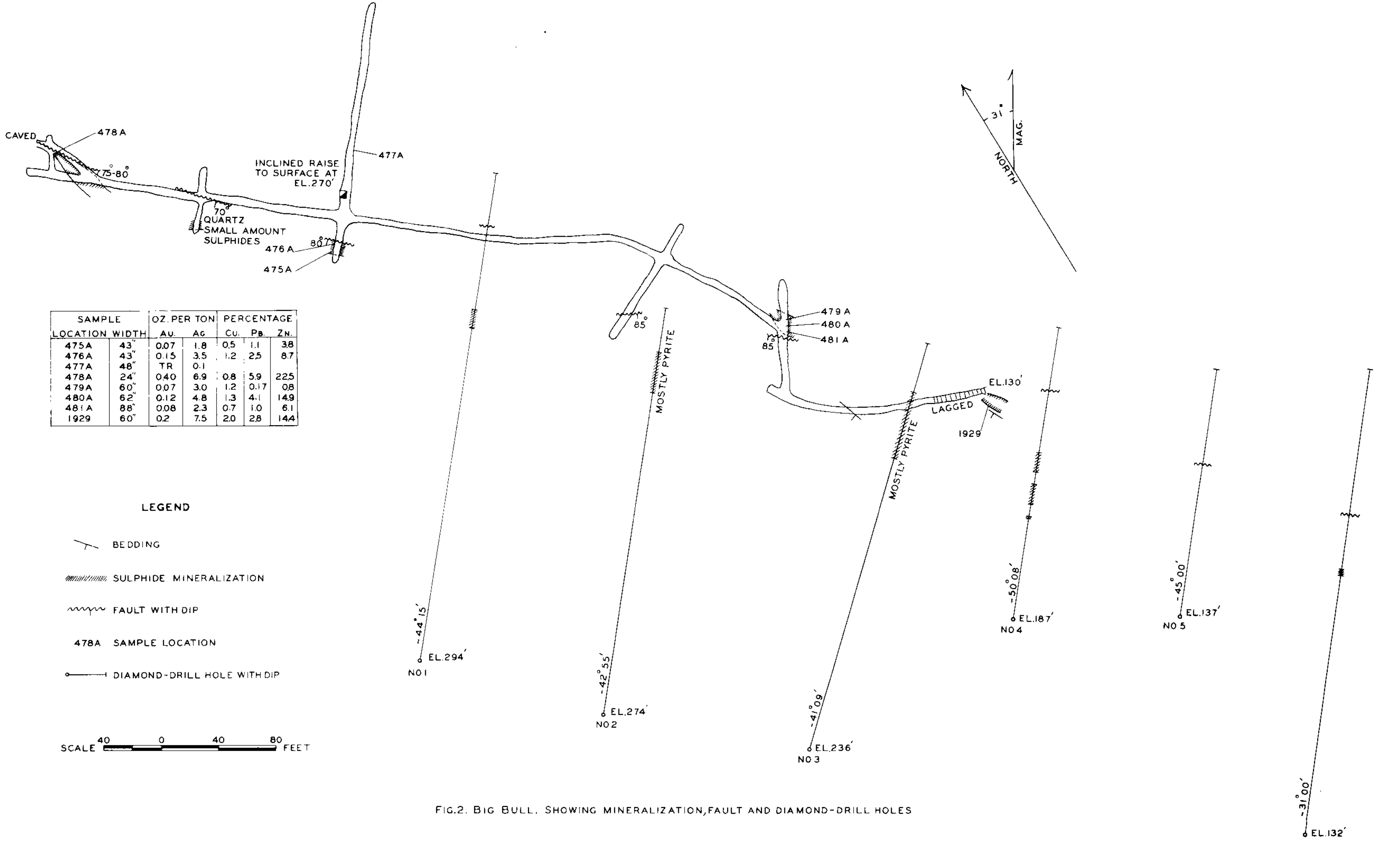
Another mineralized zone occurs on Middle Creek, about 1 mile north-westerly from the first shear. The country rock of quartzose argillaceous schist, striking north-westerly and with a south-westerly dip, is cut by a shear-zone and, 10 feet west of the shear, by a felsite dyke about 2 feet wide. Both the dyke and the shear strike in a northerly direction, while near the shear the schistosity curves until it becomes parallel to the shearing.

The above shear-zone, which is from 3 to 5 feet wide, consists of a very dark silicified zone, partly leached, containing pyrite and arsenopyrite. At the southern end of its exposed length the shear dips moderately westward, and a sample taken across 48 inches assayed: Gold, 0.15 oz. per ton; silver, 0.2 oz. per ton.

At the northern end of the shear, as exposed, and 50 feet northerly from the lowest exposure, the dip of the zone is gently westward. A sample taken across 42 inches, which may be less than the width of the zone because the schist of the hanging wall is eroded, assayed: Gold, 0.01 oz. per ton; silver, *nil.*

[References: *Minister of Mines, B.C.,* Ann. Rept., 1931, p. 62. *Geol. Surv., Canada,* Sum. Rept., 1932, Pt. A II, pp. 25–27.]

Big Bull. This group of eight claims, 3 miles north of the confluence of Tulsequah and Taku Rivers, is reached by boat or by a mile of newly built road which joins a road built in 1947 up the east side of Tulsequah Valley. Two of the claims, formerly part of the Manville group, have been held by a syndicate in Juneau since they were located in 1929. In 1929–30 an attractive showing in a creek



SAMPLE		OZ. PER TON		PERCENTAGE		
LOCATION	WIDTH	AU.	AG	CU.	PB.	ZN.
475A	43″	0.07	1.8	0.5	1.1	3.8
476A	43″	0.15	3.5	1.2	2.5	8.7
477A	48″	TR	0.1			
478A	24″	0.40	6.9	0.8	5.9	22.5
479A	60″	0.07	3.0	1.2	0.17	0.8
480A	62″	0.12	4.8	1.3	4.1	14.9
481A	88″	0.08	2.3	0.7	1.0	6.1
1929	60″	0.2	7.5	2.0	2.8	14.4

FIG. 2. BIG BULL. SHOWING MINERALIZATION, FAULT AND DIAMOND-DRILL HOLES

on the Big Bull claim was trenched and drilled; an adit was driven under it and a raise put up from the adit to the surface-showing. In 1946 Consolidated Mining and Smelting Company of Canada optioned the Big Bull and the Big Bull Extension, and located six other claims near by. In 1947 the same company drilled 5,469 feet in twelve holes, of which six had been completed when the property was examined in August. A tent camp was set up, and about ten men were employed, with J. C. MacLean in charge.

Near the workings impure tuffs of many shades of green and grey, striking north-westerly and dipping south-westward, are cut by many green dykes. Near the mineral-zone the rocks are altered, and range from dark to light grey in colour and are slightly schistose. In the southern part of this altered zone there is much hematite and some jasper. Where intensely altered, the rock is composed of quartz, light-coloured mica, pyrite, and possibly some talc. This altered zone strikes north-westerly and dips steeply southward. It contains mineralized bodies consisting of quartz with pyrite, sphalerite, chalcopyrite, and galena, and some unreplaced country rock.

The sulphide mineralization exposed in the creek near the raise has a banded or layered appearance, and each of the many layers differs slightly in the amount and proportion of the associated sulphides, and it appears that some of the beds, not all of the same composition, had been replaced. The exposure at the portal of the adit has a similar appearance. Trenching indicated that surface exposures of the sulphides form part of a practically continuous zone or zones.

The sulphide mineralization exposed in that part of the adit which is now accessible is shown on Fig. 2. The adit, which is 1,950 feet long, extends 1,250 feet beyond the point where it is now caved, but, according to Kerr,* in that distance of 1,250 feet little mixed sulphide mineralization is exposed. All the exposures in the adit, except the most easterly one, appear to be part of one zone about 950 feet long. The easterly one appears to be part of a zone about 450 feet long, while the most easterly exposure may be part of a second zone that includes also the mineralization near the portal.

All the exposures of mixed sulphides in the adit are near a gouge-filled fault that strikes north-westerly and dips steeply south-westward. Most of them appear in one of the walls of this fault, and the one exposure that is separated from the fault by some country rock has a much smaller proportion of sulphides. Nearly parallel to this main fault are many other faults, along each of which there is less gouge. It is probable that this set of faults gave access to solutions that altered the tuffs and mineralized them. A small dyke is displaced by the main fault, possibly 110 feet to the right, though this movement may be only the last of many along the fault.

Six samples were taken across the exposures of sulphide mineralization, and the assays for these and one taken by J. T. Mandy in 1929 across the outcrop at the portal are given herewith:—

Width.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.
43 inches	0.07	1.8	0.5	1.10	3.8
44 „	0.15	3.5	1.2	2.50	8.7
24 „	0.40	6.9	0.8	5.90	22.5
60 „	0.07	3.0	1.2	0.17	0.8
62 „	0.12	4.8	1.3	4.10	14.9
88 „	0.08	2.3	0.7	1.00	6.1
60 „	0.20	7.5	2.0	2.80	14.4

A sample (477A) of pyritic mineralization free of other sulphides assayed a trace of gold and 0.1 oz. of silver per ton.

* *Geol. Surv., Canada*, Sum. Rept., 1930, Pt. A., p. 34.

There is much pyrite in drill-cores and in some of the ore sulphides in zones indicated in Fig. 2. Judging from the proportion of sulphides in these zones, the grade is about the same as that of the samples taken. In the widest intersections, in Holes 2 and 3, there are very little sulphides other than pyrite, and these are probably of much lower grade. The mineralized zone appears to narrow toward the east. Many faults are intersected by the holes, and the most prominent are shown in Fig. 2.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1929, pp. 118, 120, 130, 139–141. *Geol. Surv., Canada,* Sum. Rept., 1930, Pt. A, pp. 32–35.]

McDAME CREEK (59° 129° S.E. AND S.W.).*

Gold.

McDame Creek, a tributary of Dease River, has been noted for its placer deposits, which have included some of the richest in northern British Columbia. Adjacent to the headwaters of the creek are many lode deposits, and some of these were examined in 1947.

The McDame area is reached from the coast via Stikine River to Telegraph Creek, thence by road to Dease Lake, and from there by boat down Dease Lake and Dease River. Alternatively it may be reached from Lower Post on the Alaska Highway by ascending Dease River to the mouth of McDame Creek. A tractor-road extends for 12 miles up McDame Valley, and from the end of this road a pack-trail continues for about 17 miles to Quartzrock Creek, from which pack-trails lead to the various prospects. Aircraft can land on McDame Lake and several other lakes in the vicinity.

A 70-mile tractor-road, now being built from the Alaska Highway to a point 12 miles above the mouth of McDame Creek, will afford much easier access to the valley.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1935, pp. B 12–B 22.]

Benroy Gold Mines, Ltd. Company office, 1508 Standard Building, Vancouver. R. R. Armstrong, President; T. S. Davey, engineer. This company, formed in 1946, bought the Cornucopia group of seven claims, located in 1935 and held by J. C. Simpson until sold in 1946. The group is on the east slope of Quartzrock Creek valley and 2 to 3 miles north of McDame Lake. Several thousand feet of trenching has been done, and in 1946 about 5,000 feet of diamond-drilling was completed from the surface in order to explore gold-bearing quartz veins. No work was being done when the property was examined in 1947.

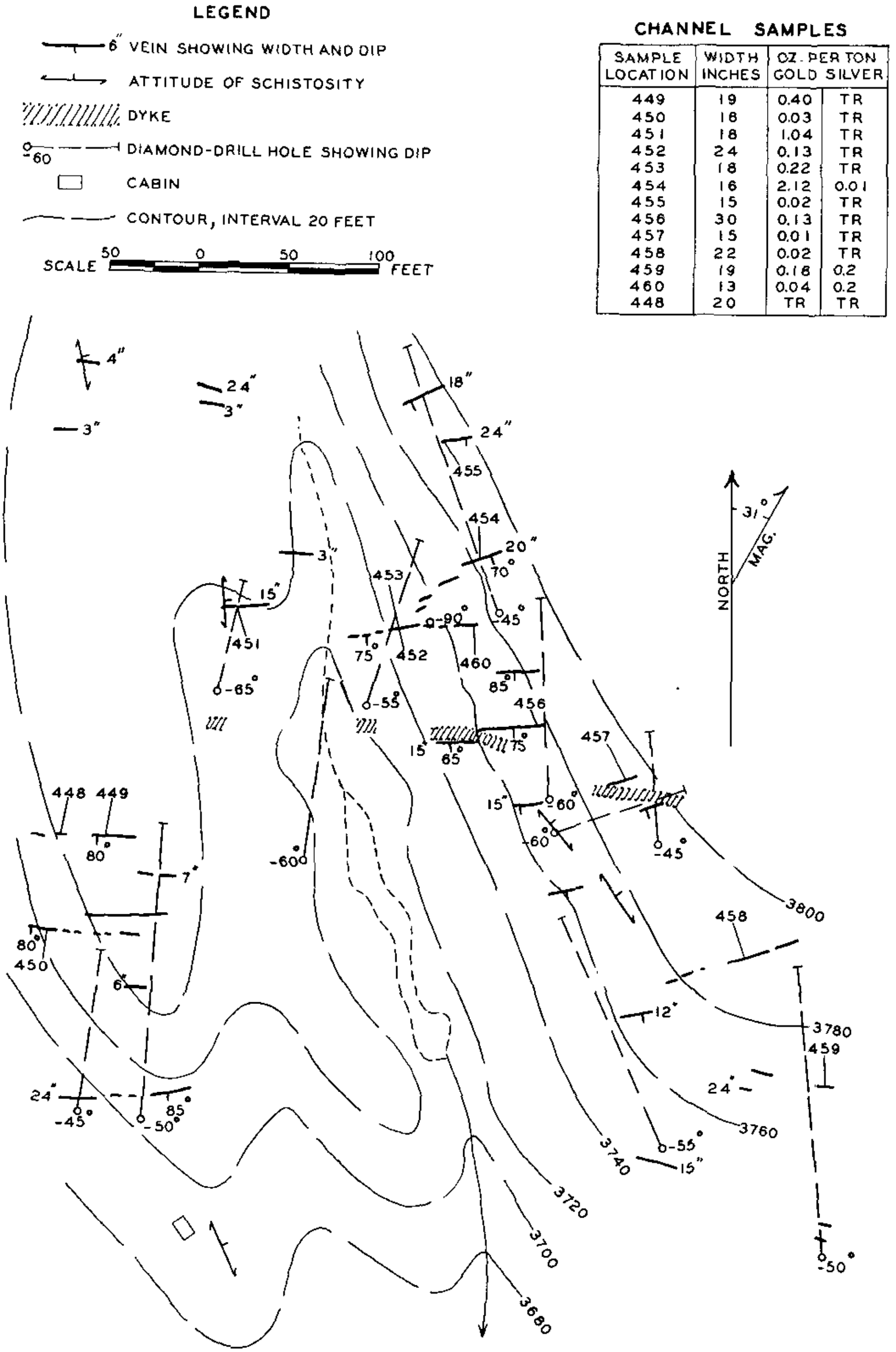
The veins, which occur on a rolling slope at an altitude of about 3,750 feet, are exposed in a few outcrops and by many trenches. Fig. 3, based on a plane table survey, shows the veins, assays, and the general features of the geology.

Flows and tuffs, mostly grey and green, contain a few argillaceous and cherty interbeds. The bedding cannot be seen in the surface exposures probably because of the development of a rude schistosity which strikes north-westerly and which dips eastward at moderate angles.

A greenish-brown diorite dyke varying up to 15 feet in width, with coarse feldspar crystals at the centre, strikes a little north of west and nearly parallel to the veins. It cuts the volcanics and the veins, and for part of its exposed length follows a vein-fracture. The most westerly exposure of dyke-rock is similar to the other exposures, is about on strike, and may mark the extension of the same dyke. It is about 75 feet west of and across a draw from the nearest exposure of dyke. The draw, in which there is a narrow pond and a stream, may mark the line of fault, but, if so, there has been but little horizontal displacement subsequent to intrusion of the dyke.

It is probable that the veins were formed not long before the dyke was intruded, and that they also have not been displaced.

* By J. M. Black.



CHANNEL SAMPLES

SAMPLE LOCATION	WIDTH INCHES	OZ. PER TON GOLD	SILVER
449	19	0.40	TR
450	18	0.03	TR
451	18	1.04	TR
452	24	0.13	TR
453	18	0.22	TR
454	16	2.12	0.01
455	15	0.02	TR
456	30	0.13	TR
457	15	0.01	TR
458	22	0.02	TR
459	19	0.18	0.2
460	13	0.04	0.2
448	20	TR	TR

Fig. 3. Benroy Gold Mines, Limited—plan showing veins, assays, and diamond-drill holes.

The width of veins varies from a few inches to 3½ feet, and the veins strike from north 60 degrees east to south 80 degrees east, with a generally steep dip to the south. They consist of white and rusty quartz, some bluish quartz, and small amounts of pyrite, generally near the walls. They are marked by fracturing; much of the pyrite has been leached from the surface exposures, leaving small cavities containing a small amount of limonite, and the wall-rock itself has been sheared and pyritized. Drill-cores show that replacement by coarse pyrite crystals, accompanied by some quartz stringers, extends for several feet from some of the veins.

Thirteen samples, taken from surface exposures (*see* Fig. 3), assayed as follows:—

Width.	Gold.	Silver.	Width.	Gold.	Silver.
	Oz. per Ton.	Oz. per Ton.		Oz. per Ton.	Oz. per Ton.
20 inches	Trace	Trace	15 inches	0.02	Trace
19 „	0.40	Trace	30 „	0.13	Trace
16 „	0.03	Trace	15 „	0.01	Trace
18 „	1.04	Trace	22 „	0.02	Trace
24* „	0.13	Trace	19 „	0.18	0.2
18† „	0.22	Trace	13 „	0.04	0.2
16 „	2.12	0.1			

* Foot-wall. † Hanging wall.

The higher assays represented samples which contained pyrite, while the lower assays represented samples which contained little or no pyrite and were from veins that appeared to be barren or devoid of cavities. Results thus indicate that much of the gold content is associated with the pyrite.

Positions, approximate directions, and length of the drill-holes are indicated in Fig. 3. Vein-sections from the cores were removed for assay, and it is not known whether these sections contained more pyrite than did the surface exposures. It is reported that, because of the fracturing in and near the veins, core-recovery of the veins was low and that much of the sludge was not recovered.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1935, p. B 21. *Geol. Surv., Canada*, Mem. 194, pp. 15, 16.]

Klondike Fraction.

This fraction, south of the Cornucopia group of the Benroy Company, is held by P. Hankin, and is reached by a trail, a quarter of a mile long, which runs easterly from the Cornucopia Trail. The branch trail ends at about 3,700 feet altitude, at a vein of white quartz from 2 to 3 feet wide, containing a few rusty cavities. This vein, which strikes westerly and dips 65 degrees southward, is in sheared volcanics which strike north 30 degrees west and dip eastward. In a length of 150 feet the vein is indicated by two cuts, a few outcrops, and some float. A sample taken across 3 feet of well-fractured quartz assayed: Gold, 0.16 oz. per ton; silver, trace.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1935, p. B 21.]

Gold Hill and Lake Shore.

These two claims extend south from McDame Lake and are held by P. Hankin. They include ground that was formerly the Lakeview claim, on which several showings were opened up and tested by the Consolidated Mining and Smelting Company of Canada in 1937. Recently more work has been done to the south of the earlier workings, though no work was being carried on when the claims were visited. The trenches found are half a mile south 55 degrees west from the cabin on the south shore of the lake, and at an elevation some 250 feet higher. They are 300 feet west of the trail that leads south-west from the cabin.

Country rock adjacent to the trenches consists of grey silicified and pyritized flows or tuffs. It is not exposed in two trenches which partly uncover two veins, although one of these trenches is 3 feet deep. The veins consist of massive and shattered milky white and glassy quartz, with small amounts of pyrite and tetrahedrite and some rusty cavities.

One vein, nearly 3 feet wide, appears to strike north 70 degrees east, and a picked sample from it assayed: Gold, 0.02 oz. per ton; silver, 0.4 oz. per ton. The second vein, which is 175 feet north 65 degrees east from the first, is more than a foot wide and strikes north-easterly. A picked sample assayed: Gold, 0.02 oz. per ton; silver, 0.4 oz. per ton.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1937, pp. B 36, B 37.]

Turmoil. The Turmoil, Turmoil No. 2, No. 3, and No. 4, and the Turmoil Extension Mineral Claims were recorded in the years 1942 to 1946 by P. Hamlin. The property lies at the headwaters of Pooley Creek, a tributary of Dease River, and is 5½ miles south of McDame Lake. It may be reached by any of three trails, which vary in length from 8 to 10 miles. One trail was built from the mouth of Cottonwood Creek, another from the mouth of Pooley Creek, and a third from McDame Lake. The greater part of the trail from McDame Lake was built some years ago to Table Mountain, and the last few miles, which do not follow the most direct route, could be shortened considerably.

The workings lie on a broad, rolling upland bordering a swampy meadow and are at an elevation of approximately 3,850 feet. Overburden is generally several feet thick and outcrops are few. Timber is abundant on the better-drained slopes to the west.

At the mineral-occurrence the rock is medium-grained, green, and massive, and is probably a volcanic flow. About 100 feet to the north are exposures of a dark soft serpentinized gabbro. These rocks may be members of the McLeod series. An altered bleached zone, strike south 60 degrees west and dip steep, appears to be a sheared zone in the massive greenstone, near its contact with the intrusive. The zone has been exposed by trenches for 300 feet and by a shaft 20 feet deep at the west end. Some of the trenches are now sloughed and the shaft was partly filled with water.

The zone is silicified and pyritized, and contains many steeply dipping quartz veins which lie nearly parallel with it. At their western ends these veins dip toward the north, while at their eastern ends toward the south. A few of the veins are as much as 3 feet wide, though most of them are a few inches wide. These veins consist of white quartz, but some narrow stringers are of grey and blue quartz. Most of the mineralization is in the wall-rock and consists of pyrite, tetrahedrite, chalcopyrite, and sphalerite. Fairly coarse free gold is reported to occur at the intersection of three veins at the bottom of the 20-foot shaft.

As exposed in a wide trench at its eastern end, the zone is 9 feet wide and consists of three veins of white quartz, of which only the middle one is mineralized. Between the middle vein and the two others are small stringers and much pyrite. The middle vein and other mineralization was sampled, and the following assays reported:—

Width.	Description.	Gold.	Silver.
		Oz. per Ton.	Oz. per Ton.
22 inches	Silicified and pyritized zone	0.05	0.4
26 ,,	Quartz vein with little tetrahedrite	0.01	0.2
30 ,,	Silicified and pyritized zone	0.07	Trace

PORTLAND CANAL.*

SALMON RIVER (56° 130° S.E.).

Gold-Silver.

Silbak Premier Mines, Ltd.† Company office, 911 Birks Building, Vancouver; mine office, Premier. D. L. Pitt, managing director; J. C. Pearcey, manager. The mine is about 15 miles by road north of the town of Stewart, at the head of Portland Canal. The Silbak Premier property includes the former Premier, B.C. Silver, and Sebakwe properties which adjoined. Silbak Premier Mines, Limited, was incorporated in 1935, and thereafter operated the consolidated property as one mine, using the Premier mill and plant. Exploratory work on the Premier property had been done as early as 1911. Work on the B.C. Silver and Sebakwe properties had been done over a period of years, and in 1925 the properties came under the control of the same company. Following a period of active exploration, little was done on the B.C. Silver and Sebakwe properties from 1930 until the consolidation. Ore was shipped from the B.C. Silver in 1924, 1926, and 1927.

Vigorous development of the Premier property was started by Spokane, Wash., and Fernie, B.C., interests in 1917. In 1919 the American Smelting and Refining Company acquired an interest in the property, and the Premier Gold Mining Company, incorporated that year, operated the Premier mine until 1935. Shipments of high-grade ore to the Tacoma and Anyox smelters were made from the Premier, beginning in 1918; and after the mill began operating, the practice of shipping high-grade and fluxing ores was continued until 1933. A 100-ton mill, completed in 1921, recovered the values in part as cyanide precipitates and in part as table and flotation concentrates. In 1926 cyanidation was abandoned. Since 1933 all ore has been milled and values have been recovered in concentrates shipped principally to the Tacoma smelter, but some lead-bearing concentrates have been shipped to the smelter at Selby, Calif. The capacity of the mill was increased from time to time, and in 1931 was increased to about 550 tons a day. However, for the last few years the mill has been operated at less than capacity.

Early shipments were of very high-grade ore, containing several ounces of gold per ton, and in one year averaged more than 200 oz. of silver per ton. The ore shipped to Anyox was lower grade than that shipped to Tacoma. The maximum quantity of ore shipped in any one year was in 1925. Shipments of ore in the years 1922, 1925, and 1929 were:—

Smelter.	Ore.	Gross Contents.	
		Gold.	Silver.
1922.	Tons.	Oz.	Oz.
Tacoma	38,959	77,582	2,990,073
Anyox	26,615	26,317	807,389
Totals	65,574	103,899	3,797,462
1925.			
Tacoma	89,219	76,541	1,598,761
Anyox	23,634	16,383	379,929
Totals	112,853	92,924	1,978,690
1929.			
Tacoma	74,617	36,965	1,030,185
Anyox	27,212	14,108	378,668
Totals	101,829	51,073	1,408,853

* By J. M. Black, except as noted.

† By W. H. White and J. M. Black.

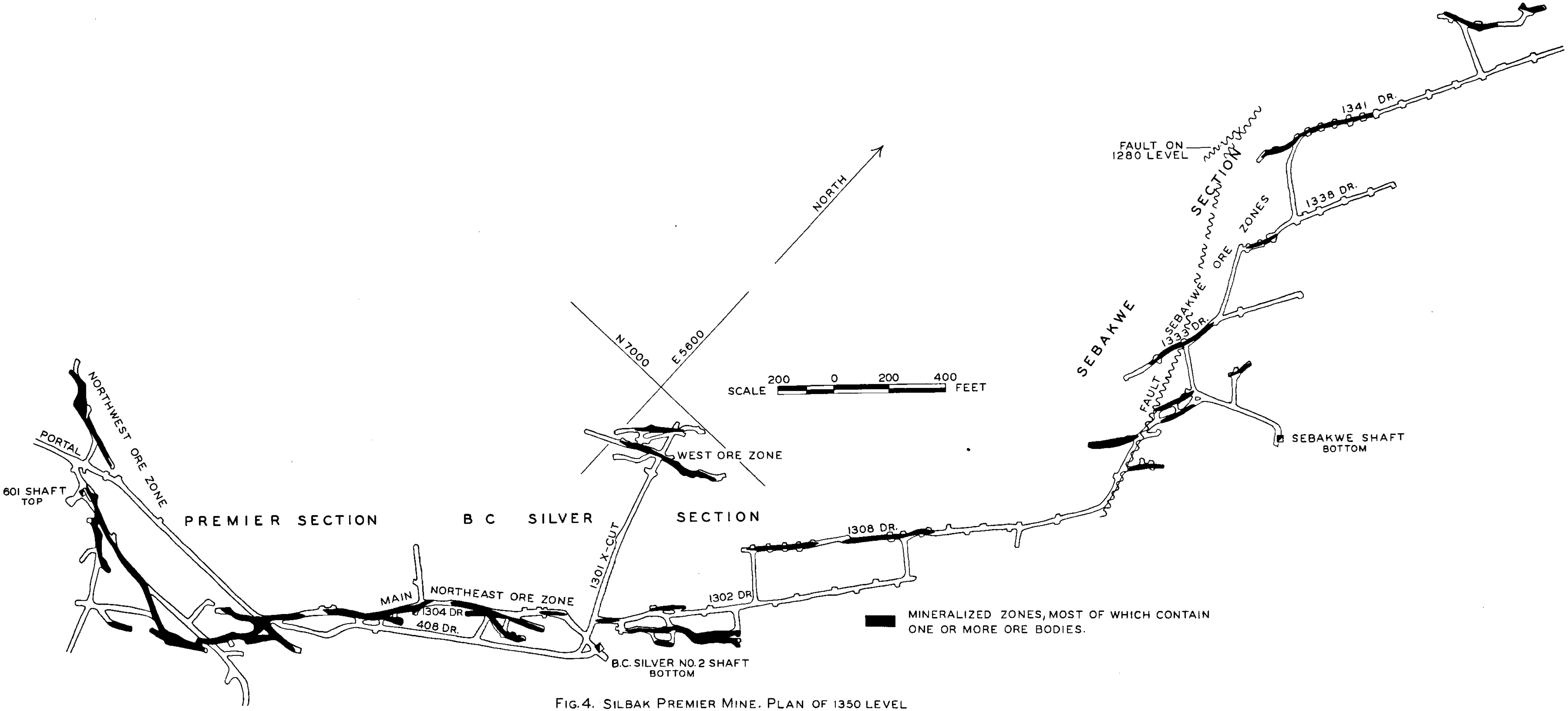


FIG. 4. SILBAK PREMIER MINE. PLAN OF 1350 LEVEL

Shipments from the B.C. Silver property in 1924, 1926, and 1927 amounted to 1,103 tons, and contained 2,136 oz. of gold and 83,831 oz. of silver.

After the first few years the grade of ore mined declined gradually. The proportionate decline in silver was greater than in gold. This decline was in part because changes in mining and milling practice made it possible to derive a profit from lower-grade material and in part because the price of gold increased materially in 1932 and 1933 and again in 1939.

The total production from the property up to the end of 1947, including production before the consolidation and including ore shipped crude and ore milled, amounts to 4,374,287 tons. Net contents: Gold, 1,736,248 oz.; silver, 36,703,762 oz. Thus the Silbak Premier property ranks among the foremost producers of gold and of silver in the Province. Dividends paid by the Premier Gold Mining Company up to and including 1936 amounted to $18,858,075. Dividends from subsequent operations by Silbak Premier Mines to the end of 1947 amounted to $2,375,000. Gold and silver have contributed most of the revenue from the ore, but past production also includes copper and a not inconsiderable quantity of lead. In 1947 the ore milled amounted to 59,343 tons, averaging: Gold, 0.22 oz. per ton; silver, 1.49 oz. per ton; and lead, 2.25 per cent. The current ore, drawn mainly from the lower levels of the mine, contains more than 2 per cent. lead and roughly 3 per cent. zinc. The mill circuit is being modified to produce a marketable zinc concentrate. At present prices the lead and zinc content are of considerable importance, particularly as the average ore is lower in gold and in silver than was the case in the early life of the mine.

Since 1922 an aerial tramway 11½ miles in length has been used to transport shipping-grade ore and concentrates from the mine and mill to bunkers at tide-water. Arrangements are now being made to replace the aerial tramway by truck-haulage.

In addition to its own ore, the company mines and mills some ore from the Northern Light No. 1 claim under an agreement with the Premier Border Gold Mining Company, owners of that claim which adjoins the Silbak Premier property on the west. Workings on the two properties are connected underground.

The general layout of the Silbak Premier mine is illustrated by Fig. 4—a plan of 1350, the main haulage-level. The distribution of the principal mineralized zones, most of which contain one or more ore-bodies, is indicated. The names of the former mines are now used to refer to sections of the combined workings. The original Premier mine was developed by six main levels, five of which were adits, located at elevations of 2,000, 1,760, 1,555, 1,345, 1,070, and 790 feet. The levels were numbered in sequence downward. The lowest, No. 6, is now known as the 790 level. No. 4, now known as 1350 level, was the main haulage-adit. At its portal, ore trains were dumped directly into the mill bins. Levels above No. 4 were served by two internal shafts, and a third internal shaft, known as 601, provided service and ore-hoisting facilities to levels below No. 4. The B.C. Silver mine, immediately north of the Premier workings, had five levels between elevations of 2,070 and 1,350 feet, and two internal shafts, one of which extended down to 1350 level. The Sebakwe mine, which adjoined the B.C. Silver on the north-east, had three levels between elevations of 1,670 and 1,350 feet and one internal shaft extending down to 1350 level.

By 1935 the large and rich ore-bodies of the original Premier mine had been worked downwards to elevations a short distance below 1350 level, where they appeared to "bottom" in low-grade or barren pyritic zones. Limited exploration at greater depth in the Premier section disclosed a few small bodies of low-grade ore, and one body of unknown size and grade was found 150 feet below No. 6 (790 level). After the consolidation the initial exploration by Silbak Premier Mines, Limited, was directed toward developing ore-bodies above 1350 level to the north-east of the Premier workings, along what is known as the main "north-east zone." Several ore-bodies of moderate size found or previously known in the B.C. Silver section were mined from 1350 to 1670 levels. At the same time the continuations of the more north-easterly Premier ore-bodies, downward across the former property boundary, were mined from above 1350 to 1070 level. Development from 1350 and upper levels was extended farther to the north-east into the Sebakwe section, and some relatively small ore-bodies were mined between 1350 and 1820 levels. The main haulage-level, 1350, finally attained a length of about 7,000 feet. However, by 1939 most of the ore available above 1350 level had been mined, and interest turned to lower levels. The 1070 level was extended 3,400 feet north-easterly to the Sebakwe section, and several stopes were established in the downward continuations of ore-bodies mined previously above 1350 level. In the course of this development programme a long diamond-drill hole from 1070 level encountered mineralization in the B.C. Silver section some 600 feet to the north-west of any previously known ore-zone. Subsequent development in this area, now known as the West ore-zone, between 790 and 1350 levels, has disclosed some of the largest ore-bodies discovered thus far in the B.C. Silver or Sebakwe sections.

Development-work during 1947 consisted of 20,205 feet of diamond-drilling and 5,330 feet of drifting, crosscutting, and raising. The ore mined during the year came from two stopes below 1350 level in the Sebakwe section, from several stopes below 1220 level in the West ore-zone of the B.C. Silver section, and from 781 stope below 940 level which is on Premier Border ground and constitutes the lower part of the West ore-zone. All this ore was hoisted in 601 shaft to 1350 level.

General Geology.

The general geology will be mentioned only briefly, as it is treated in detail in other publications.* Volcanic rocks of the Bear River formation and bodies of quartz-sanidine porphyry, known as Premier porphyry, are the main rock types. These form the north-eastern limb of a large open syncline, the axis of which trends north-westerly and plunges gently in that direction. The greenish-coloured massive and tuffaceous rocks so commonly seen underground exhibit no obvious primary textures whereby the local structure might be determined. However, an overlying, presumably conformable group of somewhat coarser, reddish, and vari-coloured fragmental volcanics known as " the purple tuffs " provide a clue to the local structure in the Sebakwe section, where the contact has been reached by some workings and by numerous diamond-drill holes. Structural contours on the lower surface of the purple tuffs in the Sebakwe section suggest a broad anticlinal cross-fold on the flank of the main syncline, which plunges steeply westward. The location of the purple tuff contact in other parts of the mine is too imperfectly known to indicate whether or not other such flexures exist. These rocks are of considerable importance, as they appear to constitute a horizon above which no ore-bodies of major importance extend.†

The Premier porphyry occurs as rudely lenticular and, in places, tabular bodies, most of which are elongated in a northerly or north-easterly direction. There is a general tendency for porphyry bodies to dip north-westward, roughly parallel to the major structure. These bodies range from more than 2,000 feet to a few hundred feet in length and from several hundred feet down to a few feet in width. In its typical occurrences in the Premier section, the porphyry is readily identified in hand specimen by its blocky fracture and by the presence of a few phenocrysts of feldspar which may

* Schofield, S. J., and Hanson, G. (1922): Geology and ore deposits of the Salmon River district, British Columbia; *Geol. Surv., Canada*, Mem. 132.

* Hanson, G. (1935): Portland Canal area, British Columbia; *Geol. Surv., Canada*, Mem. 175.

† The present writer concludes that the upper limit of commercial mineralization is generally about 100 feet below the base of the purple tuff horizon, notwithstanding the somewhat different interpretation in respect of some ore shoots in prophyry presented in the excellent paper of E. G. Langille (1945): Some controls of ore deposits at the Premier mine; *Western Miner*, Vol. 18, No. 6, pp. 44–50.

be up to 1 inch in length. However, in parts of the B.C. Silver and Sebakwe sections the porphyry loses its identity and may merge in any direction into massive, non-porphyritic, dark-green rock indistinguishable from massive phases of the greenstone. At no place are ordinary intrusive relationships exhibited. Microscopic examination of specimens of porphyry and massive greenstone taken from 1301 crosscut showed that, at that place at least, the two rocks are mineralogically identical. The only difference observed was that of texture. The porphyry contained ¼-inch phenocrysts of sanidine, whereas in the greenstone the sanidine laths were 2 millimetres or less in length.

The genesis of these porphyry bodies is open to question. It has been assumed that their intrusion was a phase of the emplacement of the Coast Range batholith, but the mineralogic similarity of the porphyry to the volcanic flows of the pre-batholithic Bear River formation casts some doubt on the validity of this assumption. The porphyry bodies may be genetically related to the source of the volcanic rocks, possibly representing the " feeders " of the extrusive phases.

The porphyry bodies are of prime importance in regard to the localization of ore in the Premier section and in many other parts of the mine. The mineralized shear-zones, parts of which constitute ore-bodies, occur along or near porphyry-greenstone contact-zones. One outstanding exception to this rule is the West ore-zone, to be discussed in a subsequent paragraph.

Large dykes of medium- to coarse-grained quartz diorite, striking north-westerly and dipping steeply to the south-west, occur on Silbak Premier property and elsewhere in the district. Some of these can be traced to the Coast Range batholith which outcrops about 1½ miles west of the mine and are seen to merge into the batholith. One quartz diorite dyke 400 feet wide occurs in the workings between the B.C. Silver and Sebakwe groups of ore-zones. It cuts across greenstone and porphyry alike, but its relation to the ore-zones is unknown.

A variety of smaller dykes having the same general attitude as the large quartz diorite dykes are also present in the workings. In hand specimen some of these dykes appear dioritic, others resemble lamprophyre, while a few are very fine-grained and felsitic. These dykes cut the greenstone and porphyry, and usually the mineralized zones as well. However, in places movement has occurred along dyke-contacts, and some dykes are slightly offset by slips within the mineralized zones. One light-coloured felsitic dyke on the 790 level became highly contorted on passing through an unmineralized shear-zone, suggesting that it had been intruded during a period of slight movement on the shear-zone. Some dykes, where they cross mineralized zones, contain films and disseminated crystals of the ore minerals. On the whole, the evidence suggests that these dykes were intruded during and probably near the end of the period of mineralization.

Mineralization.

The ore-bodies of the main North-east ore-zone and of the Sebakwe ore-zone are replacements of massive fine-grained sulphides which grade laterally and toward their extremities into zones of silicified rock containing much pyrite. In the West ore-zone, however, the ore-bodies are well-defined lodes composed of sulphide-bearing quartz-calcite veins or stringers, of which the wall-rocks are not silicified and contain but little pyrite. The ore-bodies vary a good deal in size. Stope-lengths range from less than 100 feet to more than 300 feet, and stope-widths range from 6 feet to as much as 40 feet. Metallic minerals constitute about 12 per cent. of the mill-feed.

The ores have been studied by several investigators. In 1926 Burton[*] described the mineralogy of ores from the upper levels of the old Premier mine. Hanson gives general descriptions of the ores of the B.C. Silver and Premier mines.[†] In 1939 White[‡] described the mineralogy of ores from various elevations between 1070 and 1820 levels in the main North-east ore-zone, and recently Fyles[§] made a comparative study of ores from the main North-east ore-zone and from the West ore-zone of the B.C. Silver section. The following descriptions pertain mainly to the B.C. Silver and Sebakwe sections of the mine.

In addition to the principal sulphides, pyrite, sphalerite, galena, and chalcopyrite, all ores contain minor amounts of pyrrhotite, tetrahedrite, polybasite, and electrum. The principal gangue minerals are quartz, calcite, and sericite, but the pink manganese silicate, rhodonite, is not uncommon. Tetrahedrite and polybasite, the most important silver-bearing minerals in the present workings, persist to the deepest level of the mine. Fyles found these minerals intimately associated with galena on the 790 level in the West ore-zone. Other silver-bearing minerals, including ruby silver, argentite, and native silver, have been found occasionally on the upper levels of the B.C. Silver and Sebakwe sections, but not in as great abundance as on the upper levels of the Premier section. Microscopic examination indicates that these were among the last minerals to be deposited, and some doubt exists as to whether they are of primary or secondary origin. Electrum, the pale yellow alloy of gold and silver, ranges from 40 to 60 per cent. gold, but no progressive change in its composition with depth has been noted. Native gold has been reported from time to time, but its distribution and mineral associations are unknown. White observed tiny dark-yellow grains embedded in quartz in polished sections of ore from the 1220 level of the main North-east ore-zone. These proved on analysis to contain 90 per cent. gold. A specimen of "free gold" found during recent development-work on the 1070 level in the Sebakwe section contained 73 per cent. gold.[||]

Hanson has drawn attention to the progressive decrease in the ratio of silver to gold with depth of ores in the old Premier workings.[¶] A similar, although by no means regular, decrease in the silver-gold ratio with depth occurs in the B.C. Silver and Sebakwe sections. The West ore-zone is, however, anomalous in this respect. The average silver-gold ratio in the West ore-zone is 7:1, but in 781A stope, one of the lowest in the mine, the silver-gold ratio is about 15:1. For comparison, the silver-gold ratio in stopes between 1070 and 1350 levels in the main North-east ore-zone was only about $2\frac{1}{2}$:1.

Notes on Active Parts of the Mine.

In the following paragraphs special features of the Sebakwe section and of the West ore-zone of the B.C. Silver section will be discussed. These were the parts examined by the writers during their ten-day visit to the mine in June, 1947. The notes on the Sebakwe section are by J. M. Black; those on the West ore-zone by W. H. White.

Sebakwe Section.—The rocks in the Sebakwe section are greenstone and porphyry. The greenstone is altered and is considered to be part of the volcanic series referred to earlier in this report as part of the Bear River formation. The rock called porphyry here is green of many shades, altered, and fine-grained, and much of it is not porphyritic. In many places it is difficult to determine whether the rock is greenstone or

[*] Burton, W. D. (1926): Ore deposition at the Premier mine, *B.C. Econ. Geol.*, Vol. 21, pp. 586–604.
[†] Hanson, G. (1935): *Geol. Surv., Canada*, Mem. 175.
[‡] White, W. H.: *Unpublished thesis*, Dept. of Geology and Geography, Univ. of B.C., 1939.
[§] Fyles, J. T.: *Unpublished report*, Dept. of Geology and Geography, Univ. of B.C., 1948.
[||] Pearcey, J. G.: Oral communication, April, 1948.
[¶] *Geol. Surv., Canada*, Mem. 175, p. 163.

porphyry. The " porphyry " appears to be in elongated bodies, striking northerly and north-easterly, and intruding the greenstone.

Ore-shoots have been found in several silicified and mineralized zones that strike north 15 degrees to north 50 degrees east and dip from 45 to 75 degrees westward. The ore-shoots rake from 45 to 70 degrees southward. The mineral zones contain many quartz veinlets, with various attitudes, including some that are nearly parallel to the zones. Ore sulphides occur in these veins and in the wall-rock between the veins. In places the quartz and sulphides have incompletely replaced the wall-rock and have formed what appears to be a breccia cemented by quartz and sulphides.

In and near the mineralized zones are many slips, commonly with some gouge, and in many cases one of these slips becomes the wall to which the zone is mined. Many of these slips dip steeply westward and strike a few degrees west of north, cutting the mineralized zones obliquely. The displacement on the slips appears to be small.

All but two of the ore-shoots mined or being mined in this section are in two groups about 700 feet apart. One group near the Sebakwe shaft consists of one or more ore-shoots on each of several parallel zones. The ore-shoots of the other group found so far are in the mineralized zone exposed in 1341 drift, and are being stoped currently. Another zone belonging to the same group has been found on 1070 level and is being explored there. Its projection on 1350 level lies about 200 feet west of 1341 drift. In the 700 feet between the two groups one comparatively small shoot has been found; it is in a zone not aligned with any in either of the two groups. Another isolated shoot (13R) occurs at the north end of the workings.

Dykes of lamprophyre, felsite, and porphyry cut the mineral zones. This porphyry, unlike the porphyry in which most of the ore-bodies occur, is dark grey and brown with prominent phenocrysts. The dykes, which are up to 20 feet wide, strike in a general north-westerly direction and have steep dips south-westward, though there are many deviations from this general attitude. There has been some movement along the contact of some of the dykes, and some of the dykes are slightly displaced by slips within the mineral zones. Some of the felsite dykes contain very narrow mineralized veinlets and were probably intruded before the end of the period of mineralization and before the last movements on the slips of the mineralized zones.

A major fault, which has been traced beyond the workings by diamond-drill holes, has a curving course with an over-all strike of north 15 degrees west and a dip that ranges from nearly vertical to about 60 degrees westward. The approximate trace of this fault on the 1350 level is indicated on Fig. 4. In some exposures the fault is several feet wide, and consists of gouge, shattered rock, and some quartz stringers. It passes through both groups of ore-bodies, and some of the ore-shoots end at it, although some of the mineralized zones appear to continue across the fault. It is difficult to determine the displacement, if any, since the ore-shoots are not well defined, and the angle between the fault and the mineral zone, followed by 1341 drift, is only a few degrees. However, the displacement of some of the dykes suggests that it is a reverse fault with considerable displacement about parallel to the rake of the ore-shoots.

West Ore-zone, B.C. Silver Section.—The geology of the West ore-zone is quite different from that of other parts of the mine, inasmuch as neither tuffaceous rocks nor porphyry are found there. The main rocks are lavas, but lamprophyre, diorite, and felsite dykes are also present. The lavas are dark green to black in colour, and fine-grained to dense in texture. A preliminary microscopic study of twenty rock specimens from the West ore-zone, by Kenneth North* in co-operation with the writer, indicates that all are lavas and may be classified as either augite, trachyte, or augite andesite. They contain over 80 per cent. plagioclase (oligoclase-andesine or andesine)

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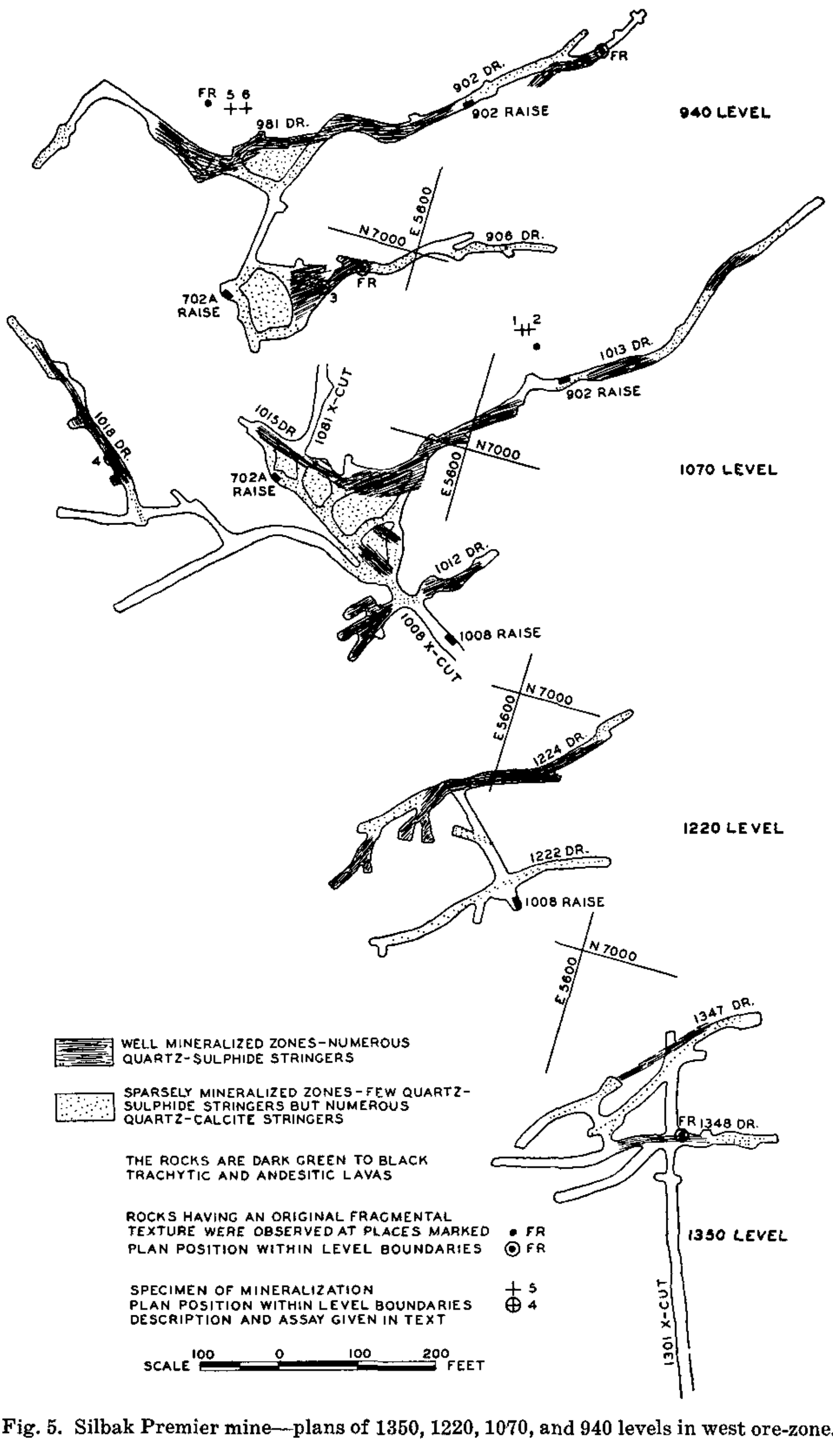


Fig. 5. Silbak Premier mine—plans of 1350, 1220, 1070, and 940 levels in west ore-zone.

in the form of lath-shaped crystals from one-half to 2 millimetres in length. In some specimens flow-structure is clearly indicated by the alignment of the plagioclase laths, but in other specimens the alignment is poor or absent. The textural variations are such as might be expected between contiguous flows. The plagioclase has been somewhat altered and all of the augite converted into chloritic aggregates, but even within ore-bodies much of the original rock is still recognizable.

When the workings were examined, rocks which exhibited a vaguely fragmental texture were observed in some of the stopes. The places where such material was seen are indicated on Fig. 5. In one instance a sub-rounded pebble of light-coloured rock 2 inches in diameter was seen enclosed in a matrix of dark-green fragmental material. At the time it was thought that this apparent fragmentation might be a secondary texture formed during the period of fracturing and mineralization. However, microscopic examination of several thin sections showed angular fragments of lava embedded in a matrix of volcanic material of similar composition but of slightly different texture. Both the fragments and matrix are cut by veinlets of quartz, carbonate, and sulphides, thus indicating that fragmentation preceded the period of fracturing and mineralization. The pebble mentioned above proved to be altered porphyry similar in some respects to the Premier porphyry. How it got there is not easily explained.

Field and laboratory evidence suggests that more than one lava-flow is present in the West ore-zone. Furthermore, it is believed that narrow horizons of volcanic breccia are present also, but the continuity of such horizons has yet to be investigated. A great deal of careful mapping, coupled with microscopic study, would be required in order to identify individual flows and to determine their structure. Such features may be of considerable importance in the localization of other mineralized zones similar to the West ore-zone.

Fig. 5 illustrates the distribution of mineralization in the West ore-zone on the 1350, 1220, 1070, and 940 levels. The ore-zone has a general north-easterly trend, and the dip averages about 65 degrees north-westward. Toward its south-western end the zone curves to a westerly and finally north-westerly direction and the dip steepens nearly to vertical. The greatest mineralized widths, present where the change of strike occurs, coincide with areas broken by north-easterly and north-westerly striking fractures. In this area the foot-wall rock on the 940 and 1070 levels is intensely fractured and is traversed by a network of short quartz-calcite veinlets and some stringers containing sulphides. Where the latter are sufficiently numerous, the rock may be of mining grade, and several irregularly shaped stopes have been established in this foot-wall area. As may be seen by inspection of Fig. 5, the West ore-zone, as developed at the present time, has the shape of a curved and somewhat dished triangle, having its base on the 940 level and its apex a short distance above 1350 level. In common with many others in the mine, the ore-shoots of the West ore-zone have a marked rake to the south. The rake of the south end of a shoot is usually flatter than that of the north end, so that in a plane parallel to the walls the shape is that of an obtuse-angled triangle. This characteristic shape is believed to be due, in part at least, to the influence of the cross-fractures, some of which are occupied by dykes, which strike north-westerly and dip to the south-west. In stopes in the West ore-zone, as in the Sebakwe section, places were seen where the ore stopped abruptly at one of these obscure cross-fractures, although mineralization identical in appearance to the ore, but barren or sub-marginal in grade, continued beyond the fracture.

The ore-bodies are lodes composed of quartz-sulphide and quartz-carbonate stringers and narrow veins occupying sub-parallel, branching, and *en echelon* fractures. The metallic minerals visible in hand specimens include pyrite, sphalerite, galena, and chalcopyrite. Individual stringers may contain one or more of these sulphides in widely varying proportions. Furthermore, the gold and silver content of individual stringers varies a great deal. The rock between the stringers and veins of the lodes is barren, so that whether or not a given zone is ore depends on the quantity and value of the mineralized stringers which it contains. As a rule commercial values in gold and silver may be expected where the stringers contain sphalerite and galena in addition to pyrite, but not where pyrite is the only visible sulphide. An exception to this rule is found in 781A stope between 790 and 940 levels, in which the ore has a much higher than average content of lead, zinc, and silver, but the gold content is unusually low.

No channel samples were taken in the West ore-zone, but specimens were selected to illustrate the types of ore and variations in metal content characteristic of that zone. The descriptions and assays of these specimens are given below, and the points from which the specimens were taken are indicated by the corresponding numbers on Fig. 5.

No. and Location.	Description.	Gold.	Silver.	Lead.	Zinc.
		Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.
1. 9E stope	Typical quartz-sulphide stringer containing a small amount of sphalerite and a few grains of galena	0.76	1.4	......	......
2. 9E stope	Quartz-pyrite stringer, same location as above, with no visible base-metal sulphides	0.10	Trace	......	......
3. 9D stope	4-inch stringer containing abundant pyrite, galena, and sphalerite	0.91	6.4	22.1	8.2
4. 1018 drift	6-inch vein characteristic of ore-body containing abundant galena and some sphalerite, in a quartz gangue	Trace	16.5	32.2	5.0
5. 781A stope	3-inch stringer characteristic of ore-body containing abundant galena and sphalerite	0.07	11.0	22.0	10.0
6. 781 stope	Specimen from a small lens consisting mainly of galena and tetrahedrite	0.02	36.2	41.3	0.4

The wall-rock of the West ore-zone and even rock masses and fragments within the lodes are only slightly altered. The original feldspars can be identified under the microscope and primary textures are preserved. This is in marked contrast to the high degree of wall-rock alteration found in the main North-east ore-zone, where the wall-rocks are well silicified and pyritized and the original rock minerals are largely destroyed.

Silvertip Gold Mines, Ltd. Company office, 211 Pemberton Building, Victoria. G. E. Winkler, managing director. Capital: 3,000,000 shares, 50 cents par value. The property is on the south slope of Mount Dilworth and lies 1½ miles from the Big Missouri camp-site at the end of the road from Stewart. Since the discovery of mineralization on the property about thirty years ago, many occurrences have been explored by trenches and adits, but certain of these workings are no longer accessible. During 1947 five men were employed advancing a crosscut and trenching. Mineralization occurs within and near the southern margin of a belt of dykes that traverses the district. Sheared tuffs, most of which are very dark in colour, are intruded by many nearly parallel dykes. These consist for the most part of coarse light-coloured porphyry and diorite.

On the crest of a hill on the Bella Coola claim a shear-zone several feet wide, in dark tuffs along the foot-wall of a dyke, strikes westerly and dips 60 degrees southward. Within this zone, across a width of about 1 foot, in which many small slips dip 25 degrees southward, white quartz and a greenish-brown sub-metallic sphalerite and small amounts of galena and pyrite have cemented and replaced fragments of tuffs.

In this, the Butte zone, underground work in 1946 and 1947 was directed toward locating its downward extension.

Over a period of years an adit has been advanced 550 feet westerly along and near the contact of a porphyry dyke. This adit passes beneath a line of trenches, now caved, which have a general northerly trend, and which were considered to expose a mineralized zone with a northerly strike. However, this zone was not intersected in the adit. From the face of this adit, which is south of and 225 feet lower than the outcropping of the Butte zone, a crosscut was driven in a northerly direction. When examined in September, 1947, this work had advanced 290 feet. Within this distance are exposed sheared tuffs, some of which contain coarse fragments, and which are cut by five dykes which strike westerly and dip moderately to steeply southward. In the tuffs near the dyke-contacts are quartz stringers containing pyrite, and two of these were sampled. One of these samples, taken across a 3-inch vein 230 feet from the main adit, assayed: Gold, trace; silver, 0.2 oz. per ton. The other sample, taken across a 9-inch vein, 190 feet from the main adit, assayed: Gold, trace; silver, 0.4 oz. per ton. At a distance of 280 feet from the beginning of the crosscut a zone of fractures, mineralized with quartz, pyrite, sphalerite, galena, and native silver, is partly in the foot-wall of a dyke and partly in the tuffs. A sample taken across the width of this zone, 38 inches, assayed: Gold, 0.01 oz. per ton; silver, 3.9 oz. per ton. It is reported by the management that at a distance of 295 feet from the drift the crosscut intersected a zone 2 feet wide. In this zone, and across a width of 9 inches adjacent to the foot-wall, some tetrahedrite and native silver, similar in appearance to that encountered in the Butte zone, was encountered.

Half a mile south of the adit, work on two veins outcropping in the bed of Silver Creek, and on the Ladybird No. 2 claim, indicated a higher degree of mineralization than had been anticipated. Previously only a limited section of each vein had been exposed. One of these veins strikes westerly, dips from 20 to 45 degrees southward, and consists of dark-grey quartz, with some dark sphalerite, chalcopyrite, galena, pyrite, tetrahedrite, and native silver. It is parallel to and within dark tuffs between two light-coloured dykes which have about the same attitude. These dykes contain small mineralized veinlets, and a sample taken across a well-mineralized, though oxidized, section 10 inches wide assayed: Gold, 0.03 oz. per ton; silver, 91.4 oz. per ton.

The second vein, strike south 75 degrees west, dip 35 degrees southward, is about 100 yards down-stream, and occurs in sheared tuffs which strike south 60 degrees west and dip 30 degrees southward. Apparently the width of the vein exceeds 18 inches but, owing to erosion of the hanging wall, is not fully exposed. It consists of white quartz with inclusions of black tuff or argillite, and mineralization includes sphalerite, pyrite, and galena. A picked sample of part of the oxidized mineralization assayed: Gold, trace; silver, 0.3 oz. per ton.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1946, p. 62. *Geol. Surv., Canada*, Mem. 175, p. 169.]

Indian.—In 1947 ore, reported to have been brought from the Indian property and stored in Stewart twenty years ago, was shipped by the Crawford Transfer Company to the Trail smelter. Ore shipped amounted to 44 tons. Net contents: Gold, 3 oz.; silver, 247 oz.; lead, 8,140 lb.; zinc, 17,944 lb.

SUMMIT LAKE (56° 130° S.E.).

Salmon Gold (Morris Summit Gold Mines, Ltd.). Company Office, 510 Stock Exchange Building, Vancouver. E. M. Thomson, president; E. E. Harris, mine manager. Capital: 3,000,000 shares, $1 par value. The property is about 25 miles from Stewart and is west of Summit Lake. In 1931, surface showings on the above property were explored by Premier Gold Mining Company by means of open-cuts and drill-holes at shallow depths. From 1934 until 1939 Consolidated Mining and Smelting Company of Canada explored the same area at depth by means of long diamond-drill holes and an adit.*

The long holes drilled from the surface, and also some others drilled by the present owners from the adit, now known as the 3600 level, have indicated mineralization with erratic gold values in several zones which strike westerly to north-westerly and dip steeply northward. However, the exact location of some of the mineralized intersections has not been determined because the holes, most of which exceeded 500 feet in length, were not surveyed. Therefore, there is some uncertainty as to the correlation of the intersections and the continuity of the mineralized zones. The projection of these zones, up the dip to the surface, would come beneath the glacier, south and west of mineralization exposed at the surface elsewhere. An adit, known as the 3000 level, has been driven at an elevation of 2,925 feet from a point about 600 feet below the upper adit, in order to explore the mineralized zones about 1,000 feet below the surface. This adit was driven westward about 2,250 feet, and a crosscut from it to the south-west at 150 feet entered a mineralized zone. (*See* Fig. 6.)

In 1947, underground development was continued, an assay office was built, and, starting from Big Missouri camp-site, 1½ miles of tractor-road was built. About twenty men were employed, and they worked underground 306 days. During the year 4,791 feet of diamond-drilling was done and about 1,500 tons of ore was mined.

The rocks exposed on the 3000 level are fine- to medium-grained, massive, grey and green. Some are probably tuffs, though no bedding is apparent, and some contain coarse fragments. Others are slightly porphyritic intrusives, with small phenocrysts of feldspar, and of a dark-green mineral. Pyrite is abundantly disseminated, and there has been some siliceous and carbonate alteration.

The above igneous complex is cut by many light-coloured carbonate veins up to 2 feet in width and containing a small percentage of quartz. Although most of the veins have a north-westerly strike and a south-westerly dip, a few dip north-eastward. Most of them have some gouge along their walls. Some contain pyrite, and in the wall-rock of one vein some needles of arsenopyrite were noted.

Many faults which strike from north 40 degrees west to north 40 degrees east are exposed on the 3,000 level. For 700 feet from the portal most of these faults dip eastward, but elsewhere most of the dips are westward. On two of these faults, according to the drag and displacement of carbonate stringers, the movement has been only a few feet, with the hanging wall moving down relatively to the foot-wall. Many other faults, which have a great variety of attitudes, are exposed. All the faults curve, split, and have some gouge, and many of them also contain carbonate stringers.

About 1,900 feet from the portal the 3000 level crosscuts a prominent fault-zone containing about 1 foot of gouge. This zone strikes north 35 degrees west and dips 50 degrees south-westward. It lines up with, has about the same attitude as, and is considered to be the extension of a major fault which is exposed on the surface, where it can be traced for more than a mile. North of the workings the offsetting of a granodiorite-hornfels contact to the right may have resulted from a downward movement of the hanging wall in relation to the foot-wall; the movement may have had a considerable horizontal component.

For 115 feet east of this fault, quartz and carbonate veins replace the country rock in a much faulted zone which has the same relationship to the major fault as does a wide quartz lode at the surface. This zone ends at several gouge-filled slips, which strike north-westerly and dip 35 degrees south-west. A similar altered zone, with fewer veinlets, extends for 160 feet west of the fault.

* *Minister of Mines, B.C.*, Ann. Rept., 1946, pp. 62–66.

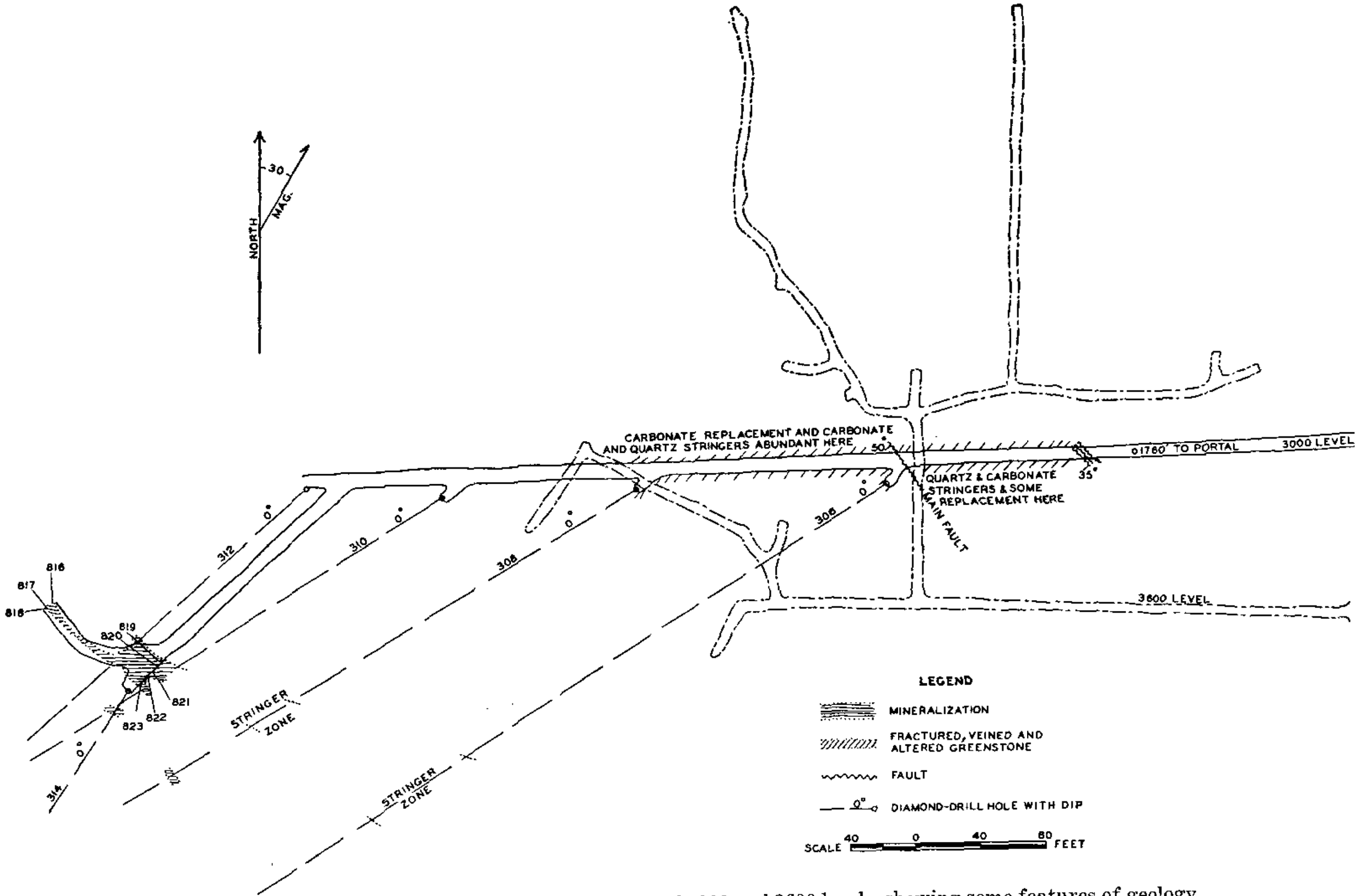


Fig. 6. Morris Summit Gold Mines, Limited—plan of 3000 and 3600 levels, showing some features of geology, mineralization, and the location of samples.

The mineral zone exposed in the drift on 3000 level strikes north-westerly and consists of a central white carbonate vein, on both sides of which the wall-rock is replaced by white and pink carbonate, light-coloured quartz, massive and disseminated pyrrhotite and pyrite, and small amounts of sphalerite, chalcopyrite, and galena. This mineralized zone is without definite walls, is 22 feet wide at the crosscut, narrows to a few inches at 50 feet along the drift, and widens to about 6 feet within a further distance of 25 feet. The central vein generally dips steeply north-eastward, and in a few places south-westward. Three samples (816, 817, and 818) were taken at a point 75 feet along the drift where pyrite predominates, and five samples (819 to 823) were taken at the crosscut where pyrrhotite predominates. The assays are as follows:—

No.	Width.	Description.	Gold.	Silver.
			Oz. per Ton.	Oz. per Ton.
816	40 inches	Small amount of pyrite	*Nil*	*Nil*
817	41 „	Moderate amount of pyrite	Trace	*Nil*
818	Picked	Abundant pyrite	0.05	0.1
819	50 inches	Well mineralized	0.42	0.8
820	51 „	Well mineralized	0.01	1.2
821	44 „	Carbonate vein	0.05	1.1
822	60 „	Very little mineral	0.01	0.1
823	72 „	Small amount of pyrrhotite	0.01	1.1

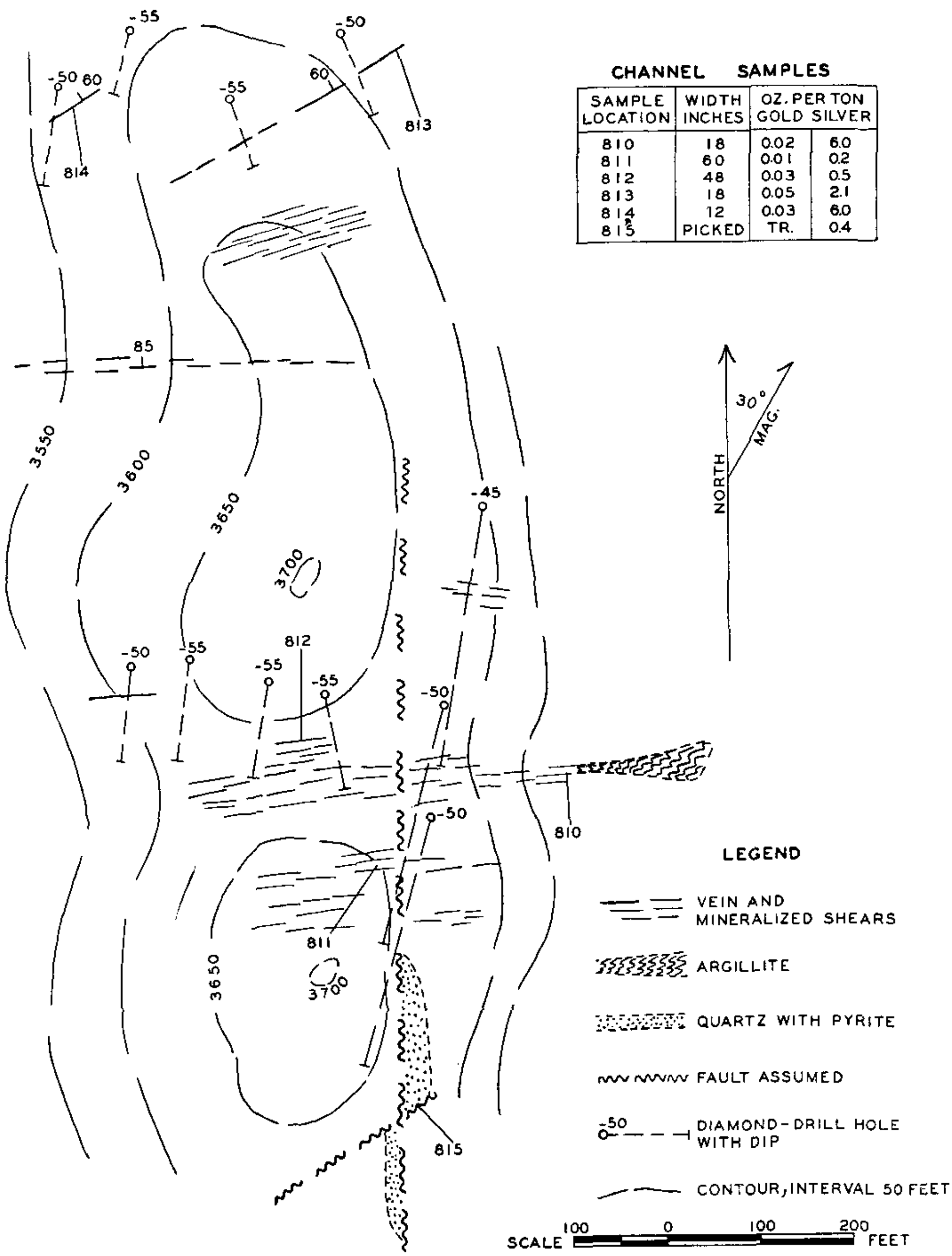
Five horizontal holes drilled toward the south-west intersected the mineralized zones shown in Fig. 6. In Hole 310 some of the massive sulphides are similar to those which occur in the main zone, but toward the east, as indicated by the intersections in Holes 308 and 306, this zone widens into many stringers without massive mineralization. A second zone about 5 feet wide is indicated in Holes 314 and 310, which were drilled to the south-west of the zone explored by the drift. Further exploration will be required in order to correlate these zones with the zones indicated above them by the drill-core intersections. Width of mineralization on this level is greater than that usually found, and may be attributed to the intersection of two zones.

To the east of the major fault no mineralization of economic importance has been found on this property. If the foot-wall has moved up relative to the hanging wall, and after mineralization took place, most of the mineralization east of the fault may have been eroded. Another possibility is that the wide altered zone (275 feet wide on 3000 level), in which additional quartz and carbonate has been incorporated, may not have reacted, as did the unaltered rocks, to forces which resulted in the formation of westerly striking fractures. The manner in which the mineralized zone appears to widen and to split into many stringers as it approaches the altered zone indicates that, extending as far as the fault, there was no single fracture-zone along which mineral-bearing solutions might circulate. If other mineralized zones cannot be followed as far as the fault-zone, it will indicate that the mineralization is younger than the altered zone. During 1947, 359 feet of crosscutting, 2,468 feet of drifting, and 4,791 feet of diamond-drilling were done, and 1,600 tons of ore was broken in drifting on veins.

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

Cassiar Rainbow Gold Mines, Ltd.

The Rainbow and the Rainbow Extension groups controlled by the company and comprising twenty-four claims were located by C. D. E. Barker, of Premier, B.C., who is the agent for the company. The claims are on the ridge east of Summit Lake, 8 miles by trail north of the road to the Big Missouri property. This ground has been previously located, and a map on page 65 of the British Columbia Minister of Mines Annual Report, 1920, shows the White Moose and War Eagle near this location.



SAMPLE LOCATION	WIDTH INCHES	OZ. PER TON GOLD	SILVER
810	18	0.02	6.0
811	60	0.01	0.2
812	48	0.03	0.5
813	18	0.05	2.1
814	12	0.03	6.0
815	PICKED	TR.	0.4

Fig. 7. Cassiar Rainbow Gold Mines, Limited—plan of surface, showing veins, shears, diamond-drill holes, and assays.

In 1931 some work was done on showings by J. Haahti. Many trenches near the crest of the ridge expose mineralized shears, and in 1947 the surface showings were explored at depth by 5,000 feet of diamond-drilling.

The country rock comprises sheared massive tuffs and possibly some flows. For the most part the texture is coarse, colours include many shades of grey and green, and there are large elongated fragments which lie parallel to the direction of shearing. Black argillites are exposed in the valley to the east, and a belt of these rocks extends up the ridge to the mineralized zones. This belt, together with associated beds, strikes westerly, dips steeply, and near the top of the ridge appears to be interbedded with the tuffs which are also sheared. This belt of argillites gradually narrows westward and pinches out just below the top of the ridge. Many unsheared dykes ranging from a few inches to 4 feet wide strike north-westerly, dip toward the south-west, and cut the tuffs.

Trenches and some natural outcrops expose wide zones of shearing that strike westerly and dip steeply northward. This shearing can be followed for 600 feet across the top of the ridge and extends farther down the slopes. Unless trenched, shear-zones are poorly exposed, since they have been more susceptible to erosion than the unsheared rocks. One zone, partly exposed on the surface, is seen in the drill-core to be about 160 feet wide, but much of this width is not intensively sheared. Within the shears, pyrite is abundant, silicification is common, and stringers of white quartz and carbonate are numerous. Sphalerite, galena, pyrrhotite, chalcopyrite, and arsenopyrite are found in parts of the shear which is generally restricted to widths of not more than 5 feet. A few veins less than 2 feet wide occur where there is less shearing. The core from the diamond-drill holes resembles material observed in surface exposures, although shearing is more noticeable and sulphides appear to be more abundant. Fig. 7, based on a pace and compass traverse, shows the shears, the location of samples, and location of the diamond-drill holes.

Assays of three samples (810, 811, and 812) taken from shear-zones and of two (813 and 814) veins gave the following results:—

Sample.	Width.	Gold.	Silver.
	Inches.	Oz. per Ton.	Oz. per Ton.
No. 810	18	0.02	6.0
No. 811	60	0.01	0.2
No. 812	48	0.03	0.5
No. 813	18	0.05	2.1
No. 814	12	0.03	6.0

A topographic break, consisting of a northerly trending line of low ground and ponds, and with low bluffs along the west side except where shearing is intensive, may mark a major fault. The rocks on both sides of the break are similar massive sheared tuffs without markers to indicate displacement. The mineralization is found on both sides of the break, but may be younger than the presumed fault. In the south a zone of quartz and pyrite up to 25 feet wide is found on both sides of the break. A picked sample of quartz-pyrite mineralization (815) assayed: Gold, trace; silver, 0.4 oz. per ton.

[Reference: *Geol. Surv., Canada,* Sum. Rept., 1931, Part A, p. 21.]

Gold.

BEAR RIVER (55° 129° N.W.).

Stewart Canal Gold Mines, Ltd. Company office, Stewart. J. Haahti, manager. Capital: 3,000,000 shares, 50 cents par value. The claims are on the east side of Bear River, about half a mile from Stewart. The lower adit, elevation about 500 feet, was advanced 100 feet south 50 degrees east before work was stopped early in 1947. It exposes a zone of quartz stringers with small amounts of pyrite and chalcopyrite. The wall-rock near the stringers is silicified and has small lenses of the same sulphides. The zone is several feet wide, dips steeply south-west, and is extremely hard. It is cut by many slightly mineralized fractures, one of which occurs near the face and 290 feet from the portal, where the adit has been slashed to a width of 15 feet. Here the zone is 11 feet wide, and in the foot-wall are several quartz stringers devoid of sulphides.

Four samples across a width of 11 feet between the hanging wall and the foot-wall assayed as follows:—

Width.	Gold.	Silver.	Copper.
	Oz. per Ton.	Oz. per Ton.	Per Cent.
24 inches	*Nil*	0.1	......
28 „	0.04	0.2	......
27 „	0.01	0.6	0.44
54 „	*Nil*	0.9	0.44

A fifth sample taken across 41 inches in the foot-wall assayed: Gold, *nil;* silver, *nil.* [Reference: *Minister of Mines, B.C.,* Ann. Rept., 1946, p. 79.]

Silver-Lead-Zinc.

Big Four Silver Mines, Ltd. Company office, Royal Bank Building, Vancouver. W. B. Milner, president; A. Bugnello, manager. Capital: 4,000,000 shares, 50 cents par. The company holds thirty Crown-granted claims and fractions on Mount Rainey, 2 to 4 miles south-east of Stewart. In 1947 Zero level was advanced a few feet, and 320 feet from the portal a raise was started up the dip of a silicified shear-zone containing a little pyrite. The shear-zone strikes north 10 degrees west and dips 60 degrees westward. Two samples, taken across the zone 65 feet above Zero level, assayed as follows:—

	Width.	Gold.	Silver.
	Inches.	Oz. per Ton.	Oz. per Ton.
Foot-wall	24	Trace	1.0
Hanging wall	8	Trace	*Nil*

Some diamond-drilling from Zero level and from a sub-level below it intersected No. 2 zone, which is parallel to No. 1 and about 100 feet south-west of it. The management reported that two short diamond-drill holes put down from the surface to test some shearing containing quartz and tetrahedrite on the Silverado slope near the top of the ridge did not encounter a definite structure.

During the summer the steep and rugged slope between Mount Rainey and Marmot River on the Prosperity group of claims was prospected. Here the glacier fronts have retreated, and more ground is accessible for prospecting than hitherto. This slope is reached from the camp at the Silverado workings by a 3-mile trail over the glacier which occupies the pass in the ridge, or by a trail 9 miles long from the mouth of Marmot River.

The old Prosperity bunk-house at 5,000 feet elevation was used as a camp, and supplies were dropped by aeroplane. Numerous rusty zones were explored by shallow trenches, and some were found to be mineralized. The mineralized shears were found late in the season, and the trenches exposing them were not completed and, when examined, contained snow and ice.

The rock exposed on this slope consists chiefly of fine-grained, massive feldspar porphyry in dykes and irregular masses intruding beds of coarse volcanic fragments, some tuffs, and probably some flows. In general the rocks are less schistose than on the Silverado slope.

In a trench (Black Nick), at an elevation of 5,850 feet, half a mile north of the bunk-house, a zone of shearing and gouge several feet wide is exposed and cuts fairly coarse feldspar porphyry. The shear-zone strikes north 15 degrees east and dips about 55 degrees westward. On the hanging wall there is a lens several inches wide of sphalerite, together with some quartz, galena, and tetrahedrite. A picked sample from this lens assayed: Gold, 0.05 oz. per ton; silver, 65.6 oz. per ton. Toward the foot-wall of the zone 2 feet of sheared rock contains small amounts of disseminated sulphides, and a 26-inch vein of quartz is slightly mineralized. A picked sample of sulphide from the vein assayed: Gold, trace; silver, 0.7 oz. per ton. On the foot-wall of the zone there are several inches of gouge. At the same elevation, and about 1,000 feet south 35 degrees west of the Black Nick trench, another shear-zone is incompletely exposed. This is a gouge-filled zone which strikes north-east and dips moderately westward. A wide silicified zone between these two shears contains abundant pyrite, strikes north-westerly, and dips steeply. A sample from this zone assayed: Gold, trace; silver, trace; and a small fraction of 1-per-cent. cobalt.

At an elevation of 4,850 feet, 225 feet south 60 degrees east from the bunk-house, a shear-zone several feet wide strikes north 10 degrees west and dips 50 degrees westward. It cuts grey and green massive intrusives which are bleached near the shearing, except where stained by manganese oxides. In this zone are small amounts of sphalerite and galena, and near the hanging wall is a lens or vein about 3 or 4 inches wide. This vein contains galena, tetrahedrite, pyrite, sphalerite, quartz, and ruby silver, and adjoining it is a narrow vein of quartz which contains tetrahedrite. A picked sample including some of both types of mineralization assayed: Gold, 0.05 oz. per ton; silver, 588 oz. per ton.

Some of these shear-zones are similar in appearance to vein-zones, exposed lower down this slope, from which high-grade shoots of silver ore were mined. The present showings indicate that the same kind of mineralization extends nearly to the top of the ridge. More work will be required in order to determine the widths and the values of the mineralized shears that have been found.

A shipment of ore made to the Trail smelter amounted to 20 tons. Net contents: Silver, 1,676 oz.; lead, 3,445 lb.; zinc, 2,371 lb.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1930, pp. 102–104; 1946, pp. 74–78. *Geol. Surv., Canada,* Mem. 175, pp. 138–140.]

RAF

This group of two claims, located by G. Bunn, of Stewart, in 1946, includes a part of the former Ruth and Francis group. The group is north of Glacier Creek, on one of its tributaries, and lies at elevations of from 3,300 to 3,500 feet. The distance to it by trail is about 4 miles from Glacier Creek bridge on Bear River road. Some showings were found on these claims in 1912, and the main vein exposed in the creek-bed has been developed by two drift-adits.

The upper drift exposes several feet of massive sulphides, including some jamesonite which appears to be in the main vein, which strikes north 60 degrees east and dips nearly vertical. A chip sample of these sulphides, taken by G. A. Clothier in 1918, assayed: Silver, 31.6 oz. per ton; lead, 15 per cent.; zinc, 18 per cent.; antimony, 8.3 per cent. The lower adit is about 50 feet lower and is on the same vein. Since 1927, when last reported on, this drift has been advanced about 100 feet and is now beyond the projected position of the sulphide-shoot, assuming that it plunges vertically. The vein near the face consists of several sparsely mineralized quartz stringers. This stringer-zone was sampled at the face across 42 inches and assayed: Gold, *nil;* silver, 0.3 oz. per ton. Near the face is a zone of quartz stringers about normal to the main vein, and a sample taken across 32 inches assayed: Gold, *nil;* silver, 0.1 oz. per ton.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1918, pp. 77, 78; 1927, p. 88. *Geol. Surv., Canada,* Mem. 159, pp. 43, 44.]

Bitter Creek (56° 129° S.W.).

Silver-Lead-Zinc.

Bingo. This group of four claims is on the steep slope east of and above the glacier at the head of the north fork of Bitter Creek valley. It has been held since September, 1946, by A. Cameron and L. Robichaud, of Stewart. In 1919 and 1920 the Saint Elmo group may have included the same ground, and a short adit was driven some years ago for a few feet on the vein that was explored in 1947. The property is reached by trail, some of which was improved and the rest newly constructed in 1947. From the Bitter Creek bridge on Bear River road, the distance by trail is 9 miles.

The rocks on this group are grey-green, medium-grained, sill-like intrusives, intruding and surrounding masses of argillite. The argillite beds strike north-easterly and dip gently south-eastward, except where crumpled locally. The contacts of the argillite and intrusives strike about north 20 degrees east, though tongues of the intrusives cut into the argillites for a few feet. A bleached and pyritized zone, rusty on the surface and from 10 to 20 feet wide, extends up the slope. In this zone a mineralized fracture, striking north 70 degrees east and dipping steeply southward, can be followed for 500 feet up the slope, between 3,600 and 3,800 feet altitude. At the lower end the vein is covered by wash; at the upper end it splits and the diverging stringers have not been explored.

For most of its exposed length, the vein is from 1 to 2 inches wide. It is generally narrowest where it cuts argillites and is widest, about 1 foot, where it cuts intrusives. This maximum width is exposed in two cuts, 50 and 125 feet from the lowest outcropping of the vein. At each the width decreases in both directions along the strike, and there are practically two lenses joined by the generally narrow vein.

The old adit was driven on the vein at the upper lens, and in 20 feet the vein-width decreases to half an inch. In 1947 a short adit was driven to the lower lens, and it is reported by the owners that about 16 tons of sorted ore was mined from it.

The above vein consists of coarsely crystalline calcite, galena, and light-coloured sphalerite with small amounts of fine-grained quartz, tetrahedrite, and chalcopyrite. One sample was taken from the weathered surface of the vein, 18 feet westerly from the portal of the upper adit, and one sample at each of the two cuts that expose unoxidized mineralization. The assays are given below:—

Location.	Width.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.
Upper cut	7	0.02	86.7	0.8	8.3	4.60
Between cuts	8	*Nil*	0.2	......	......	0.66
Lower cut	7	0.02	56.6	0.5	13.5	9.80

In the unoxidized samples there was a considerable amount of galena and sphalerite, but little tetrahedrite. A comparison of the assays indicates that the silver content is proportional to the copper content, and it is probable that most of the silver is associated with the tetrahedrite.

A shipment of ore, made to the Trail smelter, amounted to 15 tons. Net contents: Silver, 1,807 oz.; lead, 4,971 lb.; zinc, 5,811 lb.

ALICE ARM (55° 129° S.E.).*

Esperanza Mines, Ltd. Company office, 607 Fort Street, Victoria. A. MacDonald, managing director; I. Fiva, foreman. Capital: 1,000,000 shares, $1 par value. This company, formed in 1927, holds the Esperanza mines and the Alice group, comprising three Crown-granted claims—Aldebaran, Black Bear, and I'll Chance It—and thirteen recorded claims close to Alice Arm. Mineralized veins were found here in 1908 and have been developed intermittently. Since 1916 some 2,400 tons of ore, containing about 100,000 oz. of silver, 165 oz. of gold, and some lead and copper, has been mined. About one-half of this tonnage was shipped after sorting and the rest was milled.

The main workings are a mile north of Alice Arm, and it is another mile to the workings of the Alice group. The workings are all on the west slope of Kitsault River valley and lie at elevations of 400 to 1,500 feet. A road wide enough for a jeep has been built from the Kitsault River road to the lower workings. There is a combined cook-house, bunk-house, office, and storehouse in Alice Arm and also a diesel power plant between the Kitsault road and the main workings. In 1947 a crew of from six to ten men rehabilitated the power plant, built the road, retimbered the entrance to No. 5 adit, started drifting on a vein, and began to mine ore from the vein in No. 4 adit.

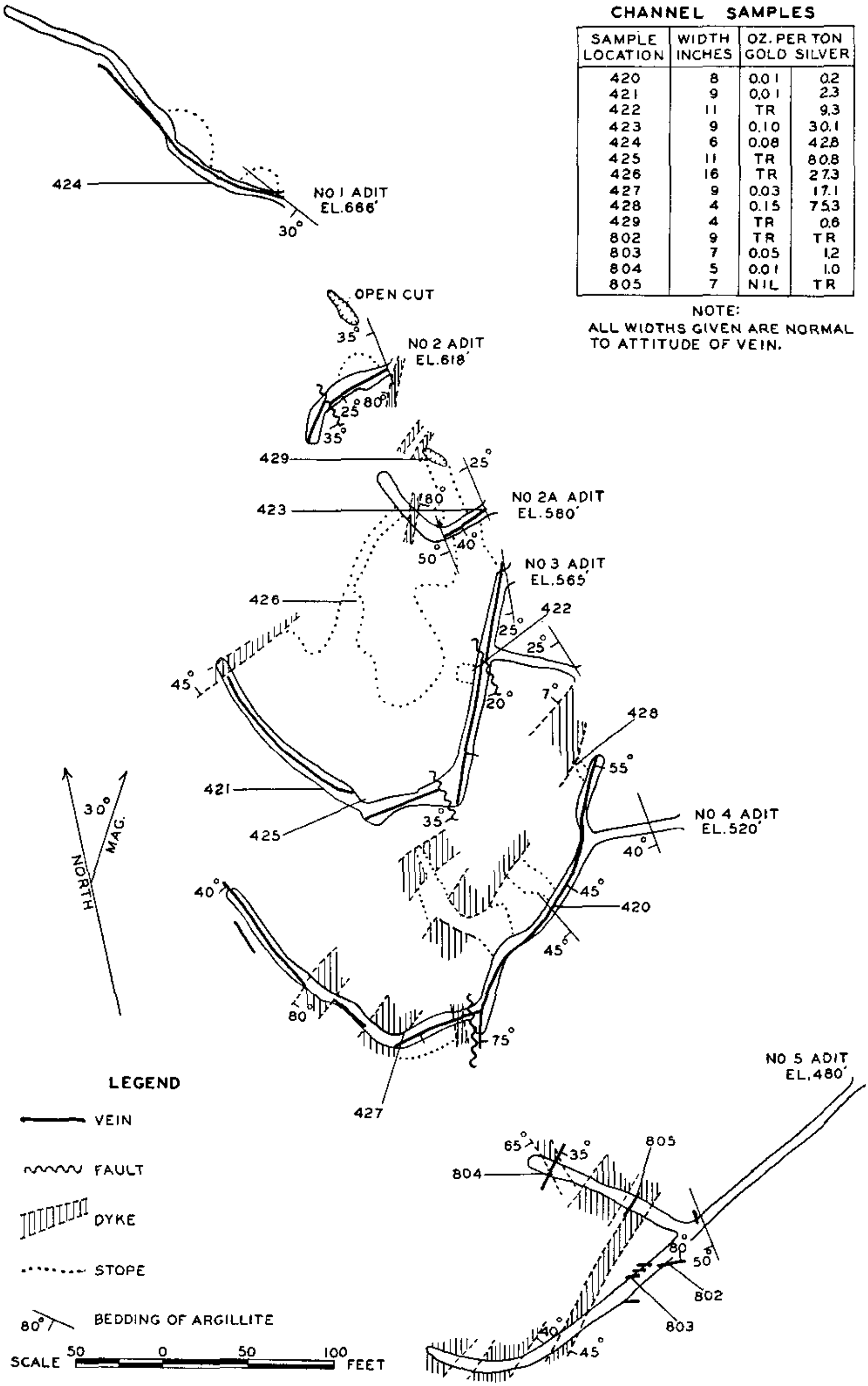
The main occurrence consists of a quartz vein dipping gently southward in a fractured zone in a series of argillites which strike northerly and dip moderately westward. The zone changes strike from south-westerly to westerly to north-westerly, and is exposed in four adits (*see* Fig. 8). The argillites and the vein are cut by dark grey-green fine-grained dykes. Some of these, up to 30 feet wide, strike north-east and dip steeply to moderately either north-westward or south-eastward. Others, including some up to 10 feet wide, strike northerly and are nearly vertical. Many narrow sills similar in appearance to the dyke-rock also intrude the argillites.

Post-dyke movements, along the faults of the vein-fracture zone, fractured some of the dykes where they cut the vein and permitted the formation of a quartz vein in these fractured dykes. The result is that the main quartz vein continues through these dykes, though the width of the vein within a dyke is less than outside it. Many bedded slips displace the vein by a few feet. The majority have some gouge, and in some there are quartz stringers.

The vein itself ranges in width from a few inches to 3 feet and contains narrow unreplaced inclusions of wall-rock, many of which are parallel to the walls and give the vein a banded appearance. Pyrite, sphalerite, galena, arsenopyrite, tetrahedrite, ruby silver, and scheelite occur in the quartz, for the most part near the walls. In the western part of the workings the attitude of the fracture is similar to that of the beds of argillite, and there has been movement along several bedding-planes. As a result, two or more parallel quartz veins connected by many narrow transverse veins have been formed.

The workings on and near the main vein are shown on Fig. 8. This figure is based on a map prepared in 1928 and on a tape and compass survey of subsequent advances. No work has been done in recent years on several other veins exposed by adits south of those shown.

* By J. M. Black.



CHANNEL SAMPLES

SAMPLE LOCATION	WIDTH INCHES	OZ. PER TON GOLD	SILVER
420	8	0.01	0.2
421	9	0.01	2.3
422	11	TR	9.3
423	9	0.10	30.1
424	6	0.08	42.8
425	11	TR	80.8
426	16	TR	27.3
427	9	0.03	17.1
428	4	0.15	75.3
429	4	TR	0.6
802	9	TR	TR
803	7	0.05	1.2
804	5	0.01	1.0
805	7	NIL	TR

NOTE:
ALL WIDTHS GIVEN ARE NORMAL TO ATTITUDE OF VEIN.

Fig. 8. Esperanza Mines, Limited—plan showing underground workings, geology, veins, and assays.

Much of the vein between No. 4 and No. 2A adits has been stoped. Ten samples, taken from the four upper adits, indicate the grade of vein which remains. The assays of these samples are:—

Width.	Gold.	Silver.	Width.	Gold.	Silver.
	Oz. per Ton.	Oz. per Ton.		Oz. per Ton.	Oz. per Ton.
8 inches	0.01	0.2	11 inches	Trace	80.8
9 ,,	0.01	2.3	16 ,,	Trace	27.3
11 ,,	Trace	9.3	9 ,,	0.03	17.1
9 ,,	0.10	30.1	4 ,,	0.15	25.3
6 ,,	0.08	42.8	4 ,,	Trace	0.6

The bedded vein in the western part of No. 9 level consists of several stringers, each of which is from a fraction of an inch to a few inches in width.

In No. 5 adit several veins with little mineralization are exposed. A vein in a dyke near the face of a crosscut has about the same attitude as the main vein, may be its extension, and is being drifted on. Samples from this vein and from three others assayed as follows:—

Width.	Gold.	Silver.	Width.	Gold.	Silver.
	Oz. per Ton.	Oz. per Ton.		Oz. per Ton.	Oz. per Ton.
9 inches	Trace	Trace	5 inches	0.01	1.0
7 ,,	0.05	1.2	7 ,,	*Nil*	Trace

At the Alice group, nearly black thin-bedded argillites, which weather to a light grey, strike north-westerly to northerly and dip westward. Many dark grey-green fine-grained dykes, which strike south-west and dip steeply, cut the argillites, and they, with numerous closely associated sills, make up a large proportion of the country rock. The principal vein, strike north 40 degrees west and dip 65 degrees south-westward, is up to 1 foot wide. Most of it, where well mineralized, has been mined for a few feet from the surface. Many quartz stringers intersect the principal vein, and a sample (419A) taken at a 4-inch intersection assayed: Gold, 0.02 oz. per ton; silver, 10.3 oz. per ton.

Two adits crosscut to the vein and drift along it. In the upper one the vein-zone is exposed for 65 feet and consists of several narrow stringers. In 1947 the other adit, 30 feet lower, was extended south-easterly for a few feet into massive intrusive rock, following a narrow zone with small lenses of mineralization. A 10-inch vein at the other end of this drift, 65 feet to the north-west, contains quartz and wall-rock well mineralized with galena and sphalerite. A sample taken here (801A) assayed: Gold, 0.41 oz. per ton; silver, 67 oz. per ton.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1928, pp. 80–84; 1934, p. B 14. *Geol. Surv., Canada*, Sum. Rept., 1928, Pt. A, pp. 32–38.]

Silver-Lead.

Torbrit Silver Mines, Ltd.* Head office, 350 Bay Street, Toronto. J. H. C. Waite, president; H. D. Forman, mine manager. Capital: 3,000,000 shares, $1 par. The property is on Kitsault River, about 8 miles from Alice Arm. A road was built along the old Dolly Varden right-of-way from the beach to the mill-site. A temporary camp for forty men was built, and excavations for a mill and for other mine buildings have been started. Five miles of trail between the mine and

* By Charles Graham.

Clearwater Creek have been widened and repaired. The diversion-dam, 1 mile above the mouth of Clearwater Creek, has been completed and a power-house built.

A sawmill to supply lumber for construction is in operation at the beach. Equipment is being taken in for the mill. It is proposed to start an adit at 1,030 feet elevation early in 1948 and to drive for about 1,000 feet. No underground work was done during 1947, but eighty-five men were employed.

Gold.

Homestake. (55° 129° N.W.) This group of six claims, including four Crown-granted claims—namely, Homestake, Homestake No. 1, Homestake No. 2, and Homestake No. 3—and also two held by location, is partly owned by British Lion Mines, Limited. This company has an option to buy the share of the other owners. A. F. Smith is the manager. The group lies west of Kitsault glacier and south of its lowest tributary glacier, at an elevation between 3,000 and 4,000 feet, and is reached by 7 miles of pack-trail from the end of the Kitsault River road. During the last thirty years the mineral showings have been explored by many trenches and several adits.

The rocks consist of green tuffs and flows which are intruded by many bodies of feldspar porphyry and diorite. A major shear-zone which strikes south-easterly and dips north-eastward includes many lenses and veins of quartz. The quartz is mineralized with sulphides, including some massive chalcopyrite, which partly replace the wall-rock.

Myberg adit is a crosscut to, and drift along, the main zone below mineralization, with high, though erratic, values. The drift has been advanced a few feet since 1938, and exposes a fault-zone of several gouge-filled slips, which is mineralized with abundant pyrite and some chalcopyrite. A sample, taken across 42 inches at the face, assayed: Gold, trace; silver, 0.4 oz. per ton.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1934, pp. B 15–B 17; 1938, pp. B 7–B 12. *Geol. Surv., Canada,* Sum. Rept., 1921, Pt. A, p. 20; Mem. 175, p. 67.]

Vanguard. (55° 129° N.W.) This group of five claims has been held for thirty years by M. Petersen. These claims are between Kitsault River and its west fork, and are 6 miles by trail from the end of the Kitsault River road. Some shoots of chalcopyrite ore have been developed by underground workings and have been previously described (*see* references). Recently some trenching has been done on a wide sheared zone north of the chalcopyrite mineralization. This new work is at 3,200 feet elevation and on a gently rolling slope above the steep valley-sides. Outcrops are few in number, except at changes of slope and in the streams.

The rocks are dark and light grey, fine-grained, altered feldspar porphyry intrusives. They are members of the copper-belt, so called from some copper-occurrences within it. The surface is rusty from the weathering of pyrite, which is present in all exposures. Green fine-grained dykes that strike northerly and dip steeply eastward cut the porphyry. There is no evidence as to the relationship of the intrusives to a belt of black argillites striking north-westerly a quarter of a mile to the east.

A shear-zone, more than 10 feet wide and 100 feet long, strike north-westerly and dip nearly vertical, is exposed in three trenches. It has not been traced to the north-west beyond a small stream which follows along a fault striking south-west and dipping south-eastward. To the south-east it is not seen beyond another stream. The lowest trench has been advanced for a few feet as an adit and, although slashed out to a width of 11 feet, does not disclose the full width of the shear-zone. Quartz veinlets and lenses in the shear-zone are separated by dark-grey laminæ containing pyrite. In and near the quartz are small amounts of sphalerite, galena, and chalcopyrite. Five samples were taken across the zone, and the highest assay from these was: Gold, 0.02 oz. per ton; silver, 0.1 oz. per ton—from a sample across a width of 20 inches. At the highest trench 75 feet away, where 8 feet of similar mineralization is exposed, three samples were taken, the highest assay being: Gold, 0.02 oz. per ton; silver, 0.2 oz. per ton—from a sample taken across 40 inches. On the south-west of this trench is some sugary white quartz with some pyrite, a picked sample of which assayed: Gold, 0.02 oz. per ton; silver, trace.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1928, p. 88; 1929, p. 100; 1931, p. 38. *Geol. Surv., Canada,* Mem. 175, pp. 84, 85; Sum. Rept., 1928, Pt. A, pp. 48, 49.]

Gold Leaf. (55° 129° S.W.) This claim, located in 1938 and held by James Flynn, of Alice Arm, is on Granby Peninsula, 2 miles south of Anyox. Some high-grade ore was found in 1938, at which time several small shipments of sorted ore were made. A vein from 2 inches to 2 feet wide containing some free gold and a small amount of sulphides is exposed at the beach and can be followed westerly for 150 feet until covered by overburden. The vein strikes south-westerly and dips steeply south-eastward; on its hanging wall is a narrow lamprophyre dyke, and at its foot-wall the rock has been sheared.

In order to locate the extension of this vein, an adit has been started from a point 50 feet south-west of the most southerly exposure and on the hanging wall of a north-westerly striking fault. The adit crosscuts north 55 degrees west for 35 feet to a fault-zone just beyond a lamprophyre dyke. This dyke is similar in attitude and appearance to the one at the beach, and has quartz veinlets in both walls. The fault-zone has been followed for 45 feet along the strike, south 40 degrees west, dips from 50 to 60 degrees south-westward and contains some lenses of unmineralized quartz.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1938, pp. B 4–B 7.]

Siliceous Flux.

Silica. (55° 129° S.W.) This group of three claims, held by Charles Clay, of Alice Arm, is at the north end of Larcom Island, in Hastings Arm of Observatory Inlet, opposite Anyox. Silica, shipped to the Anyox smelter for flux, amounted to 7,000 tons. A trench 30 feet long, excavated through about 5 feet of overburden, exposes a shattered dyke cutting argillite. This dyke is silicified and contains pyrite and also veinlets and lenses of white and blue quartz. Associated with the quartz are some pyrite, sphalerite, and galena. A sample assayed: Gold, trace; silver, 1.1 oz. per ton. The zone is not exposed by trenches at points removed from the beach.

PRINCE RUPERT (54° 130° S.E.)*

A piece of quartz containing gold, found after a blast in a quarry at Prince Rupert, aroused interest in the possibility of lode gold occurring there. As found, the piece was more than an inch in diameter. When seen by the writer, the piece had been crushed and broken into many fragments to separate the gold from the quartz. The fragments were up to half an inch long, and included pieces of quartz, quartz containing gold, and gold without quartz. Some of the pieces of gold were about a quarter of an inch long and nearly as thick. The appearance of the gold indicated that the pieces had been pounded.

The quarry is in Lot 1992, about 2,800 feet south 73 degrees west of the south-west corner of Lot 251, just east of Park Avenue, within the City of Prince Rupert. The Gail and the Hazel claims, and the Joanne Fractional claim, located to cover the quarry and the surrounding area, were recorded in September, 1947. Ten other claims and five fractional claims were located, mostly south and east of the point where the gold was found.

In and near this quarry micaceous quartzites and argillites that dip moderately to gently eastward are cut by veins of white translucent quartz. The veins are len-

* By J. M. Black.

ticular and range in width from a fraction of an inch to several feet. Some of the veins cut across the altered sediments and the others are conformable with them. Black mica and pyrrhotite occur in and near some of the veins.

The quartz in the piece containing the gold is opaque, white, and rusty, and no similar-looking quartz was found near the quarry. The broken rock in the quarry, near the point where the find was made, was excavated without uncovering any vein from which the piece of gold-bearing quartz appeared to have come. No other exploration or development-work has been done.

HAZELTON (55° 127° S.W.).*

Silver-Lead-Zinc.

Silver Standard Mines, Ltd. Company office, 602 Hastings Street West, Vancouver, R. W. Wilson, managing director; H. B. Gilleland, superintendent. Capital: 3,500,000 shares, 50 cents par value. This company, formed at the end of 1946, owns fifteen Crown-granted claims and fractions, and has also recorded twenty-four claims. The claims are on the west slope of Glen Mountain, 6 miles by road north of Hazelton. The first claims were located in 1910, and between 1913 and 1918 some high-grade shoots were mined and some ore was shipped. From 1918, when a mill was built, until 1922, when production stopped, the ore was milled and concentrates of lead and zinc, both containing silver and a little gold, were produced.

The mine is developed by an inclined shaft and two adit-levels. In 1947 the crosscut on the lower level, the 1300, was advanced 415 feet, south 83 degrees east, to intersect No. 4 vein at 1,350 feet from the portal. No. 1 vein was drifted for 180 feet, and a raise put up 37 feet. No. 4 vein was drifted on for 116 feet on 1300 level; a raise was driven on it 248.5 feet to 1500 level and 37 feet of drifting done on the vein on 1500 level. About 1,400 tons of ore from development-faces was stock-piled at the mine. The old buildings were rehabilitated and some new ones built. The ground west of the workings was prospected. About fifteen men were employed.

The veins cut massive, blocky, light- and dark-grey beds which are fine-grained, calcareous sandstones, argillites, and probably tuffs. There has been some chloritic alteration. Bedding is not common, and where it is seen, dips gently. Near the face of 1300 crosscut the rocks dip eastward, and near the portal up to 35 degrees westward.

Ten veins are exposed on the surface and in the underground workings, and all strike north-easterly and dip 50 to 75 degrees south-eastward. Several stringers and No. 4 vein were exposed by the new crosscut on 1300 level. No. 1 vein, which is 285 feet from the portal, is about 2 feet wide, dips 55 degrees south-eastward, and consists of white quartz which is fractured and mineralized with sphalerite, arsenopyrite, pyrite, chalcopyrite, and galena. It has some inclusions of wall-rock and some carbonate. A few veinlets, principally of sphalerite, extend into the hanging wall for a few inches. A sample taken 110 feet from the crosscut and across 21 inches, including the mineralized wall-rock, assayed: Gold, 0.07 oz. per ton; silver, 3.1 oz. per ton; lead, 0.30 per cent.; zinc, 9.4 per cent.

No. 4 vein at the crosscut dips 70 degrees south-eastward. It is a quartz vein 6½ feet wide, and the wall-rock for 3½ feet on the south-east side of the vein is slightly mineralized with small amounts of sulphides. An additional width of 4 feet to the south-east consists of quartz stringers and wall-rock with small amounts of sulphides. The main quartz vein is fractured and contains small amounts of the ore sulphides.

* By J. M. Black.

Near its foot-wall is a gouge-filled slip. Four samples taken across the entire zone from hanging wall to foot-wall assayed as follows:—

Width.	Description.	Gold.	Silver.	Lead.	Zinc.	Arsenic.
Inches.		Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.
48	Stringer zone	0.04	6.6	1.00	1.8	1.8
42	Mineralized wall-rock	0.01	*Nil*	*	*	....
54	Main vein	0.08	21.2	0.58	1.8	3.3
36	Main vein with 1 foot wall-rock	0.03	0.5	*	0.32	3.6

* Percentage of metal less than 0.3 per cent.

A raise to the level above was driven on No. 4 vein at 65 feet from the crosscut. In it near the drift the vein is nearly 3 feet wide and, except that it contains a little pyrrhotite, is similar to the vein at the crosscut. A sample taken across 36 inches, including a few inches of mineralized wall-rock, 20 feet above the drift, assayed: Gold, 0.01 oz. per ton; silver, 1.4 oz. per ton; lead, less than 0.3 per cent; zinc, 0.9 per cent.; arsenic, 3 per cent.

In the drift beyond the raise the vein narrows to a few inches and then widens to 5 feet at 100 feet from the crosscut. Two samples taken 100 feet from the crosscut on the hanging wall and foot-wall sections of the vein and including the mineralized wall-rock assayed:—

Width.	Description.	Gold.	Silver.	Lead.	Zinc.	Arsenic.
Inches.		Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.
33	Hanging wall	0.01	9.8	2.8	*	2.0
36	Foot-wall	0.06	1.1	*	1.6	3.5

* Percentage of metal less than 0.3 per cent.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1920, pp. 84, 88; 1923, pp. 105, 106. *Geol. Surv., Canada,* Mem. 223, pp. 28–35; Paper 44-24.]

SMITHERS (54° 127° N.E.).*

Silver-Lead-Zinc.

Duthie Mines (1946), Ltd. Company office, 702 Stock Exchange Building, Vancouver. J. E. R. Wood, managing director; E. Parr, superintendent. Capital: 3,500,000 shares, no par value. This company, formed in 1946, took over the assets of Smithers Mines, Limited. The property includes the following Crown-granted claims: Henderson Fraction, Raven Fraction, Raven, White Swan, Muriel, and Cobalt; three claims leased from the Crown—namely, Southwest, Avalon Fraction, and Payroll; sixteen claims held by location; and some others under option. The mine is 14 miles by road west of Smithers and lies at altitudes of from 3,200 to 4,500 feet on the south-western slope of Hudson Bay Mountain.

Silver-lead showings discovered in 1908 were explored by trenches prior to 1920. In 1920 the veins were developed by adits, and some high-grade ore was shipped. In 1927 a mill was built, and subsequently most of the ore mined was concentrated before shipment. Operations were suspended from 1930 until 1946, except between 1937 and 1940 when lessees shipped some high-grade ore. In 1946 the camp was rehabilitated and a diesel plant was installed because of difficulty in obtaining parts for the steam plant. Some diamond-drilling was done from the surface and later from

* By J. M. Black.

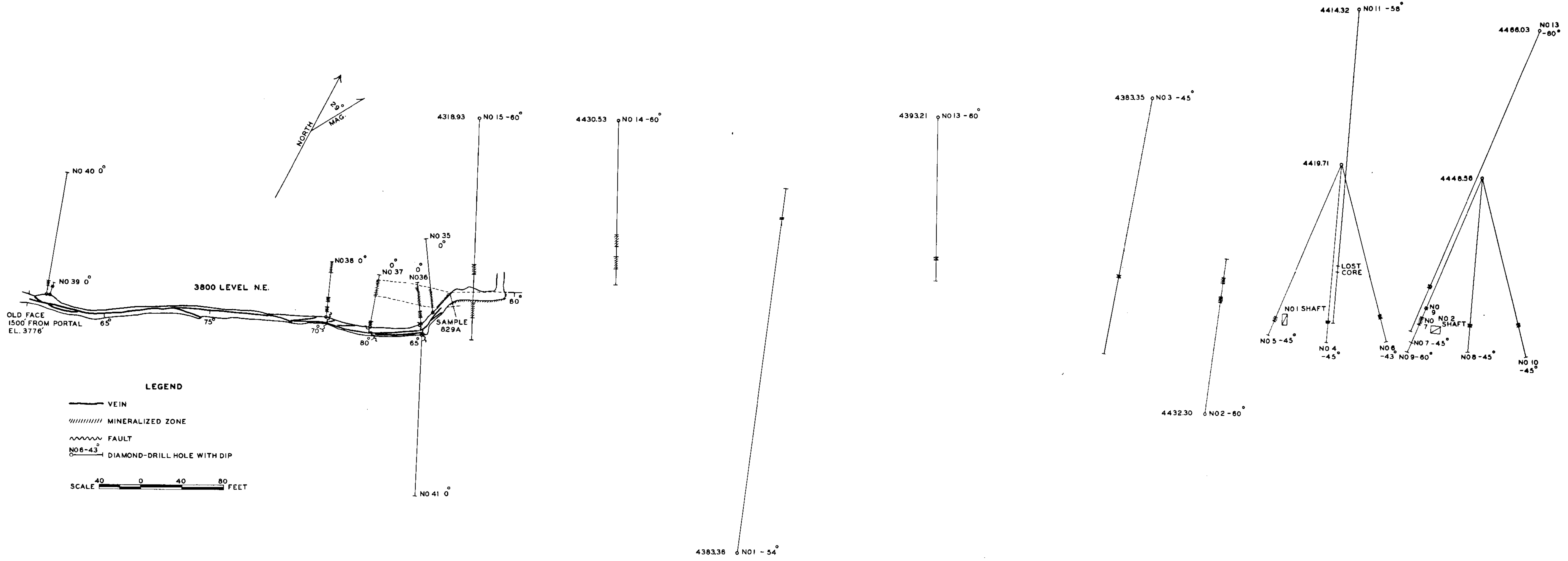


FIG. 9. DUTHIE MINE. SHOWING PART OF THE 3800 LEVEL, MINERALIZATION AND DIAMOND-DRILL HOLES

the underground workings. In 1947 the drift on the Henderson vein, on the 3800 (or MacPherson) level, was advanced. Fifteen men were employed until operations were suspended for the winter.

The veins strike north-easterly and dip moderately to steeply south-westward. The most productive vein has been the Henderson, which has been developed by four adit-levels and several sub-levels, all of which are connected by shafts and raises. Drilling from the surface showed that a mineralized zone extended for more than 1,450 feet beyond the face of the drift on the Henderson vein on the 3800 level, and in two drill-holes (14 and 15) greater than average widths of well-mineralized vein material were obtained.

The rocks exposed in the underground workings and diamond-drill cores are massive flow-breccias and flows, some of which are porphyritic. Rhyolitic types predominate, but andesitic rocks are also present. Light-coloured rhyolites are the most abundant rocks, but the series includes rocks of many colours, including greys, greens, and purples. Many dykes, most of which are dark green, cut this extrusive series.

The Henderson vein, where exposed by the new work on the 3800 level, ranges from a few inches to a foot in width. It is gently curved, strikes about north 60 degrees east and dips from 55 degrees to 85 degrees south-eastward. Several veins a few inches in width branch from the main fracture and gradually diverge from it. The mineralization in this vein in the drift and in the drill-holes beyond consists of cream-coloured carbonate and white quartz with arsenopyrite, pyrite, sphalerite, galena, pyrrhotite, chalcopyrite, and tetrahedrite. Outside the vein the wall-rock has been altered and bleached, and carbonate, silica, pyrite, and arsenopyrite replace it. Some of the carbonate in the vein-fracture has been leached and small cavities are common. A few cross-faults, with steep dips, offset the vein-fracture slightly.

In the north-eastern part of the working the Henderson vein-fracture curves northerly into a mineralized zone 16 feet wide, which along most of its length has about the same attitude as the Henderson vein. This wide zone is fractured and bleached, and contains small amounts of sulphides. The proportion of sulphides increases toward the foot-wall, where there is a chalcedony stringer from 1 to 2 inches wide. Some galena occurs in the zone in the 2 feet nearest the foot-wall, and a sample (829A) taken across this 2-foot width assayed: Gold, 0.13 oz. per ton; silver, 0.5 oz. per ton; lead, 0.28 per cent; zinc, 4.7 per cent. This wide zone extends south-westward, maintains about the same width for 70 feet, and, judging by drill-core intersections, appears to narrow beyond this point. The zone is exposed in the drift for 55 feet, and in that distance the proportion of sulphides decreases. This zone is about 200 feet below the well-mineralized sections of Hole No. 15, and from a crosscut to the north it was proposed to drill other holes upward to explore the ground between this level and the drill intersection.

Four short holes drilled downward from the crosscut on the 3800 level between the Henderson and the Ashman vein (which is about 180 feet north and nearly parallel to the Henderson vein) did not intersect mineralization of ore grade.

From the 3300 level, which is the lowest and was formerly called the Mill or 500 level, fourteen holes were drilled between the portal and the most westerly stopes. Five of these holes, between the portal and a major fault called No. 1, did not intersect veins. Eight out of the other nine holes drilled cut the Henderson vein or the fault-plane vein (a branch of the Henderson vein). Each of the vein intersections was less than a foot in width. One other hole, drilled from this level toward the Ashman vein, failed to intersect it.

Shipment of 1 ton of ore to the Trail smelter was reported in 1947. Net contents: Silver, 52 oz.; lead, 769 lb.; zinc, 168 lb.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1927, pp. 134–136; 1934, pp. C 9–C 11. *Geol. Surv., Canada*, Mem. 223, pp. 84–92; Paper 44-23.]

SUSTUT-AIKEN-McCONNELL LAKE AREA (56° 126°).*

The Sustut-Aiken-McConnell Lake area of northern British Columbia was the scene of much prospecting and preliminary development activity during 1946 and 1947. In all, approximately 420 claims were recorded. The discovery of gold-bearing veins was reported in the latter part of 1946, and in 1947 development operations were undertaken by Springer-Sturgeon Gold Mines, Limited, with a crew of twelve men, and by Goldway Peak Mines, Limited, with a crew of six men. Also in 1947 three well-equipped parties prospected for Springer-Sturgeon Gold Mines, Limited, and about ten independent prospectors were active in various parts of the area.

Placer gold was discovered on McConnell Creek in 1906, and placer-mining is still done from time to time. The Consolidated Mining and Smelting Company of Canada began systematic prospecting in the Aiken Lake area about 1927. Several lode showings were discovered and explored, notably those on the Croyden group, which were under development from 1937 to 1940.†

The present report deals with properties recorded in 1946 and 1947 in an area lying within the McConnell Creek sheet‡ and extending to the common boundary between the McConnell Creek sheet and the Aiken Lake (south half) sheet.§ The McConnell Creek and the Aiken Lake preliminary geological maps were published by the Geological Survey, Canada, 1946. Aiken Lake area,† published by the British Columbia Department of Mines in 1940, touches on the geology and describes mining properties in an area most of which lies within the Aiken Lake sheet, and includes the Croyden property.

The topography is featured by steep and jagged mountain masses and ridges, isolated from one another by broad valleys and low passes. The terrain is not as difficult to traverse as might appear at first sight because the average elevation of the valleys is about 4,500 feet above sea-level, and few of the peaks and ridges rise much more than 2,500 feet above the valleys. Goldway Peak, one of the highest in the area, has an altitude of 7,415 feet. Tree-line is about 4,700 feet altitude. The lower valleys sustain sparse stands of spruce, balsam, and some jack-pine, but on the higher surfaces open grassy meadows are interspersed with patches of scrub spruce, heather, and muskeg.

Fig. 10 shows the main travel routes within the area. Overland access is by way of a winter road, in poor condition, from Germansen Landing to Aiken Lake—a distance of 105 miles. The distance from Aiken Lake to Johanson Lake is 10 miles, and to Sustut Lake, 23 miles. The distance from Johanson Lake to McConnell Lake is about 32 miles by a poorly defined trail. The overland route to the area from Germansen Landing is rarely used except for bringing in pack-horses, practically all traffic being by air from Fort St. James. In 1947 the charter rate for an aircraft from Fort St. James to Sustut Lake was $234 each way, the incoming load limit being 1,200 lb. and the outgoing limit about 700 or 800 lb.

The field season in this part of northern British Columbia is short. Snow remains in the open valleys until the first or second week of July and in the higher passes and on northward slopes until late in August. Some of the higher mountains have small glaciers on their northward slopes. Snow which falls late in September usually remains for the winter. In 1947 Aiken Lake was open on May 20th and the first aircraft landed

* By W. H. White.

† Lay, D.: Aiken Lake area, *B.C. Dept. of Mines*, Bull. No. 1, 1940.

‡ Lord, C. S.: McConnell Creek, *Geol. Surv., Canada*, Paper 46-6.

§ Armstrong, J. E.: Aiken Lake (south half) preliminary map, *Geol. Surv., Canada*, Paper 46-11.

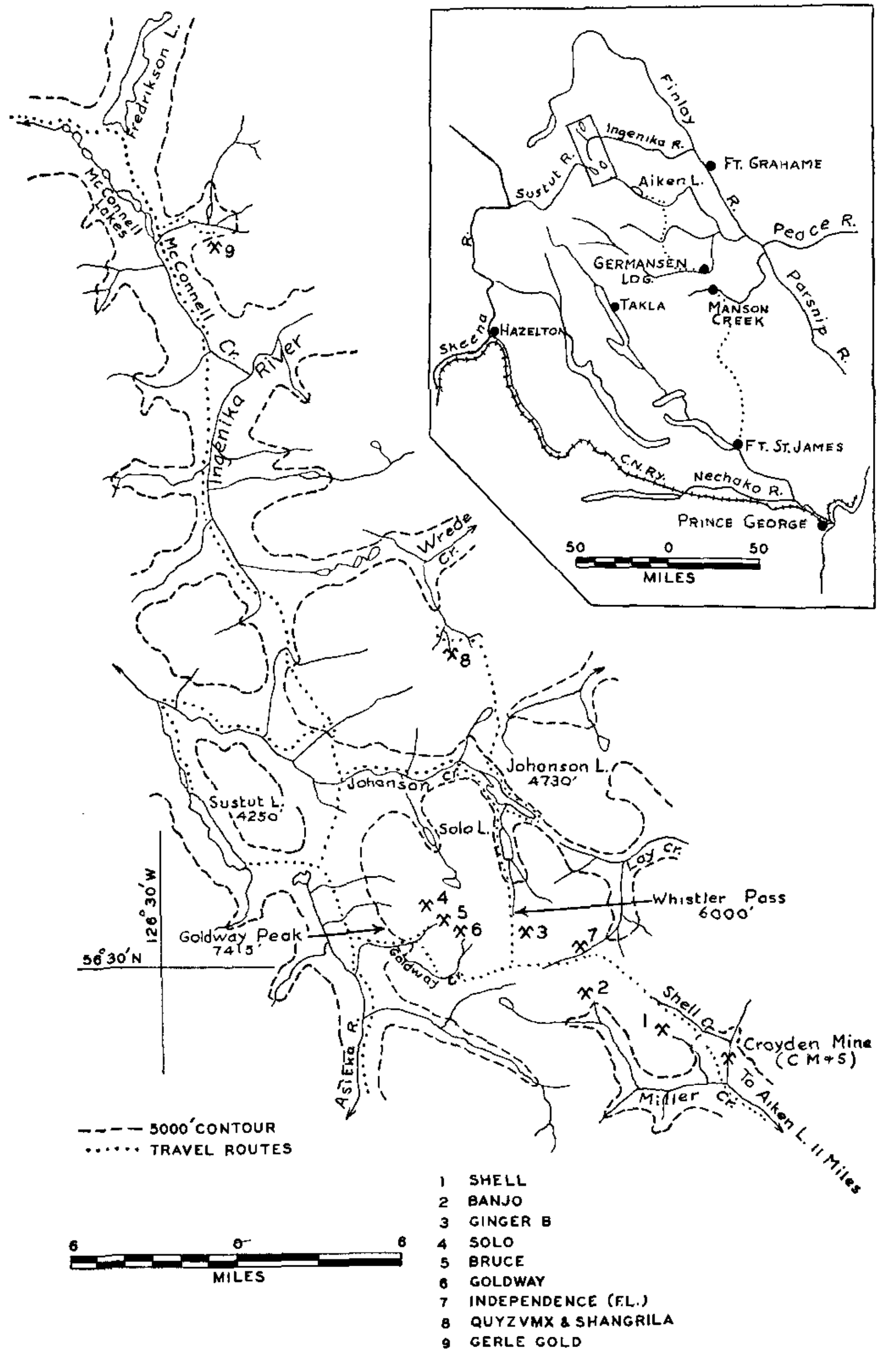


Fig. 10. Sustut-Aiken-McConnell Lake area, showing location of properties.
Inset map shows location of area.

on Sustut Lake on June 10th. The summer climate is cool and moist. During August, 1947, some rain or sleet fell every day.

The general geology of the area, shown on Preliminary Map 46-6A of the Geological Survey, is characterized by Upper Mesozoic volcanic rocks and some sediments intruded by small granitic stocks which typically form the cores of isolated mountain masses. A rolling upland surface several miles in extent, east of McConnell Lake, is underlain by a larger body of granodiorite and quartz diorite. The older rocks are moderately folded along northerly trending axes and are displaced by several normal faults. One such fault near the headwaters of Wrede Creek shows an apparent vertical displacement of about 200 feet. Near granitic stocks the older rocks are metamorphosed to chlorite and amphibole schists and gneisses, and in some instances the development of large hornblende crystals has produced rocks simulating diorite. Mineralization has been discovered both in the small stocks and in metamorphosed volcanic rocks.

The writer spent the month of August, 1947, examining properties, then under development, which are indicated on Fig. 10. Other claims, on which no development-work was in progress and of which the locations were not known precisely by the writer, were not examined. The properties on which showings were examined are listed below; the owners of the claims, as on the records in November, 1947, are also shown:—

Property.	Owner.
Shell—	
Shell 1 to 8	N. Hals
Shell 9, 10, 13, and 14	*G. G. Campbell*
Shell 15 to 18	J. Dumbrille
Shell 19 and 20	J. Munroe
Shell 23 to 26	J. Dumbrille
Shell 29 to 32	E. Kvale
Shell 33 to 36	S. D. Townsend
Shell 46 to 53	E. Harvey
Shell 54 to 55	N. E. Townsend
Ginger B—	
Ginger 1 to 4	J. Lawlor
Ginger 5 to 8	J. W. Burton
Ginger 9	K. J. Springer
Ginger B 10 and 11	K. J. Springer
Ginger B 12 to 18	D. Dumbrille
Ginger B 20	D. F. Kidd
Ginger B 29 to 35	D. J. Hoey
Ginger B 39	J. Munroe
Banjo	Forfeited
Independence	Forfeited
F. L. 1 to 8	Frank Larsen*
Goldway—	
Goldway 1 to 5, 7 and 8	Goldway Peak Mines, Ltd.
Dot 1 to 6	Goldway Peak Mines, Ltd.
Mars 1 to 4	Goldway Peak Mines, Ltd.
Nonie 1 and 2	Goldway Peak Mines, Ltd.
Bruce 1 to 9	Goldway Peak Mines, Ltd.
Solo—	
Solo 1, 3, 4, and 5	C. A. Bennett
Solo 7	R. A. Barker
Solo 1 Fr. and Solo 2 Fr.	R. A. Barker

* Located October, 1947, covering ground formerly covered by Independence 1 to 8.

Property.	Owner.
Quyzvhx 1 to 8	A. B. Goodridge
Shangrila 1 to 6	O. C. Chayer
Gerle Gold—	
Gerle Gold 1 to 8	J. H. Gerlitzki
Leger Gold 1 to 8	J. Leontowich

The approximate positions of the properties are shown on Fig. 10. The boundaries of the claims have not been surveyed. The ground covered by claims in and near the area is indicated on the maps of the Department of Mines Central Records Offices in Victoria and Vancouver, from data supplied by the locators.

Elevations given in this report are based on altimeter readings and on an assumed elevation of 4,730 feet for Johanson Lake. Owing to the changeable weather, considerable variations occurred in altimeter readings.

Gold-Copper.

Shell. The claims Shell Nos. 1 to 10, 13 and 14, 15 to 20, 23 to 26, 29 to 36, and 46 to 55, inclusive, recorded in the names of several owners, are understood to belong to Springer-Sturgeon Gold Mines, Limited. Several claims held previously have been allowed to lapse. The claims straddle a north-westerly trending mountain ridge which separates the deep main valley of Miller Creek from the shallower valley of a tributary to the east, locally known as Shell Creek. The ground ranges in elevation from 5,000 to 7,200 feet. The main camp of Springer-Sturgeon Gold Mines, Limited, is on Shell Creek, about 14 miles by trail north of Aiken Lake, from which place most of the supplies were brought by pack-horses.

The rocks are volcanic flows, breccias, and thin-bedded tuffs. Some flows exhibit well-developed flow-structure and scoriaceous tops. The rocks are gently folded along north-westerly and northerly trending axes and nowhere were seen to dip more steeply than 20 degrees. Intrusive rocks are represented by several dykes of feldspar-quartz porphyry and by a small granitic stock, the highest outcrop of which is seen at an elevation of 5,500 feet on the Miller Creek side of the ridge near the south-west corner of the property.

A feature of the geology is the high degree of alteration exhibited by the volcanic rocks. In addition to the common greenstone, diverse types have been produced, such as hornblende gneiss and several varieties of coarse-textured rock, composed essentially of hornblende, chlorite, and epidote, which in hand specimen simulate diorite and gabbro. Numerous light-green " dykes " composed of epidote and calcite traverse the gneiss and " dioritic " rocks. The development of these greenstones, gneisses, and other types from the original volcanic rocks is attributed to emanations from an igneous source believed to underlie the mountain ridge at no great depth.

The main showings are on a rude bench, varying in elevation from 5,700 feet to 5,900 feet, which forms the floor of a basin on the north-east side of the ridge. Development-work consists of some sixty open-cuts. The most easterly showing is a shear-zone which on the average strikes north-west and dips steeply to the south-west. It is a composite " horsetail " structure made up of several minor shear-zones, arranged *en echelon,* the strikes of which diverge slightly from the general trend of the zone. Some of these subsidiary shear-zones are silicified and erratically mineralized with stringers and disseminations of pyrite and chalcopyrite. Although the composite shear-zone has been traced by open-cuts for a distance of 550 feet, the largest and most continuously mineralized section is only 70 feet long and averages less than 2 feet wide. To gain some idea of the values which might be expected, two channel samples 50 feet apart were cut across this mineralized section. The first, across 18 inches, assayed: Gold, 0.28 oz. per ton; silver, 1.1 oz. per ton; and copper, 6.5 per cent. The second, across 9 inches, assayed: Gold, 0.47 oz. per ton; silver, 0.6 oz. per ton; and copper, 12.5 per cent.

Four hundred feet to the south-west from this showing is a peculiar vein-like body of massive chalcopyrite with a little pyrrhotite and magnetite. The magnetite occurs mainly near the walls, forming an irregular selvage. The vein stands vertically and curves slightly, so that going westward along the outcrop the strike changes progressively from north 75 degrees west to due west. The total length is 275 feet and the width varies little from 20 inches. At either end the mineralization pinches out in unmineralized parallel shear-zones which strike north 55 degrees west and dip 75 degrees north-eastward. Two channel samples of the unoxidized ore were taken. The first, 100 feet from the east end of the vein, across 19 inches, assayed: Gold, 0.47 oz. per ton; silver, 1.6 oz. per ton; and copper, 20.5 per cent. The second, 75 feet farther west, across 21 inches, assayed: Gold, 0.48 oz. per ton; silver, 2.4 oz. per ton; and copper, 22.5 per cent.

The third showing, some 800 feet farther west and 200 feet higher, is a broad, northerly trending shear-zone traceable for 1,700 feet. The sheared greenstone and " dioritic " rock in this zone is irregularly silicified and contains disseminated pyrite. Several open-cuts have been made on the west side of the zone in a lens of deeply oxidized material consisting of cellular, friable quartz and abundant pyrite. The lens is 20 feet long and varies from 6 inches to 28 inches in width. Because this material is oxidized and enrichment in residual gold is probable, no samples were taken. Similar mineralized lenses, some containing a little chalcopyrite, were seen elsewhere in the shear-zone.

The fourth showing on the Shell group is on the Miller Creek side of the ridge, approximately 1½ miles west of the showings described above. This is a north-westerly trending zone, in volcanic rocks, characterized by abundant magnetite and a little chalcopyrite. It can be traced by its oxidized outcrops for about 2,000 feet. In places magnetite is disseminated across widths of 50 feet, and occasionally it is in massive lenses up to 10 feet wide and 100 feet long. A specimen of massive magnetite assayed only a trace of gold, but another selected piece containing about 15 per cent. chalcopyrite assayed: Gold, 0.86 oz. per ton; silver, 2 oz. per ton. As no work has been done on this showing, no further sampling was attempted.

Gold.

Ginger B. The claims Ginger 1 to 9, Ginger B 10 to 18, Ginger B 20, Ginger B 29 to B 35, and the Ginger B 39, recorded in the names of several owners, are believed to belong to Springer-Sturgeon Gold Mines, Limited. Some other claims which with those listed made a continuous succession from 1 to 39 have been allowed to lapse. The property is about 3 miles north-west of the Shell. The showings are on a mountain immediately east of a pass, locally known as Whistler Pass, leading to Johanson Lake. The rocks include alternating beds of tuff and breccia, flows of hornblende andesite, and a few thin strata of limy slate containing poorly preserved fossils. These rocks have a uniform attitude, the strike being northerly and the dip about 45 degrees westward.

The most conspicuous feature of this property is a series of bright-red and yellow bluffs which extend for more than 2 miles south-easterly from Whistler Pass. The bluffs mark an oxidized shear-zone at least 300 feet wide, dipping about 65 degrees to the north-east. The zone is well silicified and abundantly impregnated with fine-grained pyrite. A specimen of this material contained only a trace of gold. Two shallow trenches on the east side of Whistler Pass at an elevation of 6,500 feet, believed to be near the north-east corner of Ginger B No. 24 Mineral Claim, expose two small veins. These strike north-westerly and dip steeply south-eastward, cutting across the general foliation of the shear-zone. One vein, consisting of crushed and oxidized quartz and pyrite, 5 inches wide, assayed: Gold, 2 oz. per ton; silver, 0.4 oz. per ton. The other, 7 inches wide, assayed: Gold, 0.02 oz. per ton; silver, trace. Neither vein could be traced more than a few feet along its strike.

Numerous quartz veins in epidotized andesite and andesite breccia occur on the south side of the mountain, some 1,500 feet east of the shear-zone mentioned above. The largest vein, elevation 6,700 feet, is near the south boundary of Ginger No. 3 Mineral Claim, about 600 feet west of the south-east corner. This vein strikes northerly and dips steeply eastward. It can be traced by outcrops and open-cuts for a distance of 420 feet. The vein is drift-covered beyond the most southerly exposure, but to the north it ends abruptly at a zone of sheared and gougy rock, believed to represent a north-easterly trending fault. The vein consists of sheeted and in places drusy quartz containing a little fine-grained pyrite and occasional grains of chalcopyrite and galena. Near the north end of the exposures several smaller veins merge with the main vein, forming a lode structure locally as much as 8 feet wide. The results of three channel samples of this vein are as follows:—

Location.	Description.	Width.	Gold.	Silver.
Distance measured from the southern end of the exposure—		Inches.	Oz. per Ton.	Oz. per Ton.
130 feet north	Sheeted quartz with some fine-grained pyrite	32	0.06	0.1
280 feet north	Massive quartz, little sheeting or mineralization	42	Trace	0.1
400 feet north	Sheeted quartz with streaks of pyrite and a little galena	53	0.15	0.1

Another vein, at about the same elevation, is exposed intermittently for a distance of 100 feet by five open-cuts near the north-east corner of Ginger No. 3 Mineral Claim. The vein strikes north 10 degrees west and dips steeply westward. Immediately north of the open-cuts is an area of deep talus. No vein was seen in bare rock bluffs about 400 feet farther north. At the south end the vein terminates at a north-easterly trending fault. This vein differs from the one described above, in that it is very closely sheeted parallel to its walls and the drusy quartz contains abundant fine-grained pyrite. Three channel samples were taken on this vein, with the following results:—

Location.	Description.	Width.	Gold.	Silver.
		Inches.	Oz. per Ton.	Oz. per Ton.
North end	Sheeted, vuggy quartz	14	0.47	0.7
50 feet south from the north end	Sheeted quartz and silicified rock with abundant pyrite	26	1.38	2.8
100 feet south from the north end	Sheeted quartz and silicified rock with abundant pyrite	72	0.36	0.7

Banjo.

The claims Banjo 1 to 4, inclusive, recorded in the names of C. A. Bennett and G. G. Campbell, were forfeited in August, 1947. This group covered ground a short distance south-east of the Ginger B group, approximately midway between the Ginger B and Shell groups. The oxidized shear-zone on the Ginger B group reappears on the Banjo No. 4 Mineral Claim and continues south-east along the rugged north-east side of the Miller Creek valley. The magnetite zone on the Shell group probably represents the continuation of this shear-zone.

Workings on the Banjo ground consist of several small open-cuts on two " veins," which, in microscopic examination, proved to be altered and pyritized feldspar porphyry. A specimen of the best mineralization assayed only traces of gold and silver.

Independence (F.L.). The claims Independence 1 to 17, inclusive, recorded in the names of B. Goodridge and O. C. Chayer, were forfeited in August, 1947. The claims F.L. 1 to 8, covering ground formerly covered by the Independence 1 to 8, were recorded in October in the name of Frank Larsen. These claims cover ground east of the Ginger B group and north-west of the Shell group. Two veins were seen and much quartz float indicates the presence of others. A north-westerly striking vertical vein 3 feet wide is exposed for 70 feet by several open-cuts on the south side of an easterly flowing tributary of Lay Creek. This vein is on Independence No. 3 Mineral Claim, at an elevation of 6,000 feet. No metallic minerals were seen in the lightly stained quartz. A channel sample, across a width of 34 inches, assayed only a trace of gold and no silver.

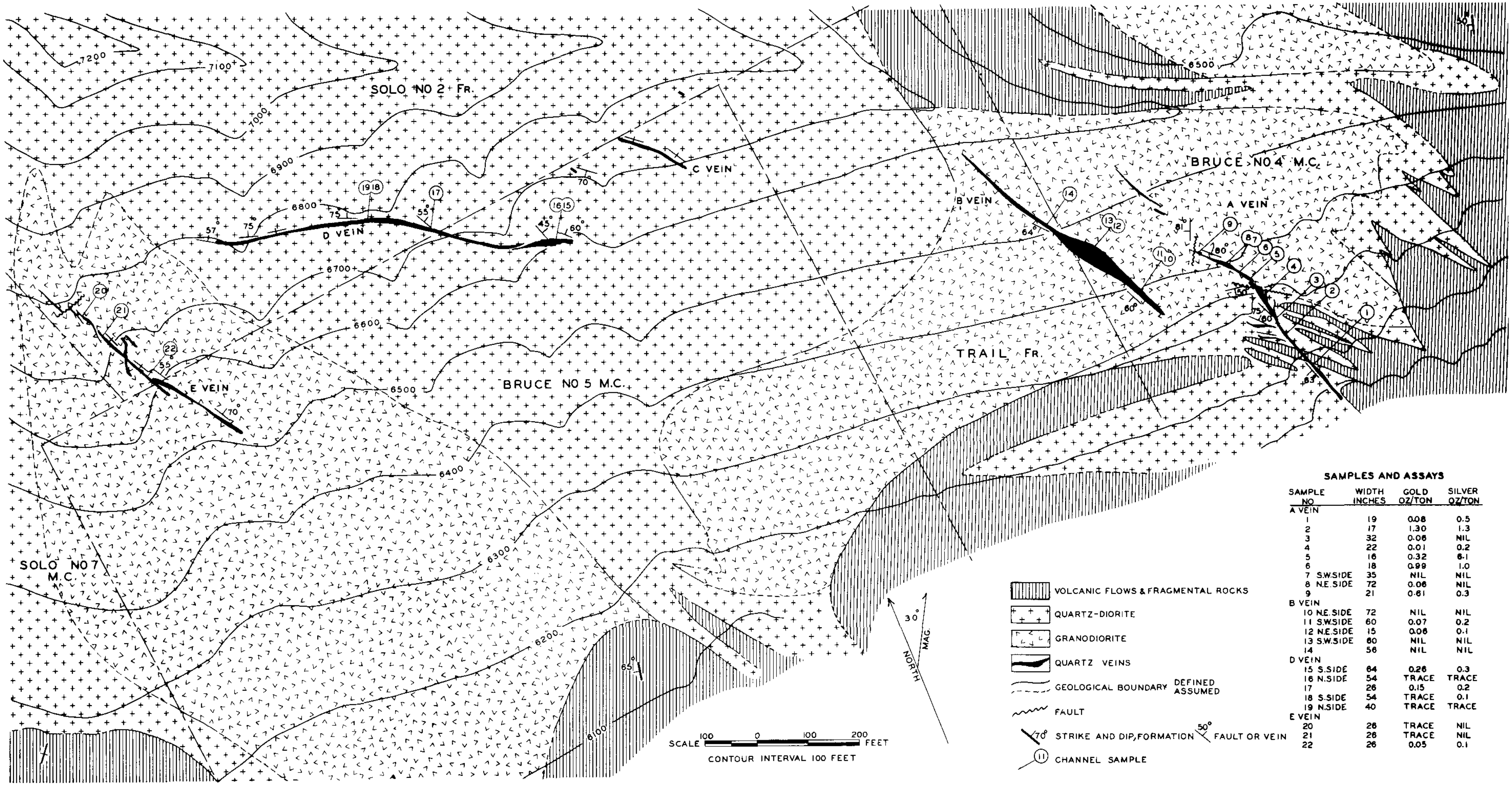
On Independence No. 3 Mineral Claim, elevation 6,200 feet, a large quartz lode is exposed by trenches for a distance of 106 feet. Both ends are drift-covered. The strike is north-west and the dip 70 degrees to the south-west. This lode, consisting of quartz veins and silicified rock barren of metallic minerals, varies from 4 to 12 feet in width. An 8-foot chip sample taken across the lode assayed: Gold, trace; silver, 0.1 oz. per ton. A 64-inch channel sample cut from the best-looking section near the north end of the exposure assayed: Gold, trace; silver, *nil.*

Goldway. The claims Goldway 1 to 5 and Goldway 7 and 8, Dot 1 to 6, Mars 1 to 4, and Nonie 1 and 2, recorded in the name of Goldway Peak Mines, Limited, are in a mountain basin drained by the most easterly tributary of Goldway Creek. It is about a mile and a half west of the Ginger B group, and some of the claims may join or overlap the Bruce group to the west. Elevations range from 5,000 to 7,300 feet. The claims are underlain by a gently folded series of tuffs, agglomerates, and flow-rocks. These are disrupted by several broad zones of intense shearing which have an average strike of north 20 degrees west and along which the rock is converted to phyllite and sericite schist.

Innumerable exposures of white, unmineralized quartz are seen, consisting of narrow veins and stringers and contorted lenticular masses following the foliation of the schist in local flexures. There are also a few larger veins of unmineralized quartz striking north-easterly, cutting the foliation at angles of about 75 degrees. One of these larger veins is 3 feet wide and may be traced by shallow open-cuts and outcrops for 300 feet. Another, somewhat shorter, in places attains a width of 12 feet. These veins appear to be barren of gold values. Of seven channel samples deliberately taken from the best-looking sections of the three largest veins, none assayed more than a trace of gold and silver.

Bruce. The claims Bruce 1 to 9 are recorded in the name of Goldway Peak Mines, Limited. The claims Bruce 10 to 17 were forfeited in August and September, 1947. These claims are in a high mountain basin at the head of Goldway Creek, the main showings being on the south slope of a steep ridge which forms the eastern continuation of the prominent mountain known as Goldway Peak. From a comfortable tent camp located on Goldway Creek at the edge of the scrub timber a crew of six men carried on development-work under the direction of Goldway Peak Mines, Limited.

Fig. 11 shows the local geology and the veins explored during 1947. Goldway Peak and the ridge to the east are made up of andesite and basalt flows, with intercalated beds of breccia, agglomerate, and finely stratified tuffaceous sediments. Most of the rocks are dark green in colour due to the metamorphic development of abundant hornblende, and of chlorite and epidote. The major structure is an open anticline, the axis of which strikes about north 20 degrees west. Within the area of Fig. 11 the bedding and flow layers dip from vertical to 50 degrees westward, but to the east the dips become progressively less. Thin-bedded tuff, which forms a high peak three-quarters of a mile east of the area mapped, dips 30 degrees to the east.



SAMPLES AND ASSAYS

SAMPLE NO	WIDTH INCHES	GOLD OZ/TON	SILVER OZ/TON
A VEIN			
1	19	0.08	0.5
2	17	1.30	1.3
3	32	0.06	NIL
4	22	0.01	0.2
5	16	0.32	6.1
6	18	0.99	1.0
7 S.W.SIDE	35	NIL	NIL
8 N.E.SIDE	72	0.06	NIL
9	21	0.61	0.3
B VEIN			
10 N.E.SIDE	72	NIL	NIL
11 S.W.SIDE	60	0.07	0.2
12 N.E.SIDE	15	0.06	0.1
13 S.W.SIDE	60	NIL	NIL
14	56	NIL	NIL
D VEIN			
15 S.SIDE	64	0.26	0.3
16 N.SIDE	54	TRACE	TRACE
17	26	0.15	0.2
18 S.SIDE	54	TRACE	0.1
19 N.SIDE	40	TRACE	TRACE
E VEIN			
20	26	TRACE	NIL
21	26	TRACE	NIL
22	26	0.05	0.1

FIG. 11. GEOLOGY AND VEINS ON PART OF THE BRUCE GROUP.

The volcanic rocks are intruded by a composite stock of quartz diorite and granodiorite which is about 3,000 feet from east to west and 2,000 feet from south to north. The extreme irregularity of the southern and eastern margins of this stock is indicated on Fig. 11. In most places the contacts are remarkably abrupt. The quartz diorite is a dark-coloured rock of medium grain characterized by abundant hornblende and about 20 per cent. quartz. The granodiorite is lighter in colour and generally coarser in texture than the quartz diorite and in thin section the dark mineral is seen to be green biotite rather than hornblende. Some of the observed contacts are abrupt, others appear transitional; but the general field relations indicate that the granodiorite is the later intrusion.

The five main veins, named "A," " B," " C," " D," and " E " veins, and several other smaller veins are shown on Fig. 11. They occur for the most part in the stock, having diverse strikes from north to nearly west. The lengths and widths of the main veins may be summarized as follows:—

"A" Vein.—Length: 420 feet, in two sections separated by a fault-zone. The fault may have occurred either before or during ore-deposition. Some mineralized quartz lies in the fault-plane.

Width: Averages 24 inches, being somewhat wider in the central part where the vein is joined by short branch veins.

" B " Vein.—Length: 500 feet.

Width: Varies from 5 feet at the south-east end to a maximum of 40 feet, then narrows to 4 feet and finally tapers and splits into several small stringers at the north-west end. Much of the quartz on the south-west side of the central enlargement is finely comminuted.

" C " Vein.—Length: 145 feet.

Width: Average 18 inches. Fairly constant in width.

" D " Vein.—Length: 700 feet.

Width: Averages about 6 feet, but varies from 5 feet at the east end to 10 feet in the central part, then tapers gradually to 3 feet at the west end.

" E " Vein.—Length: 500 feet is the total length of a zone of small veins arranged *en echelon.*

Width: Generally less than 24 inches, but individual veins in the zone may vary from 3 inches to 3 feet.

A curious feature of these veins is their abrupt terminations. For example, " E " vein, 3 feet wide at the south-east end, terminates abruptly against an obscure cross-fracture or joint along which a half-inch stringer extends for a few inches. No sign of the vein-fracture could be seen in the massive granodiorite beyond the end of the vein. "A" vein also ends abruptly at a fault surface along which a 6-inch stringer persists for several feet. " B " vein terminates against the same or a similar fault-plane. However, these are regarded as separate veins, terminating at what may be the same pre-mineral fault, and not, as the relations in Fig. 11 might suggest, faulted sections of the same vein.

The veins consist of slightly iron-stained, fractured quartz characterized in many places by parallel fractures arranged *en echelon,* and making a slight angle with the vein-walls. Some of the veins are crossed at a large angle by other fractures which may be so closely spaced as to be termed cross-sheeting. Many of the longitudinal and transverse fractures are open, and are lined with projecting quartz crystals. Metallic minerals, only sparingly and locally present, include fine-grained pyrite and occasional aggregates of small galena crystals. As a rule the metallic minerals are found in zones of drusy quartz associated with the longitudinal and transverse fractures. A very few small grains of gold were found in fractures closely associated with galena.

To gain some idea of the values which might be expected in these veins, twenty-two samples were taken. Fig. 11 shows the location, width normal to the vein, and assay value of each of these samples. With the exception of No. 13, which is a chip sample, all are moiled channel samples. Where it appeared likely that the values might lie in cross-fractures, the samples were cut diagonally so as to include several such fractures. The results are believed to be indicative of the values in these veins. However, it must be pointed out that in veins of this type the gold values are likely to have an erratic distribution. Many more closely spaced samples would be required to determine the average values of the veins.

On Fig. 11 parts of "D" and "E" veins are shown on the adjoining Solo No. 2 Fraction, owned by Springer-Sturgeon Gold Mines, Limited. The claims have not been accurately surveyed and the position of the boundary-lines have not been established.

Solo.

The claims Solo 1, 3, 4, 5, and 7, Solo No. 1 Fraction, and Solo No. 2 Fraction, recorded in the names of C. A. Bennett and R. A. Barker, are understood to belong to Springer-Sturgeon Gold Mines, Limited. The claims Solo 2 and Solo 6 were forfeited on August 2nd, 1947. The showings on this group are on the north side of the ridge north-east of Goldway Peak, approximately 1,500 feet north of the veins on the Bruce group, and occur in the same composite stock near its complex north-western contact.

Several open-cuts at an elevation of 6,500 feet on the rugged north side of the ridge expose an irregular branching vein in a shear-zone traversing quartz diorite. The average strike is north 20 degrees west and the dip steeply westward. The vein is 120 feet long and varies in width from a few inches at either end to a maximum of 68 inches near the centre. Two channel samples were cut at the widest part of the vein at a point 58 feet from the southern extremity. The sample on the west side, across 27 inches of slightly fractured white quartz, assayed: Gold, 0.02 oz. per ton; silver, trace. The adjoining sample on the east side, across 41 inches, containing a little pyrite and galena, assayed: Gold, 0.02 oz. per ton; silver, 0.2 oz. per ton. A third channel sample, taken 20 feet farther north, across 44 inches, the full width of the vein, assayed: Gold, 0.16 oz. per ton; silver, 1 oz. per ton. Several cuts were made a short distance west of this vein on what is supposedly a subsidiary shear-zone. This irregular and discontinuous zone contains crushed quartz, pyrite, and, locally, galena. A 21-inch sample of the well-mineralized crushed quartz assayed: Gold, 0.01 oz. per ton; silver, *nil*.

Several large quartz veins and complex lode structures outcrop in a north-westerly trending belt from 500 to 1,500 feet north-east of the showing mentioned above. These are adjacent to the north-western margin of the composite stock and trend approximately parallel to the contact. For the most part the vein material is unmineralized white quartz, but local concentrations of pyrite are marked by heavily oxidized outcrops. No development-work had been done on these veins, consequently no samples were taken.

Quyzvhx and Shangrila.

The claims Quyzvhx 1 to 8, recorded in the name of A. B. Goodridge, and Shangrila 1 to 6, recorded in the name of O. C. Chayer, are in a mountain basin drained by the headwaters of Wrede Creek and are about 5 miles due north of Johanson Lake. The rocks include volcanic flows, breccias, and agglomerates, similar to those found elsewhere, and an upper formation of thin-bedded red shale which is about 800 feet thick. The whole assemblage is gently folded into an open anticline, the northerly trending axis of which coincides approximately with the bottom of the valley. The rocks are cut by several normal faults of large displacement.

The only mineralization seen was on Quyzvhx No. 4 Mineral Claim, at an elevation of 5,900 feet on the west side of the valley. A small creek cascading down from a glacier cirque has excavated a small canyon along a composite shear-zone about 20 feet wide. The shear-zone is exposed naturally and by stripping for a distance of 200 feet. The walls are massive, somewhat porphyritic, volcanic flow-rock having a very light-green colour. The shear-zone strikes north 70 degrees west and dips 75 degrees southward. Toward the west end it frays into several subsidiary shears which bend to the north and disappear in a short distance. Beyond the most easterly exposures the zone is marked for 200 feet by the vertical walls of the creek-canyon. The material in the shear-zone is mainly chlorite and sericite schist split longitudinally by several gouge-filled fault-planes. Lenses of quartz and silicified rock sparsely mineralized with pyrite and chalcopyrite occur in the schist near these fault-planes. One such lens is 70 feet long and attains a maximum width of 6 feet. A channel sample across this widest part assayed: Gold, 0.01 oz. per ton; silver, 0.2 oz. per ton. A second lens, in *en echelon* arrangement with the first, is 30 feet long and up to 5 feet wide. A channel sample of the best-mineralized part of this lens, 62 inches wide, assayed: Gold, 0.01 oz. per ton; silver, 0.1 oz. per ton. A third channel sample was taken across a well-mineralized quartz vein 12 inches wide, bounded by fault-planes along the foot-wall side of the shear-zone. This sample assayed: Gold, 0.01 oz. per ton; silver, 0.1 oz. per ton.

In two days spent on the property without a guide, no other showings were seen. The owners state that other showings were found and development-work was done on other parts of the property.

Gerle Gold. The claims Gerle Gold 1 to 8 and Leger Gold 1 to 8 were recorded on August 5th, 1947, in the names of J. H. Gerlitzki and J. Leontowich. The claims are on a rolling upland about 2 miles east of the south end of McConnell Lake. The altitude ranges from 4,500 to 5,500 feet. Good stands of spruce and balsam grow on the lower slopes, and McConnell Creek, which crosses the property, would provide a supply of water adequate for mining purposes.

The claims are staked two abreast for 2 miles along the eastern edge of an elongated, north-westerly trending roof-pendant in a large body of diorite and granodiorite. This roof-pendant is thought to represent an original feldspathic rock—possibly an

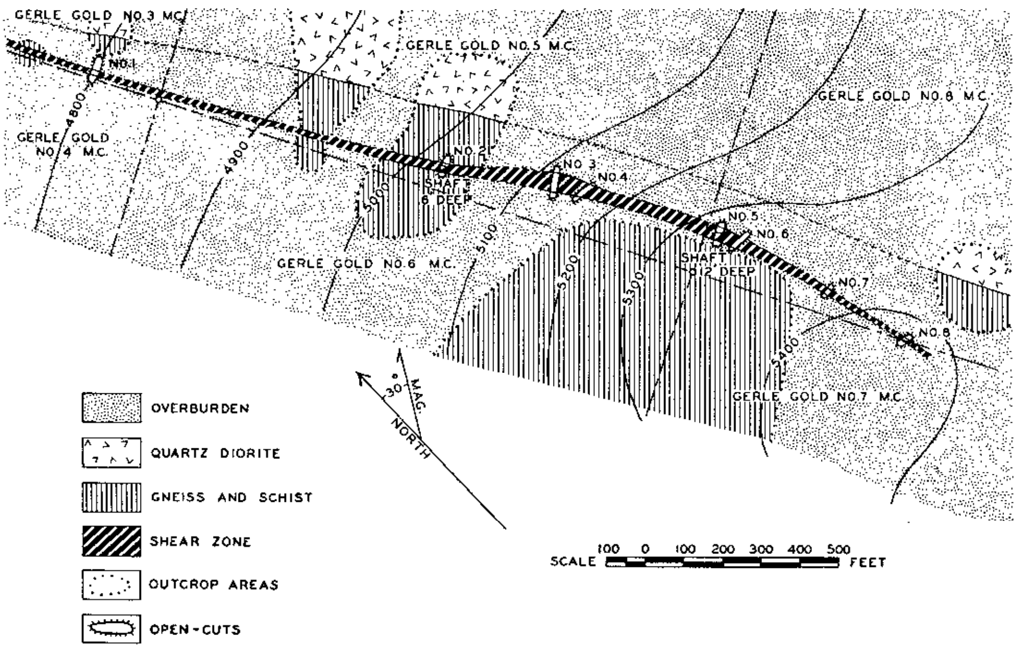


Fig. 12. Gerle Gold group.

impure arkose or tuff—which was closely folded and severely metamorphosed before or during the period of intrusion. The rock is mainly coarse-grained hornblende-feldspar gneiss containing some chlorite and epidote. The foliation, marked by segregation of hornblende and feldspar in alternating septa, and complicated by small, tightly compressed drag-folds, strikes north 20 to 35 degrees west and dips 45 to 85 degrees north-eastward. Near the contact the intrusive rock is medium-grained quartz diorite, rich in hornblende.

The local geology of part of the Gerle Gold group and the development-work done are shown on Fig. 12. A strong shear-zone in gneiss is parallel to and about 100 feet distant from the quartz-diorite contact. The dip varies from vertical to steeply north-eastward. Within this shear-zone the gneiss has been converted to bright-green chlorite and sericite schist across widths of as much as 50 feet. The foot-wall rock, where exposed in bluffs west of Cut No. 5, is amphibolite and chlorite schist, traversed by a network of small felsitic and pegmatitic dykes. Mineralization consists of numerous stringers and some larger lenticular masses of quartz and ankeritic carbonate intercalated in the foliated schist and in places making up more than 50 per cent. of the zone material. In most places, however, the full width of the shear-zone is not mineralized. Where exposed the mineralization was seen to vary in width from 6 to 20 feet. Small crystals of pyrite are disseminated throughout the schist, and both pyrite and chalcopyrite are seen locally in fractures in the quartz-carbonate bodies. Needles of black tourmaline are disseminated in the quartz, in places forming clusters of matted crystals. A piece of quartz float, found about 1,500 feet south-easterly from the main showings, contained in irregular fractures a soft dark-grey metallic mineral. The mineral has not been identified, but spectroscopic analysis indicated that its major constituents are bismuth and lead, and the presence of tellurium was detected.

The zone material in shallow trenches and natural exposures is thoroughly weathered. In places all that remains is cellular gossan. Gold can be panned readily from this rusty oxidized material, and it is evident that there has been much residual enrichment. A few small flakes of gold in fractures in quartz were seen in unoxidized material from Cut No. 5.

The zone has been prospected for a distance of 2,500 feet by eight open-cuts. Natural exposures are not numerous as the surface is drift-covered, and beyond the limits shown in Fig. 12 the extent of the zone is unknown. Three of the open-cuts—namely, Nos. 1, 2, and 5—expose unoxidized material. In Cut No. 2 a pit 6 feet deep was made, and a 6- by 12-foot shaft was sunk 12 feet in Cut No. 5.

Twelve large channel samples having a total weight of 75 lb. were taken. In cutting these samples, care was taken to exclude as far as possible oxidized material which might contain residual gold. The weight of the heavier samples was reduced by crushing, coning, and quartering them in the field. The location, description, width, and assay of each of these samples is given in the following table:—

Location.	Description.	Width.	Gold.	Silver.
		Inches.	Oz. per Ton.	Oz. per Ton.
Cut No. 1	Quartz with tourmaline, some pyrite, and chalcopyrite (oxidized schist on either side not sampled)	62	0.13	Trace
Cut No. 2, distance from western end of shaft—				
0 to 5 feet east	Sericite schist with quartz-carbonate lenses making up 60 per cent.	60	*Nil*	Trace
5 to 8 feet east	White quartz with sericite folia	36	0.04	0.5
8 to 11½ feet east	Sericite schist with few quartz-carbonate lenses (oxidized quartz poorly exposed in north-east end of cut was not sampled)	42	Trace	Trace
Cut No. 5 (north wall of shaft), distance from western end of shaft—				
0 to 3½ feet east	Foliated schist with 50 per cent. quartz-carbonate lenses	43	0.39	0.2
3½ to 5½ feet east	Quartz with sericite folia and some pyrite and chalcopyrite in fractures	26	4.41	0.9
5½ to 9½ feet east	Foliated schist with few quartz-carbonate stringers (somewhat oxidized)	48	0.09	Trace
9½ to 10½ feet east	Quartz with sericite folia and some pyrite and chalcopyrite in fractures (somewhat oxidized)	13	1.91	1.1
10½ to 15 feet east	Foliated schist with few quartz-carbonate stringers	53	0.05	Trace
15 to 17½ feet east	Quartz with some sericite folia, pyrite, and chalcopyrite	29	Trace	Trace
17½ to 21½ feet east	Foliated schist	48	Trace	Trace
South wall of shaft, distance from western end of shaft—				
0 to 6 feet north-east	Foliated schist with 50 per cent. quartz-carbonate lenses	72	0.65	0.4

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; L. Walker, mine superintendent. Capital: 2,000,000 shares, $1 par value. The Cariboo Gold Quartz mine is a short distance south of the town of Wells, which is 56 miles by road from Quesnel, the northern terminus of the Pacific Great Eastern Railway.

Efforts to increase production to full mill capacity (about 370 tons per day) continued throughout the year. Shrinkage stoping was tried wherever possible, and less hand-sorting was done in the stopes. In August all work below the 1500 or main haulage-level was stopped to allow work to be concentrated on enlarging No. 1 shaft. This shaft, which extends from the 1500 level to the 2000 or bottom level, was enlarged to accommodate two larger hoisting compartments. Completion of work on the shaft, including the sump and pockets, should not only greatly facilitate mining on the lower levels, but will also eliminate difficulties which formerly have seriously handicapped transportation of mechanical equipment. In the latter part of the year the B.C. shaft

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

area was reopened, and a search for ore instituted on the 1000 or second level from the surface.

During the first ten months of the year an average of 220 men was employed, but thereafter this average was increased to 360. New development-work comprised 2,403 feet of drifting, 2,178 feet of crosscutting, 806 feet of raising, and 17,614 feet of diamond-drilling.

On the surface the power-house was extended in order to provide space for the installation of two new diesel units. Work on the fifty-unit housing programme begun in 1946 was continued, and at the close of the year about thirty units were nearing completion.

Production: Ore milled, 88,623 tons. Net contents: Gold, 20,126 oz.; silver, 1,710 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 value. This company, a subsidiary of Newmont Mining Corporation, operates the Island Mountain mine, just west of the town of Wells. Development was chiefly on the lower levels, where long drives are becoming necessary in order to reach the Baker-Rainbow contact. Two new levels were opened up from the shaft, the bottom or 2550 level being extended 130 feet in order to provide sump water storage and the 2850 level being driven more than 1,000 feet from the shaft-station.

With a crew averaging ninety-seven men, production varied from 115 tons to 150 tons per day. Ore was mined on all levels, from 4000 to the 3000 level, and came from nearly vertical quartz veins and from replacement deposits in folded limestone. The quartz veins are mined by cut-and-fill methods, while the replacement bodies are mined up the plunge of the folds. Because of the 20- to 30-degree slope, stulls and cribbing are necessary to support the back and slushers are used to remove the ore. The replacement ore-bodies are higher grade but only yield about one-third of the ore mined. Neither type of ore-body continues far laterally or vertically. The numerous small ore-bodies complicate the mining problem. In 1947 it was possible, by opening more stopes than in previous years, to allow mining without a cross-shift. An innovation tried in cut-and-fill stopes has been successful; lime-rock fill, when saturated with water, sets like concrete, making an ideal scraping floor and thus saves the use of planking.

In the Shamrock crosscut some timbering was done to keep the adit in safe condition.

During the year 4,138 feet of drifting, 223 feet of raising, and 2,824 feet of diamond-drilling were done.

Production: Ore milled, 41,197 tons. Net contents: Gold, 17,721 oz.; silver, 2,251 oz.

Canusa Cariboo Gold Mines, Ltd. (53° 121° S.W.) Company office, 306 Crown Building, Vancouver. J. Dunsmuir, president; W. F. McGowan, mine manager. Capital: 3,000,000 shares, 50 cents par value. This company holds property lying at the heads of Lowhee Creek and Stouts Gulch. The shaft and mine buildings are 2 miles from Barkerville, are reached by road up Stouts Gulch, and are about 2,000 feet south of the B.C. shaft of the Cariboo Gold Quartz Mining Company.

The 300-foot shaft that was allowed to flood at the end of 1946 was unwatered in February, 1947, to permit diamond-drilling being done from the 260 level station. Two holes were drilled but were abandoned at about 40 feet after encountering a slip. Further underground work was then stopped, pending the installation of new equipment.

In addition to the 150-horsepower Ruston diesel engine and Sullivan 500-c.f.m. air-compressor previously set up, a 190-horsepower Petters diesel engine connected to a Westinghouse generator was installed; it was then possible to replace the former air-hoist with an electric single-drum hoist. Drifting on the 260 level, in a south-westerly direction, was commenced in October and by the end of the year had progressed about 340 feet. One 12-foot quartz vein was intersected.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1946, pp. 90, 91.]

Williams Creek Gold Quartz Mining Co., Ltd.*

(53° 121° S.W.) Company office, 184 Bay Street, Toronto. J. Y. Murdoch, president. F. Warning succeeded P. N. Pitcher as mine manager in May, 1947. Capital: 3,000,000 shares, $1 par value. The property, consisting of the Morning Star, Evening Star, Wintrip, Westport, Black Jack, Black Jack Extension, Diller, and other Crown-granted claims, was acquired from the Cariboo Gold Quartz Mining Company, Limited, in exchange for 800,000 shares of capital stock in the newly formed company. The company is being financed by sales of treasury stock under option to Quebec Gold Mining Corporation, Noranda Mines, Limited, and F. C. Buckland.

A programme of diamond-drilling, begun in 1946, was continued with two drills until mid-August, 1947. Forty-eight drill-holes, totalling about 15,000 feet, were completed. Most of the drill-holes explored a block of ground close to Williams Creek between the Black Jack and Westport adits. A number of holes were also drilled around the Sirius fault-zone near the Wintrip adit on the Wintrip claim, and nine holes, totalling about 2,500 feet, were drilled to explore veins exposed by bulldozer stripping on the north side of the B.C. ditch on the Morning Star claim.

During the early spring a network of trenches was bulldozed on the southern slope of the Morning Star claim and to the north of the B.C. ditch, together with the uncovering of an area some 300 feet long and 150 feet wide, represented about 10,000 lineal feet of bulldozer stripping. A large number of fairly short transverse quartz veins are exposed in the stripped area. Some veins, though narrow, are well mineralized with pyrite, and gold may be panned from many of the oxidized outcrops. The veins are in the Rainbow formation about 800 feet from the Baker contact and close to and on the hanging-wall side of two, presumably small, bedded faults. The above work was carried out on certain of the old Alladin-Honest John showings.

Farther uphill to the north, a normal fault, striking west and with a displacement of about 40 feet, is exposed in several of the bulldozer trenches. This fault appears to bear no relation to the fractures occupied by quartz and pyrite mineralization.

During the 1947 season the surface geology of the ground between the Morning Star and the Black Jack Extension claims was mapped in detail by Warning. The rocks, for the most part, are light and dark quartzite of the Lowhee and Rainbow members and lie to the north-east of black argillite of the Basal formation. They have a more or less gradational contact with the Baker member, which lies in a parallel band to the north-east of them.

Two large northerly striking right-hand faults cross the property. One, the Sirius fault, observed underground in the Shamrock adit near the northern corner of the Sirius claim, crosses the Wintrip claim as a zone several hundred feet wide. One strand of the Sirius fault is near the Wintrip adit on Stouts Gulch, and another strand could be seen in the newly built road-bed several hundred feet to the east.

The second northerly striking fault, the Barkerville, was mapped by Hanson as running south-westward up Williams Creek to the mouth of Black Jack Gulch. A revision of that mapping by Warning indicates that it runs southward through the Diller and Black Jack Extension claims and several hundred feet east of the Bonita

* By Stuart S. Holland.

line. Its southward extension may coincide with a fault that displaces the Basal-Lowhee contact along Williams Creek, south of the Alder Fraction.

The vein-zone on Williams Creek, where most of the diamond-drilling was done, is in the upper part of the Rainbow member, within a few hundred feet of the Baker contact, and about midway between the Sirius and Barkerville faults. The veins in the zone on the Westport and Black Joe claims were found to lie, for the most part, on the hanging-wall side of a bedded fault that extends south-eastward from the Westport adit across Williams Creek to the Black Jack workings. A considerable number of quartz veins, some well mineralized with pyrite, were intersected by the drill-holes. The veins, for the most part, are comparable in size and in contained gold values to transverse veins such as make up the ore-zones in the Cariboo Quartz mine.

Work done on the Wintrip claim consisted of cleaning out, examining, and sampling the old Wintrip adit, driven in 1933 by the Britannia Mining and Smelting Company, and of diamond-drilling in the zone close to the Sirius fault.

At the Cariboo Quartz and Island Mountain mines to the north-west, vein-fractures are believed to be genetically associated with the northerly striking faults. On Williams Creek the association of vein-fractures with the analogous Sirius and Barkerville faults is less apparent, for the veins on the Black Jack and Morning Star claims lie a considerable distance from them. Consequently, the view has been advanced that the vein-fractures are more closely related to bedded faults such as have been found between the Westport and Black Jack adits, on the Morning Star claim, and in the Wintrip adit.*

[References: *Minister of Mines, B.C.*, Ann. Rept., 1918, p. 135; 1930, p. 166. *Geol. Surv., Canada*, Mem. 149, pp. 193, 194; Mem. 181, pp. 27–29.]

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 value. The company's holdings, consisting of sixty-five recorded claims, extend along Antler Creek from Sawmill Flat to California Gulch. During the 1947 season E. S. Dowsett was continuously engaged in prospecting, mainly on the Zone and Pittman groups on the east side of Antler Creek, near the mouth of Nugget Gulch. In August and September ten short drill-holes, totalling about 789 feet, were put down by X-ray diamond-drill to explore at shallow depth below vein-showings.

On the Zone group, about 500 feet south-east of the Antler Creek bridge, a group of five sub-parallel veins was found on the south side of a low ridge. The veins, which strike north 25 degrees east and which cut vertically through grey thinly fissile ankeritic schist, are from 2 to 16 inches wide, and were stripped for short distances. They are very sparsely mineralized with pyrite and some arsenopyrite, and small amounts of fine gold may be panned from certain of the oxidized outcrops.

Four flat drill-holes, totalling about 400 feet, were drilled at an elevation of about 50 feet below the outcrop. These crossed narrow widths of sparsely pyritized quartz, from which the highest assay was 0.06 oz. gold per ton.

Two narrow parallel quartz veins were found on the east side of Antler Creek, 150 feet down-stream from the Gisco vein, which occurs opposite Nugget Gulch. Fine visible gold could be seen in the quartz-outcrops, from which most of the pyrite mineralization had been leached. One flat drill-hole, 25 feet below the outcrop, intersected several 4- to 10-inch quartz veins, one of which, at a distance of 83 feet from the collar of the hole, assayed 0.81 oz. gold per ton.

Five holes, totalling about 200 feet, were drilled to test the downward extension of the Gisco vein. Vein quartz was intersected in two of the holes, but no core was recovered from the others.

* The Western Miner, January, 1948, Vol. 21, p. 43.

† By Stuart S. Holland.

Toward the close of the 1947 season a discovery of replacement mineralization was made on the Pittman group, near the mouth of Victoria Creek. Although some of the rock was well mineralized with galena and sphalerite, as well as pyrite, the gold and silver content is low. A picked piece containing galena, and sphalerite in abundance, assayed: Gold, trace; silver, 1.1 oz. per ton; lead, 4.9 per cent.; and zinc, 34.9 per cent.

Up to the present time all veins found on the Spitfire, Gisco, Zone, and Pittman groups have been short, narrow, and sparsely mineralized, even though gold may be panned from the oxidized vein material or fine visible gold may be seen in their oxidized outcrops. There is a considerable number of these veins clustered on both sides of a zone of limestone-beds that crosses Antler Creek just down-stream from the Gisco vein. Under favourable conditions this limestone-zone might form a locus for replacement mineralization, which, if it were gold-bearing, could be of considerable interest and economic importance. For this reason it should be worth considering as a zone for intensive prospecting.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1946, p. 94.]

Cariboo Hudson Gold Mines (1946), Ltd.* (53° 121° S.E.) The Cariboo Hudson property consists of the Cunningham, Cutler, Hudson, and Shasta groups extending southward from Penny Creek, at the head of Cunningham Creek, past Pearce Gulch to the head of Simlock Creek. The camp, mill, and 200 adit-portal are on Pearce Gulch, and are reached by about 21 miles of road from Barkerville.

The original company acquired the property, developed the mine, built a 100-ton cyanide mill, and mined 12,938 tons of ore, from which 5,186 oz. of gold were extracted, before operations were discontinued in 1939. In 1940 about 19,000 lineal feet of bull-dozer stripping was done on the Hudson and Shasta claims under the direction of A. M. Richmond. The new company formed in 1946 to acquire the holdings of Cariboo Hudson Gold Mines, Limited, did some underground drifting and surface and underground diamond-drilling in 1946 and 1947.

The original surface showings were described by A. H. Lang, Geological Survey of Canada, Paper 38-16, pages 27–29, and by D. Lay, British Columbia Minister of Mines Annual Report, 1929, page 191.

The mine is developed by a total of about 8,000 feet of drifting and crosscutting on five levels connected by a winze. Development-work has been largely confined to the 200 and the 600 levels, which have been opened up for distances of some 3,800 feet and 3,700 feet respectively. Other drifting has included 350 feet on the 250 sub-level, 800 feet on the 300 level, and 300 feet on the 400 level. Most of the underground work was planned with a view to exploring the Hudson shear below the 200 level.

The 200 level adit was started in 1937, and was driven from Pearce Gulch through the mountain to the Simlock Creek side. In 1938 the winze was sunk, the 250 and 300 level workings were started, and the 600 level driven in from the Simlock Creek side. From it, in 1939, a raise connection was made to the bottom of the winze on the 300 level.

All rocks encountered are parts of the Hudson member of the upper Richfield formation. They are dominantly medium grey fissile to flaggy quartzite or quartz sericite schist, with a few black argillaceous beds, sericite schist, and green chlorite schist. The green chlorite schist appears only on the 200 and 250 levels, and is interbedded with the flaggy quartzite that contains the Hudson vein. Thin limestone-beds on 200 level, between the portal and the Hudson vein and on the crosscut to the south, probably are of the same horizon. In each instance drag-folds in the beds indicate that an anticlinal axis lies between them and that it has a plunge of 20 degrees down to the north-west.

* By Stuart S. Holland.

The rocks are crossed by a series of parallel north-south shears, some of which are mineralized, and by flat north-westerly striking thrust-faults of small displacement. The most important of these breaks is the Hudson shear.

The 200 adit crosscut was driven south 83 degrees east and 280 feet in from the portal intersected the Hudson vein where it was 6 feet wide. The vein occupies the Hudson shear which strikes about north 6 degrees east, stands vertical or dips about 80 degrees east, and cuts across the formations striking north 30 to 60 degrees west and dipping 60 to 75 degrees north-east.

The Hudson shear is a comparatively weak break, with branches running off along the bedding on both hanging-wall and foot-wall sides. The Hudson shear, as shown by the displacement of correlated beds, appears to have a right-hand movement of about 15 feet. In some places small crumples along the sides of the shear suggest a later, small, left-hand movement. Striations on the walls pitch to the north.

On the 200 level the Hudson shear was occupied by quartz for a stope-length of 195 feet, and on the 250 level for 185 feet. The quartz was mined to the surface, 95 to 110 feet above 200 level and between 250 and 200 levels, but no ore was mined below 250. The quartz ore-body terminates abruptly on the 200 level in quartz stringers running off into the walls and parallel to the beds.

The Hudson shear above 250 level contained but one ore-body which was as much as 9 feet wide and in some places carried high gold values. Prior to 1940 this encouraged extensive work on the Hudson shear below 250 level. This shear was explored by some 800 feet of drifting on 300 level, by about 300 feet of drifting on 400 level, and by about 250 feet of drifting on 600 level. None of the above work resulted in the discovery of additional ore.

Several shears lying to the east and west of the Hudson shear are approximately parallel with it and strike roughly north-south. To the west, on the foot-wall side, is the Shasta shear, which was explored on the 200 level to the south and found to contain no ore. Seventy-five feet east, on the hanging-wall side, is a strong fault with a broken zone 10 to 12 feet wide dipping 55 to 70 degrees eastward but containing no ore. Three hundred and sixty feet east is the 605 shear, which was drifted on for 150 feet on the 200 level and which is filled with quartz. Company sampling at regular intervals along the vein, including four gold assays higher than 0.50 oz. per ton, averaged about 0.25 oz. gold per ton.

Other faults which cut the rocks and veins include a series of fairly flat thrust-faults, striking about north 60 degrees west and dipping 15 to 40 degrees north-eastward. Judging from the amount of gouge, it appears that in only one instance has important displacement taken place. With respect to other faults, visible evidence indicates movements of but a few feet.

Causes of the localization of the Hudson ore-body have not been determined. The ore-body appears to be localized where the Hudson shear cuts heavy bedded quartzite in a section of 40- to 55-degree dips on an anticlinal limb that normally is dipping 60 to 75 degrees. The flatter dipping beds may be seen on the east side of the ore-shoot on the 200 level. These flatter dips are believed to represent a flexure assumed to be plunging about 20 degrees north.

In 1946 a diamond-drilling programme, based on the hypothesis that the flexure was the controlling structure, was directed toward exploring shears parallel to the Hudson shear at places where they would intersect the northward-plunging flexure. Fifteen underground diamond-drill holes from 200 level and ten surface holes were drilled without encouraging results.

A vertical section, drawn at right angles to the Hudson shear, suggests that below 250 level that shear has a fairly uniform dip. Above 250 level, however, it is possible that there are several irregularities or flatter sections in the shear which, together with other factors, may have combined to localize the ore-body at that place.

The final work undertaken in 1947 consisted of drifting on 600 level along a shear which lies on the foot-wall side of the Hudson shear. In this 635 drift, which is about 60 feet in length, a 55-foot length of quartz averaging slightly more than 2 feet wide is mineralized with pyrite, galena, sphalerite, and bright-orange scheelite. It is stated by the company that this section averages about 0.20 oz. gold per ton, in addition to having a small scheelite content.

Colin MacDonald was in charge of the work during the latter part of 1946 and during 1947.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1925, p. 150; 1929, p. 191. *B.C. Dept of Mines,* Bull. No. 10, 1943, pp. 93–96. *Geol. Surv., Canada,* Paper 36-15, p. 17; Paper 38-16, pp. 27–31.]

SUGAR CREEK (53° 121° S.W.).*

Sugar Creek has been known for a great many years, not only as a placer creek, but also as a locality in which numerous large quartz veins may be seen. Placer activity has greatly diminished latterly, but interest in lode possibilities was renewed with the finding of float of pyritic replacement mineralization, and the recording in 1945 and 1946 of about seventy mineral claims on Sugar Creek and certain of its tributaries—namely, Stevens Gulch, and Cooper and Little Mustang Creeks.

The following report is based on a ten-day examination during July, 1947, the accompanying sketch-map (Fig. 13) being based on tape and compass traverses along Sugar and Cooper Creeks.

The Sugar Creek cabin, at the junction of Cooper Creek with Sugar Creek, is about 10½ miles north-west of Wells. It is reached by 7 miles of road down Willow River from Wells and thence up Hardscrabble Creek to a summit near the first of two small lakes. From that point the road, which is passable only for trucks or cars with high clearance, continues a further 3½ miles down Sugar Creek to the junction of Cooper Creek. This wagon-road at one time continued down Sugar Creek to the falls, about 2½ miles distant, but is now overgrown with willows and partly obliterated.

The valley of Sugar Creek is thickly timbered with spruce and hemlock, and, except in creek-bottoms, bluffs, and in artificial exposures, bed-rock is obscured by a thick mantle of glacial drift. The accompanying sketch-map incorporates geological observations from traverses along Sugar and Cooper Creeks and the Cooper Creek ditch-line. Owing to dense growth, the ground between the lines of outcrop in creek-bottoms affords little opportunity for tracing beds along their strike. Moreover, prospecting on timbered slopes is exceedingly difficult, and consequently most of the veins presently recognized are those which outcrop along the creeks. Veins indicated on the sketch-map are, for the most part, old discoveries dating back many years, since few new discoveries have been made.

Bed-rock in that part of Sugar and Cooper Creeks shown on the accompanying sketch-map comprises a variety of rocks which all belong to the Cariboo series of Precambrian age. Quartzites are the commonest types. Some are grey, hard, and massive; some are black and argillaceous or have thin interbeds of argillaceous material; and others are brown, soft, and fissile. A band of schistose pebble conglomerate crosses just up-stream from the forks on Cooper Creek but was not seen elsewhere. A prominent band of black slate, some of which has numerous ankerite porphyroblasts, crosses Sugar Creek about 1,500 feet south of the junction of Cooper Creek. Limestone is not abundant and was observed only as thin beds and lenses in the rocks west of the Cooper Creek ditch-line where, in addition, a considerable width of brown and biscuit-coloured papery schist is, in part at least, calcareous.

* By Stuart S. Holland.

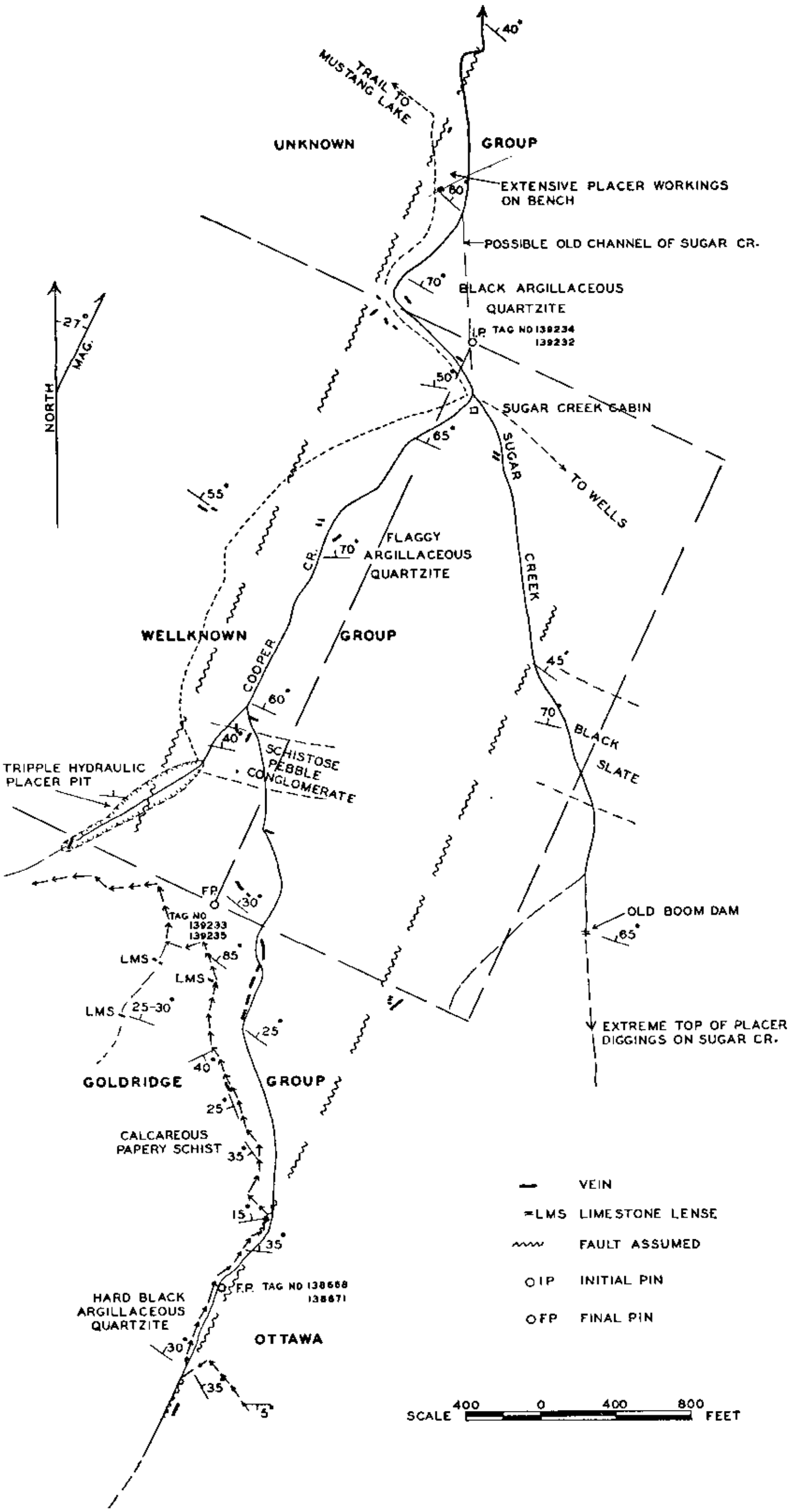


Fig. 13. Sketch-map of Sugar and Cooper Creeks.

All the above rocks are strikingly similar lithologically to components of the Richfield formation to the south-east. Despite this fact, it has not been possible as yet to subdivide the Cariboo series north of the Willow River fault into the three formations that have been recognized and mapped south of it. Apart from the scarcity of outcrops, one main reason for failure to complete the above study is the apparent absence of thick and massive limestone-beds of the Barkerville formation.

The prevailing strike of the rocks throughout the area is from north 45 degrees to north 70 degrees west, with dips to the north-east. For the most part these rocks dip 60 to 70 degrees to the north-east, though there is a suggestion of a flattening of the beds near the upper end of the Cooper Creek ditch-line. For 800 feet or more along the Cooper Creek ditch-line the beds depart from the prevailing attitude. Strikes of a few degrees west of north, westerly dips, and other attitudes probably represent local drag-folding or crumpling of the thinly fissile schists against hard resistant black quartzite underlying them to the south.

The rocks exhibit well-developed cleavage, which, in most instances observed, is essentially parallel to the bedding. This relationship indicates close folding, with axial planes overturned to the south-westward. In one observed instance, locally developed cleavage is seen crossing well-developed regional cleavage, and this is probably in response to a second period of deformation. Though delineation of rock-types is incomplete, available information suggests the presence of two north-easterly trending faults.

One fault is believed to run from the south fork of Cooper Creek in a direction north 30 degrees east to a point about 1,400 feet south of the junction of Cooper and Sugar Creeks. Evidence for its presence lies in the abrupt south-eastern termination of the hard black quartzite band at the head of the Cooper Creek ditch-line, in the fact that the prominent band of pebble conglomerate at the forks of Cooper Creek is not seen outcropping to the south-east on Sugar Creek, and in the fact that the wide band of black ankeritic slate on Sugar Creek does not outcrop to the north-east in the canyon of Cooper Creek below the forks. The possibility is suggested that the displacement along the fault is to the right, and in the order of about 1,500 feet.

The presence of a second fault is suggested with somewhat less evidence and confidence. Some observations suggest that a fault extends from the Triple Hydraulic placer pit in a direction about north 25 degrees east to a point on Sugar Creek about 1,800 feet north of the mouth of Cooper Creek. A. W. Frankish, who hydraulicked the west branch of Cooper Creek, stated that a fault was seen in bed-rock in the pit several years ago, when it was laid bare by hydraulicking. Bed-rock now is completely covered with accumulated tailings. The dissimilarity of the rocks on the two sides of Sugar Creek suggests the presence of a fault at a sharp bend in the creek 1,800 feet north of the mouth of Cooper Creek. Moreover, about 800 feet north-west from the mouth of Cooper Creek, and on a straight line between the Cooper Creek hydraulic pit and the sharp bend in Sugar Creek, the presence of a fault is suggested, not only by the shattered rock, but by lack of outcrops, on the west side of Sugar Creek, of a prominent band of black argillaceous quartzite that outcrops on the east side. There is no indication of the direction of movement of this possible fault, but by analogy to northerly striking faults along the Barkerville Gold Belt the displacement should be to the right. No evidence was seen for a fault striking north-east and running along Cooper Creek, as suggested by Hanson.*

Many of the veins on Sugar and Cooper Creeks had been recognized prior to 1886, when Bowman examined and recorded observations and assays on nine separate quartz veins.

The veins occupy fractures of a variety of attitudes and may be grouped, as in the Barkerville area, as "A" and " B " veins. The "A" veins are parallel to the strike of the

* Hanson, G. A.: *Geol. Surv., Canada*, Sum. Rept., 1933, Pt. A, p. 42.

rocks, and may be formational veins parallel to the dip or strike-fault veins that cut across the dip. The " B " veins cut across the formations and have several different strike directions. About half the veins seen are "A" veins, several of which are of considerable width; the " B " veins, though all crossing the formational strike, do not appear to have any preferred or dominant trend.

The quartz veins are mineralized mainly with pyrite and galena; pyrrhotite, sphalerite, and chalcopyrite have also been reported. In general, the average sulphide content of the veins is low, though occasional small segregations of pyrite or galena do occur.

Assays of vein samples taken by Bowman indicated a very small gold content. In general, the gold content of the veins was found to be low, though the owners report some high gold assays from several of the veins. The highest gold assay obtained by the writer from a sample of specially selected high-pyrite mineralization was 0.12 oz. per ton. On the other hand, the veins may have a moderate to high silver content, and when silver assays are appreciable, galena is present in the ore. There is, however, no suggestion of a constant silver-lead ratio. This probably means that the silver is present as grey copper or some other silver mineral, even though none so far has been identified in hand specimens.

The majority of veins on Cooper Creek and part of Sugar Creek are on the Well-known claims, recorded in the name of W. H. Armstrong, of Wells. The Goldridge group, recorded in the names of W. H. and Mrs. W. H. Armstrong, covers the upper part of Cooper Creek, but the large quartz vein just south of the intake of the Cooper Creek ditch-line is on the Ottawa 5 claim, which, together with the Ottawa 6, is recorded in the name of Horace Cherry, formerly of Wells. Veins on Sugar Creek, below the junction of Cooper Creek, are on the Unknown group, recorded in the name of Q. C. Heppner, of Wells.

A group of quartz veins outcrops on Cooper Creek, about 1,000 feet up-stream from its mouth. On the west side of the creek two " B " veins are exposed in a bluff to a height of about 50 feet. The more northerly of these strikes about west, dips 52 degrees south, ranges in width from 12 to 24 inches, and is sparsely mineralized with pyrite and some galena. Twenty feet on the hanging-wall side is another vein apparently striking about north 50 degrees west, dipping 70 degrees south-westward, up to 12 inches wide, and containing segregations of galena, and some pyrite. A selected sample of galena mineralization assayed: Gold, trace; silver, 21.9 oz. per ton; and lead, 53.1 per cent. Some work has been done on the outcrops of the vein, and from the dump a sample of selected pyrite assayed: Gold, *nil;* silver, 0.2 oz. per ton. At the foot of the bluff north of the first vein, a bedded vein, 6 to 30 inches wide, has been exposed by stripping for a length of 25 feet.

About 100 feet farther up-stream and on the east side of the creek, another larger vein, strike north 60 degrees east, dip 75 degrees north-westward, is from 2 to 5 feet wide in one section but narrows to 6 inches up the slope to the north-east. The quartz contains very little visible mineralization. A sample of selected pyrite from the dump assayed: Gold, 0.01 oz. per ton; silver, *nil.*

At the forks of Cooper Creek, 2,000 feet up-stream from the mouth, a large formational vein outcrops on the bench east of the old Chinese cabin for an exposed length of 40 feet and a maximum width of 12 feet. The quartz appears to contain no sulphide mineralization.

Two veins, from which the owner reports some high gold assays, outcrop south-west of the forks of the creek. One, strike south, dip 70 degrees west, 12 to 16 inches wide in a bottom cut and 7 to 12 inches wide in a cut 50 feet uphill to the south, is mineralized with some pyrite and galena. A sample of selected pyrite from the lower open-cut assayed: Gold, 0.09 oz. per ton; silver, 0.90 oz. per ton. One hundred feet south-east a second vein striking about south 30 degrees west and up to 3 inches wide is traced uphill for 100 feet. Selected pyrite from this vein assayed: Gold, 0.06 oz. per ton; silver, 0.60 oz. per ton.

Several good-sized pieces of angular quartz float well mineralized with pyrite were found close to the head of the hydraulic pit on the west branch of Cooper Creek. A sample of this float, source unknown, assayed: Gold, 0.12 oz. per ton; silver, 10.1 oz. per ton.

A vein outcrops on the east side of the south branch of Cooper Creek, about 700 feet up from the forks. The vein, partly exposed by old trenching about 40 feet long, strikes north 70 degrees west, dip indeterminate, and width about 14 inches. The vein has about an inch of ankerite along each wall, and though oxidized and iron-stained from the weathering of ankerite, no other mineral was seen. A sample of quartz across 12 inches assayed: Gold, 0.07 oz. per ton; silver, 4.7 oz. per ton.

A very large quartz vein outcrops about 1,100 feet south of the forks of Cooper Creek and up the bank 150 feet to the west. The vein, exposed in natural outcrops on one face about 25 feet high, extends along the hillside for about 150 feet. Its attitude is uncertain, but it appears to be a bedded vein dipping gently south-west. No sulphide mineralization was seen in the quartz.

Up-stream a further 150 feet another large quartz vein outcrops along the creek-bottom for about 400 feet. The quartz has one face about 35 feet high, but there is no indication of the vein's dip. The quartz has crystal-lined vugs and contains inclusions of wall-rock; no sulphide mineralization was seen.

About 800 feet to the south-east, on the Stevens Gulch side of the ridge, three veins of another cluster, striking west and standing vertical, outcrop in grey hard massive quartzite on the face of a 15-foot bluff. The northernmost vein, 8 to 10 inches wide, is poorly mineralized. Fifteen feet south of it a vein 15 to 24 inches wide is exposed on the bluff and also for 10 feet along strike on top of the bluff. It is mineralized with disseminations and bunches of pyrite and galena. A sample of selected pieces of sulphide assayed: Gold, 0.10 oz. per ton; silver, 102.5 oz. per ton; and lead, 25.7 per cent. Seven feet farther south a third vein 6 to 12 inches wide is exposed on the bluff-face. It is sparsely mineralized with scattered galena, from which a sample of selected pieces assayed: Gold, 0.02 oz. per ton; silver, 40.4 oz. per ton; and lead, 9.5 per cent. These veins were discovered by Armstrong and evidently had not been found by the earlier prospectors.

Another quartz vein is exposed along the east side of the south branch of Cooper Creek at a point 200 feet south of the intake of the Cooper Creek ditch-line. A fault is believed to run along the creek-bottom about 50 feet to the west of the vein. The vein, striking north 15 degrees east and dipping 75 to 80 degrees westward, is exposed by old stripping for a length of 50 feet. At the south end the vein expands from about 2 feet to a width of about 5 feet where there is a roll in the quartz and offshoots run out along the planes of schistosity of the wall-rock. At the south end there was a local segregation of galena; pieces of galena selected from the dump assayed: Gold, 0.10 oz. per ton; silver, 47 oz. per ton; lead, 56.7 per cent. The quartz vein has some ankerite along the walls and contains some pyrite in addition to the galena, but the average sulphide content is very low. This vein is believed to be on either the Ottawa 5 or Ottawa 6 Mineral Claim, both of which are recorded in the name of Horace Cherry, of Wells.

On Sugar Creek, up-stream and down-stream from Sugar Creek cabin on Well-known and Unknown group claims, numerous quartz veins are exposed in the old placer diggings and in old strippings along the sides of the creek. The veins contain little or no sulphides, except locally where sparingly disseminated pyrite is occasionally seen; of several samples taken, none assayed more than a trace of gold.

During 1946 and 1947 some interest was aroused locally by the finding of mineralized float amongst boulders from an old placer shaft west of the trail leading to Mustang Lake, and about 1,600 feet north of Sugar Creek cabin. This float, similar to other material that may be seen in placer rock-piles along Sugar Creek, is of pyritic replacement mineralization that, superficially at least, resembles replacement ore in Island Mountain mine. The pyrite mineralization is, in part, fine-grained and dark, and is a replacement of dark quartzite; no calcareous material is present. A sample of a piece from the old placer shaft assayed: Gold, *nil;* silver, *nil.*

A piece of float, picked up on Sugar Creek about 500 feet south of Sugar Creek cabin, consisting almost entirely of pyrite, also containing a small amount of galena, assayed: Gold, 0.03 oz. per ton; silver, 39.5 oz. per ton; lead, 7.9 per cent.

To the south-east, along the Barkerville Gold Belt, the gold-bearing quartz veins have a close spatial and genetic relationship with northerly trending faults. On Sugar Creek two such faults are thought to be present, and an analogous relationship may exist, though confirmatory evidence is lacking.

Showings on the Ewa group, recorded in the name of Q. C. Heppner, of Wells, lie about 1¾ miles north-west of the meadows on lower Little Mustang Creek and are on a small unnamed north-flowing tributary of Big Valley Creek. The ground was held formerly as the Tyee and Comstock groups, which were prospected and worked in 1933. No further work has been done since then.

The first showing on the creek, about 50 yards north of an old camping-ground, is a water-filled inclined shaft, sunk for 20 feet down the dip of a 2-foot formational quartz vein striking north 55 degrees west and dipping 50 degrees north-east. The quartz contains pyrite along the foot-wall side, some sericite, and little or no ankerite. A sample of pyrite selected from the dump assayed: Gold, 0.01 oz. per ton; silver, 0.3 oz. per ton.

About 600 feet down-stream to the north, where the creek runs through a rocky canyon, several narrow very sparingly mineralized quartz veins striking north 70 degrees east and dipping 70 degrees southward cross the creek.

About 500 feet farther down-stream a crosscut on the east side was driven by Tom Riley and J. Perrin in 1933 for about 80 feet in a direction south 50 degrees east. An irregular mass of poorly mineralized quartz is cut near the portal. Very little sulphide mineralization is to be seen.

On the west side of the creek, directly opposite the crosscut, a stripping about 40 feet long exposes about six closely spaced and more or less parallel 6- to 20-inch quartz veins striking north-west to west and dipping south. One vein at the northern end of the stripping contains a small pocket of galena, from which a picked sample assayed: Gold, 0.01 oz. per ton; silver, 19.3 oz. per ton; and lead, 52.9 per cent. The veins are poorly exposed and apparently are, on the average, very sparsely mineralized.

There are no indications of former placer-mining along the stretch of creek near the showings.

Placer gold has been found, and worked, on Sugar Creek since the early 1860's, but this stream has never been regarded as an important source of production. Early records of gold production are incomplete, and despite the fact that the creek is known to have been worked, there is no recorded production of gold prior to 1879. From 1879 to 1895 the estimated combined production of Hardscrabble and Sugar Creeks totalled about 5,180 oz., valued at $82,900*, but the actual amount recovered from Sugar Creek itself is not known. Since 1913, 257 oz., valued at $4,590, have been recorded from Sugar Creek, while between 1937 and 1941, 229 oz., valued at $6,353, have been recorded from Cooper Creek.

* For statistical purposes a value of $16 per crude ounce has been used.

The Annual Reports of the British Columbia Minister of Mines for 1881 and 1883 give the value of Sugar Creek gold as $15.70 and $15.35 per ounce, corresponding to an average fineness of about 750. This agrees very closely with the average fineness of three shipments of placer gold from Cooper Creek which totalled 80 oz. and contained 753½ parts gold and 219½ parts silver.

Old placer-workings extend along Sugar Creek for about 3,400 feet up-stream from the mouth of Cooper Creek. Low bed-rock benches on either side of the creek were worked by hand and by hydraulicking. From the mouth of Cooper Creek, old workings extend down-stream for about 2 miles. The most extensive workings are on bed-rock benches which lie from 10 to 25 feet above creek-level and extend from the mouth of Cooper Creek to the mouth of Little Mustang Creek. The gravel in most places was fairly shallow, except in several old hydraulic pits on the east side of the creek. There is no placer-mining on Sugar Creek at present.

There are no indications of former placer operations along Stevens Gulch, which joins Sugar Creek about 2,600 feet up-stream from Cooper Creek.

Cooper Creek has been placered from its mouth up-stream for about 3,200 feet to the head of the hydraulic pit on the west branch. Most of the ground up-stream to immediately above the forks evidently was shallow and rapidly worked out.

There are no indications of former placer-workings on the south branch of Cooper Creek. It seems reasonable to conclude that the quartz veins along that branch did not shed any gold into the creek.

A small hydraulic plant was installed on Cooper Creek by Triple Hydraulic Placers, Limited, an organization which worked the creek from 1937 to 1941. Work was in charge of A. W. Frankish and George Warren, of Calgary. Officially recorded production in the above five-year period amounted to 229 oz. of gold, valued at $6,353. The average fineness of three shipments, totalling 80 oz., is 753½ parts gold and 219½ parts silver.

Water required for the hydraulicking is obtained through a ditch running from the head of Stevens Gulch around to the south fork of Cooper Creek, and thence through another ditch 3,500 feet long around to the west fork of Cooper Creek. In 1947 the above ditch system delivered water under a head of 100 feet to a No. 1 monitor. The hydraulic pit, opened up about 400 feet west of the forks of Cooper Creek, is some 900 feet long. The creek has a grade of about 12 per cent. It is said that most of the gold recovered was nuggetty and coarse, and that much of it carried attached quartz.

During 1947 A. W. Frankish camped on Cooper Creek and did some work to recondition the plant and ditches.

[References: *Geol. Surv., Canada,* Ann. Rept., Vol. III, Pt. C, 1889, pp. 40–42; also Map No. 370, 1895, Sugar, Hardscrabble, and Slough Creeks; Sum. Rept., 1933, Pt. A, pp. 40, 41, 60, 61. *Minister of Mines, B.C.,* Ann. Rept., 1934, p. C 26.]

Gold.

Max (El Toro B.C. Mines, Ltd.).* (52° 121° N.W.) Company office, 514, 19 Melinda Street, Toronto. W. E. Bateman, president; J. E. Callaghan, vice-president and general manager. Capital: 5,000,000 shares, $1 par value. During 1947 the company undertook a diamond-drilling programme to explore quartz-vein showings, between 3,900 and 4,300 feet altitude, on the north-east side of Spanish Mountain (Fig. 14). Transfer of the Max group to the company has been recorded. This group of eight claims on the north-east side of Spanish Mountain was recorded in July, 1946, covering ground formerly located by E. J. Eddington, as the Joe claims.

* By Stuart S. Holland.

In the same vicinity the claims Mariner, Mariner No. 5, Mariner No. 6, and Mariner Fraction were recorded in October, 1947, by John E. Callaghan, covering ground recorded in 1933, as the Mariner claims, by F. A. Dickson and T. Bayley.

The property is reached by a trail which branches from the Spanish Lake road about 100 yards east of Johnny Lyne's cabin, and climbs about 900 feet to an old cabin near the top of a ridge north-east of Spanish Mountain. In 1947 the company established a camp well down the hillside, about a quarter of a mile up the trail from the Spanish Lake road.

The first vein discoveries were made in 1933, and for several years thereafter the claims were prospected, additional veins found, and some stripping was done. In 1938 an option was taken on the property by the N. A. Timmins Corporation, which did a large amount of stripping and drove two adits on the lower vein-showings. The north slope of Spanish Mountain is closely timbered and apparently covered by fairly heavy overburden. Outcrops are exceedingly scarce.

The claims are underlain largely by black argillaceous schist, dark argillaceous quartzite, and light-coloured quartzite belonging to the Precambrian Cariboo series. The rocks near the quartz showings, between elevations of 3,900 and 4,200 feet, are intruded by sills or dykes of a white to pale biscuit-coloured rhyolite porphyry. Argillaceous schist, quartzite, and rhyolite porphyry are carbonatized in varying degrees with ankerite. An analysis of ankerite separated from a specimen containing about 20 per cent. ankerite is 28.1 per cent. CaO, 13.7 per cent. MgO, 13.1 per cent. FeO, and 45.1 per cent. CO_2. The fresh unweathered ankerite is white to grey in colour, but weathering produces spots and patches of various shades of orange and red brown. Ankerite in the argillaceous schist appears as porphyroblasts up to a quarter of an inch across, and in the quartzite and rhyolite porphyry as irregular areas and crystals replacing quartz grains and feldspar phenocrysts and ground-mass. In some instances the degree of ankeritization is so complete that the identity of the original rock can only be deduced by microscopic study of thin sections. For example, white ankeritized core from diamond-drill hole No. 4, at footages 50 and 125 feet, is carbonatized quartzite and carbonatized argillaceous schist, in contrast to core from drill-hole No. 1 at footages 360, 442, and 520 feet which is ankeritized porphyry, as is the outcrop near the small vein-showings 200 feet north of the cabin at elevation 4,200 feet.

A considerable number of quartz veins are exposed on the property, and, for convenience, descriptions are referred to five areas shown on the accompanying sketch-map (Fig. 14).

At elevation 3,950 feet (north-western part of Fig. 14), two quartz veins are exposed in surface cuts for lengths of 100 and 150 feet respectively. The lower vein is about 6 feet wide in the face of two open-cuts and dips about 20 degrees southward. The other vein, about 5 feet wide in the western adit (*see* Fig. 14), evidently pinches on its eastern end and also dips about 20 degrees south. The quartz in both is hard and unfractured, and is sparsely mineralized with ankerite and pyrite. Work on these veins was done by the N. A. Timmins Corporation in 1938, which drove an adit 42 feet south 27 degrees west from a point on the foot-wall side of the vein. Ninety feet to the east an incline was driven down the dip of the vein for an unstated distance. The incline is now flooded and inaccessible.

The vein at the portal of the western adit lies above a fault dipping 20 degrees and also south of a fault dipping about 55 degrees south. It is thought that the two vein-outcrops represent a single, faulted vein. This belief is supported by the fact that hole No. 2, drilled at an inclination of minus 45 degrees and 192 feet deep, did not penetrate any vein-quartz at depth.

The company drilled two other holes from a set-up at the mouth of the adit, No. 1 hole being drilled flat for 709 feet and No. 3 hole being drilled at an angle of 45 degrees

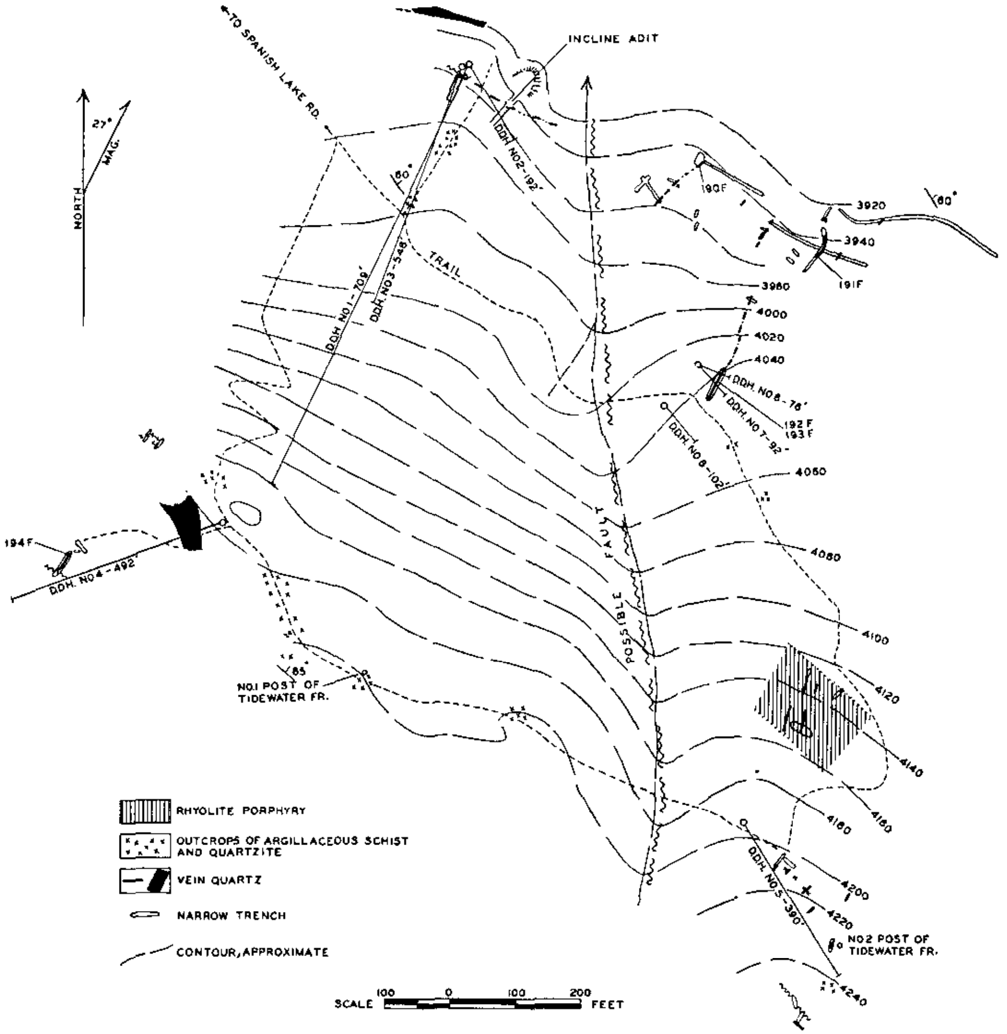


Fig. 14. Sketch-map of Max group, Spanish Mountain.

for 548 feet. Although No. 1 began on the foot-wall side of the vein near the portal, it did not intersect any vein-quartz. It did, however, cross several white ankeritized rhyolite porphyry sills in grey ankeritic argillaceous schist.

No. 3 drill-hole did not cut any quartz vein, being too steep to intersect the projection of the upper vein-outcrop and also being on the hanging-wall side of the fault which drops the vein down to its lower outcrop position. At depth it penetrates white, strongly ankeritized rock, some of which is quartzite and some of which may be rhyolite.

East of a depression and a small creek, between the 3,920- and 4,060-foot contours, extensive trenching has disclosed and partly stripped five veins, all more or less parallel and striking about north 30 degrees east. One vein, close to the trail, at elevation 4,040 feet, is stripped for a length of 35 feet, and two open-cuts off to the north extend its length to about 150 feet. The vein is 20 to 24 inches wide and dips 65 degrees west. The quartz is mineralized with pyrite, galena, and sphalerite. The pyrite occurs in pencil-like aggregates at right angles to the walls and, on weathering, produces a honeycomb or horse-tooth structure in the quartz. This vein has visible gold in the oxidized surface quartz, and from it F. A. Dickson is said to have crushed and panned several hundred dollars' worth of gold. One sample (192F) of selected quartz, well mineralized with pyrite and galena, assayed: Gold, 0.30 oz. per ton; silver, *nil.* Another selected sample (193F) of pieces containing about 25 per cent. pyrite assayed: Gold, 1.12 oz. per ton; silver, 0.4 oz. per ton.

During July, 1947, the company put down three minus 45-degree drill-holes close to the outcrop of this vein. No. 6 drill-hole encountered 12 inches of quartz sparsely mineralized with pyrite and galena at 32 feet, No. 7 hole encountered no quartz, nor did No. 8 drill-hole, which lies 80 feet to the south-west.

Downhill to the north, extensive trenching along a length of 500 feet and across a width of 150 feet has disclosed four sub-parallel veins up to 18 inches in width and with sparse ankerite and pyrite mineralization. No visible gold was seen, and although the vein-showings appear less attractive than the one uphill to the south, several high gold assays were obtained from them.

Sample 190F (*see* Fig. 14), taken from a 4- to 6-inch quartz vein mineralized with pyrite, galena, and chalcopyrite, assayed: Gold, 4.43 oz. per ton; silver, 2.3 oz. per ton. Sample 191F (*see* Fig. 14), of selected honeycomb quartz containing pyrite, assayed: Gold, 0.52 oz. per ton; silver, *nil.*

Also east of the creek, at elevation 4,150 feet, two narrow quartz veins are exposed in trenches in ankeritized rhyolite porphyry. The sill apparently has an outcrop-width of about 100 feet. The two veins, 4 to 12 inches wide, are parallel and 20 feet apart, strike about south 35 degrees west, and dip 50 to 65 degrees north-westward. The western vein has sparse pyrite and ankerite mineralization and contains visible gold in small specks.

South of the cabin and about elevation 4,200 feet (south-eastern part of Fig. 14), several short, narrow, poorly mineralized quartz veins are exposed in old open-cuts. The veins all strike between south 20 degrees and south 40 degrees west. At the southernmost exposure two open-cuts expose a strong north-easterly trending fault and irregular broken vein quartz. It is reported that from this locality two spectacular samples containing free gold have been obtained.

Diamond-drill hole No. 5 was drilled 390 feet at minus 45 degrees in this vicinity. No mineralized quartz was intersected. A 100-foot section of white, highly ankeritized rhyolite, cut between footages of 215 and 320 feet, is evidently another sill or dyke in the dark, ankeritic argillaceous schist.

The quartz veins east of the creek are sub-parallel and lie within 350 feet to the east of a fairly straight, north-trending gully. The setting strongly suggests the possibility that a north-south fault may trend along the gully and may be responsible for the fracturing now occupied by vein-quartz. There is no evidence to prove the presence of a fault that is associated with the vein-fracturing. Nevertheless, if it were so, the strip of ground to the west of the gully and parallel to it would offer encouragement for further prospecting.

An outcrop of vein-quartz (south-western part of Fig. 14) is 25 to 40 feet wide and about 75 feet long. The quartz contains little mineralization, and diamond-drill hole No. 4 beneath the surface exposure intersected only 1 foot of unmineralized quartz at 56 feet depth.

Two hundred feet west of the large outcrop, on the west side of a shallow depression, the company excavated an open-cut on a vein striking about south 35 degrees west. The vein, exposed for about 30 feet in the open-cut, is terminated at the southern end by a fault striking north 50 degrees west and dipping 50 degrees southwestward. The vein-quartz has a maximum width of 18 inches and is mineralized with pyrite, galena, chalcopyrite, and tetrahedrite. It is reported that specimen pieces of free gold have been obtained from this vein. A sample of selected quartz, well mineralized with galena and containing some sphalerite and small amounts of pyrite and chalcopyrite, assayed: Gold, 5.88 oz. per ton; silver, 32 oz. per ton.

During 1947 the company undertook a programme of diamond-drilling. Eight holes, totalling about 2,600 feet, were completed by July, when work on the property was suspended. The only other work was done on the open-cut on the vein at location (5).

In October 4 tons of picked ore from surface cuts were shipped to Tacoma smelter. Net contents: Gold, 8 oz.; silver, 40 oz.; copper, 82 lb.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1933, p. 134; 1936, p. C 38; 1938, p. C 48.]

Silver-Lead.

Providence.* (52° 121° N.E.) Fourteen mineral claims extending up Black Bear Creek from the falls, in a block five claims long by three claims wide, are recorded in the names of L. O. Gostling, of Likely; W. P. Horton-Jack, of Vancouver; and C. S. Pascoe, of Tacoma, Wash. Black Bear Creek enters Spanish Creek from the east about a mile above its junction with Cariboo River. A trail about 2¾ miles long runs up the east side of the creek from the bridge across Spanish Creek to a camp at an elevation of about 3,500 feet.

Work has been done on some quartz veins on the east side of Black Bear Creek just up-stream from the camp. The " T " vein outcrops about 50 feet above creek-level on the east bank, and for a length of about 45 feet is about 4 feet wide. Its strike is about north 45 degrees west and its dip north-east. Twenty-five feet below the outcrop an adit is driven north 57 degrees east for 49 feet, at which point a drift is driven south 28 degrees east for 23 feet. The drift reveals irregular vein-quartz with spotty mineralization of galena, pyrite, and ankerite. The vein cutting across ankeritic schists which strike north 60 degrees west and dip 50 degrees south-westward may be the underground projection of the " T " vein outcrop.

At the portal of this adit a 4-foot quartz vein exposed on the east wall dips 62 degrees east and pinches upward to 6 inches within a distance of a few feet. About 3 tons of selected galena ore is piled on the side at the portal of the upper adit.

It is recorded in the 1926 Annual Report of the British Columbia Minister of Mines, page 178, that 10 to 15 tons of sorted ore was sacked, and that a grab sample of the best of this ore assayed: Gold, 0.06 oz. per ton; silver, 144 oz. per ton; lead, 76 per cent. The owner states that a shipment was made at that time, but there is no official record of the tonnage or grade.

From a point 40 feet south of the upper adit a second adit 20 feet lower is driven toward the veins. It runs north 53 degrees east for 31 feet, at which point a raise extends upward for 20 feet to a 24-foot sub-level drift along a vein running north 38 degrees west. At the 31-foot point the direction of the adit changes to north 24 degrees east and continues a further distance of 40 feet to the face.

The adit crosses mostly soft, brown and biscuit-coloured papery schists striking about north 30 degrees west, and with low but variable dips to the south-west. There appears to be some rolling in the formation, but the exact structure has not been determined.

At a point 23 feet from the portal the " L " vein, 3 to 20 inches of quartz with erratic galena mineralization, crosses the adit. The vein strikes about north 30 degrees west and dips 45 degrees north-eastward.

A third vein, strike about north 35 degrees west and dip north-eastward, was followed for 24 feet in the sub-level. It is cut in the lower adit at a point 53 feet from

* By Stuart S. Holland.

the portal, and quartz is exposed along both walls for 17 feet to the face. On the sub-level the vein attains a width of 24 inches, but, on the level below, quartz several feet in thickness and dipping gently toward the north-east is exposed.

The three veins referred to above occupy sub-parallel north-east-dipping fractures. The fractures are weak, and the veins not only send branches out along the planes of schistosity, but may roll over from a cross-cutting north-east-dipping fracture-filling to a south-west-dipping formational vein. The veins, as a consequence, are almost unpredictably irregular.

The quartz is mineralized with small lenses and irregular masses of galena. Although no attempt was made to obtain average values by sampling, it is apparent that the average galena content of the vein-quartz is low. A silver-lead ratio of 2 oz. to 1 per cent. is indicated by an assay of gold, 0.06 oz. per ton; silver, 85.3 oz. per ton; and lead, 42.9 per cent., from selected galena ore piled at the portal of the upper adit. This sample also contained 0.6 per cent. bismuth. A selected piece containing 50 per cent. pyrite assayed: Gold, 0.01 oz. per ton; silver, 0.4 oz. per ton. This indicates that the gold content of both the galena and the pyrite mineralization is low.

The total underground work in the two adits aggregates 190 feet of crosscuts and drifts. Both adits were begun in 1926, and a considerable proportion of the total work was done in that year.

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

Gold.

Jim and Midas. (52° 121° N.E.) These groups of claims are on Snowshoe Plateau, north-east of Yanks Peak. Lieut.-Col. F. H. M. Codville, of Duncan, B.C., assisted by his two sons and J. Pickering, did a considerable amount of prospecting on these claims, which includes the old Midas property formerly worked by Amparo Mining Company. Using a portable 90-lb. gasoline-driven jack-hammer, numerous quartz veins were exposed in surface trenches. A crosscut was started on the Don Fraction to explore a vein on the Jim claim.

TASEKO LAKE (51° 123° S.W.).*

Gold.

Hi Do (Pellaire Mines, Ltd.). Company office, 184 Bay Street, Toronto. G. H. Rainville, president; J. W. Scott, mine manager. Capital: 3,000,000 shares, $1 par value. This company continued to develop the Hi Do group, which is on the south-eastern side of Falls Creek, about 5 miles south-west of the southern end of Taseko Lake. The property is reached by 150 miles of road and lake travel from Williams Lake.

The tent camp, which is at elevation 7,880 feet, was reopened in April and underground work was commenced on May 14th. The No. 2 and No. 3 adits, which were started in 1946 on Nos. 4 and 3 veins respectively, were advanced a further 707 feet and 617 feet respectively. The No. 4 vein was further prospected by another adit, which was collared 108 feet lower down the slope, where 146 feet of drifting was done. Two adits were also started on the No. 5 vein at elevations 7,768 and 7,685 feet. Drifting, amounting to 651 feet and 232 feet respectively, was done in these adits. The surface exposures on all the veins were carefully resampled, and a considerable amount of stripping was done with the bulldozer, particularly on the No. 2 vein-zone south of the camp. Roads were built to the various portals, and about 2 miles of the main road was relocated. About twenty-seven men were employed. Operations ceased on October 12th owing to weather conditions.

* By J. W. Peck.

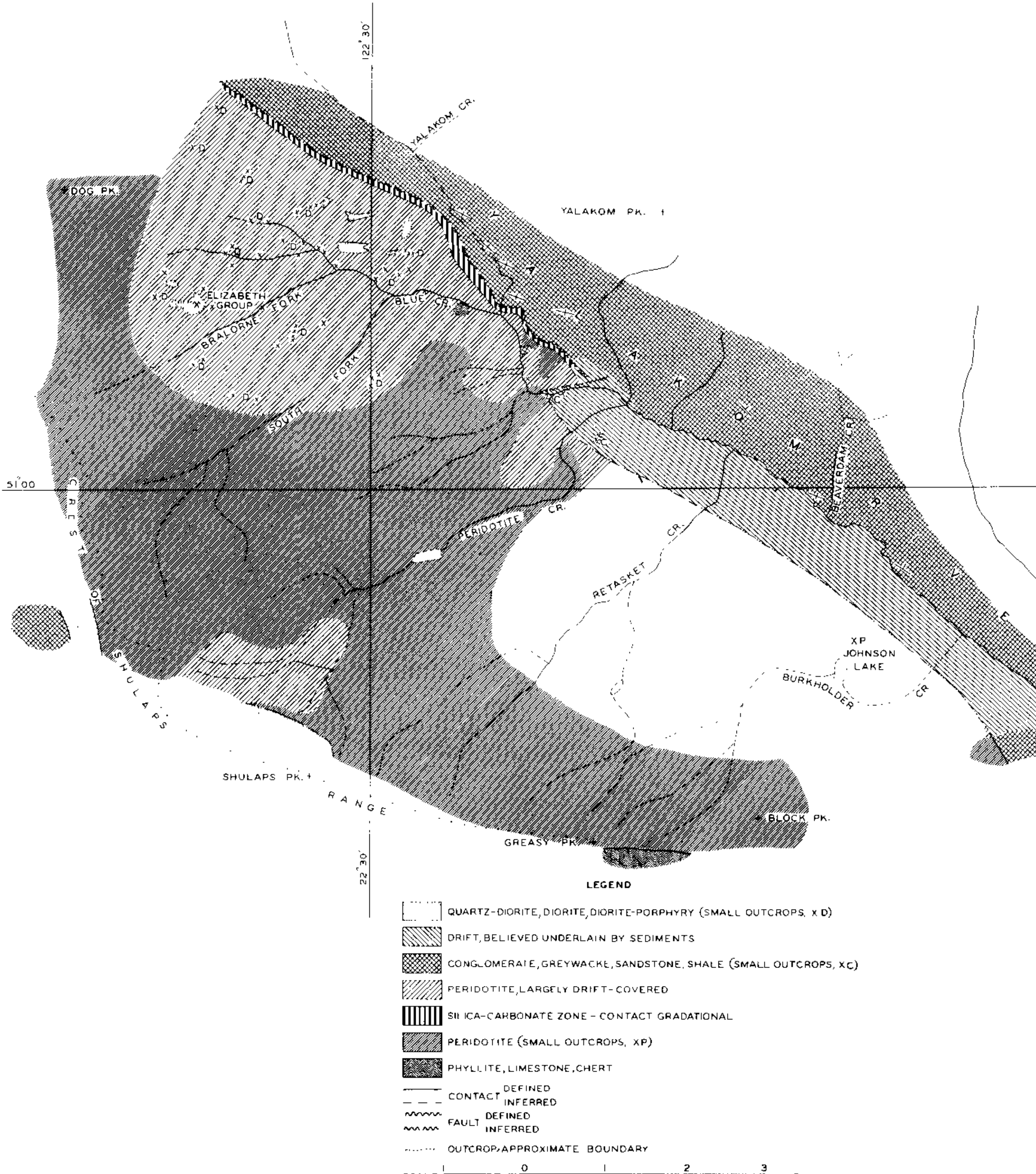


FIG 15 GEOLOGY OF PART OF THE SHULAPS-YALAKOM AREA

Summary of the Geology of Part of the Shulaps-Yalakom Area.*

Location and Access.

The Shulaps Range, Lillooet Mining Division, slopes south-west to the Bridge River and north-east to the Yalakom River. Both flanks of the range are accessible by road and trail. Part of the east side was mapped geologically in 1947. This side is reached by road up the Yalakom River via Moha. Lillooet, 24 miles by road from Moha, is the nearest base for supplies. The Yalakom road ascends Blue Creek to the property of Bralorne Mines, Limited. This property, at timber-line in the northern part of the range, is 35 miles from Lillooet in a direct north-west line and 48 miles by road. From the property a trail crosses the crest of the range by a high pass and descends Liza Creek on the western slope. Branches from this trail lead to the Shalalth-Minto Mine road and the Minto Mine-Manitou Mine road. Another trail leaves the Yalakom road at Shulaps Creek, on the eastern side of the range, crosses the summit, and descends Brett and Marshall Creeks to the Shalalth-Minto Mine road. Timber-line on the east flank can be reached by a rough trail which follows the north side of the valley of Retasket Creek. These trails are suitable for pack-horses.

Topography.

The Yalakom Valley drops, in 18 miles, from an altitude of about 4,150 feet at the mouth of Blue Creek to 1,400 feet at its junction with the Bridge River at Moha. The crest line of the Shulaps Range is mostly between 8,000 and 9,000 feet in altitude, with Shulaps Peak, about 9,450 feet, the highest point. Timber-line averages 6,600 feet, and above it the slopes are almost totally barren of vegetation. The upper part of much of the north-east flank is scalloped by a series of deep cirques. Ice-patches lie at the heads of most of the cirques and feed Burkholder, Retasket, and Peridotite† Creeks, and part of Blue Creek. Outcrops are not abundant on the lower portions of the north-east flank, except on the north side of Blue Creek and in the canyon on lower Peridotite Creek. The thickly wooded area between Peridotite and Burkholder Creeks is deeply mantled with glacial deposits and is subject to large-scale ground-creep.

Peridotite.

Peridotite in varying degrees of serpentinization underlies most of that portion of the Shulaps Range mapped in 1947 (*see* Fig. 15). It is intruded by dioritic rock, and is bounded on the north-east and south by steeply dipping sediments which probably represent rocks of more than one geological age. The peridotite is part of a large mass which is believed to extend 20 miles in a north-west to south-east direction and to be about 7 miles wide in the vicinity of Shulaps Peak. The mass is well exposed above timber-line, but only irregularly at lower altitudes. Below timber-line, north of Peridotite Creek, outcrops of peridotite are sufficiently numerous to indicate that the drift-covered areas between them are also underlain by peridotite, except possibly for local dioritic intrusives. In the deeply mantled area between Peridotite and Burkholder Creeks the only outcrop found consists of serpentinized peridotite.

Except where it is intensely serpentinized, the peridotite is a dense black rock consisting of medium- to coarse-grained olivine and enstatite, with olivine usually in excess of enstatite. It weathers red-brown and the surface is warty because the enstatite grains, which average one-quarter inch in length, weather in relief. Dunite, a variety of peridotite which contains no pyroxene, occurs as irregular masses and bands in the

* By G. B. Leech.

† Peridotite Creek is the first tributary entering the Yalakom from the Shulaps Range north of Retasket Creek. The stream is marked "Haylmore Creek" on the Bridge River map-sheets (Geological Survey of Canada publication Nos. 1708 and 1882) which accompany Geological Survey of Canada Memoir 130. A change in name is necessary because "Haylmore Creek" has prior usage elsewhere in the Lillooet Mining Division.

normal peridotite. It comprises only a small proportion of the total rock and can be recognized easily from a distance by its smooth yellow-brown weathered surface. The fabric of nearly all the peridotite is uniform, but in a few localities it is conspicuously banded because of alternating concentration and impoverishment of enstatite in the space of a few inches. Banding is developed best at the head of Peridotite Creek and on the divide between Blue Creek and Wilfred (Noax) Lake. It strikes north-westerly and dips steeply south-westerly.

Chromite is widespread as disseminated grains in peridotite, especially in dunite, but no significant concentrations of the mineral are known to occur in the area described in this report.

The original nature of moderately serpentinized enstatite-bearing peridotite can be recognized because the enstatite is replaced by bastite, a variety of serpentine, which reproduces the original texture of the grains, and which glistens on the otherwise dull surface of the fresh rock. The joint surfaces of moderately heavily serpentinized peridotite are commonly covered with smooth apple-green enamel-like serpentine.

Intensely serpentinized peridotite is light to dark green. The rock is traversed by a network of small slip planes which are coated with slick serpentine and beneath which the rock is darker and duller. Asbestos sometimes occurs in the joints and slip planes. The original peridotite texture is not recognizable in hand specimens.

In the Shulaps Range moderately to intensely serpentinized peridotite is more abundant than lightly altered rock. A zone of intense serpentinization underlies most of the drainage area of Blue Creek and extends southward to lower Peridotite Creek. Patches of intense serpentinization are irregularly distributed elsewhere, many of them coinciding with locations of dioritic intrusions. Areas of relatively fresh peridotite occur at the heads of Retasket Creek, Peridotite Creek, and the south fork of Blue Creek, and around the basin which drains into Wilfred (Noax) Lake.

Silica-Carbonate Alteration.

Serpentinized peridotite has been further altered to silica-carbonate rock along certain zones that were permeable to solutions. The resultant rock weathers to a buff-coloured rough surface. Fresh surfaces are white if crystalline carbonate and silica predominate, but tend to be reddish if jaspery silica is abundant, and flecked with green if unreplaced serpentine is present. All gradations occur from serpentine to pure magnesite. Crystalline magnesite, accompanied by quartz, forms banded veins which traverse the cherty serpentine-carbonate rock.

The zone of silica-carbonate alteration mapped in 1947 lies against sediments on the north-eastern edge of the peridotite and represents, at least in part, a major fault-zone. The silica-carbonate zone has been traced from the vicinity of a pronounced bend in the Yalakom Valley 1 mile below Blue Creek to a point west of the Yalakom 4 miles above Blue Creek. Its width ranges from 100 to 900 feet, and it contains horses of unreplaced serpentine. An offshoot crosscuts serpentine on the steep north-east bank of the Yalakom 1 mile below Blue Creek. The southern extension of the main zone strikes into a heavily drift-covered area. It has not yet been traced to its north-western terminus.

About 100 yards above the mouth of Blue Creek the silica-carbonate zone crosses from the eastern to the western side of the Yalakom and forms a series of prominent buff-coloured outcrops on the sharp ridge between lower Blue Creek and the river. It is on this ridge that vein-magnesite is best developed. Most of the veins are measurable in inches, though composite veins are larger, and one is 12 feet across. The larger veins trend parallel to the strike of the silica-carbonate zone and are nearly vertical, but smaller ones have random attitudes and the veins pinch, swell, and join one another irregularly. Outcrops are not sufficient to indicate the full length of any of the wider composite veins, but the nature of the deposit is such that pure magnesite, which makes up but a small proportion of the whole silica-carbonate zone, cannot safely be projected far on the strike of any particular occurrence.

Dioritic Intrusives.

Dioritic rocks form dykes, stocks, and irregular masses in peridotite in the drainage basin of Blue Creek, and small bodies occur on the Yalakom River slope to the north. Between Blue and Retasket Creeks there are lenses and dykes of dioritic rock, especially in the vicinity of the lake on Peridotite Creek, but all are small, most of them being less than 25 feet in maximum dimension. Larger masses are exposed in the vicinity of Shulaps Peak and the southern headwaters of Liza Creek.

The Blue Creek bodies occur in an area where bed-rock outcrops are not extensive and the full size of many of them is unknown. The largest stock, on the ridge between the Bralorne fork and the north fork, is exposed for half a mile from east to west and extends at least 1,500 feet north to south. Its maximum east-west length is probably not more than three-quarters of a mile. Dioritic rocks form two prominent bluffs on the north side of Blue Creek 2 miles from its mouth. Small bodies are widely distributed, some of them are flat-lying lenses with serpentine above and below them.

Weathered surfaces of dioritic rock are brown or buff, and fresh surfaces light to dark grey or grey-green. Most of the dioritic rocks are porphyritic, with phenocrysts of zoned white plagioclase and less abundant hornblende in a finer-grained ground-mass of the same minerals. Quartz is not commonly visible to the naked eye, but certain of the rocks are quartz-diorite and granodiorite. Textures range from medium-grained equigranular to porphyritic with almost aphanitic ground-mass. The most abundant type is a diorite porphyry with a fine-grained ground-mass. Alteration to sericite, carbonate, epidote, and chlorite and clay minerals is usual. Pyrite occurs as widely scattered grains. The dioritic rocks commonly have an altered border consisting of dense fine-grained grey or white material against serpentine, which is gradational through 1 to 6 inches into fresher rock of normal texture.

Quartz and quartz-carbonate stringers and quartzose shear-zones cut some of the dioritic rocks, especially in the northern half of the Blue Creek drainage area. Assays do not appear to have shown gold in important amounts, except in strong quartz veins which cut the large quartz-diorite mass underlying the Elizabeth group on the north side of the Bralorne fork (*see* Minister of Mines, B.C., Ann. Rept., 1946, pp. 98–101). The peridotite surrounding the dioritic intrusives is heavily serpentinized and is not as favourable structurally to fissure and vein formation as the more brittle diorite.

All the dioritic rocks are believed to be related in origin, differences in composition and texture appearing to be due to difference in time and conditions of intrusion.

Sediments.

Above Junction Creek the east wall of the Yalakom Valley and most of the valley-bottom are underlain by conglomerate, greywacke, and shale. The sediments strike north-westerly, in general about north 60 degrees west, and dip to the north-east at moderate to steep angles. A few local reversals of dip occur. Crumpling and shearing are especially evident near the mouth of a creek which enters the Yalakom from the north 2¼ miles below Blue Creek.

The sediment-peridotite contact is drift-covered between Burkholder and Peridotite Creeks. Adjacent to the Yalakom River, north of Peridotite Creek, the sediments are steeply inclined or vertical and strike toward the peridotite, and must be obliquely truncated at the contact. The contact is sheared wherever observable. On the east side of the Yalakom, in the vicinity of the prominent bend in the river a mile below Blue Creek, several outcrops of dark-green, soft, altered impure sandstones and shales are almost entirely surrounded by serpentine. One outcrop of altered sediment that rises 500 feet steeply eastward from the river is in contact with serpentine on its northern, eastern (upper), and southern edges. The area to the west is drift-covered.

Adjacent to the silica-carbonate zone the sediments contain carbonate stringers and are partly replaced. Carbonate alteration occurs also in fracture-zones in sediments not immediately in contact with peridotite, as, for example, on the south side of the nose below the high point on the Yalakom road a mile southward from Beaverdam Creek.

Marine fossils and plant remains and the abundance of relatively fresh feldspar fragments indicate that the sediments originated through rapid erosion, and that deposition was in a near-shore marine environment, for at least part of the sedimentary sequence. The beds exposed along the steep banks of the Yalakom for a mile above Blue Creek contain Lower Jurassic fossils. The age of the beds exposed at higher altitudes on the eastern side of the Yalakom River has not yet been determined.

At the head of Burkholder Creek peridotite intrudes phyllitic argillaceous and siliceous sediments which contain banded grey limestone. The contact is exposed in the head-wall of a small glacier, and is vertical and nearly conformable to the bedding of the sediments, which here strike south 80 degrees east. These sediments are believed to be older than those at the mouth of Burkholder Creek.

On the southern headwaters of Liza Creek, which rises on the west slope of the Shulaps Range opposite Blue Creek, conglomerate is intruded by both diorite and serpentine. The pebbles and fragments in this conglomerate are almost all of grey limestone. No fossils have yet been found in this rock.

Prospecting.

The central and northern portion of the drainage-basin of Blue Creek, and some of the Yalakom slope to the north, are covered by claims which were staked following the 1941 discovery in quartz-diorite of quartz veins carrying free gold. These veins lie on what are now the Elizabeth No. 1 and related claims of Bralorne Mines, Limited (*see* Minister of Mines, B.C., Ann. Rept., 1946, pp. 98–101). Stripping and a small amount of diamond-drilling were done by Bralorne Mines, Limited, soon after the discovery, and two adits, both less than 35 feet long, were driven in serpentine. No further underground work was done in the district until 1946, when H. Reynolds had an adit driven 17 feet into serpentine near creek-level on the Bralorne fork, a little more than 3 miles above the mouth of Blue Creek.

In 1947 Bralorne Mines, Limited, H. Reynolds and associates, L. Hansen and associates, and F. Billings were active on Blue Creek. The operations of Bralorne Mines, Limited, are described elsewhere in this report (*see* below). H. Reynolds continued prospecting on claims which adjoin the south boundaries of the groups held by Bralorne Mines, Limited, and attempted to test a talus-covered slope with an X-ray drill. L. Hansen and associates and F. Billings, who hold claims on the northern and eastern sides of the Bralorne groups, continued prospecting by trenching and stripping.

BLUE CREEK (51° 122° S.E.).*

Gold.

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

This property is on Blue Creek, a tributary of the Yalakon River. The main camp is 48 miles by road from Lillooet. After the completion of 15½ miles of new road by the Government, active operations were resumed by Bralorne Mines, Limited, in the autumn of 1947. Camp buildings consist of seven bunk-houses, one dwelling, one change-house,

* By J. W. Peck.

and one cook-house, while services such as water, sewer, and lighting facilities were installed. A portal-site was cleared and a large workshop containing a Caterpillar diesel-electric set and two 220-c.f.m. compressors erected. An adit was started on the Churn No. 1 claim and was driven nearly due west toward the Elizabeth No. 1 claim, the objective being the downward extension of the Elizabeth veins 750 feet below the outcrop of the No. 1 or " High Grade " vein. A Sullivan jumbo, Eimco 21 mucking-machine, and sliding switch were used to advance the crosscut 1,250 feet by the year's end.

Elevation of camp is 6,550 feet and that of the portal is 6,640 feet. The heavy snowfall necessitates keeping a bulldozer available at the mine. James Mollard was in charge of operations and about twenty-four men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1946, p. 98.]

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. Capital: 2,500,000 shares, $1 par value. The Pioneer mine is on Cadwallader Creek, about 55 miles by Bridge River Highway from Shalalth Station on the Pacific Great Eastern Railway. Development during the year was concentrated on work necessary to open up the " 27 " vein. Drifting amounted to 3,265 feet, crosscutting 2,926 feet, and raising 1,092 feet. Drifting on the " 27 " vein was as follows: 1,112 feet on the 22 level, 879 feet on the 23 level, 452 feet on the 24 level, and 822 feet on the 25 level. Raises were started on all levels so as to provide a current of air from the 26 level of downcast No. 2 shaft, through the " 27 " vein, to the 13 level of upcast No. 3 shaft. On the 15 level a station was cut, and a pocket raise driven toward the bottom of No. 3 shaft, which extends from the 1400 level to the surface. At the end of the year preparations were about completed for sinking No. 3 shaft to the 26 level. On the surface the No. 2 portal was relocated, and this necessitated driving a 153-foot crosscut to No. 2 shaft.

Ore mined amounted to 44,696 tons, of which 14,884 tons came from development. Ore milled amounted to 41,304 tons. Net contents: Gold, 19,332 oz.; silver, 3,560 oz.

New equipment consisted of an Ingersoll-Rand angle compound 2,000-c.f.m. compressor. Three new houses were built for employees. The average number employed was 180.

Holland. The Holland group of sixteen claims and fractions, which lie north of Pioneer and east of Bralorne, is being developed by Golden Slipper Mines, Limited, of 1305 Concourse Building, 100 Adelaide Street West, Toronto, under an agreement assigned from Santiago Gold Mines, Limited, of 423 Hamilton Street, Vancouver, of which R. Crowe-Swords is president and managing director.

The vertical diamond-drill hole that was started in 1946 on the south-west corner of the Langdon claim was sunk to a depth of 2,000 feet. In general, there was no change in the rocks from the collar of the hole to the bottom, but there was a slight increase at depth in the ratio of argillite to quartzite. Core-recovery was 53.5 per cent. No veins or important mineralization were cut, and the hole was considered to be in the Ferguson sediments for the entire distance.

A second vertical diamond-drill hole was started in August on the south-west corner of the Ruby Fraction and about 2,000 feet east of the old Holland tunnel. It is proposed to drill the hole to a depth of 1,000 feet.

* By J. W. Peck.

Pacific (Eastern) Gold Mines, Ltd. Company office, 184 Bay Street, Toronto. G. H. Rainville, president; A. W. Stollery, mine manager. This company is controlled by the Quebec Gold Mining Corporation and Noranda Mines, Limited. The mine-workings are 2 miles by road east of Pioneer mine on Cadwallader Creek. The large-scale drifting programme on the 520 level, begun in 1946, was continued throughout the first half of the year. Several short crosscuts were driven from the main drift in search of ore, the total footage for the year amounting to 2,707 feet. A total of 6,573 feet of diamond-drilling was done underground in twenty-two holes.

On August 18th, 1947, an explosion of methane gas on the 520 level resulted in the death of three men. Shortly after this the mine was abandoned, the equipment removed, and the mine allowed to flood.

Golden Contact Mines, Ltd. Company office, 318 Vancouver Block, Vancouver. M. McGregor, president and managing director. Capital: 3,000,000 shares, 50 cents par value. The company was formed in 1947 to take over the holdings of the McGillivray-McGregor syndicate. The claims are on the north side of McGillivray Creek, and the camp is about 4 miles by easy pack-trail from McGillivray Falls Station on the Pacific Great Eastern Railway.

A diamond-drill programme was started in July and continued until October, when failure of the water-supply forced the shut-down of the water-driven compressor. Five holes—80 feet, 217 feet, 268 feet, 230 feet, and 300 feet in length—were drilled on the McAllister and Anderson claims, making a total of 1,095 feet. The first hole was abandoned at 80 feet due to drilling into a fault. The object of the drilling was to test for continuity of the west segment of the old National Gold vein. The vein was intersected in the last four holes, proving another 1,000 feet of length. The average number of men employed was six.

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. Capital: 1,250,000 shares, no par value. The Bralorne mine is on Cadwallader Creek, about 53 miles by road from Shalalth Station on the Pacific Great Eastern Railway.

Development during 1947 consisted of 6,337 feet of drifting and crosscutting, 394 feet of raising, and 7,640 feet of diamond-drilling. Drifting was done on the following vein systems: "51," "53," "55," and "55E" block, "75" and "77." Nearly half this drifting was done on the 1200, 1500, and 1600 levels of the 53 vein, the best ore-shoot being encountered on the 1500 level. On the "51" system, drifting was done on the 100, 200, 1100, and 2000 levels, with good ore developed on the 1151 East drive. On the "55E" block, drifting was done on the 1400 and 1500 levels, while on the "75" and "77" vein systems only a small amount of work was done. On the 1700 level a break-through made to the Empire shaft greatly improved ventilation on this level.

Two informative diamond-drill holes were completed during the year. A long hole was drilled 1,182 feet north-easterly from the "59" vein on 1400 level to explore virgin ground lying between the "59" vein and the Alhambra vein in the King mine. No conclusive results were obtained. The second hole, 233 feet in length, was drilled from the "77" vein on 2000 level to intersect the "81" vein below this level, an intersection of 3 inches, high in gold, being obtained.

The installation of a trolley system on the main haulage was started. At the year's end the trolley-wire was in place and the greater part of the power-cable installed.

The number of men employed underground rose from a low of 190 in April to a high of 226 in December. Accident frequency was one of the lowest in the Province, with forty-three compensable accidents. Ore mined amounted to 136,838 tons, and the amount milled was 133,047 tons. Net contents: 61,912 oz. of gold and 16,531 oz. of silver.

A large building programme was initiated at the Empire camp. Thirty five- and six-room houses were erected, of which thirteen were ready for occupancy at the end of the year. Two twelve-men bunk-houses and an addition to the cook-house were completed. Additions were made to the Bralorne and Empire change-houses, and a new concrete basement for the church was poured.

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 value. The property lies east of the Hurley River, with the main camp 3½ miles north of Bralorne on the Bridge River Highway. The three-compartment 54-degree inclined California shaft was deepened to a depth of 816 feet from the collar. At 800 feet, station C 8 was cut, and four diamond-drill holes totalling 812 feet were drilled, three into the hanging wall and one into the foot-wall. After the installation of guides and special safety-skip, crosscutting of 232 feet and drifting of 316 feet in a northerly direction were done into the hanging-wall side of the shaft in order to investigate the results of the drilling. An average of fourteen men was employed.

Golden Ledge Syndicate.

Company office, 503 Rogers Building, Vancouver. J. S. Harrison, president. This is a private syndicate which owns and is doing intermittent work on a group of claims which straddles the Hurley River below its confluence with Cadwallader Creek. The camp is about half-way between Bralorne and B.R.X. mines on the Bridge River Highway. A small crew was employed a few months drifting in the lower adit, which is about 80 feet above the Hurley River. A narrow quartz lead was followed in a north-westerly direction, and when work ceased, the face was more than 800 feet from the portal.

Wayside.

The Wayside mine, which is approximately half-way between Minto and Gold Bridge on the Bridge River Highway, was reopened in 1946 by the L.A.P. Mining Company. In 1947 unwatering was completed to allow an inspection of all levels down to the bottom or ninth level. Aside from a few small cave-ins, the levels were found to be in fair condition and no difficulties were encountered in the unwatering. The lower levels were then allowed to flood, and work was concentrated on the rebuilding and raising of the winze head-frame. Improvements of and additions to the surface plant were also continued during 1947 and included a new magazine for explosives, a new concrete portal, reconditioning of the old Hadsel mill, and rebuilding of the mill storage-bin.

Congress Gold Mines, Ltd.

Company office, 703 Royal Trust Building, Vancouver. R. E. Berry, president; E. Hanson, mine superintendent. Capital: 4,000,000 shares; $1 par value. The Congress mine is on the Bridge River Highway, near the confluence of Gun Creek and Bridge River. Shaft-sinking, started in 1946, continued through January. In February, Sheep Creek Gold Mines, Limited, which was financing the work, gave up its option, and all operations ceased. All equipment remained on the property, however, and an air-lift was installed in the shaft for quick unwatering. The shaft at time of shut-down had reached a depth of 428 feet, with the sixth level cut.

Bristol Mines (1946), Ltd.

Company office, 572 Howe Street, Vancouver. J. C. Adam, president; A. E. Stromberg, mine manager. Capital: 3,000,000 shares, 50 cents par value. The property is on Tommy Creek, 4 miles by narrow truck-road from a point on the Bridge River Highway 12 miles east of Minto. An underground diamond-drilling programme was continued throughout the year. One drill working two shifts drilled more than 9,000 feet. Large quantities of water were encountered, and owing to the pressure thereof great difficulty was experienced in drilling certain of the up-holes. All drilling was done on the third or lowest level, the object being to locate ore-shoots similar to the one reported about 30 feet below the second level. New construction consisted of a bunk-house and cook-house built at same elevation as the office.

SETON LAKE (50° 122° N.E.).*

Russell Ventures Mining Co., Ltd. This company, under agreement with Rusdon Mines, Limited, undertook hand-steel work on the White Slide group on Puck Creek. These claims are 1½ miles up Puck Creek from Seton Lake and are reached by a 4-mile trail from Shalalth Station on the Pacific Great Eastern Railway. An adit on the west side of the creek was extended to a distance of 368 feet from the portal in an effort to reach granite that is exposed on the surface above the adit. Results of this work were unsuccessful, but at a point 300 feet from the portal some mineralization was encountered and 37 feet of drifting completed. Work was carried out by L. Russell and two other men.

CAYOOSH CREEK (50° 122° N.E.).*

Ample. The Ample group of claims lie on the west side of Cayoosh Creek, about 6 miles by road and trail from Craig Lodge at the east end of Seton Lake. They are held by S. M. Jones, J. D. Devitt, and E. Brett. In October, Leitch Gold Mines, Limited, obtained an option on the property. Two holes, 240 feet and 250 feet in depth, were drilled on the Ample claim. Water was obtained from the old flooded No. 1 inclined shaft, but when this gave out in November, drilling was discontinued. S. D. Townsend was in charge of the drilling and six other men were employed.

NICOLA (50° 120° S.W.).

Copper.

Copperado (Guichon Mine, Ltd.).† Company office, 124 Pacific Building, Vancouver. James D. Ferguson, manager. The Copperado property, east of Mill Creek, about 5 miles north-east of the village of Nicola, was last operated by Turlight Mines, Limited. A report on the property appears in the British Columbia Minister of Mines Annual Report, 1929, page 246. The property had been inactive for many years when it was reopened in 1947. A shaft sunk to a depth of 60 feet during earlier operations was unwatered in the autumn of 1947, and drifting was begun on the ore-body northward from the shaft. Ore was trucked to a Canadian Pacific Railway loading-point at Nicola and was shipped to the Tacoma smelter. On October 7th the crew consisted of two men working underground and five on the surface.

MERRITT (50° 120° S.W.).

Lead-Zinc.

Lucky Todd Mine.† This property, operated by George G. Hunter and partners, is on Iron Mountain, about 14 miles by road from Merritt. After being inactive for several years, the mine was reopened during the summer by the present operators. Three of the partners worked underground and two on the surface; no other help was employed. A compressor was installed, and the old inclined shaft was rehabilitated. Ore from lateral workings near the shaft, including 18 tons mined previously, was shipped to the Trail smelter. Production: Ore shipped, 36 tons. Net contents: Silver, 67 oz.; lead, 11,819 lb.; zinc, 484 lb.

* By J. W. Peck.
† By E. R. Hughes.

COPPER MOUNTAIN (49° 120° S.W.).

Copper.

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

A. S. Baillie, president; J. C. Dumbrille, assistant to the president; W. I. Nelson, assistant general manager; R. S. Douglas, mine superintendent; J. E. McMynn, assistant mine superintendent; E. H. Foy, mine captain; L. H. McKay, mill superintendent; A. C. Eastcott, power plant superintendent, all addressed at Copper Mountain. 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 serves the power plant, mine, and concentrator.

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

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

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 is used in breaking ore. This practice reduces 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. A total of 214,966 feet of blast-hole diamond-drilling and 6,712 feet of core diamond-drilling was done during the year.

Further experimenting was done in the use of diamond-drills in drifting, but drifters are still used for development-work.

Toward the end of the year, test-work with tungsten carbide bits was carried on with a fair degree of success.

Ore-drawing was completed in the 36 block and the slusher equipment was removed for use elsewhere. Development-work was done in five new ore-blocks, having a total tonnage of approximately 3,500,000 tons of 1.27 per cent. copper. Ore-drawing was done in six ore-blocks. Total development consisted of 7,444 feet of raising and 4,080 feet of drifting; 1,587,479 tons of ore was broken during the year. Ten new chutes were built. Four new 50-horsepower M.M. 4D slusher-hoists were added to the ore-transportation equipment, making a total of fifteen slusher-hoists in operation.

Underground ventilation was well maintained and two new auxiliary fans were added to the eight already in use. The total potential mechanical ventilation capacity is now approximately 500,000 cubic feet of air per minute. The fans draw fresh air into the mine through the old glory-holes and ventilation raises and force it to slusher drifts and other working-places, and thence outside. Ventilation doors are placed in the drifts and crosscuts to control the flow of air.

No. 7 and No. 8 levels, the lowest levels in the mine, have received little attention during recent years, but a development programme has now been started that will result

* By E. R. Hughes.

in much increased activity in these lower workings. These levels are serviced by the underground No. 2 shaft, through which the ore is raised to the No. 6 level, where it is taken out of the mine on the main transportation system. The 7-10 and 7-20 ore-blocks in this area are being developed for mining by blast-hole diamond-drilling and the use of slusher equipment. Because of the soft nature of the ground, slusher drifts and draw-points are being lined with concrete. The old No. 2 shaft hoist was considered to be inadequate to handle the increased tonnage expected from the new workings, and during the autumn months it was replaced by a Nordberg 54- by 84-inch double-drum electric hoist, with fully automatic controls. This hoist is capable of hoisting 3,000 tons daily.

The surface equipment was increased by the addition of three 500-kva. 13,000/2,300-volt transformers, making a total of 3,000 kva. at the main transformer bank. A new Allis-Chalmers 36- by 48-inch jaw-crusher of all-welded construction was installed at the crushing plant, replacing a 42- by 30-inch Farrell-Bacon style B jaw-crusher.

Safety Committees make regular tours of inspection of all surface and underground workings, and their recommendations are discussed at subsequent meetings. The company employs a safety engineer. An emergency hospital with the customary equipment and supplies, including a supply of blood plasma, is maintained at the mine for the treatment of injured workmen. A trained nurse and an industrial first-aid attendant are on hand at all times. Aluminium-dust therapy is available for all employees. A doctor visits the Copper Mountain camp twice a week and is available in emergencies. An ambulance is maintained for transporting sick or injured persons to the Princeton General Hospital, 12 miles from the mine. A new prefabricated staff-house was built during the year.

The mine was worked continuously throughout the year. The average crew for the year included 250 men underground and 170 on the surface at Copper Mountain. At Allenby the crew averaged 150, and 30 men were employed at the company's steam-electric power plant at Princeton. The total pay-roll was 600 employees.

Production: Ore mined, 1,333,474 tons; average grade, 0.98 per cent. copper; ore milled, 1,292,342 tons. Net contents: Gold, 5,141 oz.; silver, 149,497 oz.; copper, 21,323,366 lb.

HEDLEY (49° 120° S.E.).*

Gold.

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

The Nickel Plate mine is connected underground at several points with the Hedley Mascot mine, and as the upper outlets of the Nickel Plate are approximately 2,000 feet higher than the lowest outlet of the Mascot, the motive column is sufficient to provide natural ventilation during most of the year. Extension of the 4150 level is being made toward a raise driven up from the Mascot 3700 level; when this connection is made, there will be a difference of approximately 2,600 feet between the lowest and highest outlets at these mines.

Developments during 1947 consisted of 2,334½ feet of drifting, raising, and crosscutting, and 17,139 feet of diamond-drilling. Tonnage of ore from the mine has

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

been increased to 415 tons daily for the 5½-day week. The milling capacity has been increased by the addition of a 6- by 6-foot Allis-Chalmers ball-mill, a 11½- by 12-foot filter, a 35- by 12-foot thickener, three 18- by 16-foot agitators, two 66-inch filter cells, and a Dorr classifier.

The hoist in use at the Morning shaft has been replaced by a Canadian Ingersoll-Rand 42- by 30-inch double-drum 100-horsepower electric hoist driven by an English Electric motor.

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

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 surface and underground employees. First-aid rooms are provided at the mine and at the mill, and qualified industrial first-aid attendants are always available.

Production: Ore milled, 102,597 tons. Net contents: Gold, 36,589 oz.; silver, 2,379 oz.; copper, 12,581 lb.

Hedley Mascot Gold Mines, Ltd. Company office, 908 Royal Bank Building, Vancouver; mine office, Hedley. V. J. Creeden, general manager, Vancouver; C. W. S. Tremaine, resident manager, Hedley; J. C. S. Moore, mine foreman. The company operated the Mascot and Good Hope mines, and did some drifting on the Horsefly Mineral Claim.

Hedley Mascot.—The concentrator and mine offices are on the east bank of Hedley Creek and the mine camp is on the western slope of Nickel Plate Mountain. The ore is transported 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 are used underground.

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

The main development during 1947 was the starting of a raise from the 3700 level, which is to be continued up to the 4150 level in the Nickel Plate mine, and which will provide additional ventilation for both mines. The raise was about half completed at the end of the year. No further work was done on the 2700 incline.

Development-work done in 1947 included 1,217 feet of drifting and crosscutting, 770 feet of raising, and 19,105 feet of diamond-drilling. There were no major additions to plant or equipment during the year.

Milling was resumed in April, having been stopped on July 3rd, 1946, because of a strike. The mine was operated continuously throughout 1947. Since milling was resumed, ore has been treated at the rate of 175 tons daily, with heads approximating 0.39 oz. of gold per ton.

Production: Ore milled, 29,151 tons. Net contents: Gold, 10,736 oz.; silver, 1,995 oz.; copper, 20,901 lb.

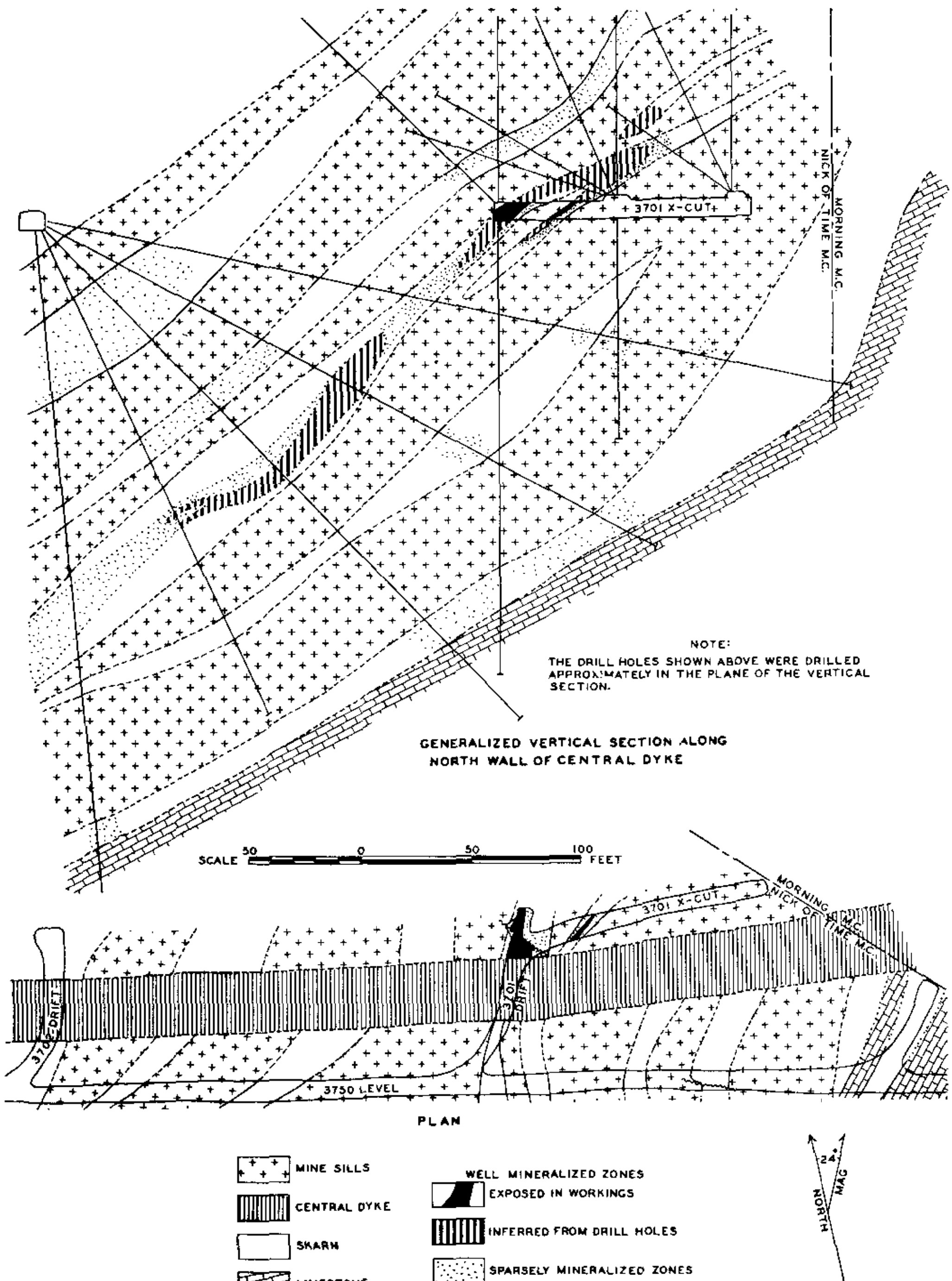


Fig. 16. Hedley Mascot—plan and section of part of 3700 level.

*Nick of Time.**—This claim, controlled by Hedley Mascot Gold Mines, Limited, is a short distance west of the Mascot Fraction, but separated from it by the south-west corner of the Morning claim and the north-east corner of the Copper Cleft claim, both of which are owned by Kelowna Exploration Company, Limited. In 1946, during the course of development-work on the 3700 level, ore was discovered and partly explored on the Nick of Time claim close to its north-east boundary. This occurrence was examined during a three-day visit to the property in July, 1947. The underground geology, as indicated by workings and diamond-drill holes at that time is shown on Fig. 16.

Here, as elsewhere on Nickel Plate Mountain, the main rocks are coarse- and fine-grained skarn, and dykes and sills of diorite and gabbro porphyry. On the 3700 level the bedding-planes of the skarn strike east of north and dip at moderate to low angles to the north-west. The skarn, considered to be metamorphosed impure limestone of the Nickel Plate formation, gives way rather abruptly near the east end of 3700 level to soft bluish limestone. This contact, known as the " Marble Line," is of economic importance. Experience in both the Mascot and Nickel Plate mines has shown that most of the ore-bodies occur within 250 feet of the Marble Line. Many ore-bodies in the Mascot and Nickel Plate mines are associated with the " Central Dyke " (known as the " Flange Dyke " in the Nickel Plate mine). It is a westerly trending composite dyke standing approximately vertical. This dyke is joined by a swarm of tabular bodies of similar rock known as the " Mine Sills." As a rule these are concordant with the bedding of the Nickel Plate formation.

The ore-body found on the 3700 level on the Nick of Time claim appears to be a manto-type deposit localized between two Mine Sills in the crotch formed by the sills and the north wall of the Central Dyke. In a length of 27 feet, exposed in 3701 drift, the thickness decreases from 8 feet at the Central Dyke to 2½ feet at the north face of the drift. Beneath the sill, which forms the foot-wall of the main ore-body, another mineralized zone occurs; it, however, is less than 2 feet thick. The ore is very hard fine-grained greenish skarn containing coarsely crystalline arsenopyrite, both as disseminated crystals and as discontinuous lenticular masses. Some quartz and pyrrhotite are found in the mineralized zone, but neither appears intimately associated with the arsenopyrite. The data for ten channel samples cut from the west wall of 3701 drift and the assays of the samples are summarized as follows:—

Location.	Width (Normal to the Ore-body).	Gold.†
Distance north of north wall of Central Dyke—	Inches.	Oz. per Ton.
2 feet—		
Bottom	55	0.12
Centre	10	2.54
Top	27	0.02
7 feet—		
Bottom	72	0.32
Top	22	4.54
12 feet	72	0.07
17 feet—		
Bottom	46	0.17
Top	24	2.66
22 feet	30	0.40
25 feet (face)	30	0.36

† Silver values were all less than 0.02 oz. per ton.

A programme of diamond-drilling to determine the extent of the ore-body above and below 3700 level met with only partial success. Since the ore-body hugs the north wall of the Central Dyke and may have a strike-length of little more than the 27 feet

* By W. H. White.

exposed in the 3701 drift, long down-holes drilled from 3702 drift could easily deviate enough to miss the ore. The vertical section in Fig. 16 is based on the examination of cores from some of the drill-holes, the projections of which are shown on the section. The cores appear to indicate that one or more well-mineralized bodies, ranging in width up to 18 feet, occur for a distance of 270 feet in the direction of dip. It will be noted that below the 3700 level the Marble Line rises gradually through the Nickel Plate formation. This convergence of the Marble Line and the Mine Sills may well limit the further downward continuation of this mineralized zone.

The 3700 level is virtually isolated from the main ore transport system of the Mascot mine, the only connection being a light aerial tram from the portal of 3700 level to the portal of 4300 level. Production of ore from the 3700 level would require an improved surface transport system or, alternatively, long underground connections with either the 2700 incline or 4300 level.

*Good Hope and Nighthawk.**—Hedley Mascot Gold Mines, Limited, owns or controls twenty-nine claims and fractions, including the Good Hope, Nighthawk, Star, Strike, Tungsten, Lode, and several others recorded from September, 1942, to September, 1945. The company began work on the Good Hope in 1944. The workings are on an upland surface of low relief, elevation about 5,000 feet, approximately 1½ miles south-east of the Nickel Plate camp. The property is reached by a truck-road 2 miles in length which branches to the east from the Nickel Plate road at a point 6 miles from the main highway.

Operations on this property include open-pit mining and diamond-drilling. In five months' operation during the summer season production amounted to 2,513 tons of ore, having an average grade of 0.62 oz. of gold per ton. The ore was hauled to the Hedley Mascot mill for treatment. Exploratory diamond-drilling included thirty-three short holes totalling 2,832 feet. Eleven men were employed under the supervision of C. Higgins and F. Whiting.

In July six days were spent examining and mapping the workings and logging drill-core.

As shown by Maps 568A and 628A of the Geological Survey, Canada, the property is in a roughly triangular area of volcanic and sedimentary rocks, bounded on the north, east, and south by bodies of granite and granodiorite. Scarcity of outcrops obscures the relationship with formations exposed to the west on Nickel Plate Mountain. The local geology and workings are shown on Fig. 17.

The property is underlain by volcanic rocks, some limestone, and several granitic masses. The volcanic rocks are a heterogeneous assemblage of discontinuous beds, including greenish and brownish fine-grained rocks which are probably tuffs, fragmental types of various colours, and both massive and finely porphyritic flows. Mineralogically the volcanic rocks are characterized by plagioclase of medium composition, brown biotite and green chlorite in varying proportions, and green hornblende. Metamorphic minerals present include epidote, garnet, and calcite. Discontinuous lenses of grey crystalline limestone a few feet thick are intercalated with the volcanic rocks.

A body of coarse-grained granodiorite rich in biotite forms a broad ridge about 800 feet west of the workings. Granitic rock, also outcropping at a few places around the eastern base of the small hill on which the workings are situated, is evidently a tabular body about 80 feet thick extending beneath the known ore-bodies at a stratigraphic depth of about 70 feet. One diamond-drill hole passed through this body into underlying volcanic rocks and limestone, and several other drill-holes reached its upper surface. Drill-cores of this granitic rock show a progressive change in composition

* By W. H. White.

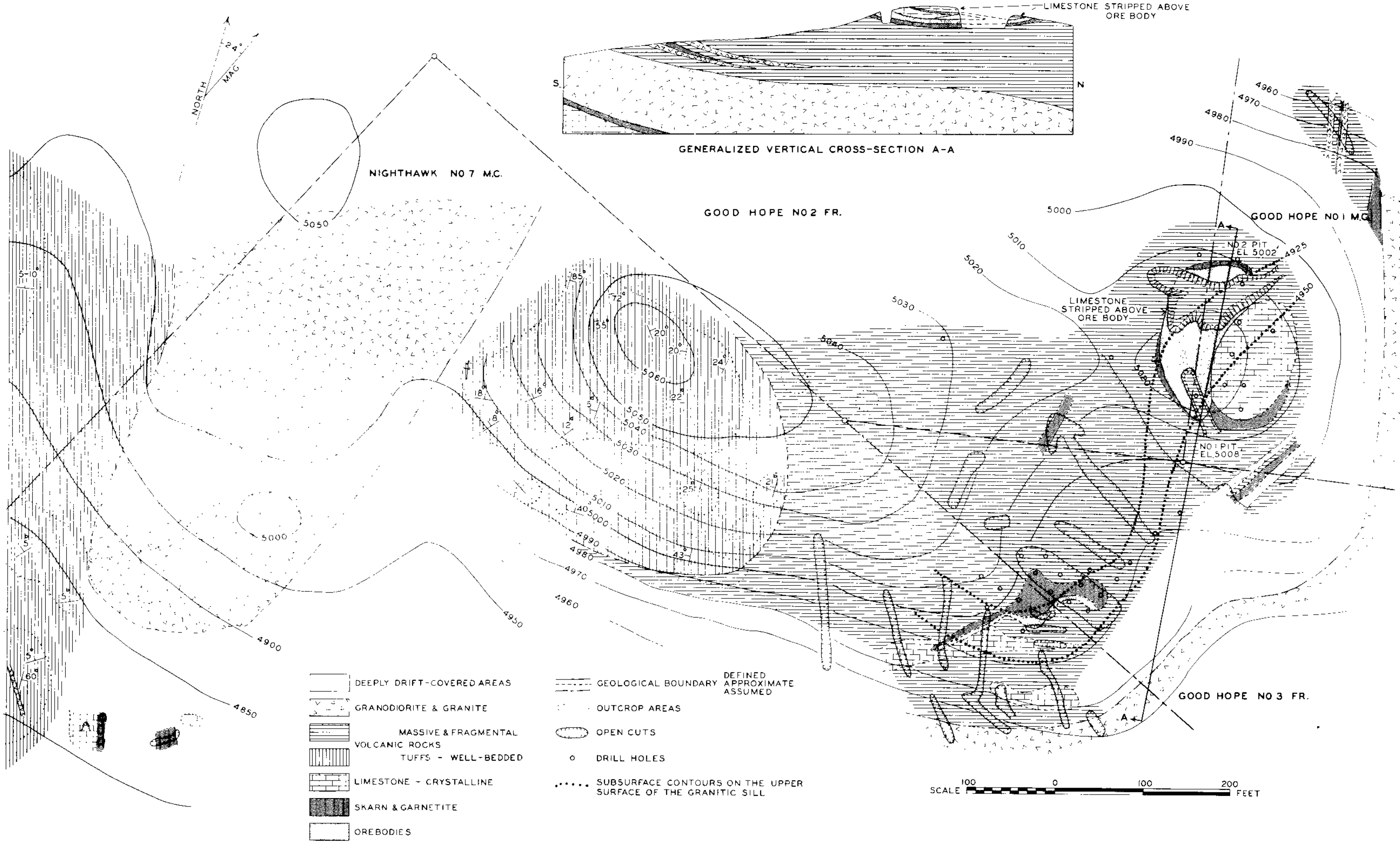


FIG 17 GEOLOGY AND WORKINGS ON PART OF THE GOOD HOPE AND NIGHTHAWK GROUPS

with depth. The upper few feet is cream-coloured rock composed essentially of microcline, and coarse plates and sheafs of sericite. This changes to coarse-grained white granite, containing abundant quartz and microcline, which in turn grades downward into normal granodiorite rich in biotite. The biotite-rich granodiorite closely resembles the granodiorite body to the west.

Because of the scarcity of outcrops at critical places and the general lack of bedding and of marker horizons in the volcanic rocks, the structure is incompletely known. Near the workings the beds dip very gently to the north-east, north, and north-west. An upper group of thin-bedded tuffs, exposed farther west on a small hill, dips at various moderate to high angles, suggesting a northerly plunging syncline crumpled against the granodiorite. Immediately west of the granodiorite body similar thin-bedded tuff lies almost horizontal, even at the abrupt granodiorite contact. The contact itself, exposed at one place for a few feet only, appears to dip gently eastward. Contours on the upper surface of the granitic body below the workings, plotted from drill logs, together with the configuration of the outcrop, imply that the upper surface of this sill-like body dips gently and variably to the north and west. It is considered likely that the two granitic bodies are connected at no great depth, and it is possible that both are sill-like.

The ore-bodies so far discovered are indicated in plan on Fig. 17, which shows also a vertical cross-section of the main ore-body being mined in No. 1 and No. 2 pits. This is a flat-lying, slightly saucer-shaped deposit, roughly oval in plan, 180 feet long in a north-south direction, 70 feet wide, and about 4 feet thick. The limits of the ore have been determined by test-pits and diamond-drill holes. Any original extension beyond the limits shown has been removed by erosion.

This peculiar gold ore consists mainly of large prismatic crystals of dark-green pyroxene with interstitial glassy quartz and coarsely crystalline calcite. Reddish-brown garnet occurs locally in the ore. Microscopic examination shows that the garnet was brecciated and partly replaced by pyroxene. The pyroxene crystals, some of which are 6 inches long, are arranged with their long axes approximately vertical; that is, normal to the general attitude of the deposit. The quartz, calcite, and metallic minerals were deposited later than the pyroxene and occur in fractures in pyroxene crystals. Metallic minerals sparingly present include arsenopyrite, pyrite, chalcopyrite, pyrrhotite, native bismuth, a lead-bismuth telluride which has been named "hedleyite,"* molybdenite, and native gold. The gold is erratically distributed and does not appear intimately associated with any particular mineral. Small grains of gold were seen in cleavage cracks in pyroxene and coarse calcite, and also in apparently casual association with quartz, arsenopyrite, and native bismuth.

The ore-horizon is in abrupt contact above with crystalline limestone. As a rule the terminal faces of the pyroxene crystals are in direct contact with the limestone, but in some places the contact is marked by a thin sheet of banded cream-coloured opal. Downward, the coarse-grained pyroxene gives place in a few inches either to massive coarse-grained garnetite or to fine-grained skarn which is an intimate intergrowth of garnet, pyroxene, quartz, calcite, and epidote. The garnetite or skarn in turn merges downward into fine-grained green tuff. The foot-wall rocks are cut by a few northerly trending vertical quartz veins from 1 inch to 4 inches wide. These do not continue upward through the ore-body, but rather seem to merge with the ore, forming irregular siliceous areas. In the green tuff below the ore-horizon the walls of these veins are altered to medium-grained skarn which in a few inches grades outwards into the normal rock. These quartz veins are thought to represent the "feeders" through which the mineralizing fluid reached the horizon of ore formation.

* Warren, H. V., and Peacock, M. A.: Hedleyite, a new bismuth telluride from British Columbia . . . Univ. Toronto Studies, Geol. Ser., No. 49, 1945, pp. 55–69.

Near the boundary of the Good Hope No. 3 Fraction and the Nighthawk No. 7 claim, open-cuts and shallow closely spaced diamond-drill holes indicate the presence of one or more gold-bearing bodies within a broad zone of garnetite and skarn. The probable maximum surface extent of this ore is shown on Fig. 17. At the surface the ore-body appears to dip variably to the north-west, but diamond-drill holes indicate only erratic values down the dip which cannot be correlated with assurance from one hole to the next.

Several old open-cuts, in an otherwise drift-covered area about 1,000 feet south-westerly from the main workings, expose coarse-grained skarn containing pyroxene, garnet, calcite, and some arsenopyrite. This mineralized skarn is similar in appearance to the ore but contains only a trace of gold. The enclosing rock is crystalline limestone and limestone breccia. The relationship of these showings to the main workings is unknown.

Horsefly Mineral Claim.—This claim lies on the south slope of Nickel Plate Mountain, about three-quarters of a mile east of the Mascot mine. The claim was staked by Peter Scott in 1898, and was Crown-granted by F. H. Wollaston and C. H. Arundel on June 5th, 1901. Since that time several open-cuts have been made and some shallow test-shafts have been sunk. Hedley Mascot Gold Mines, Limited, now controls the claim and has started a development programme. At the end of 1947, 196 feet of drifting had been done.

Hedley Yuniman Gold Fields, Ltd.*

Company office, 417 Metropolitan Building, Vancouver. J. W. Gallagher, Hedley, president. The property, consisting of eight Crown-granted claims and fractions and eight located claims, is on Bradshaw Mountain about 7 miles south-east of Hedley. The local geology and development-work up to 1938 were described by M. S. Hedley in the British Columbia Minister of Mines Annual Report, 1937, pages D 8 to D 11. At that time the workings included three short adits, named, from north-east to south-west, No. 1, No. 2, and No. 3 respectively, and some open-cuts and pits, most of which are now sloughed. Following a period of inactivity, work was resumed in 1946 with the aid of a Schramm portable air-compressor. No. 1 adit was advanced 50 feet in a northerly direction in barren ground, apparently in an attempt to intersect mineralization reported in an old surface pit above. A new adit, known as No. 4, was started at an elevation of 5,940 feet, 275 feet south-west of and 100 feet lower than the portal of No. 3 adit. During 1947 a total of 370 feet of drifting and crosscutting was done in the new adit.

No. 4 adit explores, at an average depth of 100 feet, a group of sub-parallel narrow quartz veins previously exposed by surface work. The outcrops of some of these veins were sampled by Hedley in 1937, and the results are given in the report cited above. The veins traverse hard, dense, dark-green to black rock, which under the microscope is identified as a basic volcanic flow. In the east crosscut of No. 4 adit this rock is cut by three somewhat irregular northerly trending dykes of medium- to fine-grained plagioclase porphyry. The rock near the face of this crosscut grades insensibly into chert and chert breccia of undetermined origin.

Fig. 18 is a plan of No. 4 adit, showing the principal veins and faults. Individual veins vary in width from one-half inch to 8 inches, but the average vein-width is less than 3 inches. All veins strike within a few degrees of north 25 degrees west and for the most part dip steeply north-eastward. The vein-matter is greenish-white vitreous quartz, rudely banded by chloritic partings, containing erratically distributed aggregates of coarsely crystallized arsenopyrite and pyrite, a few local masses of pyrrhotite, and occasional grains of sphalerite and galena.

The larger and more persistent veins, numbered on Fig. 18 for identification, were sampled by cutting channels a foot apart across the vein for the exposed length and

* By W. H. White.

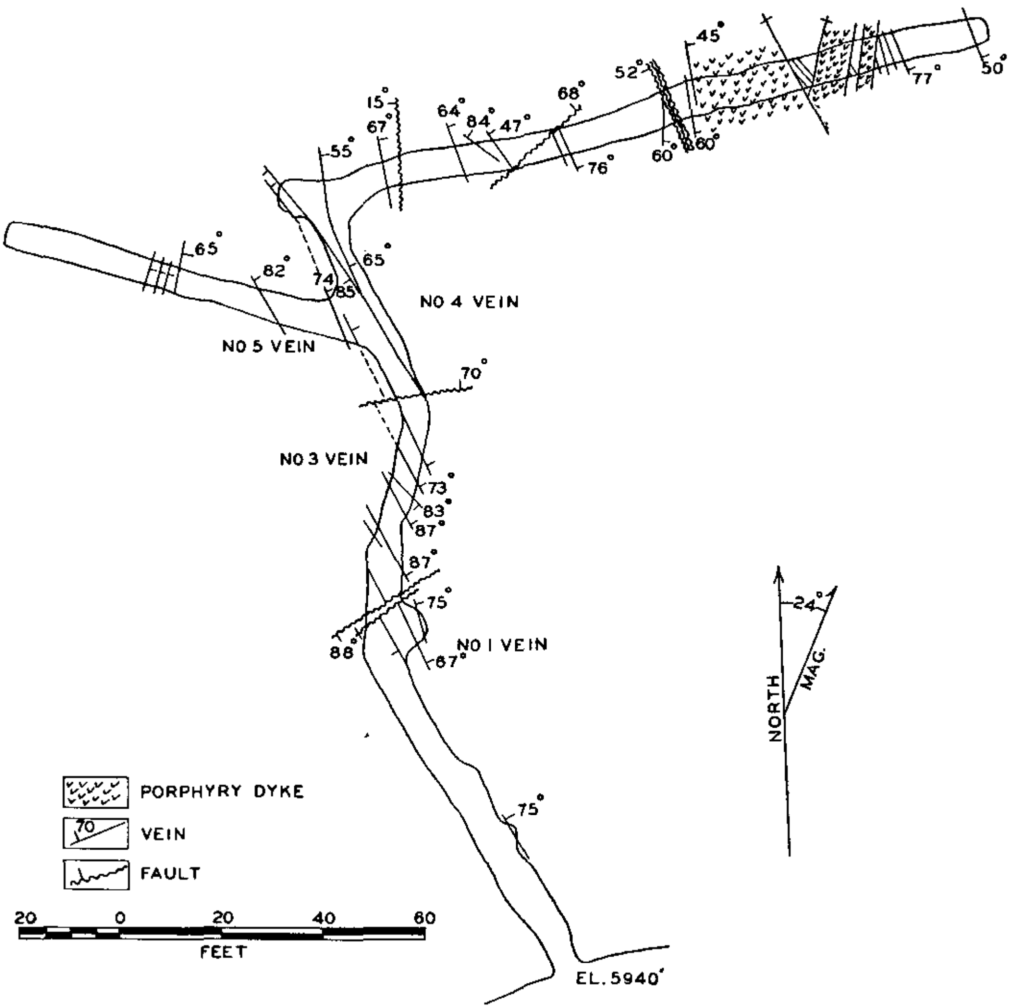


Fig. 18. Hedley Yuniman Gold Fields, Limited—plan of No. 4 adit.

combining in a single sample the cuttings from the vein for the length stated. No. 1 vein, which averages 8 inches in width, was sampled for a length of 15 feet in the back of the drift. This sample assayed: Gold, 0.06 oz. per ton; silver, 0.1 oz. per ton. No. 3 vein, sampled for a length of 15 feet across an average width of 4 inches, assayed: Gold, trace; silver, trace. No. 4 vein, the best-mineralized vein in the workings, was sampled for a length of 45 feet across an average width of 2½ inches. This sample assayed: Gold, 0.22 oz. per ton; silver, trace. No. 5 vein, 1 inch wide, characterized by abundant pyrrhotite and reported to be high grade, was sampled on both walls of the west crosscut and on the wall of a slash to the west of the face of the main drift. This sample assayed: Gold, 0.12 oz. per ton; silver, trace. Just east of the dykes in the east crosscut there is a zone of sheared rock and numerous quartz stringers. A 48-inch channel sample of this material, including twelve stringers, taken along the south wall of the crosscut, assayed: Gold, 0.05 oz. per ton; silver, trace. Comparison of these assays with those obtained by an independent engineer who examined the property recently indicates a considerable variation in the gold content of samples from the same veins.

Two sets of faults are present in No. 4 adit. The faults of one set strike north 55 to 75 degrees east and dip steeply either way, and those of the other set strike north-westerly, approximately parallel to the veins, but dip at low to moderate angles to the south-west. One of the north-easterly striking faults, crossed by the main drift at a point 80 feet from the portal, has a relationship to No. 1 vein suggesting that movement occurred both during and subsequent to the period of vein-formation. The material in the fault-zone, bounded by vertical, slickensided surfaces, is well silicified and sparsely pyritized. The vein branches a few inches before it reaches the fault. One branch ends against the fault-plane, but the other branch turns north-easterly along the fault-plane. This fault may represent the continuation of the north-easterly trending sparsely mineralized faults explored in the older workings. All the other faults in No. 4 adit are unmineralized and are younger than the veins. The amount or direction of fault displacement is unknown, but it is thought that the north-westerly striking faults are thrust faults on which considerable displacement may have occurred. These faults are characterized by thick layers of gouge and are bounded by breccia zones several feet wide. A small quartz vein which terminates against the hanging wall of one of these faults is fractured and dragged in a manner indicating reverse movement.

Silver-Lead.

Islay B.* This group consists of the claims Islay B and Islay B Nos. 2 to 6, inclusive, recorded in 1946. W. Doumont, H. Glynne, and C. Tambeau, of Hedley, are the recorded owners. The property is on Stemwinder Mountain, about 3 miles north-west of Hedley. It is reached by a truck-road 5½ miles long which branches north from the main highway at a point about 3 miles west of Hedley. The workings are on a small bench, elevation about 4,600 feet, a short distance below the broad summit of the mountain. The smooth drift-covered slopes of the mountain merge into a rolling upland surface some 500 feet below the elevation of the bench and are well timbered with pine and a little fir. Water for domestic and mining purposes is scarce.

Exploratory work done by the owners in 1946 and 1947 includes fourteen shallow open-cuts and a 13- by 4-foot shaft 8 feet deep. Kelowna Exploration Company, Limited, optioned the property early in 1947 and put down eight E.S. diamond-drill holes, totalling 624 feet. The option was later relinquished.

The rock exposed in the workings and in outcrops near by consists of alternating thin beds of buff limestone and grey limy shale. The bedding-planes strike northerly and dip steeply westward. Several large dykes and sills of dioritic rock are exposed at a few places on the south-east slope of the mountain, some 800 to 1,200 feet east of the workings.

The showing is a deeply weathered fracture-zone cutting the limy sediments. The zone undulates slightly in attitude, striking on the average north 70 degrees east and dipping 77 degrees to the north. It is exposed almost continuously by the shaft and closely spaced open-cuts for a distance of 140 feet, and is seen in more widely spaced open-cuts a further distance of 200 feet westward and 140 feet eastward along the line of strike.

The material comprising the zone is weathered and iron-stained fragments of limestone and shale cemented and probably in part replaced by dark-coloured rock, referred to as black quartz which, under the microscope, is seen to be a granular aggregate of quartz grains ranging in size from one-eighth of a millimetre to 1 millimetre. The dark colour is imparted by opaque black material, presumably graphite, which rims the quartz particles. In hand specimen the black quartz appears unmineral-

* By W. H. White.

ized, but in polished sections under the microscope tiny metallic grains, none more than one-hundredth of a millimetre in diameter, become visible. Microchemical tests suggest that these are particles of argentite. Samples taken by the writer consisting of limestone with stringers of black quartz or mainly of black quartz, assayed from 6.8 to 24.9 oz. of silver per ton. At the east end of the shaft, stringers of coarse-grained somewhat schistose galena in the limestone breccia and black quartz zone are exposed. The galena is partly altered to anglesite. No sphalerite was recognized in any of the exposures, and the maximum zinc content of samples, based on spectro-chemical determinations, is less than 1 per cent.

The locations, descriptions, widths, and assays of twelve samples taken from the shaft and surface cuts are tabulated below. With the exception of two specimen samples, all the samples are more or less oxidized. Consequently, they may not be representative of the fresh material.

Location.	Description.	Width.	Gold.	Silver.	Lead.
		Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.
Open-cut 300 feet west of the shaft	Limestone breccia slightly silicified	40	*Nil*	*Nil*	....
Open-cut 200 feet west of the shaft	Limestone breccia, slightly silicified, north side of zone	40	*Nil*	*Nil*	....
Open-cut 200 feet west of the shaft	Well-silicified breccia, south side of zone	20	0.01	*Nil*	....
Open-cut 30 feet west of the shaft	Well-silicified breccia with stringers of coarse-grained calcite	14	0.01	0.1	....
West end of shaft*	Limestone breccia with stringers of black quartz	31	Trace	6.8	3.2
East end of shaft*	Limestone breccia with stringers of black quartz, excluding the stringer of anglesite and galena noted below	27	0.03	7.8	3.7
East end of shaft	Stringer of anglesite and galena	7	0.06	114.4	55.6
East end of shaft	Unweathered black quartz specimen	....	0.11	11.8	2.8
East end of shaft	Unweathered galena specimen	....	Trace	257.7	75.5
Open-cut 16 feet east of the shaft	Mainly black quartz with some limestone breccia	31	0.02	15.8	1.2
Open-cut 33 feet east of the shaft	Mainly black quartz	36	Trace	24.9	0.6
Open-cut 200 feet east of the shaft	Limestone breccia slightly silicified	12	0.02	1.9	....

* Ends of shaft 13 feet apart.

The assays indicate that the silver-lead mineralization so far discovered is restricted to a section about 60 feet long and 30 inches wide. The eight diamond-drill holes of the Kelowna Exploration Company were put in from four set-ups spaced 50 feet apart along a line parallel to and about 45 feet south of the surface exposure in this area. The holes, drilled at right angles to the strike of the deposit and at angles of 45 and 65 degrees to the horizontal, cut the zone at vertical depths of 40 and 80 feet respectively. The core was available for examination, but little of the zone material remained. Evidently the core-loss in the zone was high, and much of the material recovered had been taken for assays. The few oxidized and clayey fragments of silicified breccia which remained apparently represented widths similar to those found on the surface.

The mineralization described is the first silver-lead-zinc mineralization discovered in the Hedley camp.

Gold.

Hedley Amalgamated Gold Mines, Ltd.*

Company office, 535 Homer Street, Vancouver. W. G. Norrie-Lowenthall, managing director. The property consists of sixteen Crown-granted claims on Stemwinder Mountain, about 1½ miles north-west of the town of Hedley. A truck-road which leaves the main highway 1 mile west of Hedley switchbacks up the steep southern slope of the mountain to the workings. Seventy feet of crosscutting was done, and two diamond-drill stations were cut in the No. 2 level. The McKinnon adit was cleaned out and partly retimbered. Exploratory diamond-drilling amounted to 4,172 feet, of which 2,693 feet was done in the upper levels and 1,479 feet in the McKinnon tunnel. Operations were suspended at the end of August, 1947.

Development-work on the property includes three main adit-levels: No. 1 level, elevation 3,755 feet, known also as the Red adit; No. 2 level, elevation 3,722 feet; and the McKinnon adit, some 500 feet lower. When the property was examined in July, 1947, five days being devoted to the work, attention was confined mainly to the two upper levels, but all drill-core available was examined. At that time a diamond-drill was working in the McKinnon adit. Fig. 19 is a plan of the upper workings, modified from company plans, on which the underground geology and mineralization have been plotted.

The rock is thin-bedded light-coloured limestone with some intercalcated strata of greyish calcareous shale, intruded by bodies of granitic rock resembling diorite. On the average the sediments strike north-easterly and dip 22 degrees north-westward, but local variations in both strike and dip indicate the presence of small gentle folds. Near the adit portals the sediments are soft and unaltered, but to the north-east they become progressively metamorphosed. The limestone becomes crystalline and finally grades into coarse-grained garnet-diopside skarn, and the calcareous shale changes to greenish siliceous fine-grained skarn. This change is attributed to the intrusion of the granitic bodies which first appear as thin wedge-shaped sheets in the bedding-planes of the skarn. On No. 2 level these sheets, some of which are too small to show on Fig. 19, coalesce to the north-east to form a larger body of diorite. It is believed that the dioritic bodies exposed in the workings and indicated in drill-cores are essentially tabular in shape and sill-like in character.

The workings shown on Fig. 19 explore a low-angle fault-zone which follows approximately the bedding-planes of the sediments and skarn and which continues without any abrupt change of attitude into the diorite. This fault-zone, consisting of crushed rock cemented and partly replaced by dark-coloured cherty quartz, and containing several gouge-filled seams, appears to be continuous between No. 2 and No. 1 levels and probably extends to the surface. No. 1 raise, now caved but presumably driven on the zone, reaches the surface 60 feet above No. 1 level. However, the fault-zone is not found below No. 2 level. No trace of it is seen in No. 2 winze, sunk at an angle of 22 degrees to the horizontal, which is the average dip of the fault-zone above No. 2 level. The rock in No. 2 winze is solid coarse-grained skarn. Furthermore, a number of holes drilled from the surface, from the long hanging-wall crosscut on No. 2 level, and from a short drift near the bottom of No. 2 winze failed to establish the downward continuity of this fault-zone.

Mineralization consists mainly of arsenopyrite, pyrite, pyrrhotite, and a little chalcopyrite. The sulphides may be seen widely disseminated in the cherty parts of the fault-zone and occur also as vein-like bodies, consisting in large part of metallic minerals. In these bodies arsenopyrite is by far the most abundant mineral. The well-mineralized, sparsely mineralized, and unmineralized parts of the fault-zone are indicated on Fig. 19.

* By W. H. White.

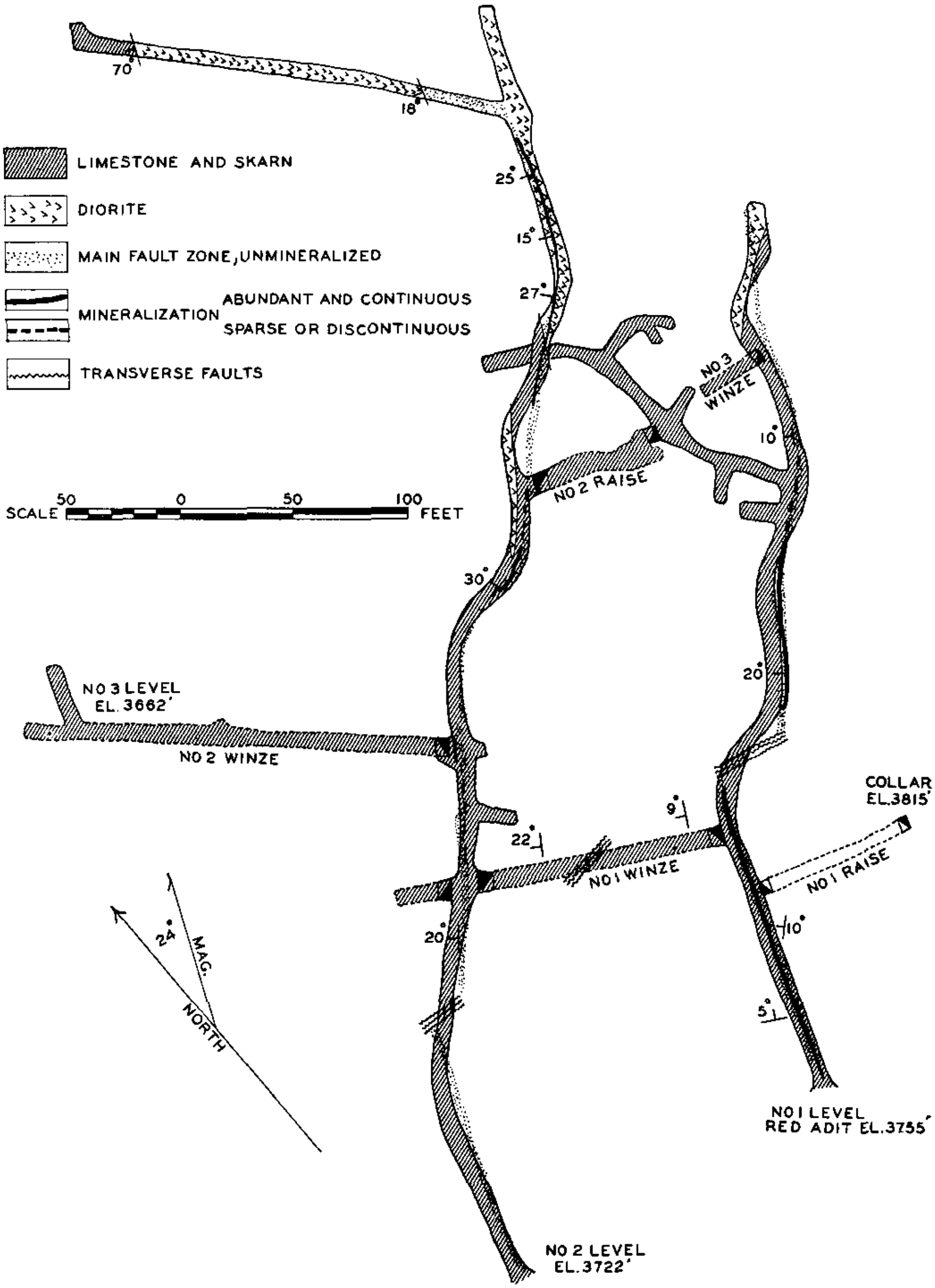


Fig. 19. Hedley Amalgamated Gold Mines, Limited—plan of No.1 and No. 2 levels.

On No. 1 level the fault-zone is well mineralized for a distance of 220 feet north-easterly from the portal across widths ranging from 40 inches to 9 inches. Beyond this point only a few sulphide stringers are seen. The mineralized material on this level is very much weathered, and exposures are coated with efflorescent iron and copper sulphates. Consequently, no samples were taken on this level. No. 1 winze is sunk at an inclination of 9 degrees for 64 feet, at which point the slope changes to 25 degrees. Stringers of massive sulphides from 3 to 6 inches in thickness extend down the winze to the point at which the slope steepens. Here they disappear in a confused fault-zone trending westerly, which may represent the transverse fault shown on both levels. Beyond this point the main fault-zone, consisting only of unmineralized gougy rock, steepens and is exposed near the roof of the winze down to No. 2 level.

On No. 2 level scattered sulphides and a few sulphide stringers are seen in silicified material near the collar of No. 2 winze, and again near the foot of No. 2 raise. This raise is driven 63 feet on a slope of 23 degrees, and from the face a vertical raise connects with No. 1 level 15 feet above. The main fault-zone, marked by much gougy rock, is seen on the walls of this raise near the floor. The fault-zone itself is unmineralized, but the fine-grained green skarn immediately above it contains small to moderate quantities of sulphides disseminated irregularly across widths of as much as 5 feet. Near the face of the raise the mineralization dies out along several unmineralized slips which dip gently to the east. From a point 40 feet beyond the foot of No. 2 raise a vein-like body consisting of abundant coarse-grained arsenopyrite, some pyrite and pyrrhotite, and a little chalcopyrite is exposed in the walls of the drift for a distance of 120 feet north-easterly. This body attains a maximum thickness of 27 inches, but to the north-east it narrows and splits into several stringers which taper out in a wide zone of fractured diorite.

Twenty-three channel samples were cut from this body where it is exposed on the north-west wall of the drift. Gold assays of the samples are given in the table below. The samples were assayed for silver as well as gold, but none contained more than 0.04 oz. of silver per ton. Samples were taken from the wall-rocks where these were silicified and mineralized. Distances shown in the table were measured along the drift north-easterly from the foot of No. 2 raise.

Location.	Description.	Width (Normal to Dip).	Gold.
Distance north easterly from foot of No. 2 raise on No. 2 level—		Inches.	Oz. per Ton.
45 feet	Hanging-wall rock	42	0.03
	Abundant sulphides	9	0.26
53 „	Abundant sulphides	22	0.86
58 „	Abundant sulphides	27	0.64
65 „	Hanging-wall rock	24	0.09
	Well-silicified zone	17	0.04
	Abundant sulphides	22	0.26
73 „	Hanging-wall rock	31	0.02
	Abundant sulphides	26	0.24
83 „	Hanging-wall rock	34	Trace
	Abundant sulphides	18	0.56
	Foot-wall rock	13	0.08
88 „	Abundant sulphides	17	0.13
95 „	Abundant sulphides	15	0.62
105 „	Abundant sulphides	14	0.38
115 „	Abundant sulphides	17	0.34
125 „	Disseminated sulphides	13	0.08
130 „	Disseminated sulphides	9	0.08
135 „	Abundant sulphides	9	0.25
145 „	Hanging-wall rock	30	0.02
	Abundant sulphides	16	0.56
155 „	Disseminated sulphides	36	0.08
165 „	Disseminated sulphides	26	0.03

The portal of the McKinnon adit is about 500 feet lower than and 1,800 feet south of the portal of No. 2 level. From its portal the McKinnon adit extends 1,230 feet north-easterly, then turns slightly to the left, and continues 960 feet in a direction north 15 degrees east. Thus the total length of the main drift is 2,190 feet, and its face is vertically beneath the mineralized zone which was sampled on No. 2 level. At 1,565 feet from the portal a crosscut 140 feet long is turned off to the left; at 1,635 feet another crosscut 75 feet long is turned off to the right; and at 2,060 feet a third crosscut extends 450 feet in a direction north 75 degrees west. Near the junction of this crosscut and the main drift a raise extends 50 feet above the level, and at the top of the raise there is a short drift.

The geology of the McKinnon adit is similar to that of the upper workings, except that no continuous fault-zone is present and practically no mineralization is seen. The adit follows the approximate strike of a succession of folded limestone and calcareous shale strata to a point 1,160 feet from the portal. At this point thin sheets and fingers of dioritic rock appear along bedding-planes, and the sediments change to coarse- and fine-grained skarn. Northerly, the intrusive bodies thicken and near the first crosscut coalesce to form a large intrusive body composed of diorite and gabbro, and the remainder of the level workings are in such rocks. However, skarn is encountered again in the raise a few feet above the main drift, and small drift at the top of the raise is in skarn which contains occasional small clusters of arsenopyrite crystals. The cores from seventeen short holes, totalling 994 feet, drilled in this area to test the contact-zone, were examined, but no mineralization of economic significance was observed.

OLALLA (49° 119° S.W.).

Gold.

Hedley Monarch Gold Mines, Ltd.* Company office, 470 Granville Street, Vancouver. T. C. Botterill, managing director: Evan G. Cameron, mine superintendent. This company continued development during 1947 of its holdings of seventy-two claims and fractions near Olalla. Underground development during the year included 250 feet of drifting and crosscutting in the Shepherd adit, 220 feet of drifting and crosscutting in the Powder adit, and 50 feet of drifting in a new working known as the Haulage adit. On the surface several large and small open-cuts were made on a shear-zone above the Powder adit. Active work was suspended at the end of June, but some bulk sampling was done in the Shepherd adit in December.

A compressor-house, blacksmith-shop, and explosives magazine were built during the year. Additions to equipment included a new 650-cubic-foot diesel-driven Sullivan compressor, a steel-sharpener, and a complete blacksmithing plant. A crew averaging nine men was employed during the first six months of the year.

The geology, mineralization, and development of this property were described in the Annual Report for 1946. The property was re-examined briefly in June, 1947. At that time work was confined to the Sunrise section.

The Shepherd adit had been extended 83 feet in a direction south 73 degrees west along the contact of syenite and a 4-foot basic dyke which dips 80 degrees northward. At 60 feet from the portal, quartz stringers in a sheeted zone in syenite gradually coalesce to form a lode of lenticular quartz veins arranged *en echelon* in sub-parallel faults along the foot-wall side of the basic dyke. The lode, including intercalated bands of silicified syenite, averages about 24 inches in width, and attains at one place a width of 40 inches. Excepting the rare occurrence of minute crystals of pyrite and galena in drusy cavities, the quartz is unmineralized and on the south side is solidly " frozen " to silicified syenite.

* By W. H. White.

The crosscut 60 feet from the portal, mentioned in the Annual Report for 1946, was extended one round farther northerly and cut a quartz stringer half an inch wide sparsely mineralized with pyrite and tetrahedrite. This stringer, known as the Sweetener vein, exposed in the portal and in an open-cut above the portal, strikes west, diverging gradually from the Shepherd vein.

At a distance of 100 feet from the portal a crosscut was driven southerly for 50 feet in unmineralized syenite, apparently with the object of intersecting the Sunrise vein, which is approximately parallel to and 115 feet south of the Shepherd vein.

An 18-foot crosscut driven northerly toward the Sweetener vein at a point 115 feet from the portal intersected a quartz vein 18 inches wide on the north contact of the basic dyke. This vein lies parallel to the Shepherd vein and is unmineralized.

An old open-cut, cleaned out in 1947, 80 feet farther west than the face of the Shepherd adit and 50 feet higher, shows the south-westerly striking contact of the syenite body with pyroxenite. It also exposes a basic dyke which agrees closely in attitude and projected position with the dyke associated with the vein in the Shepherd adit. However, no veins are associated with the dyke in the open-cut.

Ten channel samples were taken in the Shepherd adit, the locations, descriptions, and assay results of which are given in the following table:—

Location.	Description.	Width.	Gold.	Silver.
Portal plus 60 feet west—		Inches.	Oz. per Ton.	Oz. per Ton.
West side of crosscut at face	Fractured syenite on north side of Sweetener vein	13	0.12	Trace
West side of crosscut at face	Sweetener vein plus 2½ inches of crushed syenite	3	0.10	Trace
Portal plus 105 feet west	Shepherd vein	16	Trace	0.4
Portal plus 110 feet west	Shepherd vein	26	Trace	Trace
Portal plus 115 feet west	Shepherd vein	27	Trace	0.2
Portal plus 120 feet west	Shepherd vein	40	0.01	Trace
Portal plus 125 feet west	Shepherd vein	27	Trace	Trace
Portal plus 130 feet west	Shepherd vein	22	Trace	Trace
Portal plus 115 feet west—				
Crosscut, north-west wall	Vein on north side of 4-foot dyke	16	0.03	Trace
Crosscut, north-east wall	Vein on north side of 4-foot dyke	18	0.04	0.4

Late in 1946, mineralization was discovered in a shear-zone in pyroxenite outcropping on the side of a gully 700 feet west of the Shepherd adit. One large open-cut, several smaller pits, and two short adits explore this showing at intervals for a distance of 450 feet. This zone of sheared and serpentinized pyroxenite strikes south-westerly and dips steeply north-westward. Numerous gougy and slickensided fault-planes within the shear-zone have diverse attitudes. In a few places, particularly in the large open-cut, lenses of pegmatitic quartz up to 3 inches wide and 6 feet long occur in some of the fault-planes. However, no metallic minerals were observed.

An old working known as the Powder adit was extended 50 feet westerly to intersect the shear-zone, which was explored further by following it in for a distance of 100 feet south-westerly. The zone underground is sheared and faulted pyroxenite barren of veins or other mineralization. Altogether, the examinations of the Sunrise claim in 1946 and 1947 have indicated no mineralized bodies of commercial size and grade.

FAIRVIEW CAMP (49° 119° S.W.).*

Silica-Gold.

Fairview. Consolidated Mining and Smelting Company of Canada, Limited. G. E. Clayton, mine superintendent. This mine is about 5 miles west of Oliver. At the end of the year a new change-house was being built and

* By E. R. Hughes.

arrangements were being made for the introduction of aluminium-dust therapy for the workmen. An average of about 80 tons of quartz is mined each working-day and is shipped to Trail for use as flux in the smelter. The quartz contains a small amount of gold. Production for the year amounted to 24,710 tons. The number employed averaged fifteen.

BEAVERDELL (49° 119° S.E.).*

Silver-Lead-Zinc.

Highland Bell, Ltd. Company office, 844 Hastings Street West, Vancouver; mine office, Beaverdell. K. J. Springer, president; P. L. Clark, mine manager. Capital: 2,000,000 shares, $1 par value. The company owns and operates the Highland Bell mine on Wallace Mountain. During 1947 development-work on the Highland Bell property and the adjoining Idaho claim totalled 1,358 feet of drifting and crosscutting, 254 feet of raising, 203 feet of winzing, and 11,050 feet of diamond-drilling. The drifting, crosscutting, and raising was confined to No. 7, No. 8, and No. 9 levels. Two winzes were sunk on the Highland Lass claim from the No. 8 to the No. 9 levels, one on the western end of No. 8 level, and the other about 100 feet west of the Idaho claim boundary. Several thousand feet of diamond-drilling was done in the old Bell mine from the No. 5 level, and some ore intersections encountered warrant more work. The remainder of the diamond-drilling was done on No. 7, No. 8, and No. 9 levels, most of it to extend known sections of ore, but several exploratory holes were drilled into the Wallace formation on the east side of the mine from No. 8 level.

The block of ore outlined by diamond-drilling in 1946 between the No. 8 and No. 5 level horizons south-east of the main workings was opened up. A large part of the 1947 production was from this area. The extensions of this ore-body are being sought by an intensive drilling programme.

Man-shifts worked averaged approximately 865 per month. Production: Ore shipped, 5,038 dry tons. Net contents: Gold, 190 oz.; silver, 593,591 oz.; lead, 281,974 lb.; and zinc, 320,429 lb.

New equipment purchased and installed during 1947 includes one 6 by 8 Canadian Ingersoll-Rand hoist for operation on the main winze. Stoping costs were materially reduced by further mechanization in the mine.

Three fully modern residences were constructed in the main camp, and additions were made to the light plant in the village.

The ore-sorting shed was also renovated, and a sorting-belt with auxiliary washing equipment was installed therein.

Mapping of all levels has fairly well determined the complex fault pattern and has been of considerable value in planning underground development.

A geological survey was made on the Henderson group of claims on Wallace Mountain and on the Idaho and several other claims optioned from R. Forshaw. As a result of this work, the option on the Henderson group was dropped.

Silver Bounty Mines, Ltd. (Wellington, etc.). Company office, 208 Pacific Building, 744 Hastings Street West, Vancouver; mine office, Beaverdell. G. S. Eldridge, president; B. I. Nesbitt, consulting engineer; John Broatch, mine manager. This company owns the Wellington, Tiger, Bounty, Bounty Fraction, Highway, Byway, and Advance Mineral Claims on Wallace Mountain. Work done in 1947 was confined chiefly to the Wellington, although geological mapping was done on all the claims.

On the Wellington efforts were directed to exploring for the continuation of the Wellington vein west of the West fault. On No. 5 level the vein was followed for 20 feet westward in a drift toward the West fault in order to study the effects of the fault

* By J. A. Mitchell.

on the vein. High-grade silver ore was encountered in this drive. The vein was found to be 2 feet wide and dragged to the south, where it is cut off by the fault. The direction of displacement having been determined, 100 feet of crosscut was driven south on the west side of the fault, but as no vein was encountered in this distance, a crosscut was driven 25 feet out from the fault for a diamond-drill station. Another drill station was cut 50 feet above the level, and blocks of drag ore were followed 20 feet above the level in a raise.

All this development-work was done by hand-steel, but a portable compressor has been purchased for diamond-drilling in 1948.

Thirteen tons of development ore was shipped to Trail and yielded 1,540 oz. of silver, 754 lb. of lead, and 2,243 lb. of zinc, net.

Three men were employed.

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

Company office, Room 404, 470 Granville Street, Vancouver. A. Basham, president; B. I. Nesbitt, consulting engineer; D. F. Fairbairn, resident engineer. The company was formed in 1946. The property is served by a good road from Beaverdell. The claims held are Rambler Fraction, Standard Fraction, Relief Fraction, Buster, Gold Drop, Gold Drop Fraction, Gold Drop No. 2 Fraction, Homestake, and Alaska, on Wallace Mountain.

A crew averaging six men worked throughout 1947. Camp was established in rehabilitated buildings, and a portable compressor was installed on the property. Workings on all the claims were reconditioned, surveyed, and mapped geologically. Exploration-work was confined to the Rambler, Standard Fraction, and Buster claims. On the Rambler 1,420 feet of diamond-drilling, 99 feet of crosscutting, and 26 feet of drifting were done. Mineralization typical of the silver-bearing ores of the area was found in several short sections of the drill-cores, but subsequent crosscutting and drifting showed that the intersections were in short segments of a vein, repeated by faulting.

Work was then concentrated on the Standard Fraction and Buster claims. The old drift, now known as 46-77, on the Standard claim was extended from footage 70.5. It reached the boundary at footage 320 and was continued on the Buster claim to footage 596.4. This drift is being driven eastward to explore the Buster vein within the quartz diorite near its contact with the Wallace group.

CRYSTAL BUTTE.*

Little Joe and Little Billy.

These claims, near the top of Crystal Butte, about 11 miles from Beaverdell, are owned by W. R. Lawrence, of Penticton, who has held them for many years. During 1947 he connected the claims by road with the Beaver Creek road and proposed to ship material from a dump and possibly do other work on the ground. A sample of the dump material assayed: Gold, trace; silver, 2.9 oz. per ton. No mineralization of economic value was seen in the average material of the dump. Apparently little work has been done on this property since 1928.

WESTBRIDGE (49° 118° S.W.).

Silver-Lead-Zinc.

Zamora.

W. E. White, of Oliver, made a trial shipment to the Trail smelter from this group of eight claims situated 2 miles south-west of Westbridge. Production: Ore shipped, 38 tons. Net contents: Silver, 147 oz.; lead, 3,496 lb.; zinc, 3,894 lb.

* By J. A. Mitchell.

ROCK CREEK (49° 118° S.W.).*

Gold-Silver-Lead-Zinc.

Imperial. W. E. McArthur, of Greenwood, has taken an option on this group, from which ore has been shipped in the past. It is located alongside the Kettle River, 3½ miles north of Rock Creek Station. Replacement mineralization in limestone carries values in gold, silver, lead, and zinc. A few men were employed trenching and stripping on the surface. This work may be followed by diamond-drilling.

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

JEWEL LAKE.

Gold-Silver.

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. Development-work accomplished during 1947 amounted to 1,166 feet, made up of 804 feet of drifting, 10 feet of crosscutting, and 352 feet of raising. The Anchor workings were extended southward on the 300 and 400 levels. In the Enterprise section the 500 level was extended southward toward the foot-wall area of the old Jewel workings. This drift was then connected to the 400 level by a raise for ventilation and stope development. The Jewel workings were also connected to the 500 level of the Enterprise workings by a 47-foot raise. The remainder of the raising was done in the upper Anchor workings for stope development. Work done in 1947 included unwatering No. 7 level.

Diamond-drilling totalled 4,101 feet, including 3,545 feet of lateral drilling from the 300, 400, and 500 levels in the Anchor, Enterprise, and Jewel sections of the mine. The remainder was surface drilling on the Arland claim west of the mine and on the Major and May claims south of the mine.

The old mill building, from which the machinery had been removed some years ago, was altered, and after mid-year work was concentrated on the installation of mill equipment. This includes a Denver jaw-crusher, a 5- by 5-foot Denver ball-mill, an Akins classifier, a six-cell Denver Sub-A flotation unit, a 10- by 8-foot Denver thickener, and a Denver single-unit disk filter. The mill was put into operation on October 19th and started production November 1st. The first car-load of concentrates was shipped to the Trail smelter during the second week of December.

The mill-feed was obtained from above the 400 and 300 levels south in the Anchor section of the mine, where mine sampling showed erratic values. The mill-heads were low.

A well-equipped assay office was completed, and a second building intended for a cook-house has been converted into a temporary bunk-house.

Production: Ore mined, 1,678 tons. Net contents of concentrates shipped: Gold, 103 oz.; silver, 660 oz.; lead, 611 lb.; zinc, 64 lb.

Amandy (Quatsino Copper-Gold Mines, Ltd.). A programme of surface diamond-drilling was done on this property during 1947 under the direction of G. T. Johnson, manager of the adjoining Dentonia mine. D. N. Edwards, engineer at the Dentonia mine, supervised the work. The property is on Rhoderick Dhu Mountain, at an elevation of 5,000 feet. The vein strikes roughly north-south and dips about 50 degrees eastward, has been explored by a shaft 50 feet deep and by 230 feet of drifting northward from the bottom of the shaft, and by several pits and a few open-cuts.

* By J. A. Mitchell.

During 1947, 2,257 feet of diamond-drilling was done on the Amandy, Amandy Fraction, and Alice Mineral Claims. This comprised nineteen holes drilled to a maximum depth of 280 feet below the shaft-collar in the vicinity of the old workings. Most of the holes were drilled to intersect the vein from the hanging-wall side.

The only good intersection obtained was 150 feet south of and about 20 feet lower than the shaft-collar. This could be attributed to a cross-vein which may intersect the main vein near this point. Much of the drill-core was dyke material which, being post-mineral, may have obliterated considerable sections of the vein.

The Annual Reports of the Minister of Mines, 1935, page D 2, and 1941, page 61, refer to work done and to production of 290 tons of ore yielding 84 oz. of gold and 1,478 oz. of silver.

Silver-Lead-Zinc.

Dynamo Syndicate. The holdings of this syndicate comprise five claims—Dynamo, Little Home, Starve Out, Town Fraction, and Marmot—on the south edge of the town of Greenwood. The property was bought from Jerome McDonell, who retained a small interest and is doing development for the syndicate. A drift was started in May on a small quartz vein in granodiorite on the Marmot claim. From the first few feet of this drift, and from a surface cut about 50 feet higher, 50 tons of somewhat oxidized lead ore was shipped. By December the drift had followed the vein 80 feet in a south-easterly direction. About 60 feet from the portal the vein is cut by a fault striking north-eastward and dipping north-westward but without much displacement. Below and beyond the fault the vein splits into two veins which were about 6 feet apart at the face. The ground between these two veins is cut by small faults of irregular strike and dip.

Above the main fault the vein is about 3 feet wide but is somewhat narrower toward the portal and probably averages 2 feet in width. It is very sparsely mineralized with galena. A second shipment was made from this part of the vein. The drift was not far enough advanced to be under the open-cut, from which most of the first shipment was mined. Greenstone lies a short distance south of this cut, but the dip of the contact with granodiorite is unknown. Mr. McDonell worked alone until October, when he hired two men. The work was all done by hand.

Production: Ore shipped, 58 tons. Net contents: Silver, 160 oz.; lead, 7,441 lb.; zinc, 522 lb.

Gold-Silver.

E.P.U. Fraction. This old property, just south of Greenwood, was reopened by W. E. McArthur in 1946. Work was stopped in August, 1947, after a foot-wide remnant of a faulted section of the vein, below the bottom level, had been mined out. Production: The ore mined, 94 tons, was shipped to the Trail smelter. Net contents: Gold, 110 oz.; silver, 403 oz.; lead, 4,455 lb.; zinc, 2,139 lb.

Drilling was done from both surface and underground in an attempt to locate the vein on both ends of the mined-out portion. Some of the holes cut the vein but did not cut commercial ore.

Elkhorn.—W. E. McArthur employed one man and shipped ore from the dump on this property at Greenwood. Production: Ore shipped, 11 tons. Net contents: Gold, 2 oz.; silver, 411 oz.; lead, 168 lb.; zinc, 132 lb.

PHOENIX CAMP.

Copper-Gold.

Brooklyn-Stemwinder Gold Mines, Ltd. Company office, 518 Rogers Building, Vancouver. A. E. Sjoquist, president; E. H. Kellner, managing director. This company owns the Brooklyn-Stemwinder property in the Phoenix Camp. The diamond-drilling programme commenced in 1946 was completed about the end of June, 1947. The majority of the holes intersected commercial or near-commercial values, and one or more zones of interest were located. Near the end of the year an adit-site was cleared off by bulldozer, and the adit was collared in rock. Indications of mineral were found in the hard-pan.

FRANKLIN CAMP (49° 118° N.E.).*

Gold-Silver.

Union.—C. E. and J. E. Small, of Grand Forks, shipped 6 tons of dry ore from the Union mine to the Trail smelter. This yielded 1 oz. of gold and 42 oz. of silver.

ROSSLAND (49° 117° S.W.).*

SOUTH BELT.

Gold-Silver-Lead-Zinc.

Rossland Mines, Ltd. Head office, 675 Hastings Street West, Vancouver; mine office, Box 360, Rossland. W. B. Burnett, president; A. W. Fisher, secretary-treasurer; O. H. Solibakke, B. O. Brynelson, L. Telfer, W. F. Laidman, and Lloyd N. Smith, directors; E. H. Lovitt, consulting engineer; S. G. Bruce, resident engineer; Wallace Baker, geologist. The company controls about 10 square miles of ground, extending 2 miles south of Rossland and from Tiger Creek on the east nearly to Little Sheep Creek on the west. The property consists of seventy-five recorded claims and twenty-seven Crown-granted claims, including the Mayflower group.

This area is in the South Belt, south of the famous gold-copper producing belt containing the Le Roi, Josie, Centre Star, War Eagle, and others. Many veins have been known in the South Belt for years, but there has been little production. Several of the veins in the South Belt contain galena and sphalerite. Their economic value depends on gold, silver, lead, and zinc. They are lower in gold and contain less copper than the gold-copper ores which accounted for most of the production of the Rossland camp. The geology of the camp is fully described in Memoir 77 of the Geological Survey. Elevations and relief in the South Belt are less than in the North Belt and outcrops are fewer, which may have retarded development in the South Belt.

The programme of examination, mapping, and sampling of old showings, begun in 1946, was continued through 1947. A geophysical survey was made of almost the entire holdings, under the active direction of A. R. Clark. Results with the magnetometer were found to be unsatisfactory owing to the widely scattered occurrence of magnetite, and the potentiometer was thereafter used exclusively. Readings with the potentiometer were taken at 50-foot intervals along lines 400 feet apart, and some anomalies were investigated in greater detail, readings being taken at 25-foot intervals along lines 50 feet apart. The routine investigation was almost completed, but additional detailed work remained to be done on some anomalies. At the same time the area was mapped geologically on a scale of 100 feet to the inch, and a composite geological map on a scale of 300 feet to the inch was made.

Several zones of high anomaly were found, not all of which are yet fully understood. The anomalies for the most part have an easterly trend and conform with what appear to be extensions of known vein-zones; checking with test-pits in some

* By J. A. Mitchell.

instances proved a remarkably close conformity between an anomaly and a mineralized zone. One anomaly, on the southern outskirts of Rossland, on the Nest Egg claim, was at first thought to be important but was found on further investigation to be caused by disseminated pyrite in monzonite. Anomalies in the Mount Roberts formation are unreliable because concentrations of graphite which occur locally in that formation give high potentiometer readings.

The most interesting anomaly follows the Mayflower zone and appears to indicate a vein-length of more than 3,000 feet. Because the Mayflower adit contains partly developed ore and the vein appears to be one of the most promising to date, work has been concentrated on investigating this anomaly. Diamond-drilling, begun at the most likely points, was continued on a systematic basis. Somewhat higher assays are reported from the drill-holes than from the Mayflower adit.

At least four other anomalies, which may indicate extensions of known veins, have been found, but no exploratory work has been done on them other than to sink a few test-pits. Two of the anomalies are reported to have lengths of 4,000 feet. The work to date indicates that several pyritic zones are more continuous than was previously known.

Valley Mining Co. This company, a subsidiary of New Jersey Zinc Company, has acquired a block of ground on the east end of the Rossland Mines holdings. H. C. Gunning and E. P. Kaiser made a preliminary geological and geophysical survey of the ground during the 1947 field season. The name was changed from Valley Mining Company to New Jersey Zinc Exploration Company, Limited, early in 1948.

Gold.

Midnight.—B. A. Lins and associates, of Rossland, worked this property intermittently on a small scale during 1947. Production, including 53 lb. of high-grade ore: Ore mined, 218 tons. Net contents: Gold, 80 oz.; silver, 188 oz.

I.X.L. Gunnar Nordholm and Emile Lalonde continued to work on a much-faulted quartz vein in the foot-wall of the old Baker workings, some 300 feet in from the portal of No. 3 level. Production, including 285 lb. of high-grade ore, amounted to 56 tons of shipping ore. Net contents: Gold, 168 oz.; silver, 59 oz.

NELSON.*

Sitkum Creek (49° 117° N.E.).

Gold.

Alpine Gold, Ltd. Company office, 415 Baker Street, Nelson. J. B. White, president and treasurer; Ivan Eckdahl, mine foreman; C. McLanders, mill superintendent. Capital: 700,000 shares, 50 cents par value; issued, 425,000 shares. This company owns and operates the Alpine mine at the head of Sitkum Creek, which enters the West Arm of Kootenay Lake from the north-west about 10 miles north-east of Nelson.

With the exception of a few months in the summer and autumn of 1946, the property had been shut down for five years. It was reopened in July, 1947, and was worked continuously for the rest of the year.

The entire camp was reconditioned during 1946 and 1947 and snow-sheds were built, connecting buildings, shops, and mine-workings. An electric-light plant was installed to supply light to all buildings and snow-sheds. The interiors of the bunk-houses have been lined with a plastic lining known as "stoneboard," and oil-burning heaters have been placed in each bunk-house and in the recreation-room. A powder magazine and a warehouse were built.

* By J. A. Mitchell.

Underground development and exploratory work done during 1947 totalled 1,000 feet of drifting, crosscutting, and raising, and 1,200 feet of diamond-drilling. No. 7 level was advanced 200 feet to the west and 100 feet to the east, while 550 feet of drifting and 70 feet of crosscutting on No. 10 level and 80 feet of raising from that level opened up a body of ore below 716 and 718 stopes. By the end of 1947 quartz up to 6 feet wide, well mineralized in places, had been followed 150 feet in a drift on No. 10 level. This vein may be in the hanging wall of the vein mined in No. 7 level, which, in turn, is definitely in the hanging wall of the vein being mined in the west end of No. 6 level. From No. 7 and No. 10 levels a few short holes drilled into both walls failed to find new ore, but further and deeper drilling should add information regarding the vein system. One hole drilled northerly from the east end of No. 7 level cut a vein at 45 feet. This vein was exposed farther west in the drift, and while there may be slight faulting, as suggested by a gouge-filled fracture crossing the drift east of where the vein is exposed, the 45-foot deflection is largely accounted for by the fact that the drift veers off to the right below the vein.

Ore was broken in 618 and 718 stopes and stored in the stopes until required for the mill. Both stopes showed a width of between 5 and 6 feet of milling-grade ore.

Additions to the plant consist of new ore-cars, six new drifters, a Gardner Denver loader, a Sheppard diesel 5-kw. lighting plant, and a Boyles Brothers diamond-drill.

An average of twenty men was employed, but the crew numbered forty at the end of the year. The mill was operated for twenty-four days.

Production: Ore milled, 200 tons. Net contents: Gold, 89 oz.; silver, 60 oz.; lead, 1,051 lb.; zinc, 297 lb.

EAGLE CREEK (49° 117° S.E.).

Gold.

Granite-Poorman (Kenville Gold Mines, Ltd.). Mine office, Box 390, Nelson. G. H. Rainville, president; W. B. Montgomery, manager. Capital: 3,500,000 shares, $1 par value. This company is controlled by Quebec Gold Mining Corporation and Noranda Mines, Limited. The holdings, history, and general geology are described in the Annual Report of the Minister of Mines, British Columbia, 1945, pages 96 to 99. Work during the early part of 1947 consisted chiefly of slashing and retimbering to improve the main haulage-way on the 2570 level. Three of four men were employed at this work.

A surface crew was recruited in May and the construction of a 125-ton cyanide mill begun in June. Hiring of men for underground work was started in September, and by October stope preparation, including the finishing of development raises and ventilation raises in connection therewith, was well under way. The mill was completed early in November, and a start was made on the treatment of run-of-mine ore on November 10th. The mill was " run in " with this material until ore-sorting was started on December 1st. The first gold brick was poured on December 17th. About 100 tons per day was being treated by the end of the year.

The mill crew consists of six operators (two on each shift), two " swing-shift " men, one crusher-man, one solution-man, and four sorters on day shift. It is anticipated that the total number employed, including those underground and on the surface, will be slightly more than 100.

Production: Ore milled, 2,886 tons. Net contents: Gold, 245 oz.; silver, 89 oz.

TOAD MOUNTAIN (49° 117° S.E.).

Gold.

California. This property, situated on the Nelson slope of Toad Mountain and owned by Sheep Creek Gold Mines, Limited, was leased during 1947 to L. Bobier, of Nelson. It is reported that Mr. Bobier collared a new adit on the vein, west of the previous adit, and drifted 40 feet on the vein. Ore shipped to the Trail smelter amounted to 11 tons. Net contents: Gold, 17 oz.; silver, 25 oz.; lead, 243 lb.; and zinc, 369 lb.

Silver King.—P. Rolick shipped 4 tons of ore to the Trail smelter. Net contents: Silver, 48 oz.; lead, 1,446 lb.; zinc, 277 lb.

HALL CREEK (49° 117° S.E.).

Gold.

Canadian Belle Mining Co., Ltd. Company office, 510 Columbia Building, Spokane, Wash.; mine office, Box 334, Nelson. R. E. Linquist, president and general manager; Wayne Clukey was in charge of operations. This is a Washington company formed to develop the Canadian Belle, 3 miles from Hall Creek Siding, south of Nelson. Commencing in June, 1947, a road was built about a mile up Hall Creek, thence about a mile up Keno Creek to the property. A camp consisting of two bunk-houses 16 by 30 feet and 16 by 22 feet and a 12- by 22-foot mess-house was built. A diamond-drill crew of six men was then engaged. Five holes, totalling 1,500 feet, have been drilled seeking information on an east-west mineralized zone in greenstone on either side of a north-south fault 22 feet wide, on which a displacement of 450 feet has been determined.

The first four holes were fanned out from the face of the most northerly adit on the showing and investigated the fault area from the west. The fifth hole was drilled from the surface near Keno Creek. Some encouraging results have been reported, but the ground is much broken up and considerable drilling is required to prove the area. Some underground work is required to obtain suitable diamond-drill stations.

Golden Eagle and T.S. These groups, located on the ridge between Hall Creek and Fortynine Creek, are owned by William Rozan and associates, of Nelson. In the early summer of 1947 Mr. Rozan sank a shallow test-pit on the north end of the westerly of two vein-outcrops described in the 1946 Annual Report of the Minister of Mines. Gold values were found associated with rusty quartz and decomposed porphyritic material in the vein-shear near the same point where high assays were previously obtained from selected material.

Later an adit-crosscut was started 108 feet south of the open-cut on the easterly flat-lying vein. After driving for 25 feet a little west of north a vein-filled fracture striking northward and dipping about 60 degrees eastward was exposed. The vein was followed for about 5 feet. It is proposed to follow the vein toward the open-cut and rusty outcrops beyond.

YMIR (49° 117° S.E.).*

Lead-Zinc.

Oxide. This property, owned by E. P. Haukedahl, A. Bremner, and A. Phare, of Ymir, is about 4 miles east of Ymir, on the ridge between Bear and Porcupine Creeks (elevation, 5,200 feet). Exploratory work, commenced in 1946 by International Mining Corporation (Canada), Limited, was continued until September, 1947, when the option was relinquished. James M. Baker was in charge of the work.

A steeply dipping north-south oxidized zone occupying a strike-fault crosses the ridge and had been traced a few hundred feet down the south slope toward Porcupine Creek. An old adit 60 feet long, a little more than 600 feet lower than the summit, was extended northward late in 1946, and the zone was intersected early in 1947 about 120 feet from the portal. Drifting extended to a distance of 643 feet from the portal in an average direction of north 10 degrees east.

* By J. A. Mitchell.

From the point where first encountered, the oxidized zone was followed for 105 feet but, because of swelling ground, the end of the drift was abandoned and, from a point 155 feet from the portal, drifting was continued about 30 feet in the foot-wall (west). Three crosscuts were driven to investigate the zone—one at 135 feet from the portal, one at 400 feet from the portal, and one at the face, 643 feet from the portal.

The zone is heavily oxidized and contains much mud. Before the end of the year, running of soft, wet ground had filled most of the openings in the zone. The zone is reported to be as much as 24 feet wide and to contain some lead and zinc (more zinc than lead) in the oxidized material.

The crosscut at the face was extended west for 75 feet and a hole was drilled down at minus 54 degrees, a distance of 378 feet, to pass through the zone which appeared to be about 15 feet wide. Five feet of core consisted of pyritic quartz and is reported to have yielded a low gold assay.

It appears, from mapping carried out during 1947 in the Ymir Sheet by the Geological Survey of Canada, that the mineralized zone on the Oxide property occupies a major, steeply dipping strike-fault which continues south, up the valley of Active Creek. Quartzites and quartzitic schists on the west are separated from argillites, quartzites, and some limestone on the east. The face of the drift is not yet beneath the open-cuts on and near the ridge-crest, where widths in excess of 30 feet were disclosed, but shows oxidation to persist to a depth of more than 600 feet below the crest of the ridge. The degree of oxidation has been such that the original character of the zone cannot be determined. It may have been either a mineral replacement in quartzitic schist of the formation or a replacement of limestone dragged down against the fault. The intersection of quartz in the drill-hole beneath the adit indicates a change in the material of the zone, but whether this is characteristic or of chance occurrence is not known.

Zinc.

Ymir Good-Hope Mining Co.

Company office, 503 Westlake North, Seattle 9, Wash.; local office, No. 8, Burns Block, Nelson. John F. Meduna, president. Capital: 250,000 A shares, par value $1; and 1,500,000 B shares, par value 10 cents. This company, incorporated in Washington and registered in British Columbia, is continuing development-work on a group of claims, known as the X-Ray group, on the north fork of Wild Horse Creek.

Early in the year, under C. Davis, mine manager, a road-building programme was begun, using two portable compressors, a bulldozer, and other equipment. The programme included repairing the road to the lower camp and extending the road up the hill to a point nearer the workings. At this point a substantial frame bunk-house, dry-house, and mess-house were built.

Very little development-work was done in this area. The Terzian adit, elevation about 4,000 feet, described in the 1946 Annual Report of the Minister of Mines, was extended a short distance toward the possible downward extension of the surface showings before work was stopped.

The new road-work uncovered the portal of an old adit which had been driven a short distance on a well-mineralized quartz vein. This vein appears to be a parallel lead to that being investigated by the current development.

Gold-Silver-Lead-Zinc.

Goodenough (Protection).

J. Turk, F. Badolia, and A. Fata, lessees, mined and shipped ore from a pillar between the first and second levels, about 450 feet from the portal of No. 2 level. The vein here is very narrow. Ore shipped: 247 tons. Net contents: Gold, 114 oz.; silver, 1,297 oz.; lead, 24,048 lb.; and zinc, 29,526 lb. Working a little farther west on a sub-level between the second and third levels, E. Myers and V. Bruno mined and shipped to the Trail smelter 90 tons. Net contents: Gold, 65 oz.; silver, 763 oz.; lead, 22,642 lb.; and zinc, 17,355 lb.

Centre Star (Wesko).—S. W. Barclay and C. Anderson, of Ymir, shipped ore from this property to Trail. Ore shipped, 104 tons. Net contents: Gold, 52 oz.; silver, 675 oz.; lead, 15,792 lb.; and zinc, 16,476 lb.

Yankee Girl.—C. Anderson, of Ymir, shipped 28 tons of ore from the Yankee Girl mine, near Ymir, to the Trail smelter. This yielded: Gold, 19 oz.; silver, 139 oz.; lead, 3,189 lb.; and zinc, 3,657 lb.

Durango.—From cleaning up at the mill, O. W. Gowing, of Ymir, shipped 16 tons of zinc concentrates to the Trail smelter. This yielded: Gold, 3 oz.; silver, 26 oz.; lead, 720 lb.; and zinc, 9,257 lb.

SALMO (49° 117° S.E.).*

Erie Creek.

Gold-Silver-Lead-Zinc.

Arlington. R. Golak, K. Golak, F. Lipsack, P. Lefevre, and T. Waller continued operating for a short time in 1947 as in 1946. The Golaks later discontinued their activities and gave a lease to N. and P. Rolick, who installed a Sullivan 280-cubic-foot compressor driven by a General Motors 95-horsepower engine, and worked the east end of the 80 level. Later the Rolicks, Lipsack, and Lefevre worked together on the north end of the 70 level. Shortly after the end of the year the living-quarters were destroyed by fire and work was discontinued. Ore shipped (to Trail smelter): 387 tons. Net contents: Gold, 543 oz.; silver, 1,490 oz.; lead, 22,906 lb.; and zinc, 24,486 lb.

Salmo.

Silver-Lead-Zinc.

Silver Dollar.—Silver Dollar Mines, Limited (N.P.L.), under the direction of L. R. Clubine, shipped 7 tons of ore from this property, in Salmo, to the Trail smelter. This yielded: Silver, 73 oz.; lead, 1,784 lb.; and zinc, 2,803 lb.

Sheep Creek.

Gold.

Sheep Creek Gold Mines, Ltd. Company office, 616 Stock Exchange Building, Vancouver; mine office, Sheep Creek. A. E. Jukes, president; H. E. Doelle, general superintendent and managing director; F. R. Thompson, mine superintendent. Capital: 2,000,000 shares, 50 cents par value. For some time after the 1946 strike the company's mine on Sheep Creek was operated on a one-shift basis. The work was gradually increased until the mill reopened on May 1st, 1947, after being shut down since May 22nd, 1946, and operations from then to the end of the year were almost normal. The milling rate averaged 3,727 tons per month. Most of the production was from the 81 vein, above No. 9 and No. 7 levels. Development-work consisted of 2,768 feet of drifting and crosscutting and 369 feet of raising. On the No. 7 level a length of 225 feet of ore averaging 2.3 feet in width was developed on the 57 vein. A raise from the No. 7 level was in ore to within 30 feet of the No. 5 level. This ore-shoot was cut off by the Queen fault. A small ore-shoot was also developed in the 75 vein on No. 9 level. Crosscutting south from the 81 vein was continued on No. 7 and No. 9 levels. The crosscut on No. 7 level was continued to the 57 vein, and that on No. 9 level still has 1,800 feet to go to reach the 57 vein.

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* By J. A. Mitchell.

A total of 15,697 man-shifts are recorded for the year for the entire operation.

Production: Ore milled, 29,821 tons. Net contents: Gold, 8,246 oz.; silver, 2,355 oz.

Gold Belt Mining Co., Ltd. Mine office, Sheep Creek. A. E. Jukes, president; F. W. Reger, mine manager. Capital: 1,687,000 shares, 50 cents par value. The property of this company was under development for the first three months of 1947. Work consisted principally of exploring the 3040 and 3500 veins westward on the 1100, 1400, and 1600 levels. Some advance to the north was also made on the 1100 level, and a small vein, called the 4800 vein, was encountered in this crosscut. It was followed eastward for 85 feet by drifting. This work also established natural ventilation to the face of the 1400 level (4600 vein) and practically to that of the 1100 workings. The total drifting amounted to 897 feet and crosscutting to 152 feet.

A small hoist was being installed at the main raise on the 600 level, but, owing to difficulty in getting electrical equipment, this work had not been completed at the end of 1946. In January a series of snow-slides caused some damage to the machine-shop and dry at 1850 level, and these were repaired. Owing to difficulty in obtaining supplies and to unsettled labour conditions, operations ceased on April 1st. Since then roads have been maintained, and buildings and equipment have been kept in good repair so that the mine could be reopened speedily.

Kootenay Belle.—J. R. Thompson, lessee, shipped 62 tons of ore. Net contents: Gold, 58 oz.; silver, 96 oz.

Reno.—Production, from cleaning up mill, including 52 lb. of high-grade clean-up: Ore shipped, 14 tons. Net contents: Gold, 59 oz.; silver, 21 oz.

Nugget.—Production: Ore mined, 354 tons. Net contents: Gold, 75 oz.; silver, 131 oz.

Iron Mountain.

Silver-Lead-Zinc.

Black Rock.—This property lies immediately north of the Emerald mine and is owned by L. R. Clubine, of Salmo. Three diamond-drill holes were drilled by the Consolidated Mining and Smelting Company following geological mapping of this ground and of the H.B. and other holdings.

Tungsten.

Emerald (Canadian Exploration, Ltd.). Head office, 11th floor, Royal Bank Building, Vancouver; mine office, Salmo. H. L. Batten, director and consulting engineer; G. M. Christie, resident manager; H. M. Powell, mine superintendent; T. B. Magee, assistant mine superintendent; B. N. Murphy, resident engineer; W. C. Ringsleben, chief geologist; H. Lakes, consulting geologist; G. H. Grimwood, mill superintendent. This company purchased the Emerald mine, near Salmo, from the Canadian Government and commenced mining and milling tungsten ore in June, 1947.

When the war-time operations ceased in September, 1943, the full plant was left in condition for immediate production, but in the ensuing years some equipment was sold and had to be replaced. Early in 1947 plant and equipment were completely overhauled, and changes and improvements were made in camp and surface plant during the year. The tram-line was repaired and adjusted, and new foundations were built under the coarse-ore crusher at the head of the tram. Test-work, with a view to improving recovery at the mill, continued through much of the year. Living-quarters were renovated and made very attractive. A recreation-room was provided and moving pictures are shown once a week. Health insurance is mandatory and is contributed to by the company.

While the mill and plant were being prepared for use, very little development-work was done in the mine, but ventilation raises were driven to the surface from existing stopes. Milling commenced on June 12th, and the tonnage treated was steadily increased to approximately 260 tons a day by the end of the year. At first some of the ore treated was from the mine dumps, making it possible to bring the mine up to full production in a systematic manner. At the end of the year the bulk of the ore was being taken from the 40A and 39B stopes. In the former period of operation, stoping was by shrinkage methods, and the present company has continued this practice. Local slabbing of the walls, the high angle of repose of the muck, and the width and irregularity of the ore made drawing from chutes difficult. Many chutes have been removed, and in their place mucking-machines and scrapers are used for loading from the sill. Trials of chutes of a new design are in progress.

Although the ore is localized along a trough formed by a band of limestone lying above argillites and against granite, the boundaries of ore-bodies are irregular in detail. Closely spaced cross-sectional diamond-drilling by Wartime Metals Corporation outlined the minable areas accurately, but much attention to ore boundaries is needed in stoping. The ultra-violet lamp is continually used in sight estimation of grade and limits of ore.

The geology of the mine is carefully kept up to date, and exploratory diamond-drilling has been initiated along extensions of the ore-zone.

The concentrator is located on the Nelson–Nelway Highway, about 6,700 feet west of the tram-head at the mine and some 7 miles south of Salmo. Pre-production work here included the erection of a new tailings-launder and tailings-pond, so that the tailings could be stacked without polluting the Salmo River. The mill-roof was repaired, and all the mill equipment was inspected and overhauled. During the period of production, experimentation and adjustments have been carried on continuously to improve the recovery and grade of concentrates. Sensitive adjustments of the component parts of the mill, found necessary to effect desirable results, have been greatly facilitated by a wise and careful selection of modern technical equipment.

The tungstic oxide content in the final tailings is so low now that retreatment of tailings would not be economical. Extraction on the tables has been increased from 60 to 70 per cent. but, by improving the classification and sizing, it is expected that the extraction can be increased still more. A unit cell is to be tried in closed circuit with the ball-mill. Slime-tables to treat the low-grade flotation concentrates are being tried out, and research is now being started to retreat iron-bearing concentrates which have hitherto been stored.

The price for tungsten in 1947 exceeded the price when the plant was built to meet the war-time demand, and the company has a ready market for its product.

Geological work has been done on the extensive holdings with a view to finding both tungsten and lead-zinc. The known limestone replacement-zones from which lead was produced prior to 1926 have been further studied, and the structure of Iron Mountain has been partly worked out with a view to possible base-metal exploration.

[References: *B.C. Dept. of Mines,* Bull. No. 10, 1943; *Minister of Mines, B.C.,* Ann. Rept., 1943, p. 79.]

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. The Valley Mining Company relinquished its option on this group after completing a geological examination and doing some diamond-drilling. R. C. Macdonald was engineer in charge.

NELWAY (49° 117° S.E.).*

Silver-Lead-Zinc.

Lomond (International).—Sheep Creek Gold Mines, Limited, continued a diamond-drilling programme begun in December, 1946, and accomplished 816 feet of drilling before work stopped. This work was being done in association with the Gold Belt Mining Company, Limited, and Calumet and Hecla Consolidated.

Reeves-McDonald Mines, Ltd. Company office, 616 Stock Exchange Building, Vancouver. Lewis P. Larsen, Spokane, president; Henry L. Hill, mine manager. Capital: authorized, 3,000,000 shares, $1 par value. This company is a subsidiary of Pend d'Oreille Mines and Metals Company, of Metaline Falls, Wash., and owns the Reeves-McDonald mine on the Pend d'Oreille River, 4½ miles west of Nelway, near the International Boundary.

The company holds sixty-four Crown-granted claims and fractions aggregating 21,278 acres. Shortly after the end of the war negotiations were entered into with the United States War Assets Administration for the purchase of the war-time plant of Basic Magnesium Incorporated at Gabbs, Nevada, but sale of this equipment was frozen until December, 1947. Anticipating earlier completion of the negotiations the company retained the services of H. L. Hill as mine manager in April, 1947, and he recruited a small crew for the purpose of rehabilitating the camp and other pre-construction-work.

The property was under exploration and development from 1925 to 1929. In this period the main or Reeves ore-body was explored in surface workings in the upper or Reeves level (elevation 2,517 feet), in the lower or River level (elevation 1,730 feet), and by diamond-drilling. Further work was done on the River level in 1937 and 1938.

In 1947 the road from Nelway to the camp, about 4½ miles in length, was greatly improved in grade and alignment and has been almost entirely resurfaced with rock from the mine dumps.

The mine camp at river level was reconditioned to take care of the preliminary crew, and a new water system was installed. The timber in the River adit was replaced where necessary. The old diesel compressor plant was overhauled and is ready for operation.

On the Reeves level the main ore-body is estimated to be 540 feet long and to have an average width greater than 30 feet. The grade has been estimated as 6.2 per cent. zinc, 1.6 per cent. lead, and half an ounce of silver to the ton. Sphalerite, pyrite, and some galena are disseminated in the limestone, and the mineralization is not sharply delimited. Commercial boundaries are determined by sampling. Between the levels the dip-length, conforming with the dip of the limestone, is about 1,000 feet. Mineralization of ore grade may be continuous or may consist of lenses with assay walls.

It is proposed to drive a raise to connect the River adit (elevation 1,730 feet) with the upper-adit workings (elevation 2,517 feet) and with the surface. The raise will follow the foot-wall side of the main ore-body at the north end and will be approximately 1,000 feet long. It will be driven as two adjacent raises, each side advancing alternately about 75 feet at a time. One side will be 6 feet by 7 feet, and will be used as a manway and service raise; the other side will be 6 feet by 6 feet, and will be used as an ore-pass. Work is to be commenced in January, 1948. This is the main raise, from which sub-levels will be driven and mining initiated.

The company proposes to mine the ore by a sub-level and benching method, with sub-levels driven from the raise at 50-foot intervals. No chutes are contemplated, but it is proposed to drive a haulage-way on the River level in the foot-wall of the ore, and to crosscut to the ore at intervals to permit mechanical loading. It is planned to mechanize the mine as fully as possible, and it is hoped that very low costs will be

* By J. A. Mitchell.

achieved. It is proposed to bring the property into production at a rate of 500 tons per day, with the expectation of increasing the rate later to 1,000 tons per day.

In addition to the main or Reeves ore-body, mineralization in several parts of the property was explored with surface and some underground workings and diamond-drill holes about twenty years ago. Some of the surface workings have been cleaned out in the past year. The property was described in some detail in Memoir 172 of the Geological Survey of Canada, pages 57 to 61, and in the British Columbia Minister of Mines Annual Reports, 1928, pages 349 to 351, and 1929, pages 353 to 355.

Red Rock (Michaely Mines).—M. Michaely and W. E. Holland, of Trail, shipped 69 tons of ore to the Trail smelter. Net contents: Gold, 1 oz.; silver, 390 oz.; lead, 15,546 lb.; zinc, 19,118 lb.

SOUTH KOOTENAY LAKE (49° 116° S.W.).*

HUGHES CREEK.

Gold.

Black Douglas. At this group the four Hamilton brothers continued the exploratory work commenced in 1946. They worked from June 1st to September 30th on both sides of Hughes Creek. A shaft was sunk 20 feet on the main lead, where the best values were obtained in 1946. It is reported that the shaft followed vein material all the way and that oxidation was decreasing with depth, while sulphides, particularly chalcopyrite and arsenopyrite, were becoming more noticeable with depth.

Other veins were found on both sides of Hughes Creek, and some preliminary stripping was done on several of them. A log cabin was erected about 300 feet above the main showing.

SUMMIT CREEK.

Gold.

Bayonne. O. Gowing, H. Moore, and D. McDonald, of Ymir, made three small shipments from this property to the Trail smelter. The material shipped included 20 tons of ore and about 1,500 lb. made up of concentrates and material recovered in cleaning up the mill. A total of 35 oz. of gold, 107 oz. of silver, 808 lb. of lead, and 608 lb. of zinc was recovered.

SANCA.

Silver-Lead-Zinc.

Lakeview. This property is on the Kootenay Bay–Creston Highway at Sanca. A shallow shaft alongside the highway connects through a raise with an adit driven close to lake-level. Galena and sphalerite mineralization are associated with a small quartz vein paralleling the highway, and small shipments have been made in the past. During 1947 E. G. Timmons became sole owner of this property. He and his son worked for three months. They cleaned out old workings, rebuilt the ore-bin and loading-chute, and mined about 85 tons of ore by hand. A compressor is now being installed. The underground work was done from the low level, about 145 feet north of the shaft workings. The individual shipments contained values ranging from 6.7 to 9.5 oz. of silver per ton; 13.7 to 23 per cent. lead, and 33.7 to 41.1 per cent. zinc to the ton. There was a small cadmium content.

Production: Ore shipped, 85 tons. Net contents: Gold, 1 oz.; silver, 624 oz.; lead, 28,766 lb.; zinc, 55,797 lb.

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AINSWORTH (49° 116° N.W.).*

Silver-Lead-Zinc.

Ainsmore Consolidated Mines, Ltd. Mine office, Ainsworth. A. E. Silverwood, president; Carl Mohr, manager; W. Randolph Green, geologist. This company operated the Kootenay Florence mine and mill, 2 miles north of Ainsworth, continuously through 1947. Ore milled amounted to 19,398 tons, of which 5,657 tons came from the Spokane and Maestro mine dumps at Ainsworth and the remainder was mined from the Kootenay Florence mine. Concentrates were shipped to United States smelters until June, after which they were shipped to the Trail smelter. Shipments totalled 808 tons of lead concentrates and 508 tons of zinc concentrates.

The exploration and development work done during the year was confined to the Florence mine. The 800 level east drift was extended 26 feet but was abandoned on encountering soft ground and excessive water. On the 900 ore-body, lying to the east of the 940 ore-body, 145 feet of drifting and 51 feet of raising were completed. The incline shaft on the 955 ore-body was sunk an additional 55 feet in ore.

A vein in the Ainsworth formation, east of the Josephine limestone, was explored by a stope raise during the latter part of the year, with encouraging results. This vein, known as 906, had previously been explored by drifting. The new raise opened up some excellent ore at the end of the year, and future developments on this are awaited with interest.

From twenty to thirty-five men were employed throughout the year. The mine was worked on a one-shift basis and the mill on a three-shift basis from March to September and on a two-shift basis for the remainder of the year.

Production: Ore milled, 19,398 tons. Net contents: Silver, 15,219 oz.; lead, 871,393 lb.; zinc, 422,938 lb.

Highland. George L. Green and associates, of Ainsworth, leased the tailings dump in Kootenay Lake from the Consolidated Mining and Smelting Company, Limited. Milling equipment, purchased from the Ymir Good-Hope Mining Company, was erected on the property. The mill equipment includes a $4\frac{1}{2}$ by $4\frac{1}{2}$ Llewellan ball-mill; a 24-inch single-flight Dorr classifier; a Forrester-type lead rougher cell and Denver unit cleaner cell on the lead side and a Forrester-type zinc rougher cell, Denver cleaner cell, and Forrester recleaner cell on the zinc side.

Milling was started on October 15th, and a car of concentrates was shipped to the Trail smelter on December 15th. This was recovered from beach tailings, but shortly afterwards a start was made to recover tailings from under the surface of the lake. There is supposedly about 80,000 tons of tailings in the dump, but this may not all be recoverable. A higher recovery is expected from the tailings reclaimed from under water.

Production: Concentrates shipped, 28 tons. Net contents: Silver, 344 oz.; lead, 24,887 lb.; zinc, 5,211 lb.

WOODBURY CREEK.

Scranton Consolidated Mining Co. Mine office, care of J. B. Fletcher, Ainsworth. Y. C. Bressie, president; Fred. O. Hallwyler replaced C. J. Bailor as secretary-treasurer; W. T. Graham, in charge at the property. This extra-provincial company owns the Scranton-Pontiac and Sunset groups of claims, about 11 miles from Kootenay Lake, on both sides of Pontiac Creek, a tributary of Woodbury Creek. A $10\frac{1}{2}$-mile private road from the highway was started in 1945 and was completed this year except for surfacing the last half-mile. Certain portions of the road through the timber are being gravelled during the winter and the grade may

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be improved in places. A sawmill was running during September and October getting out lumber for a camp, but construction was not started.

King Solomon.—L. D. Besecher, of Kaslo, shipped to the Trail smelter 35 tons reported to have been mined many years ago. Net contents of shipment: Silver, 76 oz.; lead, 3,735 lb.; zinc, 1,131 lb.

RIONDEL.

Bluebell.—A diamond-drilling programme conducted by the Consolidated Mining and Smelting Company was still in progress at the end of the year. The Bluebell limestone was explored in the vicinity of the Comfort shaft and Kootenay Creek workings.

SLOCAN DISTRICT.*

KASLO-THREE FORKS (50° 117° S.E.).

Silver-Lead-Zinc.

Utica Mines, (1937) Ltd. Company office, 616 Stock Exchange Building, Vancouver; mine office, Kaslo. C. C. Keyes, managing director; P. N. Pitcher, mine manager. Capital: 3,000,000 shares, 50 cents par value. The company continued development-work on the Utica mine until September 15th, when operations ceased, partly because it was considered inadvisable to use the old buildings for another winter and partly because further financing was required for rehabilitation of the plant and development of the mine.

Most of the work done during 1947 consisted of mine and camp rehabilitation. A total of 226 feet of drifting, crosscutting, and raising was completed, and a shipment of ore was made to the Trail smelter. The number employed averaged fifteen.

Production: Ore shipped, 7 tons. Net contents: Silver, 627 oz.; lead, 1,984 lb.; zinc, 1,752 lb.

Whitewater (Kootenay Belle Gold Mines, Ltd.). During 1947 ore containing silver, lead, and zinc from the old Whitewater dumps was milled. Despite costly delays caused by wet weather, some 10,000 tons was milled and netted about $4 a ton, sufficient to meet capital expenditures and operating costs; under normal conditions a fair profit could be made on such an operation. A stock-pile of dump material has been put under cover at the mill, to be drawn on during wet weather next summer. The material was scraped over a grizzly into dump-trucks by a gasoline-driven scraper-hoist and hauled to the mill at the rate of about 200 tons per shift.

Production: Ore mined, 15,111 tons; ore milled, 9,711 tons. Net contents: Gold, 25 oz.; silver, 22,502 oz.; lead, 110,928 lb.; zinc, 234,729 lb.

Slocan Charleston Mining Co., Ltd. Company office, 609 Baker Street, Nelson. Ray McDonald, president. Capital: 1,000,000 shares, $1 par value. This company owns the Keystone and Charleston groups of claims, which adjoin the Whitewater mine at Retallack. Under the supervision of Charles Lind a crew of three men worked from June 1st to September 30th, 1947. The Charleston No. 5 adit was opened up and retimbered for a distance of 175 feet from the portal. Much of the timbering done in 1946 had to be replaced. Beyond the timber the adit was in good shape to the face at 840 feet from the portal.

The Keystone No. 2 adit was reopened and retimbered for a distance of 48 feet from the portal. This adit, 430 feet long, is now in good condition.

A new cook-house, 32 by 16 feet, was erected but not finished. It is planned to add a bunk-house and other buildings as soon as the snow goes in the spring of 1948.

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Lucky Jim (Zincton Mines, Ltd.).

Mine office, Zincton. J. S. McIntosh, mine manager; G. Avison, mill superintendent. This company, a subsidiary of Sheep Creek Gold Mines, Limited, owns and operates the Lucky Jim mine at Zincton. Development-work done during 1947 included 890 feet of drifting and crosscutting, 680 feet of raising, and 7,200 feet of diamond-drilling. Stoping operations commenced on a new ore-body on No. 1 level, and a new level, No. 10, was driven from the bottom of the winze. The tram-line, begun in 1946, was completed from No. 3 level to the mill. Two new dwellings were erected, and additions were made to the bunk-house.

The average number of men on the pay-roll was seventy-seven.

Production: Ore milled, 83,112 dry tons; yielded 8,350 dry tons of zinc concentrates and 160 dry tons of lead concentrates. Net contents: Silver, 20,847 oz.; lead, 132,907 lb.; zinc, 8,438,349 lb.

Rambler-Cariboo (Slocan Rambler (1947), Ltd.).

Company office, 67 Yonge Street, Toronto. George A. McMillan, president; E. K. M. Graham, secretary-treasurer. Capital: 1,300,000 shares. At this property, which was optioned in 1946 by George A. McMillan and associates of Toronto, a diamond-drilling programme was carried out until it was necessary to suspend operations for the winter. The shaft below No. 3 level was reconditioned sufficiently to permit entry and examination of parts of the mine between No. 3 and No. 14 levels. Plans were being made at the end of 1947 to continue exploration and to further rehabilitate the property under the supervision of W. Maybank.

London Ridge (50° 117° S.E.).

Silver-Lead.

Miner Boy and Jo Jo (Miner Boy, Inc.).

Company office, Portland, Ore.; mine office, Nelson. I. G. Nelson, president. This company owns the Miner Boy and Jo Jo claims on the western slope of London Ridge. The Jo Jo workings are reached from the ninth switchback of the McAllister road by about a mile of newly built road. On the Jo Jo several men were employed during 1947 in completing the road and opening up the No. 1 adit; 16 feet of drifting was done on No. 1 adit and 158 feet of crosscutting was done on No. 3 adit.

Cook-house, bunk-house, and dry-house accommodations for fourteen men were provided, and a water system was installed.

Ore was sorted from the dump at No. 3 adit-portal and shipped to the Trail smelter.

No work was done on the Miner Boy group.

Production: Ore shipped, 31 tons. Net contents: Silver, 1,055 oz.; lead, 715 lb.; zinc, 597 lb.

McAllister (Allan Nelson Mining Co., Ltd.).

Company office, Nelson. I. G. Nelson, president; Paul Lincoln, consulting engineer. This private company was formed for the purpose of acquiring the McAllister mine from the Slocan Silver Consolidated. On August 15th a small crew began repairing the old buildings for temporary occupation. The tram-line to a bin on Kane Creek, 4½ miles from the railroad bunker, was repaired, and a portable compressor was installed at the mine-portal. Six men were employed until operations were suspended on November 27th. Siliceous ore averaging about 23 oz. of silver per ton was mined and shipped to the Trail smelter. The ore was taken from just above the level in a stope about midway along the vein on No. 3 level. The stope is on a shoot of ore about 60 feet long, raking southerly. The vein is about 5 feet wide at this point and contains lenses of dry ore which angle across it from foot-wall to hanging wall. The favourable treatment rate for the siliceous ore permitted the entire width of vein to be mined and shipped.

Production: Ore shipped, 484 tons. Net contents: Gold, 2 oz.; silver, 10,673 oz.; lead, 6,182 lb.; zinc, 2,186 lb.

SANDON (49° 117° N.E.).

Silver-Lead-Zinc.

Ruth-Hope (Kelowna Exploration Co., Ltd.).—Geological exploration was carried out under the direction of Paul Billingsley by Evans B. Mayo and a crew of ten. Survey control was established, and geology was plotted on a scale of 100 feet to the inch from the Ruth-Hope to the Wakefield on the company's extensive holdings. In the latter part of 1947 the crosscut driven in 1946 on the Ruth No. 5 level was advanced 440 feet, and nine diamond-drill holes, totalling about 1,854 feet, were drilled.

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. Shortly after the beginning of the year this company completed the electrical installations at its property near Sandon. Installation of an electrically driven fan for ventilation made it possible to speed up operations, and when examined late in 1947 the adit on Tributary Creek, started in 1946, had been advanced more than 1,600 feet.

Silverite Mines, Ltd. This company operates the Silverite mine near Sandon. Development-work was done in a raise above No. 2 level, and in No. 3 level, 400 feet from the portal, a new raise was driven 15 feet. A showing of ore in this raise was followed by drifting for about 20 feet. The operation was closed down on August 14th. Three men were employed and all work was done by hand.

New Springfield.—Eugene H. Peterson and Sam Marzoli opened up an old adit at road-level on the bank of Miller Creek, between the Silver Ridge and Silverite groups.

Silversmith.—E. H. Peterson and Sam Marzoli obtained a lease on the Silversmith dumps, from which they sorted ore and shipped it to the Trail smelter. Production: Ore shipped, 12 tons. Net contents: Silver 976 oz.; lead, 14,196 lb.; zinc, 1,499 lb.

Victor.—E. Doney, with one man employed part time, continued to ship high-grade ore from this property. Production: Ore shipped, 40 tons. Net contents: Gold, 12 oz.; silver, 4,081 oz.; lead, 10,611 lb.; zinc, 14,091 lb.

SLOCAN LAKE (49° 117° N.E.).

Silver-Lead-Zinc.

Bosun (Santiago Mines, Ltd.). Company office, 423 Hamilton Street, Vancouver; mine office, New Denver. R. Crowe-Swords, president; T. R. Buckham, mine manager. Diamond-drilling was done to the east of No. 6 level in an attempt to locate the Bosun vein, which had not been recognized in the outer part of the level. A crosscut was driven to an ore intersection, and drifting commenced on a mineralized shear or vein on which stoping was started in December.

Ore was mined from No. 7 level until near the end of 1947. Thereafter all work was centred on the new area to the south-west. Much remains to be done to delimit the possibilities in this area.

Development-work during the year included: Diamond-drilling, 757 feet; cross-cutting, 75 feet; drifting, 482 feet; raising, 170 feet; a new escape-way was driven to No. 5 level.

A new Canadian Ingersoll-Rand diesel-driven compressor of 360 cubic feet capacity was installed to replace the portable plant previously in use. It was housed in a frame building on a concrete base.

A jigging and sorting plant was installed, and development ore and some of the material previously used for stope-filling, amounting to about 2,000 tons, was treated.

Whenever possible, sorting to shipping grade was done in the stopes. The plant was operated for 151 shifts; it permitted a more flexible operation, and recovery was greater than had been anticipated.

The average number of men employed was fifteen.

Shipments made to the Trail smelter, mostly in the latter half of 1947, amounted to 291 tons. Net contents: Silver, 26,820 oz.; lead, 173,800 lb.; zinc, 100,017 lb.

Van Roi Mines (1947), Ltd. Company office, Vancouver. K. G. Nairn, president; N. Nairn, secretary-treasurer; N. F. Brookes, mine manager. Capital: 2,000,000 shares, no par value. This is a new British Columbia company formed to acquire the Van Roi mine from Van Roi Base Metals, Limited, which retains a share interest in the new company. Camp was established about October 1st, and work was started immediately to widen the upper part of the road and build a crossing across Vancouver (Prior) Creek to connect with the Hewitt road. This work on the crossing was suspended when winter weather set in.

A portable Schramm compressor was set up at the mine, and No. 3 level east was rehabilitated for several hundred feet. At 420 feet from the portal a crosscut was driven toward the south vein, where it was known to contain good ore. By the end of the year the crosscut had been advanced 50 feet of the estimated 75 feet. It is the intention to mine and transfer the ore from this vein to the No. 5 level by existing raises, thence via the east portal to a loading-bin. Mining will not commence, however, until the road can be put into proper condition in the spring. In the meantime it is proposed to do exploratory diamond-drilling.

Production, from cleaning up the old mill: Ore shipped, 9 tons. Net contents: Silver, 372 oz.; lead, 5,092 lb.; zinc, 2,190 lb.

Hewitt. A small crew of men under the supervision of Fred H. Crosby and, later, Earl Snyder, for the Granby Consolidated Mining, Smelting, and Power Company, Limited, completed essential timbering of an old stope 2,300 feet from the portal of No. 10 level and began to drive a ventilation raise through to No. 9 level. Later, some ore was slashed from the walls of No. 10 drift and shipped, and a start was made to stope above the drift. It was soon evident that the heavy ground would make this a costly operation on the scale planned, and this, coupled with the lack of assurance that the shoot was continuous to No. 9 level, caused the management to discontinue work and drop the option.

Before closing the mine, the road to the property was put in condition for heavy traffic. The road will be used for hauling ore from the Van Roi when a crossing is completed over Vancouver (Prior) Creek to connect with the Van Roi road.

Production: Ore mined, 292 tons. Net contents: Gold, 3 oz.; silver, 5,408 oz.; lead, 14,948 lb.; zinc, 42,948 lb.

Galena Farm. This property was leased by Frank Mills, of Silverton, who mined and shipped some 50 tons of zinc ore from a near-surface stope-remnant, close to the power-house. This ore was milled by the Western Exploration Company at Silverton. Production also included selected lead ore shipped directly to the Trail smelter, amounting to 3 tons. Net contents: Silver, 144 oz.; lead, 940 lb.; zinc, 695 lb.

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.

Standard.—With the exception of repair-work on No. 7 level, the Standard mine remained closed until the beginning of October. A total of 2,030 feet was reclaimed on this level. Development since October included 67 feet of drifting on the 640 level and 22 feet of advance in No. 506 raise. Stoping was resumed on the No. 5 and No. 6

levels, and approximately 1,000 tons of ore has been drawn. A diamond-drilling programme was started, and 700 feet of drilling had been completed at the end of the year. The crew has been built up to thirty men.

Mammoth.—The Mammoth mine remained closed throughout the year.

Enterprise.—During 1947 most of the production was from the Enterprise mine. The development programme started there in 1946 was continued until April 30th, 1947, during which time 447 feet of drifting and 623 feet of raising were done. Shrinkage stoping was commenced at the Enterprise on May 1st on No. 6 and No. 7 levels. The mill at Silverton was reopened at this time, and from then to the end of the year a total of 6,125 tons of ore was trucked from the mine and milled at Silverton. A crew of thirty-two men is being maintained.

Production: Ore milled, 7,124 tons. Net contents: Gold, 11 oz.; silver, 66,008 oz.; lead, 432,683 lb.; zinc, 1,475,083 lb.

Mabou, Ohio, and Neepawa (Terley Mining, Milling & Smelting Co.).

Company office, Medical Arts Building, Nelson. D. W. Rowley, managing director. The Mabou, Ohio, and Neepawa claims are on the southern side of Enterprise Creek valley. Repairing and improving the switchback road from the Enterprise camp, suspended the preceding autumn, was resumed in 1947. The road, a mile in length, leads to a camp-site on Neepawa Creek, on the Mabou claim, where four buildings were erected. These consist of a cook-house 18 by 20 feet, a bunk-house 20 by 32 feet, a dry-house 12 by 16 feet, and a blacksmith-shop 12 by 16 feet. An old cabin at this site was repaired to serve as a shelter for a 350-horsepower Sullivan portable compressor.

From a point a short distance east of the camp a crosscut was driven 40 feet toward what is considered to be the extension of the Enterprise vein, which is exposed in an adit some 130 feet higher. It is reported that about a ton of ore was sorted from that adit dump and was shipped to the Trail smelter with unsorted material from the Neepawa No. 4 dump.

Production recorded: Ore shipped, 4 tons. Net contents: Silver, 151 oz.; lead, 285 lb.; zinc, 371 lb.

Dumac Mines, Ltd.

Mine office, Nelson. G. Allan MacPherson, president; W. R. Thompson, secretary-treasurer; W. S. Hamilton, consulting engineer. This company was formed to purchase and develop a group of claims on Enterprise Creek down-stream from and adjoining the Enterprise (*see* Western Exploration Co., Ltd.). A mineralized zone located in and angling away from the bed of a small stream was uncovered for 200 feet by ground-sluicing. The zone is a strong shear in granite and has considerable gouge on the walls. Sections of the zone are well mineralized with galena and sphalerite, and occasionally native silver is also seen.

White Hope.

This property has been acquired by M. L. Craig and associates, of Nelson. Five men were hired for three days to clean out an old open-cut and ship a small lot of ore to the Trail smelter. This lot netted $205 after freight and treatment. Production: Ore shipped, 5 tons. Net contents: Silver, 49 oz.; lead, 1,407 lb.; zinc, 1,778 lb.

SPRINGER CREEK (49° 117° N.E.).

Gold.

Morning Star.—This property was reopened by George A. McMillan toward the end of 1947, after being shut down since the previous winter. Mechanical ventilation was provided, and work was started on a winze to investigate the vein at shallow depth below the adit before embarking on a more ambitious programme.

Silver-Lead-Zinc.

Ottawa.—J. S. Kleman and J. J. McDonell took a lease on this property on September 18th. From then to the end of the year they mined, from 240 square feet of stoping area, 11 tons of ore, yielding 2,211 oz. of silver, net.

Silver Leaf. This property adjoins the Arlington on Speculator Creek, a tributary of Springer Creek. Working from May 1st to September 16th, J. S. Kleman and J. J. McDonell drove a 250-foot prospect crosscut adit by hand on the Silver Leaf No. 2 and Argentite Fractional claims. What was considered to be the extension of the Arlington shear was located, but what mineralization was found is in small stringers and could not be extracted at a profit. The partners sorted ore from an old dump on the Silver Leaf No. 2 claim. The material on the dump is reported to have been mined in one of the Arlington workings and dumped on the adjoining Silver Leaf No. 2 claim. Production: Ore shipped, 36 tons. Net contents: Silver, 496 oz.; lead, 3,778 lb.; zinc, 3,934 lb.

L.T.—From this property, at the head of Little Tim Creek, a tributary of Springer Creek, D. B. O'Neil, of Slocan City, shipped 4 tons of dry ore. Net contents: Silver, 362 oz.; lead, 288 lb.; zinc, 176 lb.

LEMON CREEK (49° 117° N.E.).

Gold-Silver.

Joan.—H. Parker and W. Parker shipped 4 tons of dry ore from this property on Lemon Creek, which yielded 1 oz. of gold and 121 oz. of silver.

Chapleau.—This property, owned by M. L. Craig and associates, of Nelson, remained idle during 1947, but approximately 1 mile of road was built on a uniform grade from the Lemon Creek road almost to the mine-workings.

LARDEAU.*

Ferguson (50° 117° N.E.).

Silver-Lead-Zinc.

True Fissure (Comara Mining & Milling Co., Ltd.). Mine office, Ferguson. Camillien Houde, president; G. A. MacPherson, mine manager; R. B. King, mine superintendent. By the end of the year all buildings, including the mill, had been rehabilitated, as had C or No. 3 level portal, and the road from Ferguson to the mine had been widened and resurfaced. Some work was done on the flume and hydro-electric plant at Ferguson, but a portable compressor is to be installed for preliminary underground work.

Silver Pass Development Syndicate. Charles Beeching, manager. This syndicate has under option the Silver Pass property, previously known as the Silver Dollar, on the east fork of Mohawk Creek, approximately 5½ miles from Camborne. Claims have been located on adjoining ground. During 1947 a trail, suitable for a narrow-gauge tractor and trailer, was built to the property from the Spider camp, to which a wagon-road had previously been built. Several small shipments of ore were made after this road was completed. A small Gibson tractor and a very light aluminium trailer with small aeroplane wheels equipped with balloon-type tires was used between the mine and Camborne.

* By J. A. Mitchell.

DUNCAN RIVER (50° 116° S.W.).

Silver.

Surprise. The road commenced in 1946 was completed to the mine camp early in 1947. Shortly after the road was completed, the venture was abandoned before any mining had been done. Compressor equipment and air-lines were dismantled and removed, and the option was dropped. Toward the end of the year J. Gallo, one of the owners, installed other equipment with the intention of shipping from developed sections of the mine where some high-grade ore is accessible.

UPPER ARROW LAKE (50° 118° S.E.).*

Zinc.

Big Ledge.—This property, on Pingston Creek, on the west side of Upper Arrow Lake, was optioned by the Consolidated Mining and Smelting Company. Geological and magnetometer surveys were made, and trenching was done with a bulldozer. The former road was widened, and 4 miles of new tractor road built to the property.

KIMBERLEY (49° 115° N.W.).*

Silver-Lead-Zinc.

Sullivan (Consolidated Mining & Smelting Co. of Canada, Ltd.). Company office, 215 St. James Street West, Montreal, Quebec; mine and smelter office, Trail. R. E. Stavert, Montreal, president; R. W. Diamond, Trail, vice-president and general manager. Sullivan mine office, Kimberley; J. R. Giegerich, mine superintendent; H. R. Banks, mill superintendent. Capital: 4,000,000 shares, $5 par value. The company owns and operates the Sullivan mine on Mark Creek, near Kimberley, and the Sullivan concentrator at Chapman Camp. The extensive development programme begun in 1946 was continued in 1947. Progress in 1947 included:—

Production and Development.—Production, January 1st, 1947, to December 31st, 1947: 2,252,729 tons. Total development footage of all types, 50,230 feet; 3721 tunnel advance, 3,491 feet; mine development only, 46,739 feet. The main development underground was the sinking of two shafts, 2,000 feet apart, to open up new ground below the 3350 level. The present programme calls for completing these two shafts to open up levels to the 2850 level.

Plant Additions.—1. No. 1 Shaft: Work on surface buildings completed; shaft installation completed to 3350 level; steel framing installed to 3350 pocket; hoist installation completed and put into operation (October 17th).

2. Haulage: The new tunnel was advanced 3,486 feet to a point 3,906 feet from the portal. The surface track sub-grade was completed from the portal to 1,000 feet west of the mill bin. A steel trestle crossing the Banff–Windermere Highway was 75 per cent. completed.

3. Sullivan Mine Dry Extension: An extension was completed to house 350 additional lockers, and a start was made on the installation of the lockers, wash-basins, etc.

4. New Core-shed: A new core-shed to hold 3,024 core-boxes was 90 per cent. completed at the end of the year.

5. 33503 Winze: A Canadian Ingersoll-Rand single-drum (36-inch face by 48-inch diameter) 150-horsepower hoist was installed for 33503 winze.

6. Locomotives: Two 10-ton Goodman locomotives were purchased for underground service.

Personnel and Housing.—Total pay-roll in Kimberley varied between 1,750 at the beginning of the year to 2,000 at the end of the year. This was distributed as follows: Mine, 1,575; mill, 375; miscellaneous, 50.

* By J. A. Mitchell.

During the year 125 war-time houses were completed and another 50 are under construction. The company plans to build 250 houses during 1948.

Main Haulage-tunnel.—Northern Construction Company and J. W. Stewart, Limited, took over the driving of the new Sullivan mine main haulage-tunnel on July 16th. At that date the face had been advanced 2,040 feet. Since then, with F. B. Chase in charge, the company has completed 940 feet of timbered tunnel and 926 feet in rock.

The company improved operating conditions by installing 18-inch solid welded ventilation-pipe from the portal and by adding a second Canadian Ingersoll-Rand compressor of 1,000-foot capacity, making available a total of 2,500 cubic feet of air. The drill jumbo was also remodelled and mounted with five Denver C.F. 99 4-inch drifters, and the air-pressure at the drills was increased to 110 lb. Blasting is done by electricity from the 110-volt line which supplies lighting throughout the length of the tunnel.

On the surface the dry-house was remodelled, lined throughout, and equipped with electric heater-fans and new showers. A new repair-shop, powder magazine, and cap-house were built, and extensions made to the power-house to accommodate the second compressor. The temporary trestle across the highway was raised to permit the hauling of waste from the tunnel to the fill area.

Fifty-nine men were employed underground and fourty-four on the surface.

Hollinger Consolidated Gold Mines, Ltd. Under arrangements with Western Exploration Company, Limited, Hollinger Consolidated Gold Mines, Limited, is conducting a geophysical survey of the former company's holdings, which adjoin the Sullivan mine on the north. The property consists of 111 claims, totalling approximately 5,728 acres. A reconnaissance magnetometer survey was made of the claims, using two Askania magnetometers with a sensitivity of about 18 gammas per scale division. Readings were taken at 132-foot horizontal intervals on the east-west claim lines, which are 1,500 feet apart. A total of 36 miles of line was cut and 1,465 magnetometer readings were taken. The readings are being corrected for diurnal variation and plotted to form contour plans. More detailed magnetometer work is proposed for the summer of 1948.

Two magnetometers were used, and all records of this work are being compared with continuous records from the Meanook station, with the advice of Dr. Lachlan Gilchrist, professor emeritus of geophysics at the University of Toronto.

In October forty claims were staked on the north boundary of the Western Exploration property.

The operation was under the direction of W. R. Dunbar, chief geologist of the Hollinger Company.

Conwest Exploration Company, Ltd.—This company continued the magnetometer survey begun in 1946 on ground south-west of the Sullivan mine. Toward the end of the year diamond-drilling was commenced through deep overburden to investigate one of the established anomalies.

MOYIE LAKE (49° 115° S.W.).*

Silver-Lead-Zinc.

St. Eugene Mining Corp., Ltd.—This company owns the St. Eugene mine at Moyie Lake. The programme of areal and detailed geological mapping commenced in 1946 was carried on through 1947. No other work was done.

Society Girl. This is a very old property, 2 miles east of Moyie at an elevation of 5,000 feet, adjoining the St. Eugene. The mine-workings are reached by about 4 miles of road, which in places is quite steep. The property

* By J. A. Mitchell.

has been idle for some years, but during 1947 J. F. Hutchcroft, N. Nicholson, and J. Sullivan established a summer camp at the mine and partly finished building two ore-bins and a 30- by 40-foot bunk-house. They also prepared to ship ore from the old dumps and ore sacked previously but not shipped. Half a car-load was hauled. Much of the dump is oxidized and contains pyromorphite and other secondary minerals.

Shipments from the property, in the years 1900, 1901, 1910, 1911, 1912, 1913, and 1920, amounted to 970 tons.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1909, p. 92; 1922, p. 188. *Geol. Surv., Canada*, Mem. 76, p. 127; Zinc and lead deposits of Canada, p. 328.]

WINDERMERE (50° 116° S.E.)*

Silver-Lead-Zinc.

Excelda (Thunder Bird Mines, Ltd.). Company office, P.O. Box 743, Seattle 11, Wash. R. C. Moffit, president; H. H. Thomas, vice-president and treasurer; J. E. Barbour, mine manager. This company holds a lease and option on the Excelda group and owns adjoining claims at a high elevation near the head of Michelson Creek, a tributary of Toby Creek. The property is equipped with a small mining plant, to which further equipment, including a diamond-drill, was added in 1947.

Roads, trails, buildings, and equipment were repaired and overhauled. Adverse weather conditions throughout the summer and the scarcity of suitable labour limited the amount of work accomplished; late snow at the high elevation of the workings delayed preliminary work, and actual development did not start until August.

Development by the company, since it began working in 1935, includes 1,018 feet of tunnelling and 66 feet of trenching, stripping, and shallow shafts. Of the tunnelling, 410 feet was done on Excelda ground. Diamond-drilling for parallel vein-structures was done from the east crosscut of No. 3 tunnel on the Excelda No. 3 Mineral Claim. A geological study of the property was also made.

The results of this work proved discouraging, and the option on the Excelda group was dropped.

Descriptions of the property and of previous work by the company are found in the British Columbia Minister of Mines Annual Reports, 1935, pages E 12, E 13; 1936, page E 51; 1937, page E 52; 1946, page 173.

SPILLIMACHEEN (50° 116° N.E.).*

Silver-Lead-Zinc.

Silver Giant Mines, Ltd. (N.P.L.). Company office, 707 Credit Foncier Building, 850 Hastings Street West, Vancouver; mine office, Spillimacheen. W. R. Wheeler, president; T. G. McLelan, secretary; Alfred R. Allen, consulting engineer in charge of development. Capital: 3,000,000 shares, 50 cents par value. This company was formed for the purpose of acquiring, developing, and operating the Silver Giant mine on the east side of Spillimacheen River, about 7 miles by road from Spillimacheen.

In September a crew of five began loading and trucking unsorted dump material to the railroad for shipment to the Trail smelter for test purposes. Mechanical slushing equipment was later installed. By November 15th the condition of the mine road made further shipments impossible. During the two and one-half months of operation twenty-six cars were shipped to the smelter, from which the net returns are expected to defray all expenses. The camp buildings were rehabilitated and a winter camp was established with the intention of reopening the underground workings so that they may be sampled and mapped geologically.

Production: Ore shipped, 1,383 tons.

* By J. A. Mitchell.

McMURDO CREEK (51° 117° S.E.).*

Crown Point.—It is reported that the tractor-road being built from the highway at Parson has been completed to the Crown Point camp on McMurdo Creek.

FIELD (51° 116° S.E.).*

Silver-Lead-Zinc.

Base Metals Mining Corp., Ltd.

Mine office, Field. E. J. Gleason, mine manager; C. Disney, mine superintendent. This company reopened the Kicking Horse mine in July and the Monarch on November 4th. Both mines had been inactive since they were closed by the strike on July 3rd, 1946. During the long shut-down the Kicking Horse mine became flooded. It was drained by drilling 2,181 feet of diamond-drill holes out to the steep mountain-slopes.

Underground development in the Kicking Horse mine included 75 feet of drifting, 49 feet of raising, and 370 feet of diamond-drilling. Ore milled amounted to 6,937 tons, averaging .078 per cent. lead and 14.67 per cent. zinc.

From the Monarch mine 1,067 tons was milled, averaging 7.85 per cent. lead and 5.76 per cent. zinc.

The lead concentrates were shipped to East Helena, Montana, and the zinc concentrates to the Trail smelter.

The supply of labour improved toward the end of the year. An average of fifty-two men was employed.

Production: Ore milled, 8,004 tons. Net contents: Silver, 7,873 oz.; lead, 125,931 lb.; zinc, 1,630,058 lb.

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; E. C. Roper, manager. During the year C. P. Browning retired as general manager but is being retained in an advisory capacity. Capital: 100,000 shares, $25 par value. This company operates the Britannia mines at Britannia Beach, Howe Sound. The properties were operated continuously throughout the year. The total number of men on the mine pay-roll at the year-end was 506, as compared to 423 at the beginning of the year. The total shifts worked during the year in the mining department were 116,561, as compared with 78,586 in 1946.

The total production of all mines amounted to 794,974 tons, as compared with 435,982 tons in 1946. Metals produced, including copper from the copper precipitation plant: Copper, 16,706,511 lb.; gold, 10,201 oz.; silver, 66,986 oz. The production also included 3,931 tons of zinc concentrates and 18,747 tons of pyrite concentrates.

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* By J. A. Mitchell.

† By F. J. Hemsworth.

Development-work totalled 6,882 feet for all sections of the mine and was made up as follows:—

	No. 8 Mine.	Bluff Mine.	East Bluff Mine.	Fairview Mine.	No. 5 Mine.	Victoria Mine.	Misc.	Total.
	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
Drifts	587	621	69	265	......	......	......	1,542
Crosscuts	345	202	37	106	......	......	151	841
Raises	886	2,465	195	177	213	356	......	4,292
Powder blast workings	......	92	50	......	......	......	......	142
Winzes	......	65	......	......	......	......	......	65
Total	1,818	3,445	351	548	213	356	151	6,882
Diamond-drilling.								
Core-drilling	1,366½	144	......	......	......	......	99	1,609½
Blast-hole drilling	1,162	33,015	4,611	198	2,590	......	......	41,576
Total	2,528½	33,159	4,611	198	2,590	......	99	43,185½

The ore broken in the various sections of the mine by different mining methods was as follows:—

	Shrinkage.	Cut and Fill.	Powder Blast.	Blast-hole Diamond-drill.	Open Square Set.	Square Set and Fill.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
No. 8 mine	27,590	23,336	......	......	10,342	......	61,268
Bluff mine	14,855	......	81,321	371,822	......	......	467,998
East Bluff mine	......	......	......	63,143	......	......	63,143
Fairview mine	46,045	......	71,861	......	......	......	117,906
No. 5 mine	17,458	......	......	......	915	......	18,373
Victoria mine	......	......	......	......	......	32,043	32,043
Total	105,948	23,336	153,182	434,965	11,257	32,043	760,731
Development	......	......	......	......	......	......	8,493
Grand total	......	......	......	......	......	......	769,224

The consumption of explosives and blasting accessories were as follows for the year: Powder, 11,033 cases; electric blasting-caps, 5,475; No. 6 caps, 208,266; 1,321,080 feet of fuse and 4,400 feet of primacord.

An active ventilation and dust-control programme was carried on throughout the year. The ventilation in the No. 8 mine received particular attention. Aluminium-dust was dispersed regularly in all change-rooms.

The use of slusher hoists was further increased, as is evident by the fact that nine more hoists were ordered during the year.

The successful application of blast-hole diamond-drilling for primary breaking, in lieu of powder blasting, is a progressive step from most angles. The sharp increase in the cost of diamonds, however, is of particular concern to the company because of the unusually high diamond-loss in its ground.

The usual safety programme was featured throughout the year. The management-labour accident-prevention committee held monthly meetings, and recommendations from this group proved of real value in curtailing accidents. A quarterly safety bonus plan for the men and another for foremen and shiftbosses was continued. A job-safety instruction programme was started and will be expanded to include a large percentage of the men. To encourage attendance at the first-aid classes, held regularly every year, a first-aid competition is held each spring. The competition for the Britannia cup and the several prizes is always quite spirited, and a large group participates.

The company has purchased five Chemox mine-rescue machines, five Burrell all-service masks, and two Wolf safety-lamps. Suitable mine-rescue stations are being prepared, and teams are to be trained in the use of the apparatus.

PITT LAKE (49° 122° S.W.).*

Standard. The Standard group comprises four recorded mineral claims held by E. A. Richardson and associates, of Pitt Meadows. It is situated on the west shore of Pitt Lake, about 15 miles above Pitt River bridge. The workings are 400 to 600 feet above the lake on a steep, rocky hillside, and consist of a short crosscut and drift, a shallow shaft, and several open-cuts. These expose several narrow, parallel, quartz-filled and mineralized fractures cutting quartz diorite. One of these veins is traceable almost continuously for 250 feet, with a strike of north 25 degrees east; the dip is vertical to 70 degrees north-westward. The width is 2 to 12 inches. A parallel vein about 30 feet east of the first is traceable for a length of 80 feet, with a width of 2 to 4 inches.

The most abundant metallic mineral present in the veins is pyrite, although in places considerable galena and chalcopyrite occur as well.

Typical samples of mineralized vein-matter assayed from 0.17 to 1.80 oz. of gold per ton and 1 to 8 oz. of silver per ton across widths of 2 to 12 inches. Samples of vein-quartz in which no sulphides were apparent contained negligible values.

During the summer of 1947 some work was done in extending both the shaft and adit.

SKAGIT RIVER (49° 121° S.E.).

Invermay Annex.—Ore shipped to Trail smelter: 4 tons. Net contents: Silver, 156 oz.; lead, 281 lb.; zinc, 592 lb.

TEXADA ISLAND (49° 124° N.W.).†

Gold-Copper.

Little Billie (Vananda Mining Co., Ltd.). Company office, 711 Yorkshire Building, Vancouver. H. T. James, president; C. E. Gordon Brown, manager. The company is developing the Little Billie mine near Vananda on Texada Island. During 1947 the shaft was sunk 170 feet to the 600 level. Development on the various levels was as follows: 280 level, 126 feet of drifting; 480 level, 141 feet of drifting and 238 feet of raising; 600 level, 297 feet of drifting and 42 feet of raising. The drifting was to open up the ore-bodies and for the purpose of establishing advantageous diamond-drill stations. Diamond-drilling totalled 3,187 feet underground and 1,272 feet from the surface on the adjacent Cornell ground.

The ore occurs as irregular replacement bodies along a diorite-limestone contact. Development has now progressed to the stage where construction of a mill is under consideration.

The new power-house, containing a 375-horsepower Fairbanks-Morse diesel engine and 312-kva. 2,200-volt C.G.E. generator and a 180-horsepower Petters diesel engine driving a 700-c.f.m. Sullivan compressor, 500-c.f.m. Belles Morcom compressor, and a 100-horsepower International stand-by unit, was put into service during the year.

An average of thirty men were employed throughout the year.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1944, pp. 162–174.]

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* By J. M. Cummings.

† By F. J. Hemsworth.

VANCOUVER ISLAND.

DEEP INLET (50° 127° S.E.).*

Gold.

Fil. This property, owned by the Fil Mil Mining Partnership of Kyuquot, consists of the Fil Nos. 1 to 8 and the Lamil Nos. 1 to 4. It was leased by W. H. Patmore and associates, of Kyuquot, in 1941, and in 1947 a controlling interest in the lease was taken by Gibson Brothers, Marine Building, Vancouver. During the year work was confined to mill and tram-line construction. A 15-ton mill, consisting of a crushing and sorting unit, a jig, blankets, and an amalgamation barrel, was installed about 2,000 feet from the wharf. A plank road to the mill was completed, and some work was done on the tram-line between the mill and mine. A new bunk-house was built at the beach. About seven men were employed. It is proposed to begin production early in 1948.

Eclipse.—This property, about 3 miles south-west of the head of Deep Inlet, Kyuquot Sound, consists of four claims recorded in the name of S. S. Pugh. During the summer months surface stripping and trenching were done by hand.

ZEBALLOS (50° 126° N.W.).

Gold.

Privateer Mine, Ltd.† Company office, 602 Stock Exchange Building, Vancouver. D. S. Tait, president; N. E. McConnell, managing director; C. Harry Hewat, mine manager. This company operates a consolidation of the Privateer and Prident mines, about 4 miles by road from the town of Zeballos. Milling was carried on continuously throughout the year but at only 57 per cent. capacity. Almost one-third of the ore mined is sorted out as waste at the mill. The mill operated 315 days. Production: Ore milled, 14,201 tons. Net contents: Gold, 11,509 oz.; silver, 5,648 oz.

Development-work was curtailed by the shortage of experienced miners during the first nine months of the year. Total development footages were: Drifting, 948 feet; crosscutting, 388 feet; raising, 918 feet; diamond-drilling, 281 feet. The major part of the development was on the Privateer No. 3 vein, where the 1203 drift on the 12 level was extended and the 1303 drift on the 13 level was driven. Ore-shoots opened on this vein compare favourably with some of the original high-grade shoots opened in the old workings.

In the Prident section of the mine the 500 level was continued east as a crosscut to intersect the Prident No. 1 vein, which was then drifted on to the east. The 600 level was also continued as a crosscut and, at the year's end, was approaching the downward projection of the No. 1 vein.

Spud Valley Gold Mines, Ltd.* Company office, 704 Royal Trust Building, Vancouver. Development-work was done on the Big Star group on Gold Creek, adjoining the Spud Valley mine. On January 28th, 1947, the bunk-house and cook-house were destroyed by a fire. A temporary bunk-house was built, and underground work was commenced on April 15th, 1947, and stopped at the end of May. During this period the low-level adit was extended 150 feet. The work was done on contract under the supervision of the company's engineer, W. Elliott.

Central Zeballos Gold Mines, Ltd.† Company office, 543 Granville Street, Vancouver; mine office, Zeballos. N. F. Brookes, manager. The property is under lease to Reno Gold Mines, Limited. The mill was operated at about 35 tons per day in the early part of the year. A contract was let to Ed Hall and associates, who did 224 feet of drifting on No. 6 level. Results of the development-

* By H. C. Hughes.

† By F. J. Hemsworth.

work were disappointing, and the mine was closed down and the plant and equipment were left in charge of a watchman.

Production: Ore milled, 5,353 tons. Net contents: Gold, 1,627 oz.

I.X.L.*—This fractional claim, owned by Victor D. Davies, of Zeballos, lies between the Privateer and Spud Valley holdings. During the summer months the tunnel was further extended by hand. The development ore was sorted for shipment; a pile, estimated at 15 tons, has been accumulated. Two men were employed.

Tagore (Conquest Mines, Ltd.).* Company office, 510 Dawson Building, Vancouver. Isaac Rosenthal, president; Leo Chenatte, mine foreman. This company is working the Nayda No. 1 and Nayda No. 2, part of the old Tagore ground. The camp and shaft head-frame are on the south side of the Zeballos River, about 1½ miles from the town of Zeballos. Levels have been opened from the shaft at 70 and 140 feet depth. In 1947, 55 feet of crosscutting and 80 feet of drifting were done on the 140-foot level. About five men were employed.

Beano (Victory Mining Co.).* Company office, 609 Bank of Nova Scotia Building, Vancouver. The property is on Beano Creek, 3½ miles by tractor-road from the mouth of the Little Zeballos River. Some surface work was done by Victor Davies and associates. A tram-line and small ore-bunkers were erected preparatory to making ore shipments. Three men were employed.

Ridge Fraction.*—Andy Morod, with one helper, did some work at the head of Blacksand Creek on the Ridge Fraction, owned by F. R. Moore.

Pandora.*—The Pandora group, at the head of Blacksand Creek, was relocated and worked by R. V. Murphy as the Rodger and the Patty claims.

BEDWELL RIVER (49° 125° S.W.).*

Prosper. Prosper Gold Mines, Limited, 210-211 Pemberton Building, Victoria, owns eight claims about 3 miles from the mouth of Bedwell River. The claims were acquired from the Prosper Gold Mining Syndicate. Development-work was carried on during the summer months under S. J. D. McClay and S. H. Davis. The No. 2 adit level was advanced to 420 feet from the portal and, for this distance, followed the vein explored by the No. 1 level, 118 feet higher. At 200 feet from the portal a raise was driven 42 feet on the vein, underneath the ore-shoot mined previously in the No. 1 level. Surface stripping was done on an intersecting vein lying to the east of the main showing. The number employed averaged ten.

Noble.—This property, owned by J. L. Gibson and Noble Cornelius, is on the west side of the Bedwell River, about 5 miles from tide-water. Open-cutting and surface trenching by hand-steel were done in the summer months.

Buccaneer.—Leased by S. Craig and associates, of Tofino, from Bralorne Mines, Limited. The leasers mined from the Buccaneer main vein on the 1600 level. Ore was sorted and sacked for shipment from Tofino. Production: Ore mined, 49 tons. Net contents: Gold, 60 oz.; silver, 15 oz.

WARN BAY (49° 125° S.W.).*

Mocena (Mocena Mines, Ltd.). Company office, 701 Stock Exchange Building, Vancouver. A. M. Richmond, consulting engineer. The main 230 level crosscut was advanced 234 feet to a distance of 506 feet from the portal. At 495 feet in from the portal the downward extension of the " E " vein was cut, and

* By H. C. Hughes.

51 feet of drifting was done on it. Also on the 230 level 214 feet of drifting was done on the shaft vein, cut in the outer part of the crosscut. The company plans to continue the drift on the " E " vein and also to continue the main crosscut to intersect the " F " and " H " veins.

During the year considerable work was done on improvements to the road surface between the beach and the camp, a distance of approximately 1 mile, and most of this was coated with gravel to facilitate the passage of a jeep between the beach and the camp. An average of three men were employed, and the underground work was done on contract.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1946, pp. 188–191.]

TRANQUIL INLET (49° 125° S.W.).*

Fandora (Tofino Gold Mining Co., Ltd.). Company office, 602 Stock Exchange Building, Vancouver. This company owns the Edmar, Gold Flake, Bell, and E.M. groups of claims on Tranquil River, about 6 miles from the head of Tranquil Inlet. The company was formed as a consolidation of the holdings of the Fandora, the Tofino Gold, and the Gold Flake mining companies. Construction of a new road from the beach to the mine was started. An R.D. 7 tractor was brought in, and about 1 mile of new right-of-way cleared. The old road was widened in places and several short bridges were replaced. The beach camp was expanded to seven cabins, capable of accommodating twenty men.

Underground development was continued during the year by hand-steel miners on contract, and amounted to 415 feet of drifts and 82 feet of crosscuts. The footage on the different levels was: 2100 level, 24 feet of drifting; 1900 level, 10 feet of crosscutting; 1700 level, 138 feet of drifting; 1500 level, 253 feet of drifting and 72 feet of crosscutting.

On the surface twenty-two open-cuts were dug, tracing the structure over a horizontal distance of 3,100 feet and a vertical distance of 1,100 feet.

Plans for 1948 include further development and preparing the mine for production.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1946, pp. 186–188.]

ALBERNI CANAL (49° 124° S.W.).*

Copper.

JJJ. Canadian Copper Syndicate. Head office, 417 Metropolitan Building, Vancouver; mine office, Box 1231, Port Alberni. A. J. Pearce, manager. The syndicate owns the JJJ group on the west side of the Alberni Canal, about 18 miles south of Port Alberni. This is an old property on which about 5,000 feet of underground work was done and from which a small amount of copper ore was shipped. During the summer months the old road from the beach to the mine was brushed out, and a small amount of repair-work was done on the caved portal of the upper level. A bunk-house and cook-house were built at the beach. Five men, all members of the syndicate, were employed.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1899, pp. 607, 779, 785; 1900, pp. 901, 917, 1095.]

ALBERNI (48° 124° N.W.).*

Gold.

Black Panther (Nitinat Mines, Ltd.). Company office, 800 Hall Building, Vancouver. This company owns the Havilah and is holding a lease with option to purchase the adjoining Black Panther. This property is 22 miles by road from Port Alberni. A 25-ton flotation mill was installed. The mill consists of a ball-mill, classifier, four flotation cells, and a drying-table, and is powered by an

* By H. C. Hughes.

80-horsepower General Motors diesel engine. A 40-horsepower General Motors diesel engine, belt-connected to a 300-cubic-foot Gardner Denver air-compressor supplies power for mining. No development-work has been done in the mine since 1941. Work in 1947 consisted of taking down the backs, preparatory to stoping the ore sections of the vein on the upper level. (Elevation, 2,927 feet.)

A trial shipment of 3½ tons of bulk flotation concentrate was made to the Tacoma smelter, followed by a shipment of 26 tons of concentrate to the Trail smelter. Fifteen men were employed.

DUNCAN (48° 125° N.W.).*

Copper-Zinc-Gold.

Twin J Mines, Ltd. Company office, 507 Stock Exchange Building, Vancouver. Olier Besner, president; P. E. Peterson, mine manager. Milling was resumed at this property in the spring of 1947. Copper concentrates were shipped to the Tacoma smelter and the zinc concentrates to the Trail smelter. Production: Ore milled, 8,295 tons; copper concentrates, 515 tons; zinc concentrates, 670 tons. Net contents: Gold, 507 oz.; silver, 15,878 oz.; copper, 173,952 lb.; zinc, 536,995 lb.

Repairs were made to the old Tyee shaft to a depth of 300 feet. Development-work consisted of 70 feet of raising and 12 feet of diamond-drilling.

The property was closed down in September, 1947. Some forty men were employed during the peak of the operation.

[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.*

Owing to curtailed operations on Pine Creek and on Spruce Creek, the season of 1947 has been one of the poorest in the history of the Atlin camp. Northern Resources, Limited, had made plans to operate both on Pine Creek and on Spruce Creek but, following the death of Carl Beal, president and one of the principal shareholders, the company's operations were dormant during 1947. Under a lease from J. W. Noland, Columbia Development, Limited, has been operating ground on Spruce Creek during recent years. Owing, however, to the expiration of the lease in August, 1946, operations by the company ceased at the end of July of that year. In recent years the annual production of placer gold from Spruce Creek has varied from 6,000 to 17,000

* By C. Graham.

oz., and from Pine Creek from 100 to 1,700 oz. References to the operations of both companies will be found in the Annual Report of the Minister of Mines, British Columbia, 1946, pages 192 and 193.

Spruce Creek (59° 133° N.W.).

Extremely high water in Spruce Creek at the end of May flooded practically all of the underground workings.

The original creek-bed, carrying the gold-bearing gravel, has a lower grade than the present creek. At a point on the Tax lease both beds are on the same level, but from that point down-stream the pay-channel is above the present creek-bed. Up-stream from the same point the overburden increases steadily, and at the Dream lease shaft reaches a thickness of approximately 210 feet. At the upper end of the underground workings on the Shamrock and New Year leases the thickness exceeds 300 feet.

Up-stream from the Poker lease, with the exception of the section between the old Browne shaft on the Billy lease and the Browne shaft and slope on the Mary lease, the workings are all connected underground by some form of bed-rock drain.

The drain running through the Poker, Joker, and Croker bench leases, which are owned by the Mathews Estate, drains all the workings up to the Browne shaft on the Mary lease. A second drain, known as the Wright drain, was built when attempts were made to mine the creek claims, now covered by the Lloyd and Mary leases, by underground methods. There is only about 40 feet of gravel between bed-rock in the pay-channel and the present creek-bed.

The Wright drain began at the lower end of the Olalla lease and was carried up-stream to a point about midway on the Joker lease. For the greater part of its length this drain lies between the Poker and Joker lease boundaries and the workings in the creek-bed. At one point it swings over into the Joker lease, passes beneath the Mathews drain, swings back again to recross that drain, and finally returns to the Olalla lease. There is about 6 feet of ground between the roof of the Wright drain and the floor of the Mathews drain. The two crossing-points are about 200 feet apart.

The drain which serves the up-stream section of Spruce Creek begins near the south-east corner of the Calder lease on the north side of the creek, runs up-stream through the Billy lease, is connected with the old Browne shaft on that lease, and also with all the workings of the Dorothy, Knapp, Chance, Clydesdale, Goodwill, Sunlight, Dream, Shamrock, and New Year leases.

When Columbia Development, Limited, commenced shovel operations on the Tax and Olalla creek leases, it became necessary to divert the creek by means of a flume in order to prevent water from entering the shovel pit. To carry off the pit water and the water from the Mathews and Wright drains, the company carried a timbered drain on bed-rock, about 4 feet by 4 feet in section. Tailings were stacked by drag-line in the old creek-bed behind the shovel and covered the drain itself. Shaft outlets were provided at intervals and at elevations above the tailings line in order that the drain might be inspected as required. The shovel operation cut off the outlets of the Mathews and Wright drains, but adequate drainage was provided by a connection with the timbered drain. All drains were established with the permission of the Gold Commissioner.

Columbia Development, Limited, worked to the up-stream boundary of the Olalla lease. Later the Spruce Creek Placers acquired all the creek claims up-stream from the Olalla lease. These up-stream claims were included under two leases—namely, the Lloyd and the Mary.

Preliminary to shovel operation, Spruce Creek Placers built a dam across Spruce Creek near the south-east corner of the Mary lease and also constructed a large wooden flume to carry the water down-stream from the dam-site and past the shovel pit. Owing, however, to restrictions imposed by war-time conditions, operations by

Spruce Creek Placers were discontinued in the autumn of 1942. Subsequently, in the autumn of 1946, Northern Resources, Limited, reopened the pit, which meanwhile had become filled with gravel, with a view to commencing operations as soon as weather conditions permitted in 1947.

On January 25th the possibility that the open pit might be a source of danger to underground workings down-stream was taken up with Spruce Creek Placers, Limited, by the Gold Commissioner. The Inspector of Mines also took the matter up with T. W. Thompson, of Seattle, who, as manager of the Northern Resources, Limited, had reopened the pit. Mr. Thompson started to fill the pit, but decided that the flume was inadequate to carry safely the quantity of water involved, and on May 28th diverted the water back into the original creek-channel. During the period of high water all the workings on the Joker, Poker, and Peterboro leases, on the south side of the creek, as well as the Calder lease on the north side of the creek, were flooded. By June 19th, when an examination was made by the Inspector of Mines, the high water had subsided, the creek waters were back in the flume, and the drains were carrying away the water that was entering the workings.

The section being worked on the Joker lease lies between the Mathews drain and the Joker boundary-line. This lease is worked by V. A. Brister and son.

The Mathews drain is accessible as far as its up-stream crossing over the Wright drain. At this crossing the ground between the two drains had caved, and although caving was not extensive, all water was passing from the Mathews drain into the Wright drain. At the lower crossing, 200 feet down-grade, the Mathews drain had also caved into the Wright drain. Examination of the Mathews drain down-grade between the second crossing and an old shaft indicated that it was functioning normally and should be adequate to deal with normal drainage. However, there is a possibility that the Wright drain might block up and again flood the up-stream workings on the Mathews leases.

Calder Lease. Fred Graham, layman. This man has been working alone on the lease. The high water in the creek flooded his workings and blocked his drain with silt, while his second opening through the old Nelson shaft, farther up-stream on the lease, has been cut off by caving in the connecting drift. The drain from this lease did not have any connection with the drainage system on the south side of the creek, or with the timbered drain carried up by the shovel operation. It had, however, an outlet through one of the old and previously operated underground drifts. There is not much water in these workings in normal times, and it may be possible to clean out the drain sufficiently so that it will carry the normal flow.

Poker Lease.—Owned by the Mathews Estate. Ivanic and partners, who had a lay on the Poker lease, abandoned work there some time before the flooding. They may be able to recover a quantity of mine rails which they had left piled at the foot of the slope.

Peterboro Lease.—Otto Miller, owner. Ivanic and partners now have a lay on this lease. The drain through these workings is connected to the timbered bed-rock drain. It was blocked by flooding, but no serious damage was done.

Clydesdale Lease. MacDonald and Munro, owners. The shaft was flooded, but flooding is an annual occurrence and had no connection with the shovel operation. When Spruce Creek is high, the water, which comes in mainly through caved ground, is usually beyond the capacity of the drain. Nos. 4 and 5 shafts on the Knapp and Dorothy leases, owned by J. W. Noland, are also flooded for the same reason.

Noland's Leases.—Personnel employed on the section of creek controlled by J. W. Noland consisted of two men working underground on the Dream lease. The entire property, which had been quite productive during the past six years, is standing idle.

Several individual owners of leases are working alone on the lower section of the creek.

RUBY CREEK (59° 133° N.E.).

Columbia Development, Ltd.—Neil Forbes, foreman. The company has an option on the Gladstone, Graystone, and Redstone leases. A shaft was sunk to bed-rock in 1946, operations being resumed in the spring of 1947 after the shaft had been unwatered and some cleaning up done. Drifting was continued up-stream and across the channel to locate the pay-gravel. A lava cap, about 130 feet thick, overlies gravels which have been tightly compacted. A gas, believed to be free nitrogen, is given off from the gravels, and when the fan stops for any reason, the oxygen content of the air is diluted to a dangerously low amount.

Company officials and all workmen were made fully aware of the condition which might be expected in the event of the ventilation being stopped. In such an event they were instructed to leave the mine at once.

Farmer Lease.—Sunde, Magneson, and Nelson, owners. Entrance is by short slope to bed-rock, and hoisting is done by means of a drum powered by a water-wheel. Work involved in drifting up-stream is being done by the owners, and no other men are employed.

BOULDER CREEK (59° 133° N.E.).

The leases owned by Consolidated Mining and Smelting Company are being worked on a lay by Norman Fisher and partners. This is a hydraulicking operation, two monitors being used. The water-supply during the past season was fairly good.

BIRCH CREEK (59° 133° N.E.).

Atlin Ventures.—Office, 815 Pender Street West, Vancouver. C. O. N. Taylor, manager. This new company in the Atlin field is prospecting certain optioned leases on Birch Creek, and some difficulty has been experienced in securing bulldozer equipment required for moving gravel to sluice-boxes. Depth of gravel is only about 15 feet, but since there is not sufficient water for hydraulicking, it will be necessary to reuse sluicing water.

McKEE CREEK (59° 133° S.W.).

One small hydraulic operation and some prospecting was being done on the creek.

STIKINE.

McDAME CREEK (59° 129° S.E. AND S.W.).*

Placer gold was first discovered on McDame Creek in 1874. Since that time placer gold valued at between $1,500,000 and $2,000,000 has been recovered, making it one of the richest creeks in northern British Columbia. Most of the gold was recovered prior to 1900, but owing to inactivity production during recent years has been small. Most of the gold has been mined from readily worked deposits, and there remain for investigation only such deposits as are less easily found and those which can only be worked profitably by large-scale operation.

Until recently McDame valley has been difficult of access, except by aircraft. The regular route to McDame Creek is up the Stikine River from Wrangell to Telegraph Creek by river-boat, thence by road to Dease Lake, and finally by boat down Dease Lake and River to McDame Post at the mouth of McDame Creek. From the Post

* By J. M. Black.

a tractor-road extends up the valley about 12 miles to Centreville, beyond which a pack-trail and several branch trails lead to the upper part of the valley and the tributary creeks.

Construction of the Alaska Highway, which passes through Lower Post on Liard River opposite the mouth of Dease River, has made it easier to reach McDame Creek from the north. From a point on the highway about 20 miles west of Lower Post, construction of a 70-mile tractor-road to McDame Creek has been commenced. This road will follow a general southward course west of Dease River to a point near Centreville, and will greatly increase the accessibility of the area tributary to McDame valley. Aircraft can land on Dease River at McDame Post, on McDame Lake, and on several other lakes near McDame valley.

In the above valley the advances of glaciers did not remove all the pre-glacial and inter-glacial placer deposits, and some of these have been worked, as well as some of the gravels of the present creeks. The older deposits consist of gravel on bed-rock benches, or of abandoned channels along the valley-slopes, some being covered by more than 100 feet of fluvio-glacial material. Some of the present stream gravels have been worked, especially along sections where the present creek or its tributaries flow across and erode the older deposits and reconcentrate the gold in them.

A belt some 5 miles wide and extending from about 3 miles south-east of McDame Lake north-westerly for more than 7 miles contains abundant quartz veins. Most of this area is underlain by volcanic and intrusive rocks of the McLeod series. The McLeod series, which underlies a large area south of McDame Creek, and the sedimentary Dease series, which underlies the rest of the valley, are not so abundantly mineralized.

The majority of the veins within the area adjacent to McDame Lake have a width of less than 9 feet, but are so numerous that they constitute a considerable proportion of rock-exposures. These veins contain some pyrite, tetrahedrite, and gold, and are probably the source of most of the placer gold in the valley.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1931, pp. 54–61. *Geol. Surv., Canada,* Mem. 194, p. 13.]

Wings Leases. (59° 129° S.W.) It is reported that four leases recorded in the names of D. L. Wing, P. W. Wing, and R. Wing, generally referred to as Wings Leases, were sold in 1946 to P. W. Eastwood, R. G. Wilms, and E. G. Brown. These leases are on Quartzrock Creek, above and below the confluence with Troutline Creek, and about 2 miles north of McDame Lake. They are 17 miles by pack-trail from Centreville.

Just above its confluence with Troutline Creek, Quartzrock Creek flows in a deep channel, partly a canyon, a loop of which almost encircles, at grade, a 400-foot length of buried channel. This old channel is filled and covered with up to 100 feet of gravel and fluvio-glacial material. Most of the gravel within this 400-foot length has been hydraulicked and the bed-rock cleaned. In 1947, preparatory to hydraulicking the small amount of gravel remaining at the upper end of the 400-foot length, P. W. Eastwood and V. Eastwood started to recondition the equipment which had been unused for the last few years.

The buried channel extends north-west and south-east from these workings and has a lower gradient than that of Quartzrock Creek. Up-stream the channel is below the grade of the present creek, and down-stream the channel is above the grade of the present creek. Both up-stream and down-stream from the present workings this channel has been mined by drifts.* Consequently, before further operations are under-

* *Geol. Surv., Canada,* Memoir 194, p. 13.

taken, it will be necessary to test the ground and ascertain whether remaining gold-bearing gravel will justify attempted recovery.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1931, pp. 54–61.]

Reed Leases. (59° 129° S.E.) Two leases are held by J. H. Reed on McDame Creek, 4 miles up-stream from Centreville and near what is known as Holloway's Bar. Some of this ground has been worked before, but there has been no production recently. Within the boundaries of the above leases the creek flows along the northerly edge of the valley-floor. The depth of gravel increases from *nil* at the upper end of the leases, where bed-rock is exposed, to unknown depths in the central part of the valley and the lower end of the leases. The owner reports that over much of the area there is 12 feet of gravel which can be shovelled and sluiced profitably.

At the up-stream end of the leases a dam has been constructed from the north bank to an island, and the entire flow of water is now south of the island. A mobile derrick has been built to handle large boulders, and preparatory work is almost complete.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1931, pp. 54–61. *Geol. Surv., Canada*, Mem. 194, p. 13.]

Moccasin Mines, Ltd. (59° 129° S.E.) J. P. Berry, manager. Capital: 1,000,000 shares, $1 par value. This company is reported to have acquired eight leases on McDame Creek that are recorded in the name of R. G. Wilms. They extend for 2½ miles down-stream from Centreville, and include some low benches together with the present creek-bed. This ground was formerly known as the Pendleton workings. It is reported that the same company has also acquired several special leases in the same locality.

A tent camp was set up at the lower end of the former Pendleton workings near a large cabin which was used as a cook-house. About ten men were employed testing the gravel.

The gravel of the valley-bottom was tested to a depth of 24 feet by several rows of shafts dug by hand and by the use of short lengths of telescoping caissons. The gravel was panned as it was removed, and the management reports that the values are sufficiently high to warrant the installation of a drag-line dredge. A tractor-road 70 miles long is being built from the Alaska Highway to the lower leases.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1931, pp. 54–61. *Geol. Surv., Canada*, Mem. 194, p. 13.]

OMINECA.*

Manson Creek (55° 124° N.W.).

Gruen Placers, Ltd. James M. Dunsmore, president. The company has four leases, while two additional leases between Wolverine Lake and Manson Creek have been applied for. A geophysical survey of the property has been made by Donald L. Hings. Four men were employed during the past summer. The company plans to begin underground mining in the spring. Bed-rock is slightly above the level of Wolverine Lake.

Germansen Creek (55° 124° N.W.).

G. H. Loper and son continued hydraulicking on the property formerly operated by Germansen Ventures, Limited.

* By C. Graham.

Twenty Mile Creek (55° 124° N.W.).

Mrs. W. Tate installed a small hydraulic plant and began hydraulicking on Twin Creek at the head of Twenty Mile Creek. C. Beaton was in charge of the work.

Preliminary investigation of the dredging possibilities of special leases extending for about 20 miles along Kwanika River were made by Yuba Consolidated Gold Fields, Limited.

CARIBOO.*

Willow River Area (53° 121° S.W.).

Lowhee Mining Co., Ltd. Company office, 605 Tacoma Building, Tacoma 2, Wash. Henry Lea, manager; J. House, superintendent. The Lowhee placer mine was operated throughout the summer with an average crew of eight men, about 125,000 cubic yards of gravel being hydraulicked. Although about 100 feet of ground remains to be removed to effect a connection with Stouts Gulch, the company announced that it will not operate the property in 1948. This marks the closing-down of the oldest continuously operated hydraulic mine in the Cariboo.

Devil's Canyon. L. Bedford and K. Huttula are working the Barton lease on the west side of Devil's Canyon under an agreement with the owner. Water under low head is obtained from Hong's ditch. It is reported that about 1,000 cubic yards was hydraulicked.

Laughing Man Placer.† Four leases extending up Coulter Creek and owned by the Julius Powell Estate, J. Chouse, and partners, were under option to Alvo von Alvensleben, who worked the ground during 1947. Two shifts were employed until the clean-up on July 10th, and thereafter two men worked until the end of the season. The hydraulic pit is above the head of a canyon, at a point about 1 mile up-stream from the mouth of Coulter Creek, and is reached by pack-trail along the north side of the creek. The ground, first hydraulicked by Julius Powell and latterly by J. Chouse, is a buried channel of Coulter Creek, lying about 30 feet above and on the north side of the present creek. Bed-rock gravel on the north side of the hydraulic pit is overlain by from 25 to 100 feet or more of boulder-clay. The bed-rock gradient in the pit is about 10 per cent. At its down-stream end the channel is cut by the present valley of Coulter Creek at a point just above the rock canyon. Water, under a head of about 150 feet, is made available by a ditch system which collects the run-off from upper Coulter Creek. The drainage area is small, and very little water is available from mid-July onward.

In 1947 the first clean-up was made on July 10th after sixty-five days of piping. In that time about 25,000 square feet of bed-rock was cleaned, and it is reported that 186 oz. of crude gold was recovered. The average fineness of several shipments of Coulter Creek gold is 900 parts gold and 78 parts silver, with a range of from 894 to 905 parts gold per thousand.

In fifteen seasons' operation, from 1931 to 1946, a production of 905 oz. of crude gold is officially recorded.

Alvo von Alvensleben relinquished his option at the end of the 1947 season.

[References: *Geol. Surv., Canada,* Mem. 149, pp. 141, 142.]

R. D. Rees on Shepherd Creek.—Five holes were drilled to an average depth of 12 feet.

Halverson Leases on Valley Mountain.—In the early part of the season C. H. Pitts took out a small hydraulic pit on the east side of Little Valley Creek. Later a pump was installed at the Bear Lake road crossing of Williams Creek, and a test made of the

* By J. W. Peck, except as noted.
† By Stuart S. Holland.

lower gravel on the nose of Valley Mountain. Operations were abandoned in early August.

Pine Creek Placer Leases.* Four leases on Pine Creek lying up-stream from its junction with Summit Creek are held by J. Doody, of Barkerville. A considerable amount of work and testing has been done in the past on one of the leases formerly owned by J. P. Roddick. In 1947 the leases were under option, and test-work to determine yardage and values for a drag-line dredge operation was being done under the direction of R. H. Wallace for Messrs. Larsen and Harms, of Sacramento. Wallace and a crew of three men were sinking test-holes, using steel caissons in short, telescoping lengths. All gravel excavated was sluiced, and the holes were sunk to a depth of about 25 feet. The first line of three holes was sunk across the valley-bottom about 150 feet up-stream from Roddick's old cabin, near the junction of Shepherd Creek and about half a mile up-stream from the junction of Summit Creek. Work was slow because of the time required for pumping. Four holes between 18 and 30 feet deep were sunk during the year.

M. A. Anderson on Eight Mile Lake.—A shallow cut, 200 feet long, was hydraulicked along the east side of the Thistle pit.

George Dunlop on Two Bit Creek hydraulicked about 3,000 cubic yards.

K. Johansson on McArthur's Gulch.—A small monitor was operated in this pit, which is 2 miles from Wells on the Wells–Barkerville Road.

K. K. Langford on Aura Fina Creek.—Hand-steel work was continued in the rock drive on this property. A monitor was also set up and 3,000 cubic yards sluiced from a pit.

T. Fry on Rouchon Creek.—Hydraulicking was continued on Rouchon Creek by T. Fry and one man.

O. R. Hougen on Hyde Creek.—Hydraulic operations were continued on this lease by P. McColm working alone.

United Mining & Dredging Co., Ltd.—Company office, 308 Randall Building, 535 Georgia Street West, Vancouver. This company holds three special leases on Willow River. During the summer a drilling and testing programme was carried out under the direction of R. J. Collins. A road was built from Rouchon Creek to the property, a distance of 2 miles.

ANTLER CREEK (53° 121° S.E.).

Guyet Placer. Mines Operating, Incorporated (company office, 1052 Stuart Building, Seattle, Wash.), continued to operate this property. Under the direction of A. C. Stewart four men spent most of the season getting the pit ready for hydraulic operation. The former flume had become inefficient for tailings-disposal, and it was necessary to blast a cut at the mouth of the pit so that the flume could be lowered several feet.

John Keiler on Murray Creek hydraulicked about 2,000 cubic yards.

CUNNINGHAM CREEK (52° 121° N.E.).

W. Beamish, with a small hydraulic operation on the Barkerville–Hudson Mine Road, continued to be the only active placer operator in this district.

LIGHTNING CREEK (53° 121° S.W.).

The Interior Development Company (H. D. Hadland, vice-president), employing five men, operated a hydraulic pit on the Bowman Mines leases at the mouth of Amador Creek.

* By Stuart S. Holland.

L. Biggs reported hydraulicking about 5,000 cubic yards at Slades Placer on Mosquito Creek.

Rottacker Placers.*

Three leases, extending up Donovan Creek from its mouth, formerly owned and worked by Magnus Sundberg, are now held by M. Rottacker. The leases are reached by a road which turns off from the Quesnel–Wells Highway about 3 miles east of Beaver Pass. In 1946, when the leases were acquired, the Rottacker brothers spent the season in building a new storage-dam on Donovan Creek and in putting the flumes and ditch-line from Anderson Creek into workable condition preparatory to hydraulicking in 1947.

A hydraulic pit several hundred feet long, taken out by Donovan Creek Placers, along a deeply buried channel on the north-east side of Donovan Creek, was abandoned because of low gold values. The ground was subsequently acquired by Magnus Sundberg, who, in 1927, made the discovery of a second, and separate, gold-bearing channel some 30 feet higher than the one worked by the earlier operators and joining it on the left or south-west side. Sundberg hydraulicked this channel up-stream for a distance of about 900 feet south-eastward, to a point where it crosses a band of blocky grey crystalline limestone. At this place the bed-rock gradient increased abruptly, and the channel-width narrowed from about 100 feet to about 15 feet. Correspondingly, the gold values in the bed-rock gravel decreased rapidly. At the upper end of the workings, on the Sundberg channel, it is claimed that the bed-rock suddenly dropped below sluice-box grade. This and the decline in gold values suggest the possibility that the deeper Donovan Creek channel may at this point have intersected the higher Sundberg channel.

In 1947 the Rottacker brothers spent the first part of the season taking out several pits, mainly along the south-west (left) side of the Sundberg channel, where it was reported that Sundberg had left gold-bearing gravel on bed-rock only slightly above the channel-bottom. The amount of gold recovered was small. At the end of the season preparations were being made for starting work in 1948 in an attempt to trace the Sundberg channel beyond the head of the present hydraulic pit.

The average fineness of about 550 oz. of Donovan Creek gold is 907 parts gold per thousand, with a range of 904 to 915. A total of 1,960 oz. of crude gold was produced during seventeen years of operations, from 1925 to 1941.

Of geologic interest is the fact that just below the band of limestone, near the head of the hydraulic workings, a fault-zone consisting of 1 to 2 feet of gouge and broken rock striking north 5 degrees west and dipping steeply eastward crosses the creek and is exposed on bed-rock uncovered during 1947.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1927, p. 168; 1931, p. 85.]

Lightning Creek Gold Alluvials, Ltd.

(53° 121° S.W.) Company office, Suite 414–424, Pacific Building, Vancouver; season office, Wingdam. This company holds about 25 miles of special placer leases which extend up-stream on Lightning Creek from Meadow Creek to the mouth of Anderson Creek. J. L. Sigman was in charge of operations. Geophysical Prospecting Company, Limited, of London, Eng., continued, from May to September, the geophysical survey begun in August, 1946. The primary object of the survey was to determine bed-rock profiles at various sections across the valley to form a basis for subsequent drilling and testing. Most of the work was done in the Wingdam-Beaver Pass area in order to locate bed-rock benches of the Sanderson type. A short time was spent farther east in order to trace the course of a deep lead, but this work was not completed. In the Wingdam-Beaver Pass area the rough topography and the changing ground conditions set a limit to the application of resistivity methods and complicated the interpretation of results. Six holes drilled to depths of from 109 feet to 236 feet to check results showed that as a rule the bed-rock was about 20 per cent. deeper than indicated by the geophysical survey.

* By Stuart S. Holland.

The geophysical work was done under the supervision of Philip D. Brown and Jack Robertshaw. The drillers were Walter Bauer and " Slim " MacDonald, of Wells.

On the western end of the leases, starting about half a mile up-stream from the junction of Lightning Creek with the Cottonwood River and extending up the creek to a point near the foot of Mexican Hill, test-holes and shafts in six lines, 500 to 2,000 feet long and about 1,200 feet apart, were laid out at right angles to the creek. Along these lines 217 feet of shaft-sinking and 395 feet of drilling were done. The shafts averaged 9 feet in depth and the drill-holes 16 feet. The shafts were dug using 4½- to 5-foot diameter steel caissons which fitted one inside the other, and which allowed the testing to be done safely and efficiently. Fine gold is contained in post-glacial stream gravel, which extends to depths of about 11 feet and lies above compact grey boulder-clay. In the shallow loose bouldery gravel it was found that the values obtained from 6-inch drill-holes (7½-inch cutting shoe) are consistently lower than those obtained from shaft-sinking. This work was done to determine yardages and values which would warrant the use of a drag-line dredge operation.

Cottonwood River Area (53° 122°).

Swift River Dredging Co., Ltd. This company, which holds special leases on the Cottonwood and Swift Rivers, operated the only large-scale drag-line dredge in the Cariboo in 1947. Dredging started in April, and digging was continued up-stream on Swift River in a strip along the river-bottom parallel to the strip dug in 1946. The washing plant was enclosed, and at the end of December the dredge was still in operation, having been moved up-stream in the river-bed about a mile above the junction with Lightning Creek. Under a three-shift operation, with fourteen men employed, about 2,000 cubic yards per day was handled. J. V. Rice was in charge.

Quebec Gold Mining Corp. This company holds special leases on the Swift, Little Swift, and Reddish Rivers. Seven holes, totalling 260 feet, were put down by aeroplane drill at the mouth of Fontaine Creek. Quebec Gold Mining Corporation carried out a testing programme throughout the winter on leases on Sovereign Creek acquired from D. D. Fraser, of Quesnel. Over 300 feet of drilling was done.

Inland Dredging Co., Ltd.—This company continued to operate a small drag-line dredge on Cottonwood River, at the mouth of Umity Creek, on leases owned by Umity Valley Gold Mines, Limited. Many difficulties were encountered in operation, and not much ground was moved.

Quesnel River Area.

North American Gold Fields, Ltd. (52° 122° N.E.) Company office, 513 Royal Bank Building, Vancouver. G. A. Collins, president. Capital: 2,000,000 shares, 50 cents par value. The company holds two special leases on the Quesnel River—one covers French Flats and the other Drummond Flat, about 24 miles and 34 miles by road respectively from Quesnel. Drag-line dredge equipment that was moved to French Flats in the autumn of 1946 was not reassembled there, but was sold. Some testing was done in 1947 under the direction of S. Hancock.

Beavermouth Dredging Co., Ltd. (52° 122° N.E.) Company office, 902 Rogers Building, Vancouver. In the autumn of 1946 this company operated a drag-line dredge on the Collins Pacific Company's special lease at Beavermouth, on the Quesnel River, about 30 miles from Quesnel. Work was discontinued there and no dredging was done in 1947. The equipment was dismantled and moved to a site on the Cottonwood River down-stream from Umity Creek.

Priority Mine.* (52° 121° N.W.) Two leases on Morehead Creek lying up-stream from the mouth of Little Lake Creek, are held by Priority Mines, Limited. They may be reached by a short side-road that branches from the main road to Likely near the dam at the outlet of Morehead Lake.

Ray F. Sharpe, formerly manager of the Bullion mine, was instrumental in starting work on the property. Early in the summer an examination of the property was made by Victor Dolmage, and on his recommendation Keystone drilling was begun in September. The hydraulic pit on Morehead Creek exposes what is believed to be a filled bed-rock channel, crossing the creek in a south-westerly direction. An indication of the values in the channel has been obtained from the gold recovered in hydraulicking and also from test-holes that were sunk to bed-rock, 38 feet below the bottom of the pit. The drilling programme was directed toward confirming the gold values in the bed-rock gravel of the channel fill, tracing the channel away from Morehead Creek, and to finding the bed-rock gradient and direction of flow of the channel. C. R. Cox was in charge of the drilling.

[References: *Geol. Surv., Canada,* Sum. Rept., 1932, Pt. A I, pp. 97–101. *Minister of Mines, B.C.,* Ann Rept., 1938, pp. C 44–C 46.]

Prospectors Syndicate.* (52° 121° N.W.) Prospectors Syndicate, of which J. McWalter, 1122 Northern Life Tower, Seattle, is trustee, did work on a bench lease held by H. H. Forster, of Quesnel Forks. The location-line of the lease extends half a mile south-easterly from a point 400 feet south-west of the bridge crossing the Quesnel River at Quesnel Forks.

Gold occurs at depths of 2 to 4 feet in surface gravels of post-glacial origin. Some early work was done by Chinese, using water from Whitmarsh Creek, and their diggings are scattered over the surface and along the outer rim of the bench. A considerable number of shallow pits sunk by Forster are claimed to have indicated about 200,000 cubic yards of gravel, averaging about 75 cents per yard.

It was proposed to work this ground by bulldozing the gravel onto a movable steel-rail grizzly and sluicing the undersize from the grizzly with water pumped from the Quesnel River, some 110 feet below. A trial run was made, but work was soon stopped because the small pumping capacity restricted the amount of gravel that could be sluiced. Later the intention was to convey the early-spring run-off water of Whitmarsh Creek onto the bench for use in sluicing.

Richmond Hill Mining Co., Ltd. (52° 121° N.E.) The Richmond Hill Mining Company, Limited, of which J. J. Hill is manager, holds nine placer leases lying along Spanish Creek, between Spanish Lake and the mouth of Black Bear Creek, and four leases on the south side of Cariboo River (North Fork of Quesnel River), below the mouth of Spanish Creek. The latter were held and worked by St. Eugene Mining Corporation, Limited, in 1944.

The bench worked during 1947 lies about 100 feet above the Cariboo River, between the head of the Ruby pit and the mouth of Spanish Creek. The Keithley road crosses the bench and runs along its outer margin. From 15 to 20 feet of post-glacial gravel, lying on glacial silt, was hydraulicked with water obtained from Spanish Creek. A trial hydraulic pit, about 100 feet square and 20 feet deep, was taken out in early summer. Four to six men were employed.

Cariboo Metals, Ltd. (52° 121° N.E.) This company, under the direction of Alvo von Alvensleben, continued test-work on its leases on the hill above Cedar Creek. The claims were the scene of the Cedar Creek rush of 1921, and have yielded gold valued at more than $600,000. In July an aeroplane drill was brought in and test-holes were drilled by Herb Brown to the south-east of the abandoned workings.

* By Stuart S. Holland.

Keithley Creek Area (52° 121° N.E.).

McGregor, Goldsmith, and Dunham.—These partners have leases that lie between Donaldson and Honest John Creeks. They are investigating a channel on the south bank of Keithley Creek that appears to lie parallel to the creek. During the previous two or three years a pit 400 feet long, 100 feet wide, and 50 feet to 20 feet deep had been sluiced out by means of a boom-dam. During 1947 the pit was worked up to the dam, and it became necessary to dig a ditch 1,500 feet long connecting with Keithley Creek to ensure a good supply of water. A new trail was also built to the property.

H. Asserlind and V. Johnson.—These partners continued their drifting on the north bank of Keithley Creek, between Four Mile Creek and Weaver Creek. In the adit, between 40 feet and 132 feet from the portal, it appeared that an old bed-rock channel was being crosscut. At 132 feet what was thought to be the north rim was broken through, and in December, at 160 feet, the drift was still in gravel, with the grade descending. Thus it is possible that a second channel has been found.

J. Chester continued sluicing on Four Mile Creek.

R. W. Youngash was sluicing near the mouth of Little Snowshoe Creek.

Fournier and Payne were sluicing on Keithley Creek.

R. Rawn was drifting during the winter on Harvey Creek.

O. Hargen was drifting on Harvey Creek.

Barney Boe on Nigger (Pine) Creek.—By means of a monitor and boom-dam a pit with banks over 300 feet high has been hydraulicked out over the past years. The working-site is now about half a mile up the creek from Cariboo Lake. About five men were employed during the season. In the latter part of the year a tunnel was driven through the upper banks of the pit to aid the spring waters in moving the overburden. The camp is 5 miles by boat up Cariboo Lake from Keithley Creek.

Cariboo Keithley Gold Placers, Limited.—This company operated a small hydraulic pit on its property on Snowshoe Creek. A ditch was dug to catch hillside run-off water, and a 10-inch pipe-line to the pit gives a 215-foot head. The gravel in the pit is cemented, and a 2-inch cutting-nozzle had to be used. The pit was just opened up when lack of water forced shut-down on August 1st. K. Monckton was in charge, with two men employed.

W. C. Hasbrouck.—Since starting work in 1936, Hasbrouck has advanced a hydraulic pit about 900 feet westerly up a small tributary at the head of Barr Creek, and has run out of pay-gravel. The fineness of one small shipment of gold was 905 parts gold and 81 parts silver per thousand. Blocky fractured diorite, intrusive into schists, possibly in sill-like form, is exposed for 250 feet along the upper part of the hydraulic pit.

Horsefly River Area.*

Bentibo Mine. (52° 121° S.E.) A special placer lease on the Horsefly River is owned by A. E. Horne. It is about 20 miles by road from Horsefly Village, and extends down Horsefly River from the falls to half a mile above the mouth of McKinley Creek. In 1946 a small hydraulic plant was installed. Water for hydraulicking was diverted from the river above the falls and brought into the pit through a 2-foot box flume and ditch, to reach a No. 2 monitor under about 85-foot head.

In 1947 a very small pit was opened up on bed-rock about 15 feet above river-level, on the north side of the river a short distance below the falls. Bed-rock is covered with 15 to 20 feet of coarse, heavy gravel, 1 foot of brown silt, 6 to 12 inches of lignitized wood with 10 to 15 feet of grey glacial gravel at the top. The pit uncovered

* By Stuart S. Holland.

a narrow bed-rock gutter running northward into the bank. Farther northward the gravel bank increases in height to about 150 feet.

By June a small hydraulic pit had been taken out, but only a very small amount of gold was recovered. No previous test-work had been done, so no information as to values is available. The scarcity of old placer workings in the vicinity and the absence of rich bar diggings along the river suggest that no rich gold-bearing channel has been cut by Horsefly River along this section, but does not disprove the belief advanced by Lay that a channel might lie in the bank some distance to the north.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1946, p. 201; 1931, pp. 96–101.]

Operations of P. H. V. Fosberry. P. H. V. Fosberry, of Kelowna, holds one placer lease, No. 3517, which lies immediately west of Leases 3354 and 2885, held by M. and A. Carfrae, and covering the old Ward Horsefly mine at Horsefly Village. Fosberry drove a drift in a north-westerly direction for about 143 feet at a minus 10-per-cent. grade from the western edge of the old pit of Ward's Horsefly mine. The drift was directed toward a drill-hole, 45 feet deep, about midway between the Horsefly mine and the Soda Creek shaft. At the face of the drift a 20-foot winze was sunk to bed-rock, which is there overlain by only from 2 to 8 inches of pebbly gravel, with boulder-clay above. The pebbles in the gravel are principally of white quartz; gold values are reported to be very low.

In June an unsuccessful attempt was made to unwater the Soda Creek shaft sunk in 1871. The shaft is 78 feet deep and is about 500 feet to the north-west of the drift. The shaft was unwatered in 1936, and some exploratory drifting was done. It is said that a drift driven southward from the bottom of the shaft in 1936 rises at about a 5-degree grade, but one to the east rises at a much easier gradient. It is claimed that, when work was discontinued, bed-rock gravel in the face ran $8 per yard. It was Fosberry's intention to unwater the shaft to check these statements, but his helper suffered a fatal accident and the work was not completed.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1920, pp. 100–105; 1938, pp. C 24–C 27.]

LILLOOET.*

Little work was done on placer-ground, and very little placer gold was produced in the Lillooet Mining Division in 1947.

Lillooet (50° 121° N.W.).

G. Powell Leases. These leases are on the Fraser River and 4 miles by narrow road above the confluence with the Bridge River. Early in the year Mr. Powell started a pump hydraulic operation on the west bank of the river, just opposite Fountain Station on the Pacific Great Eastern Railway. Owing to the large boulders encountered, and difficulties resulting from sudden drops in river-level, this method was soon abandoned. Bulldozing the gravel onto a grizzly, from an elevation some 50 feet higher, was then attempted, but this method was also abandoned owing to the fact that overhanging banks endangered the operator of the bulldozer. It is now proposed to use a winch and drag-line. No further work is being done until this equipment arrives.

Lytton (50° 121° S.W.).

Lytton Bar Co., Ltd.—This company, which in 1946 operated a shovel and washing plant on a Fraser River gravel-bar just north of the junction with the Thompson River, did no work in 1947.

* By J. W. Peck.

SIMILKAMEEN.

Similkameen River (49° 120° S.W.).

Atkinson Dredging Co., Ltd.* Registered office, 902 Rogers Building, Vancouver. S. K. Atkinson, president; S. K. Atkinson, Jr., superintendent. This company started dredging operations on the Similkameen River on November 7th, at a point approximately 1 mile south-west of Princeton and near the Granby Consolidated Mining, Smelting, and Power Company's steam-electric power plant. Before production commenced, it was necessary to dig a canal to ensure adequate clean water for the Granby Company's plant.

The equipment in use includes a diesel-driven Bodinson-type dredge, having a rated capacity of 5,000 cubic yards in twenty-four hours, and a Lima 3½-cubic-yard drag-line shovel. An Ainlay centrifugal separator is used, and refining is done at the company's retort-house at their camp on the Similkameen River. Other equipment includes a bulldozer and three trucks. Since starting, operations have been on a three-shift basis, employing a total of twenty men.

Tulameen River (49° 120° N.W.).

Big Jim Gold Mines, Ltd. (Eagle Creek Placer).† W. L. Newman, president; T. Clark, superintendent. The company has three leases on the Tulameen River, extending down-stream from the mouth of Eagle Creek, about 8 miles up-river from Tulameen Village. On these leases, known as Sootheran leases, from time to time small but spectacularly rich platinum discoveries have been made. The ground being worked is a bench on the north-west side of Tulameen River, about half a mile down-stream from the mouth of Eagle Creek. Bed-rock on the bench lies about 35 feet above the river and is overlain by 25 feet and more of terraced gravel. The bench, one of many such along this section of Tulameen River, extends up-stream for 400 to 500 feet above the hydraulic pit. In the past, shallow gravels on bed-rock on the outer edges of the benches have been worked by hand until the height of gravel became too great for profitable working.

In 1946 water from Eagle Creek was brought onto the ground by 1½ miles of 30-inch box flume and about 750 feet of hydraulic pipe. A No. 4 monitor with a 5-inch nozzle used the full flow, which was delivered under a head of 120 feet.

Hydraulicking was begun early in 1947, and a small pit was taken out. Tailings are dumped directly into the Tulameen River.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1926, p. 229.]

Prebble Leases.† Three leases are held by Robert H. Prebble, of Tulameen, on the Tulameen River, about 2½ miles up-stream from Tulameen Village. The leases cover low gravel benches along the river down-stream from the mouth of Britton (Slate) Creek. In 1947 the Prebble brothers worked on the bank side of a bench on the north side of Tulameen River. The location is near the site of the Keystone hole H-5 which was drilled by the Munitions Resources Commission in 1918.‡

The gold content reported, between 20- and 30-foot depth in this hole, is equivalent to $1.06 per yard with gold at $35 per ounce.

A low bench 10 feet above the river is flanked on the inner side by another bench rising gently to the north. Some old shallow placer diggings are along the edge of this bench. In 1946 the Prebbles sank a 16-foot test-hole, from which they report values

* By E. R. Hughes.
† By Stuart S. Holland.
‡ *See* Final Report, Munitions Resources Commission, 1920, map following p. 152.

of 87 cents per cubic yard in gold and platinum. This, together with the values obtained in the Munitions Commission drill-hole, encouraged them to continue. In June, 1947, they were proposing to install a slack-line drag-line shovel which would cast onto a shed-grizzly, the oversize to be carried away and dumped by a tailings-bucket, and the undersize to be trucked to the edge of the Tulameen River, where it would be sluiced.

[Reference: *Munitions Resources Commission*, Final Rept., 1920, pp. 147–154.]

STRUCTURAL MATERIALS AND INDUSTRIAL MINERALS.

By J. M. Cummings.

(Data supplied by Inspectors of Mines *re* operating quarries are incorporated in the following notes.)

CONTENTS.

INTRODUCTION.

This section comprises notes on properties and operations producing structural materials and industrial minerals, as well as brief descriptions of some of the more important undeveloped deposits of the Province. The subject is subdivided under headings indicating the mineral or material in question.

Statistics regarding production of structural material and industrial minerals are given in the following tables:—

Table I, page 13, sub-headings " Non-metallics " and " Clay Products and other Structural Materials."

Table X, page 24, " Production in Detail of Structural Materials."

Table XI, page 25, " Production in Detail of Miscellaneous Metals, Minerals, and Materials."

During 1947 a new limestone producer and three new brick plants commenced operations, and construction was started or production definitely planned for two additional brick plants and one new limestone quarry. Major alteration and expansion programmes were undertaken by two manufacturers of clay products and by one limestone producer.

Keen interest is being displayed in other industrial mineral occurrences in the Province owing to new and increased markets created by greater manufacturing and construction activity during the last few years. Serious attention is being paid to the possibilities of producing mineral wool, glass, whiteware, soda products, diatomite, synthetic granules, feldspar, silica, talc, and monumental stone, and it is expected that present investigations will result in at least one of these materials being produced on a large scale in British Columbia in 1948.

BARITE.

Barite occurs at several places in British Columbia, either alone or associated with metallic minerals, but is produced at present only from deposits near Parson (51° 116° S.W.) and Brisco (50° 116° N.E.) in East Kootenay District. Several other occurrences are known in this area, notably at the Giant (50° 116° N.E.),* 7 miles from Spillimacheen, and at the Bunyan† and Mineral King,‡ properties in the Invermere area. Barite is a major gangue mineral in the Homestake (51° 117° S.W.)§ near Adams Lake and in the Twin J Mine (48° 123° N.W.)‖ at Mount Sicker on Vancouver Island, and is an important gangue constituent in the Toric¶ and Dolly Varden¶ properties (55° 129° N.W.) in the Alice Arm section. Test-work by the Ore Dressing and Metallurgical Division, Department of Mines and Resources, Ottawa, and by the former British Columbia War Metals Research Board, University of British Columbia, Vancouver, has indicated the possibility of recovering by-product barite of marketable grade in conjunction with recovery of metallic minerals from the Giant,** Homestake,†† and Twin J ores.

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* *Minister of Mines, B.C.*, Ann. Rept., 1920, p. 109; 1923, p. 196; 1927, p. 263; 1929, p. 290; 1930, p. 232. *Geol. Surv., Canada*, Sum. Rept., 1925, Pt. A., p. 288; 1926, Pt. A., p. 255; 1932, pt. A II, pp. 173–175. *Mines Branch, Dept. of Mines, Canada*, Pub. No. 570, p. 22.

† *Minister of Mines, B.C.*, Ann. Rept., 1915, p. 100; 1920, p. 112; 1921, p. 125. *Geol. Surv., Canada*, Mem. 148, p. 51. *Mines Branch, Dept. of Mines, Canada*, Pub. No. 570, p. 23.

‡ *Minister of Mines, B.C.*, Ann. Rept., 1915, p. 90. *Geol. Surv., Canada*, Mem. 148, p. 49. *Mines Branch, Dept. of Mines, Canada*, Pub. No. 570, p. 23.

§ *Minister of Mines, B.C.*, Ann. Rept., 1922, p. 147; 1924, p. 154; 1926, pp. 185, 186; 1927, pp. 201, 203; 1929, p. 218.

‖ *Minister of Mines, B.C.*, Ann. Rept., 1942, p. 70; 1943, p. 69; 1944, p. 67.

¶ *Geol. Surv., Canada*, Mem. 175, pp. 42, 83.

** *Mines Branch, Dept. of Mines, Canada*, Pub. No. 720, p. 155.

†† *Mines Branch, Dept. of Mines, Canada*, Pub. No. 711, pp. 69, 74.

Mountain Minerals, Ltd. Company office, Morris Building, P.O. Box 273, Lethbridge, Alta.; mine office, Parson. Ralph A. Thrall, managing director. This company operates a barite deposit 6 miles from Parson (51° 116° S.W.) and another about 2½ miles from Brisco (50° 116° N.E.), both points being stations on the Kootenay Central branch of the Canadian Pacific Railway.

The Parson deposit is a steeply dipping vein from 5 to 20 feet wide containing crystalline barite of good purity and colour. During 1947 barite amounting to approximately 2,300 tons was shipped, largely to Montreal for processing and reshipment to the United Kingdom for use in paint-manufacture and in other industries. English orders were curtailed in July owing to the exchange situation, and 500 tons of barite was quarried and stock-piled at Parson.

The Brisco deposit contains material of relatively high specific gravity, but, under present conditions, discoloration prevents its use where whiteness is of importance, as for instance in the paint industry. In 1947 about 550 tons was quarried and shipped to the company's plant at Summit Lake, Alta., for grinding and subsequent use in rotary-drilling muds.

CEMENT.

British Columbia Cement Co., Ltd. Company office, corner of Fort and Wharf Streets, Victoria; plant office, Bamberton. N. A. Tomlin, managing director; C. S. Williams, general superintendent. This company produces Portland cement by the wet process in a three-kiln plant at Bamberton (48° 123° N.W.) on Tod Inlet, about 14 miles north-west of Victoria. The main raw materials used are limestone and dyke-rock from Bamberton and limestone from Texada Island (*see* descriptions of these quarries under "Limestone").

Plans for the erection of a cement plant at Deep Bay to utilize materials from Horne Lake on Vancouver Island have been announced by the company. The raw materials are being tested and methods for their handling and treatment are being investigated.

CLAY AND SHALE.

Deposits of surface clays* suitable for the manufacture of common red-burning structural products are of widespread occurrence in British Columbia. In 1947 clay of this nature was used by operators at Victoria, Sidney, Port Haney, Port Moody, Surrey, and Grand Forks for the production of brick, structural tile, drain-tile, and flue-lining. In the past, common brick, and in a few cases other structural products, have been made from surface clays at the following additional points: Terrace, Smithers, Prince George, Quesnel, Kamloops, Kelowna, Enderby, Okanagan Landing, Vernon, Cranbrook, Kimberley, Windermere, Nelson, Castlegar, Princeton, Anvil Island, Sidney Island, Cloverdale, Sullivan, Ruskin, and New Westminster. Flower-pots and art pottery are made from similar red-burning material in Vancouver, Victoria, and near Vernon. During 1947 construction was started on a brick plant to utilize clay from a surface deposit 13 miles north of Falkland.

Undeveloped clays suitable for the manufacture of common brick, and in some cases for other red-burning ware, are known on Graham Island, Porcher Island, near Prince Rupert, Vanderhoof, near Alexandria, near Revelstoke, Canford, Fort Steele, Creston, Gulliford, and at several points in the Fraser River delta.

At the present time Cretaceous shale† is utilized at a brick plant on Gabriola Island, and another at Hillbank, near Duncan, on Vancouver Island. In the past similar shale

* *Minister of Mines, B.C.*, Ann. Rept., 1908, pp. 180–188. *Geol. Surv., Canada*, Mem. 24, pp. 115–150; Mem. 25, pp. 67–82, 97; Mem. 47, pp. 7, 8, 36–66; Mem. 65, pp. 1–78.

† *Minister of Mines, B.C., Ann. Rept., 1908, pp. 25, 180–188. Geol. Surv., Canada*, Mem. 24, pp. 125, 144–150; Mem. 25, pp. 77–82; Mem. 47, p. 58; Mem. 65, pp. 3, 9, 40, 42.

has been used for brick-manufacture on Mayne Island, Pender Island, and at Nanaimo and Union Bay.

In general the best-quality clays and shales yet found in British Columbia are in Tertiary formations. Shales of this age suitable for the manufacture of excellent face-brick and other structural products occur at several points in the Fraser Delta area, notably on Sumas Mountain* near Kilgard and Abbotsford, on Blue Mountain† near Whonnock, and at Barnet near Port Moody. Fireclay also occurs on Sumas Mountain* and Blue Mountain.† An extensive deposit of china-clay is situated on the Fraser River about 19 miles north of Prince George, and cream-burning earthenware clays are found on the Fraser River 8 miles north of Quesnel and on the Canadian National Railway 19 miles west of Prince George. Bentonite occurs in the Princeton,‡ Merritt,‡ and Prince George areas. The only Tertiary shales worked in 1947 were those on Sumas Mountain, but construction was begun on a plant to use Tertiary shale at Kask's Corner, near Barnet, a few miles from New Westminster.

The following manufacturers produced clay products in 1947:—

Abbotsford Fire and Pressed Brick Co.—Abbotsford (49° 122° S.E.). F. L. Connon, manager. This company began producing dry-pressed building-brick in 1946 from Tertiary shale quarried at the west end of Sumas Mountain, about a mile from the works. Brick was burned in three coal-fired up-draft kilns. The operation was closed down in June, 1947, to permit extensive alterations to be made, notably the conversion of the kilns to the down-draft type, in which better control and higher temperatures can be attained.

B.C. Clay Products, Ltd.—Vancouver (49° 123° S.E.). Office and works, 3439 Euclid Avenue, Vancouver. P. A. Seidel, manager. Flower-pots are produced from local clay.

Baker Brick and Tile Co.—Victoria (48° 123° S.E.). Office and works, Victoria. J. V. Johnson, manager. Local surface clay is formed by stiff-mud extrusion and fired in three round down-draft kilns using wood fuel. The chief products made are building-tile, interlocking tile, drain-tile, and flower-pots.

Bazan Bay Brick and Tile Co.—Saanichton (48° 123° N.E.). Works at Saanichton. F. J. Eves, manager. Common brick and drain-tile are made from local surface clay by the stiff-mud process and burned in an oil-fired round down-draft kiln.

Bear Creek Brick Co.—Surrey (49° 122° S.W.). Office, Victoria Brick and Tile Supply Company, Vancouver. J. A. Wickson, manager. Works on Archibald Road in Surrey district. Common brick are produced from local surface clay. They are formed by the soft-mud process and are fired in wood-fired temporary scove kilns. This plant was operated for the first time in 1947.

Burrard Brick Co.—Pleasantside (49° 122° S.W.). Mr. Hutchison, manager. Common brick are made from surface clay and fired in temporary scove kilns using wood fuel.

Clayburn Co., Ltd.—Kilgard (49° 122° S.E.). Company office, Credit Foncier Building, Vancouver; works, Kilgard. R. M. Hungerford, managing director; R. Ball, superintendent. This company operates a large plant at Kilgard, in which a variety of products are made, including standard firebrick and special shapes, vitrified sewer-pipe, face-brick, and flue-lining. Stiff-mud and dry-press methods are used for standard products, and hand-moulding is employed for certain special shapes. Sewer-pipe is formed in a modern hydraulic machine, one of the first of its kind on the Pacific Coast. Firing equipment includes an eighteen-chamber semi-continuous kiln, three large rectangular down-draft kilns, and seven

* *Minister of Mines, B.C.*, Ann. Rept., 1921, pp. 9, 28, 29, 270. *Geol. Surv., Canada*, Mem. 24, pp. 126–138; Mem. 25, pp. 76, 77; Mem. 47, pp. 8, 65.

† *Geol. Surv., Canada*, Mem. 65, pp. 2–15.

‡ *Mines Branch, Dept. of Mines, Canada*, Pub. No. 726, pp. 7–10, 15.

round down-draft kilns, one of which was erected in 1947. During the past year all kilns were coal-fired, but the semi-continuous kiln is being converted to oil.

The plant is undergoing a major expansion programme, involving increased storage, handling, and drying capacity, new laboratory and plant-control facilities, and new equipment to permit the manufacture of a complete line of dry-press refractories. Considerable experimental work is being directed toward the production of fireclay bricks and shapes in higher-heat duty classifications.

The various products of the company are made from shale members of the Huntington formation, which composes Sumas Mountain, adjacent to and north of the plant. The series dips gently to the west and south-west and comprises interbedded shale, sandstone, and conglomerate, with a stratigraphic thickness of more than 1,200 feet. Nine shale-seams have been worked at one time or another in the past, but at present only four are mined—one by quarrying and three by underground methods.

The portal of the lowest working, the Fireclay mine, is 3,000 feet north-east of and 100 feet higher than the plant, at an elevation of 200 feet. Clay is mined by room-and-pillar method, the average thickness of the seam worked being 12 to 15 feet. The workings extend into the mountain about half a mile at the farthest point and cover an area of nearly 38 acres. During 1947, 24,686 tons of fireclay was mined, most of which was used for the manufacture of refractories.

The entrance to No. 4B mine (elevation 306 feet) lies 500 feet from that of the Fireclay workings, on a bearing of north 25 degrees west. The portal of No. 9 mine (elevation 530 feet) is a further 1,500 feet from that of No. 4B on a bearing of north 75 degrees west. The approximate area covered by No. 4B workings is 26 acres, and by No. 9 workings is 5 acres. Room-and-pillar methods are used in both mines, 5,585 tons being mined in 1947 from No. 4B and 5,215 tons from No. 9. Clay from both mines is used for the manufacture of products other than refractories.

Shale for production of red face-brick is obtained from a quarry (elevation 600 feet) on the road to Straiton, about 3 miles in a northerly direction from the plant. During 1947, 3,843 tons of shale was obtained from this source.

Clay is transported by truck from the mines to the plant. In 1948 the company plans to mechanize underground mining methods by the installation of a 75-horse-power air-compressor, three three-drum slusher hoists, rotary air-drills, and pneumatic picks. The installation of slusher equipment will permit better segregation and control of clay quality than has been formerly possible. During the past year the use of tungsten carbide-tipped rotary drills met with considerable success. A bulldozer was also used for the first time to strip overburden from the steep hillside at the quarry, and a system of moving broken shale from quarry-floor to truck by bulldozer was initiated.

About 150 men were employed during 1947, of whom an average of 20 men were engaged in mining. Present capacity is in the order of 36,000 tons of fired ware per annum, most of which is marketed in British Columbia, Alberta, Washington, and Oregon.

Cowichan Metallic Brick Co.—Hillbank (48° 123° N.W.). Mr. Lupton, manager. Cretaceous shale on the Koksilah River is used to manufacture dry-press brick which is fired in temporary scove kilns. Production was begun late in 1947.

Fairey & Co.—Vancouver (49° 123° S.E.). L. T. Fairey, manager. This company produces a variety of fireclay shapes and specialties. Insulating-firebrick are also made. Both local and imported materials are used.

Gabriola Shale Products, Ltd.—Gabriola Island (49° 123° S.W.). Company office, Evans, Coleman & Evans, Vancouver; works, Gabriola Island. F. A. Higgs, manager. Cretaceous shale is quarried and made into bricks by the dry-press method. A coal-fired semi-continuous chamber kiln of the Hoffman type is used for firing the brick.

Love's Bricks.—Grand Forks (49° 118° S.E.). Works and office, Grand Forks. T. A. Love, president. This plant went into operation in 1947, making soft-mud brick from clay obtained 3 miles west of Grand Forks. The bricks are fired in temporary scove kilns using oil for fuel.

Pacific Clay Products, Ltd.—Pleasantside (49° 122° S.W.). Works at Pleasantside, near Ioco. Messrs. Bell and Mutter, owners and operators. The Port Moody Brick Company plant was taken over by Messrs. Bell and Mutter and operated in 1947 under the above name. Production consisted largely of red rug-brick made by stiff-mud extrusion and fired in a rectangular down-draft kiln using wood for fuel. Surface clay is obtained from an adjacent pit.

Port Haney Brick Co., Ltd.

Haney (49° 122° S.W.). Company office, 846 Howe Street, Vancouver; works, Haney. E. G. Baynes, president; J. Hadgkiss, manager. This company operates a large plant producing structural tile, drain-tile, and flue-lining. In the past face-brick and common brick have also been made. Highly plastic surface clay is won by power-shovel from a pit about one-third of a mile from the works. The clay is dried and, after mixing with a small proportion of sand, is formed by stiff-mud extrusion. Ware is fired in eight round down-draft kilns, of which six use wood and two use coal for fuel. Year-round employment is afforded for about fifty men, and output of burned hollow-ware is about 22,000 tons per year, mostly marketed in British Columbia.

Richmix Clays, Ltd.

Kilgard (49° 122° S.E.). Works office, 2890 Twelfth Avenue East, Vancouver; mine at Kilgard. G. W. Richmond, manager. Fireclay from the same seam that is worked by the Clayburn Company is mined by Richmix Clays on a property east of and adjoining the Clayburn Company's holdings. During 1947 the weekly output, with three men employed underground, was about 150 tons a week of fireclay, of which a considerable proportion was shipped to the Gladding-McBean refractory plant at Renton, Wash. Some buff-burning shale was also mined from a lower bed for face-brick manufacture in Vancouver.

In addition to the operations described above, art pottery is made on a small scale by A. Ebring, of Vernon, using local red-burning surface clay. Two new pottery enterprises were set up in Vancouver during 1947; i.e., Lambert Potteries and Ravine Potteries.

New Clay-product Plants.

During 1947 construction was commenced on the following new clay-product plants:—

Falkland Brick, Tile, and Pottery Co., Ltd.

Falkland (50° 119° S.W.). Works and office, Falkland. Mr. McClounie, president. Buildings for a brick plant were constructed and necessary equipment installed, including pug-mills, auger machine, and wire-cut machine. When the operation commences, it is planned to fire brick in temporary scove kilns using wood for fuel. Clay will be drawn from surface deposits on the Pillar Lake–Chase Road, about 14 miles north of Falkland.

Mainland Clay Products, Ltd.

Barnet (49° 122° S.W.). Works, near Barnet. Thomas Kinvig, manager. Construction of a clay-products plant to utilize red-firing Tertiary shale from the vicinity of Barnet was begun late in 1947. Both dry-press and stiff-mud extrusion equipment are being installed, and it is planned ultimately to produce common brick, dry-press face-brick, structural tile, flue-liners, drain-tile, and sewer-pipe. Production is planned for the spring of 1948, using temporary scove kilns for initial operation. Wood and coal will be used for fuel. Down-draft kilns will be built later.

UNDEVELOPED CLAY DEPOSITS.

Brief notes follow on several of the more important undeveloped clay deposits examined during 1947:—

Giscome Rapids China-clay Deposit. (54° 122° S.W.). This deposit is situated on Lot 3991, Prince George district, on the west bank of the Fraser River, near the foot of Giscome Rapids. Access is by the Hart Highway to a point about 19 miles north of Prince George and thence by branch road for 2 miles to the river. The last three-quarters of a mile of the branch road was impassable for vehicles in 1947, but could be opened up easily with bulldozer.

In 1942 an area approximately 100 feet square on the river-bank was stripped, a loading platform built, and 20 tons of clay mined and shipped to Vancouver by F. J. Beale, owner of the property. Little development-work has been done, and most exposures are the result of natural agencies.

Holes drilled by hand-auger in 1947 on the stripped area indicate the deposit to be at least 35 feet thick at this point. Exposures occur at intervals for about half a mile along the river, and for about 300 feet west of and 40 feet above the water's edge. Farther to the west and continuing for more than a quarter of a mile is a relatively flat bench 50 to 60 feet higher than the river. The extension of the clay beneath this bench was not established owing to the impossibility of drilling through the pebbly overburden with the equipment at hand. On the basis of the evidence available, the deposit is considered to be of Tertiary age, sedimentary in origin, flat-lying, and to be of extensive proportions.

The following section is a composite of two drill-holes near the loading platform, the upper one starting from a point about 35 feet above river-level:—

0 to 6 inches: White quartzite pebbles.
6 inches to 6 feet: Cream-coloured surface clay containing considerable sand. Iron-stained in places. Becoming blue-grey at bottom. (A.)
6 to 13 feet: Blue-grey, sandy clay. (B.)
13 to 16 feet: Lighter-coloured grey clay, less sandy. (C.)
16 to 17 feet: Very sandy clay containing small pebbles.
17 to 25 feet: Sandy, light blue-grey clay. (D.)
25 to 29 feet: Light bluish-grey clay, fairly free from sand. (E.)
29 to 32 feet: Light brownish clay, relatively free from sand, containing lignitic fragments in places. (F.)
32 to 35 feet: Darker brownish clay, containing a few lignitic fragments and somewhat sandy in places. (G.)

Drill samples were submitted to the Mineral Dressing and Metallurgy Division, Department of Mines and Resources, Ottawa, for testing with the following results: All samples were found to have good plasticity despite the fact that A, B, and D contained from 42 to 55 per cent. sand. Drying behaviour at 85° C. was satisfactory in all cases. Softening-points of unwashed clays ranged from Cone 28 to 29 for D, F, and G, to Cone 30 for A, and Cone 31 for B, C, and E. Washed products from these samples had softening-points from Cone 31 for A to Cone 31½ for D and Cone 32½ for B. Samples B, C, D, and E burn to a good white at Cone 8, and slightly off-white at Cone 12, whereas samples A, F, and G burn to a cream colour in the same firing range. Clays B, C, D, and E (6 to 29 feet) are classed as excellent white open-firing clays of refractory grade, suitable for whitewares (porcelain and pottery) and refractories. Sample A, representing surface material (6 inches to 6 feet), burns to a somewhat darker colour but was considered to have possibilities for the same products. Clays F and G, although burning to a cream colour, are considered to have potential value for use in low-heat duty refractories or mixed with less refractory clay for dense-firing ware. A 4-foot section of brownish clay exposed at the river-bank 400 feet down-stream from the loading platform, and considered to represent a lower horizon than the above materials, was sampled and tested. This clay fired to a dense cream to grey body at Cone 12 (absorption 3.6 per cent.), although its softening-point was Cone 28. It is said to be probably suitable for products requiring body density such as saggars, glasspots, and certain refractories.

Although the clays encountered in the drill-holes range from light grey, through blue-grey, to brown, their surface colour is creamy white wherever exposed, owing to the removal of organic matter by weathering. In the vicinity of the stripped area the weathered zone follows in a general way the contour of the ground and varies from 3 to 6 feet in thickness. In places the surface clay is heavily stained with iron, but otherwise resembles corresponding unweathered material in ceramic properties. The 20-ton lot taken out by Beale represents surface clay corresponding in horizon to parts of B and C, but firing to a darker colour owing to the presence of considerable iron stain deposited by surface waters.

Clay from this deposit has been satisfactorily used by the Mineral Dressing and Metallurgy Division, Department of Mines and Resources, Ottawa, as an ingredient of a slip-cast porcelain body of standard composition, in which Giscome Rapids clay, owing to its plasticity, replaced not only china-clay but ball-clay as well. Washed material from the 20-ton lot has been used satisfactorily by Lambert Potteries, Vancouver, in the formulation of a number of whiteware bodies for throwing as well as casting.

Washing tests on various samples from this deposit, made by the British Columbia War Metals Research Board in 1943, gave recoveries of 23 to 43 per cent. sand analysing over 96 per cent. silica.

Considerable work is required to prove the extent of this deposit and the distribution of the various types of clay present. However, there seems little doubt that high-grade clays are available and that the deposit is large.

Big Bend Earthenware Clay Deposit.

(53° 122° S.W.) A deposit of greyish-white clay occurs close to water-level on Lot 6182, Cariboo District, near the foot of high bluffs on the east bank of the Fraser River at the down-stream end of the so-called "Big Bend," 7 miles north of Quesnel. The deposit is interstratified with other clay and sandstone members of the Tertiary Fraser River series, and is exposed for nearly one-quarter of a mile along the river. It is covered by slide material at each end, has an average thickness of 10 to 12 feet, and dips gently to the south.

A composite sample, taken from three points along the seam, was submitted for testing to the Mineral Dressing and Metallurgy Division, Department of Mines and Resources, Ottawa. The clay, though gritty, was found to have good plasticity and to dry safely at 85° C. It fired to a hard cream body at Cone 02, had a softening-point of Cone 16, and was classified as a stoneware clay suitable for the production of sewer-pipe, flue-linings, etc. A sample, tested locally, was found to work well and to be suitable for the production of pottery of earthenware type.

DIATOMITE.

Diatomite is found at a number of places in British Columbia, either in massive beds of Tertiary age or in relatively small surface deposits of Recent age. The latter deposits usually are in, or close to, swamps or lakes and commonly contain some vegetable matter mixed with the diatoms.

Tertiary deposits occur typically in the Cariboo District in the neighbourhood of Quesnel (52° 122° N.E.) and Australian (52° 122° N.E.), where they take the form of faulted and eroded remnants interbedded with other sediments of the Fraser River formation. In general the diatomite is creamy-white compact material, composed essentially of small cylindrical diatoms (Melosira granulata), and containing a small but variable proportion of clay. These deposits are the largest known in Canada, but only a few have been worked, and these sporadically.

The Quesnel deposits have been described in detail by V. L. Eardley-Wilmot.* The largest lies on the west side of the Fraser River at the "Big Bend," about 8 miles north of Quesnel, and consists of a series of large disconnected masses of diatomite, up to 40 feet thick, distributed along the top of the bank for about a mile. Other smaller deposits occur on Lot 1122, 3 miles north of Quesnel, and on Lot 906, 2 miles south-west of Quesnel. Diatomite-occurrences are also known on Lots 6182, 5017, 1120, and 385 in the vicinity of Quesnel, on the Blackwater River near the south-east corner of Lot 1469, on the Clisbako River near its junction with the Nazko River, near Tsacha Lake, and on the Canadian National Railway 13 miles west of Prince George.

Diatomite has been found at many places west of the Fraser River as far south as Lot 304 near Alexandria Ferry, north on Lot 3898 opposite Australian Station, and west to Narcosli Creek (Lots 6150 and 6151). However, the largest deposits on which information is available are found on Lots 8013, 8016, 1617, 8017, 8010 (Block A), 8011, and 1616, the property of P. G. Lepetich and family.

Lepetich Diatomite Deposits.

(52° 122° N.E.) The deposits on the Lepetich property occur on a series of broad, irregular, sloping benches, ranging from 600 to 1,000 feet above and one-half to 2 miles west of the Fraser River. The occurrence on which the most information is available lies at an altitude of about 2,300 feet, on Lot 8015, on a broad bench. Close to the south boundary of the lot and about 20 feet above the base of the side-hill is an open-cut from which 70 tons of diatomite was mined about ten years ago. The thickness at this point is more than 26 feet. Hand-drilling has indicated an area extending 500 feet northerly along the side-hill and 200 feet westerly, which is probably underlain by diatomite with an average thickness of more than 10 feet. Neither the southern nor northern limits of the deposit were established.

A typical section exposed in the cut and by drilling follows:—

	SiO_2.	Al_2O_3.	Fe_2O_3.
6"—Soil	....	....	......
6'—Light creamy diatomite	80.10	6.21	1.72
6'—Darker cream diatomite, somewhat broken	77.70	5.50	1.85
8"—Clay-ironstone band	....	....	......
3'—Pale creamy diatomite	72.80	9.45	2.79
2"—Clay band	....	....	......
6'—Pale creamy diatomite	70.60	10.60	3.42
5'—Darker, more massive diatomite	68.60	10.60	4.42

Ignition loss on the samples ranged from 12.9 to 13.9 per cent., CaO from 1.2 to 1.6 per cent., and MgO from 1.3 to 1.6 per cent.

Analyses of drill-hole samples from other parts of the deposit ranged from 66 to 79 per cent. SiO_2. An average weighted sample prepared from drill-hole material analysed 73 per cent. silica.

About 400 feet to the east and on a lower bench a second deposit has been indicated by drill-holes and pits to be more than 500 feet wide along the south boundary of Lot 8015 and 400 feet wide along the road 100 yards to the north. Exposures in pits and by land-clearing suggest that the body is continuous for at least three-eighths of a

* *Mines Branch, Dept. of Mines, Canada,* Pub. No. 691, pp. 5, 31, 42, 45–52, 94, 134, 154, 155.

mile, in a northerly direction, and probably extends to the south on Lot 8016. Neither the true width nor the average depth of the deposit have been determined, except along the above-mentioned road, where the thickness is about 9 feet. Drill samples ranged from 70 to 78 per cent. silica.

Exposures of other deposits on the property are largely the results of natural agencies, and since no systematic exploration-work has been done, it is impossible to determine their size or shape with any degree of certainty.

On Lot 1617 diatomite has been found at several points along a north-westerly trending side-hill at an elevation of 2,250 feet. On Lot 8016 (elevation 2,440) 3 feet of massive creamy diatomite appears in a bear-hole near the base of a side-hill, and a similar seam is exposed on the same side-hill about one-quarter of a mile to the north on Lot 8017.

An analysis of the material from the bear-hole showed 79.5 per cent. SiO_2, 4 per cent. Al_2O_3, and 1.4 per cent. Fe_2O_3. Near the north-east corner of Lot 8017 diatomite was encountered at a depth of 60 feet in a well (elevation 2,140 feet). On Lot 1616 diatomite is indicated at several points over a distance of 800 feet in a shallow northerly trending gulch, and at the same elevation (2,120 feet) and 300 to 1,200 feet to the east again appears at intervals for about one-quarter of a mile along the edge of the bench which trends in a north-westerly direction. It seems probable that these exposures belong to the same body, in which event an area of at least 14 acres is underlain by diatomite in this locality. A sample taken from a face 10 feet high along the edge of the bench was found to contain 78.7 per cent. SiO_2, 8.7 per cent. Al_2O_5, and 3 per cent. Fe_2O_3.

Diatomite is exposed at intervals for over 600 feet in a sharp easterly trending gulch on Lot 8011. The thickness of the deposit is more than 30 feet, as indicated by pits. The bench, through which the gulch has cut to a depth of 50 feet, is at an elevation of 2,080 feet.

It is probable that the various deposits described above are remnants of the same original bed, and now occupy their present positions as the result of major faulting or slumping. Although more exploratory and development work is needed to delimit the bodies and permit estimates of tonnage and quality to be made, there seems little doubt that the deposits on this property are extensive.

Recent Diatomite Deposits.—The largest known deposits of Recent age occur in Burnaby and Trout Lakes (49° 122° S.W.), Vancouver area; on Gabriola Island (49° 123° S.W.); on Guichon Creek (50° 120° S.W.), Kamloops District; Pukaist Creek (50° 121° N.E.), Ashcroft District; and at Glenrosa (49° 119° N.W.), Okanagan Area.

FELDSPAR.

No feldspar has been produced in British Columbia, and specific information on deposits suitable for commercial development is meagre. Nepheline syenite is known to occur on Ice River in the Field area, and on Kruger Mountain near Osoyoos, and intrusive rocks containing potash and soda feldspar as major ingredients are found in a number of places in the Province, notably in the vicinity of Copper Mountain, Oliver, Penticton, Rossland, Beaverdell, and Nelson. In all known cases, however, the iron content is too high for ceramic use, and commercial possibilities depend upon the amenability of the various materials to beneficiation.

FLUORSPAR.

The largest known deposits of fluorspar in British Columbia are in the Rock Candy mine, near Grand Forks, and near Birch Island Station on the Canadian National

Railway, 81 miles north of Kamloops. Other occurrences* are at Five Mile Point, near Nelson, at the Galena Farm property at Silverton, and in several properties in the Ainsworth Camp on Kootenay Lake.

Fluorspar has also been reported in veins in the Field, Lardeau, and Franklin areas, on Little Shuswap Lake, north of Ewings Landing, Okanagan Lake, and on Quesnel Lake.

No production has been recorded from the Rock Candy mine in recent years, but more than 42,000 tons of fluorspar ore was shipped in the period between 1918 and 1929. The deposit, owned by the Consolidated Mining and Smelting Company of Canada, has been reported† upon by V. Dolmage. References to the property are also to be found in British Columbia Minister of Mines Reports (1919 to 1925).

The Birch Island deposit has been described by R. P. D. Graham‡ and by J. F. Walker.§ The property was drilled in 1942 and bulk samples were taken for testing. A sample of 100 lb. submitted to the Department of Mines, Victoria, at that time was found to have the following approximate composition: Pyrite, 10 per cent.; fluorite, 20 to 30 per cent.; celestite, 15 to 25 per cent.; feldspar (potash and soda), 40 to 50 per cent.

Spectrographic analysis of flotation products indicated the presence of a relatively large content of the rare earth elements associated with fluorite and celestite.

Although there appears to be a possibility of a considerable tonnage of material of the grade indicated, the fine-grained and intimate association of the minerals present makes treatment difficult by conventional mineral-dressing methods.

GRANITE.

Granites and related intrusive rocks are of widespread occurrence in British Columbia, and stone suitable for building or ornamental use occurs at a number of places in the Province. Although grey granites have been quarried for building purposes at Granite Island (49° 124° N.E.), Pitt Lake (49° 122° S.W.), Fox Island (49° 124° N.E.), Hardy Island (49° 124° N.E.), Sechelt (49° 123° S.W.), and Burrard Inlet (49° 122° S.W.), the only producer of granite for building and ornamental use on the Coast at present is Vancouver Granite Company, with quarries on Nelson Island (49° 124° N.E.). In the Interior of the Province quarries have been operated at Okanagan Landing (50° 119° S.E.), Rossland (49° 117° S.W.), Coryell (49° 118° S.E.), Nelson (49° 117° S.E.), Ymir (49° 117° S.E.), and Armstrong (50° 119° S.E.), largely to supply stone for local public buildings and in some cases for monumental work. In recent years there has been a relatively small and intermittent production of grey granite from Sirdar (49° 116° S.W.), which is mostly used for monumental and trimming purposes.

So far there has been no production of so-called " black granite " in the Province, although high-quality stone would command an excellent market. Several years ago an attempt was made to open a quarry near Sechelt (49° 123° S.W.), but development was abandoned because of the fractured nature of the deposit and the presence of white streaks in the stone. Gabbro phases of the Coast Range intrusives in the Straits of Georgia and Queen Charlotte Sound areas and the gabbros of the Sooke area (48° 123° S.W.) on Vancouver Island merit further examination as possible sources of commercial black granite.

A fairly complete description of the building-stones of British Columbia is contained in " Report on the Building and Ornamental Stones of Canada—Province of

* *Geol. Surv., Canada*, Ec. Geol. Series, No. 6, 1929, pp. 28, 29.

† *Geol. Surv., Canada*, Ec. Geol. Series, No. 6, 1929, pp. 22–28.

‡ *Munition Resources Commission, Canada*, Final Rept., 1915 to 1919, pp. 49–52.

§ *Geol. Surv., Canada*, Sum. Rept., Pt. A, 1930, pp. 125–153.

British Columbia," by W. A. Parks, Mines Branch, Pub. No. 452, Vol. V, Department of Mines, Ottawa. The report discusses operations involving all types of stone in the Province up to 1917. Since that date no rock but granite has been produced in large amounts for building purposes, except andesite from Haddington Island (50° 127° N.E.). This andesite, which has been extensively used in various public buildings in Vancouver and Victoria, is quarried by J. A. and C. H. McDonald, of Vancouver, when a demand exists. The quarry has not been operated in recent years.

Granite has also been quarried at several places in the Province for rough structural stone, jetty-rock, riprap, and crushed stone. At present there are two major commercial producers of these materials, namely: Coast Quarries, Limited, at Granite Falls (49° 123° S.E.), and Gilley Bros., Limited, at Pitt Lake (49° 122° S.W.), as well as a small operation at Cheam View (49° 121° S.W.) producing chicken-grit, stucco-dash, and other crushed products. Structural stone is also quarried at times by municipalities, railway companies, and the Provincial Public Works Department to meet local requirements.

Vancouver Granite Co. Head office, 744 Hastings Street West, Vancouver. W. C. Ditmars, general manager. Grey granite is quarried on Nelson Island (49° 124° N.E.) and rough blocks are shipped by scow to Vancouver. The blocks are disposed of to local stone-dressers for cutting and finishing or exported to Pacific North-west States or the Prairie Provinces. The stone is used both for building and monumental work. In past years, operations were intermittent, depending upon the demand for dimension-stone, but recently rubble for construction-work has also been produced. During 1947 the quarry was operated fairly continuously, producing both types of material, nine men being employed.

Coast Quarries, Ltd. Head office, 1840 Georgia Street West, Vancouver; quarry office, Granite Falls P.O. J. H. Davidson, manager; T. H. Burrows, superintendent. This company quarries granite at Granite Falls (49° 122° S.W.), on the North Arm of Burrard Inlet, for jetty-rock, riprap, rubble, and crushed rock. During 1947 thirteen men were employed at the quarry, the output being as high as 400 tons of jetty-rock and riprap per day, most of which was used in Vancouver Harbour and at the mouth of the Fraser River.

After blasting, broken rock is loaded by power-shovel into 10-ton semi-cylindrical skips which are transported by derrick and unloaded onto scows. Sections of anti-submarine net are likewise used. Both methods permit of handling large stone with a minimum of damage to the decking of scows.

Gilley Bros., Ltd. Head office, 902 Columbia Street, New Westminster. R. W. Gilley, general manager. A quarry and crushing plant is operated by this company near the south end of Pitt Lake (49° 122° S.W.) to produce various grades of construction-stone and crushed-granite products. During 1947 an average of nineteen men were employed.

Valley Granite, Ltd.—Cheam View P.O. Mr. Housler, owner. In 1947 a small crushing plant was set up, and granite quarried near the main highway, several miles east of Rosedale (49° 121° S.W.), was used to make chicken-grit and other ground or finely crushed products.

GYPSUM.

Deposits of gypsum* occur near Falkland (50° 119° N.W.), Spatsum (50° 121° N.E.), Mayook (49° 115° S.W.), Bull River (49° 115° S.E.), Wardner (49° 115° S.E.), and Windermere (50° 116° N.E.). Of these, the Falkland, Mayook, and Bull River deposits have been worked; the first two were worked during 1947.

* *Mines Branch, Dept. of Mines, Canada*, Pub. No. 714, pp. 58–63, 90, 92.

Gypsite (earthy gypsum) is found at several places in the Province in the form of relatively shallow surface deposits. The more important occurrences are near Merritt (50° 120° S.W.), Canford (50° 120° S.W.), Knutsford (50° 120° N.E.), Ashcroft (50° 121° N.E.), Basque (50° 121° N.E.), Kelly Lake (51° 121° S.W.), and Princeton (49° 120° S.W.).

A large tonnage of by-product gypsum is produced annually from the manufacture of phosphate fertilizers by the Consolidated Mining and Smelting Company of Canada, Limited, at Trail. As yet this gypsum has not been utilized commercially.

Gypsum, Lime, and Alabastine, Canada, Ltd.

Head office, Paris, Ont.; British Columbia office, 509 Richards Street, Vancouver. Norman Jessiman, western manager. This company operates a gypsum property at Falkland (50° 119° N.W.), 40 miles from Kamloops on the Vernon–Kamloops Highway and on the Vernon branch of the Canadian National Railway. Gypsum is mined from open quarries 500 to 600 feet above the railway on the steep hillside north of the village. Compressed-air jack-hammers are used for drilling and 30-per-cent. and 40-per-cent. Forcite is used for blasting. Broken rock is handled by power-shovel and transported by truck to a crushing plant and bunkers at the railway for shipment to the company's mill at Port Mann, near New Westminster.

The present mill at Port Mann was completed in the fall of 1945 to replace the former mill which was destroyed by fire in 1944. Gypsum wall-board, lath, plasters, building-tile, plaster of paris, and insulating materials are made, the capacity being about 75,000 tons of gypsum rock per annum. The company has about 200 employees in British Columbia, of whom about 30 are employed at Falkland.

Western Gypsum Products, Ltd.

Head office, 504 MacArthur Building, Winnipeg, Man. This company operates a gypsum quarry at Mayook, on the Canadian Pacific Railway, 16 miles east of Cranbrook, from which gypsum is shipped to Calgary for manufacture into wall-board, tile, plasters, etc. Production was curtailed in 1947 owing to the destruction by fire of the Calgary mill, and only about 175 tons was shipped in 1947, compared with 5,420 tons in the previous year. Exploration of the deposits was continued, and considerable investigational work was carried out by the Ore Dressing and Metallurgical Division, Department of Mines and Resources, Ottawa, with a view to improving the processing characteristics of the gypsum.

Columbia Gypsums, Ltd.

L. G. Brown, Route 2, Box 956, Bremerton, Wash., president. This company has been incorporated in the State of Washington to develop a recently discovered gypsum deposit near Windermere. The deposit was staked by E. C. Phillips, of Windermere, in the summer of 1947, and several open-cuts were made. Present plans, as announced, call for the erection of a processing plant in Spokane, Wash., to manufacture wall-board, plasters, and allied products using crude gypsum to be shipped from the Windermere deposit.

IRON OXIDE (BOG IRON ORE).

Bog iron ore or limonite deposits occur* on the Zymoetz River (54° 128° N.E.), near Alta Lake (50° 123° S.E.), Taseko River (51° 123° S.W.), Nicola Lake (50° 120° S.W.), near Moyie (49° 115° S.W.), and Quatsino Sound (50° 127° N.W.), but of these only the deposits at Alta Lake have been worked.

Iron King Property.

(50° 123° S.E.) This property comprises a group of eight Crown-granted mineral claims situated on the steep hillside west of the valley containing Alta Lake and about 2 miles north-westerly from Rainbow Station on the Pacific Great Eastern Railway. Since 1945 the prop-

* *Geol. Surv., Canada,* Ec. Geol. Series No. 3, 1926, pp. 16, 20.

erty has been owned by the British Columbia Electric Company, with head offices in Vancouver.

Most of the side-hill on which the deposits occur is fairly heavily timbered with coniferous trees up to 3 feet in diameter, but is relatively free from undergrowth. The underlying formation consists of grey to green schistose rocks which weather brown and in places contain considerable pyrite. The deposits take the form of blankets or thin lenses at the surface of the ground and are covered only by humus and vegetation. They are composed essentially of limonite and are generally rather loose and earthy near the surface, but grade into fairly dense compact material a few feet lower, and are underlain by weathered rock or clay. Various analyses show the ore to range from 40 to 50 per cent. iron, 0.2 to 1.6 per cent. sulphur, 0.1 to 3.3 per cent. phosphorus, and 1 to 5 per cent. silica.

There are three main limonite-occurrences on the property. The lowest, now exhausted, was worked from 1918 to 1934 and is said to have yielded from 5,000 to 6,000 tons of moist ore containing 35 to 42 per cent. water as shipped. At present the site is too overgrown to permit the original area of the body to be determined, but it is understood that it ranged up to 10 feet in thickness and was underlain by blue clay.

A second deposit lies on the side-hill about 100 feet above the first. The surface area is about 2,800 square yards and the average depth about 5 or 6 feet. This deposit, which has been mined since 1935, has yielded nearly 4,000 tons of moist oxide (25 to 30 per cent. water), but is now almost worked out.

The uppermost deposit is about 100 feet higher and to the west of the second deposit. Future mining will be concentrated on this body, which has an estimated area of close to 3,000 square yards.

The deposits have been worked since 1918 to supply iron oxide for gas desulphurization at the Vancouver and Victoria gas plants of the British Columbia Electric Company. A total of more than 7,300 tons of limonite was mined up to the end of 1947.

The deposits are worked by hand methods, an average of seven men being employed for several months each summer in mining and loading cars. Formerly ore from the higher deposits was lowered to the road, using a winch operating a car running on a narrow-gauge track. During 1947 a road was constructed to the top deposit, permitting trucks to be loaded directly at the workings. Ore is trucked for about 1½ miles to a siding, half a mile north of Rainbow Station.

Average annual production during recent years has been in the order of 300 to 400 tons. The tonnage shipped in 1947, however, dropped to about 60 tons owing to an extensive programme of repairs to siding and bunkers which was carried out during the summer.

KYANITE.

Although kyanite has been noted in schists from a number of places in British Columbia, no deposits of commercial size and grade have so far been located in-place in the Province.

On the west side of the Columbia River, between Death and Priest Rapids, 40 miles from Revelstoke, numerous bladed crystals of kyanite occur* in pegmatitic boulders along the river-bank for over 1,000 feet. On the basis of a sample submitted to the Ore Dressing and Metallurgical Division, Ottawa, it was found† that a high-grade kyanite concentrate could be produced by flotation. Further tests by the Division of Ceramics and Road Materials, Ottawa, indicated that the flotation concentrate was of interest for the production of refractories. Kyanite-bearing rock corresponding to the above-mentioned boulders has not been found in-place, although their occurrence would suggest a near-by source.

* *Minister of Mines, B.C.*, Ann. Rept., 1931, pp. 148, 149, 211.

† *Mines Branch, Dept. of Mines, Canada*, Pub. No. 736, pp. 238–240.

In the vicinity of Albreda, on the main line of the Canadian National Railway, boulders of mica-garnet schist containing a fairly high proportion of bladed kyanite are to be found along the railway for about half a mile. Here also no corresponding material has been found in-place. A kyanite concentrate was obtained by flotation from a typical sample submitted to the British Columbia War Metals Research Board, Vancouver. This concentrate represented 17 per cent. by weight of the feed and was of high quality. A mica product suitable for use by roofing-manufacturers was also obtained at the same time from the sample.

Although no deposits of minable size have been located as yet, there should be good possibilities of finding kyanite-bearing rocks of commercial grade in the above areas by careful prospecting.

LIMESTONE, MARL, AND SHELL.

LIMESTONE.

Limestone-occurrences are widespread throughout British Columbia, and many deposits of high-calcium limestone, of excellent quality, are on the Coast or are close to rail or to centres of population in the Interior. Deposits of marl and calcareous tufa also occur. Dolomite deposits of commercial size or grade are largely confined to the eastern section of the Province. The general distribution of limestones in British Columbia has been reviewed in some detail by M. F. Goudge in " Limestones of Canada (Part V), Western Canada," Bureau of Mines Pub. No. 811, 1947, Department of Mines and Resources, Ottawa, and more complete information on deposits in the southern coastal area is contained in " Calcareous Deposits of the Georgia Strait Area," by W. H. Mathews, Bull. No. 23, 1947, British Columbia Department of Mines, Victoria.

At various times in the past, lime has been burned from deposits in at least twenty-four different places in the Province, and limestone for pulp and cement manufacture, agricultural uses, smelter flux, stucco-dash, etc., has been quarried in an additional thirty-three localities. Marble for building and monumental stone has been quarried at Anderson Bay, Texada Island (49° 124° N.E.), Nootka Sound (49° 126° N.W.), Grand Forks (49° 118° S.W.), Marble Head (50° 116° S.W.), Kaslo (49° 116° N.W.), and Grant Brook (52° 118° N.W.). Marl for agricultural purposes has been produced from deposits near Princeton (49° 120° S.W.), Cheam Lake (49° 121° S.W.), and Ritchie (54° 128° N.E.).

In 1947 limestone was quarried by six major operators from seven deposits, six on the Coast and one in the Interior of the Province. There were also four smaller operations, one on the Coast, one on Vancouver Island, and two in the Fraser Delta area, one of which commenced production in December. In 1947 construction of a grinding plant was started for a prospective operation at Clinton. In addition to supplying local requirements, the larger producers in British Columbia export a considerable tonnage of limestone to the State of Washington.

Lime was burned for sale by only one operator in 1947—i.e., Pacific Lime Company—but was burned by two pulp-manufacturers, Pacific Mills at Ocean Falls and Bloedel, Stewart & Welch at Alberni, from purchased rock for their own use.

B.C. Cement Co., Ltd.—Head office, corner of Fort and Wharf Streets, Victoria. N. A. Tomlin, managing director. This company operates two quarries, one at Bamberton, and the other at Blubber Bay, to supply its requirements for cement-manufacture.

Bamberton Quarry.—(48° 123° N.W.) Two quarries, adjacent to the cement plant, are operated to produce limestone and greenstone for cement-manufacture. Total production of rock in 1947 was 116,865 tons, of which about three-quarters was limestone. Broken rock is loaded by electric shovels into narrow-gauge cars or trucks and transported to the crushing plant, where it is reduced by gyratory crushers to a size suitable for ball-mill feed.

During 1947 a new Holman 360-c.f.m. compressor was installed and a 3-ton Fargo truck was provided for transporting rock in the upper quarry.

Extensive diamond-drilling exploration was carried out at a new location about 400 feet north-west of the present upper quarry-face. The deposit investigated is estimated by the company to contain nearly 400,000 tons of usable stone and is expected to be in operation during the first quarter of 1948.

Blubber Bay Quarry.—(49° 124° N.W.) This operation is situated on the east side of Blubber Bay, Texada Island, the crushing plant and wharf being about 1¼ miles by road from the Government wharf. Several quarries have been opened on the property, the one currently worked being near Grilse Point, one-half mile north-east of the plant. In 1947 a total of 142,439 tons of limestone was shipped to the company's cement plant at Bamberton.

Broken rock at the quarry is loaded by power-shovel into dump-cars and hauled over half a mile of narrow-gauge track to the crushing plant, where it is crushed to minus 4-inch size and stored in a bin of 15,000 to 20,000 tons' capacity. Scows are loaded from this bin by a main conveyer-belt, 325 feet long, in conjunction with a shuttle conveyer. Capacity of the crushing plant is more than 200 tons per hour of quarry-run stone, and capacity of the loading system is about 500 tons per hour.

In 1947 a Sullivan air-compressor of 315-c.f.m. capacity was installed, and a D-4 Caterpillar tractor with angle-dozer blade and four 6-yard dump-cars were acquired. To facilitate the handling of Blubber Bay rock at the cement plant, new rock-storage facilities were constructed at Bamberton in conjunction with a new stiff-leg derrick with a 1¾-yard Blaw-Knox clam-shell bucket for unloading scows. Additional crushing capacity was also provided in the form of a 4-foot Symons cone-crusher.

During 1947 an average of thirty-five men were employed at the Blubber Bay operation.

Beale Quarries, Ltd.

(49° 124° N.W.) Head office, 744 Hastings Street West, Vancouver; quarry office, Vananda. W. D. Webster, superintendent. This company quarries limestone on the east shore of Texada Island, about 1 mile south-east of Vananda. During 1947 an average of twenty men were employed and 47,377 tons of limestone was produced. Usual practice is to blast as much as 10,000 tons of stone in a single round, large blocks being reduced by plugging and bulldozing. Broken rock is handled by power-shovel onto a 5½-inch grizzly, oversize being shipped as "man rock" directly to sulphite-pulp mills. Undersize is crushed by jaw-crusher and ground by hammer-mill or ring-roll mill. Pulverized limestone is produced for agricultural use, for dusting coal mines, and for other purposes.

From white crystalline limestone, quarried at several places close to Vananda, stucco-dash, coarse and fine sand, and whiting substitute are produced by the company in a grinding plant near Vananda dock.

Stanley Beale.

(49° 124° N.W.) During 1947 Stanley Beale operated the old Marble Bay quarry under lease from the Powell River Company. This quarry is on the west side of Marble Bay, less than 1 mile by road from Vananda. About 2,000 tons per month of "man rock" was produced and shipped to Coast pulp-mills. An average of five men were employed throughout the year. Broken stone is handled by power-shovel and sized on a grizzly.

B.C. Pulp and Paper Co., Ltd.—Quatsino Sound (50° 127° S.E.). During 1947 this company's quarry on Neroutsos Inlet was operated by F. J. Beale to supply the limestone requirements of the Port Alice sulphite-pulp mill. An average of three men were employed at the quarry in 1947, and the output of "man rock" was in the order of 1,000 tons per month.

Pacific Lime Co., Ltd.—(49° 124° N.W.) Head office, 744 Hastings Street West, Vancouver; plant office, Blubber Bay. H. S. Fowler, superintendent. In 1947 Pacific Lime Company quarried 145,000 tons of limestone at its Blubber Bay quarry. A considerable proportion of this output was used for the manufacture of lime, the remainder being disposed of for a variety of purposes including smelter-flux, cement-manufacture, etc.

During the year three major projects were completed. The power plant was substantially increased by the addition of two large diesel-powered generating units. A new crushing and screening plant was completed, and a new vertical-stack kiln of large capacity was constructed. The company now operates three vertical-stack kilns and one rotary kiln, in addition to a lime processing and hydrating plant. All types of quicklime and hydrated lime are produced for building, chemical, and agricultural purposes.

The average number of men employed in the entire operation at Blubber Bay was 130.

Consolidated Mining and Smelting Co. of Canada, Ltd.—Fife (49° 118° S.E.). Head office, Trail; quarry at Fife. Limestone is quarried by the company at Fife, near Christina Lake, for use as flux at the Trail smelter. Rock is loaded into narrow-gauge cars by power-shovel and hand-trammed to a bin above the Canadian Pacific Railway track for loading and shipment to Trail. In 1947, 31,521 tons of limestone was produced, an average of five men being employed.

Koeye Limestone Co.—(51° 127° N.W.) P. Christensen, manager. This company operates a limestone quarry on Koeye River, less than a mile from its mouth on Fitzhugh Sound, 6 miles south of Namu. During 1947 production was 10,182 tons, all of which was shipped to Ocean Falls for use in pulp-manufacture. Six men were employed. About 3,000 lb. of 60-per-cent. Forcite, 980 detonators, 250 electric detonators, and 2,400 feet of hose were used.

In addition to the above-mentioned operations, limestone was quarried and ground for agricultural use at the following locations in 1947:—

Popkum.—(49° 121° S.W.) During the summer the old quarry and grinding plant at Popkum, 11 miles east of Chilliwack, was taken over by the Adanac Lime Company, 503 Randall Building, Vancouver; T. C. McAlpine, managing director. The plant and equipment was reconditioned, diesel power installed, and the main quarry reopened. First production was made in December, 1947. The grinding plant has a capacity of about 40 tons per shift of pulverized limestone for agricultural use and animal-feed. An average of ten men are employed.

Agassiz.—(49° 121° S.W.) Limestone is quarried by Hiram Cutler and sons from a deposit about 2 miles south-west of Agassiz and is pulverized for sale as agricultural limestone. The grinding plant has a capacity of about 20 tons per shift.

Cobble Hill.—(48° 123° N.W.) Pulverized limestone for agricultural use is produced from a deposit about a quarter of a mile from Cobble Hill Station on the Esquimalt and Nanaimo Railway.

Clinton Lime Holdings, Ltd.—(51° 121° S.W.) During the latter part of 1947 development-work was commenced by this group on a deposit of travertine or calcareous tufa situated 3 miles west of Clinton on the Pacific Great Eastern Railway. Some diamond-drilling of the deposit was done, and a crushing-plant building, living-quarters, office, and a powder magazine were built under the management of R. T. Gilman. Machinery had not been installed nor quarrying commenced by the end of the year.

MARL.

Marl was produced for agricultural use from at least three deposits in 1947 and clam-shell from one.

Cheam Lake. (49° 121° S.W.) An extensive deposit of marl occurs along the east shore of Cheam Lake, and on the adjoining property belonging to C. W. and Robert Munro. Several hundred tons of marl has been produced annually for agricultural use from this deposit during the past few years. Marl in suspension is pumped from the lake to a primary settling-tank 6 feet square, and thence to a series of large settling-boxes. The thickened product from these is removed and, after air-drying on a platform, is pulverized in a small hammer-mill and sacked.

It is planned to install a rotary drier early in 1948 and to mine relatively dry material from the meadow, thus eliminating the need for dredging and settling, as now done.

Allison (Burns) Lake. (49° 120° N.W.) Marl was produced in 1947 by the B.C. Marl Company, Limited (E. W. Johnstone, manager, Princeton), from this deposit, which is 20 miles north of Princeton on the highway to Merritt. A drag-line scraper was used to excavate marl from the southern shore of the lake. The moist marl is dried in a rotary drier and sacked for shipment to the Fraser Delta area and other Coast points. Three men were employed.

Roany. (49° 120° S.W.) This deposit, formerly operated by H. Knighton and W. R. Foster, occurs in the bed of a dry lake on Roany Creek, 5½ miles south-east of Granite Creek. In 1947 marl was produced for shipment to the Lower Fraser Valley by the Valley Marl and Lime Company, Limited. Five men were employed during the summer.

SHELL.

West Coast Shell Co., Ltd. Plant and office, 141 Front Street, New Westminster. R. Carter, president. This company operates a grinding plant to prepare crushed and pulverized clam and oyster shell for sale as hen-grit, chick-grit, and for admixture in poultry and stock feed. Most of the clam-shell used is obtained from a deposit at the north end of Denman Island (49° 124° N.W.), where shell is excavated by drag-line scraper, washed in a trommel screen to remove pebbles and sand, and flumed to a dock, from which, after draining, it is loaded onto scows by drag-line. The company formerly obtained their shell from a similar deposit at Kuper Island, which is now exhausted. Oyster-shell and some clam-shell, obtained from packers and canners, is also processed by the company.

At the New Westminster plant the shell is dried in an oil-fired rotary drier, then passed over a double-deck vibrating screen in closed circuit with a hammer-mill. Undersize is ground in a second hammer-mill. Products are sacked.

An average of twelve men are employed, of whom three are required to excavate shell at intervals when required. The output of the plant is about 6,000 tons per year.

MAGNESITE.

Magnesite is found in several localities in British Columbia, but most occurrences are too small or too remote to be of present interest. The largest of the known deposits is at Marysville* (49° 115° N.W.), near Kimberley, and is owned by the Consolidated Mining and Smelting Company of Canada, Limited. Small tonnages have been quarried from the Marysville deposit at various times for experimental purposes, but there has been no production in recent years. Magnesite deposits of some promise also occur in

* *Geol. Surv., Canada,* Mem. 207, pp. 19, 56–58.

the Bridge River area* (50° 121° N.W.) and in the Yalakom River area (50° 122° N.E.), 40 miles from Lillooet by road. Magnesite also occurs near the valley of Bonaparte River, 6 miles from Clinton by road.†

Several deposits of earthy hydromagnesite occur‡ in the Clinton area (51° 121° S.W.), of which those at Meadow Lake are the largest. Other deposits of considerable size occur near 105-Mile House (51° 121° N.E.), near Riske Creek (51° 122° N.W.), and near Atlin (59° 133° N.W.). Although at various times several of these were worked on a small scale for experimental purposes, there has been no production for many years.

A small deposit of brucitic limestone occurs§ on Redonda Island (50° 124° S.W.).

MAGNESIUM SULPHATE.

Natural hydrous magnesium sulphate (Epsom salts) occurs‖ in crystal beds and brines in small lakes near Basque (50° 121° N.E.), Kamloops (50° 120° N.E.), and Osoyoos (49° 119° S.E.). In all cases a considerable proportion of sodium sulphate is mixed with the magnesium sulphate, except for the uppermost portion of the crystal bed in the Basque deposits, which is relatively pure.

During the First World War magnesium sulphate was produced from Spotted Lake, near Osoyoos, for a short period, but operations were discontinued owing to the high content of sodium sulphate. Magnesium sulphate has been produced at times from the Basque deposits, the most recent venture being that of Ashcroft Salts Company, who produced high-quality products from crude crystal in a refinery at Ashcroft. The plant, which had a capacity of 10 tons per day, was closed down in 1942, and there has been no production since.

MICA.

Pegmatite dykes containing "books" of muscovite mica of commercial size occur in several places in British Columbia,¶ notably near Fort Grahame (56° 124° N.W.), Tête Jaune Cache (52° 119° N.E.), Mahood Lake (51° 120° N.W.), Clearwater Lake (52° 120° S.E.), and in the Big Bend area of the Columbia River (51° 118° N.W.). At various times efforts have been made to develop all of these, but the deposits discovered to date contain too low a proportion of sheet mica of marketable grade to permit profitable operation. Prior to 1900, however, a considerable quantity of high-quality sheet mica was mined and sold by J. F. Smith, of Kamloops, from a pegmatitic lens on Mica Mountain, near Tête Jaune Cache.

In 1947 mica schist from the vicinity of Albreda (52° 119° N.E.) was ground by L. T. Fairey & Company, 661 Taylor Street, Vancouver, and by G. W. Richmond, 2890 Twelfth Avenue East, Vancouver, for use by roofing-manufacturers in Victoria and Vancouver. The market for ground mica in British Columbia for this purpose has exceeded 500 tons per annum in recent years, but will be considerably curtailed in future owing to the substitution of specially graded sand for ground mica by the largest manufacturer. In past years ground mica has been prepared from mica schists obtained from deposits near Oliver (49° 119° S.W.) and on Baker Inlet (53° 129° N.W.).

PHOSPHATE ROCK.

Extensive phosphate-rock deposits occur in the Fernie (49° 115° N.E.) and Crowsnest (49° 114° N.W.) areas of Eastern British Columbia, but are considered too low grade to be worked under present conditions.

* *Geol. Surv., Canada,* Mem. 130, pp. 27, 47, 75, 76; Sum. Rept., 1915, pp. 81, 83.

† *Geol. Surv., Canada,* Sum. Rept., 1932, Pt. A II, pp. 72, 73.

‡ *B.C. Dept. of Mines,* Bull. No. 4, pp. 40, 41, 112.

§ *Mines and Geology Branch, Dept. of Mines and Resources, Canada,* Pub. No. 811, p. 127.

‖ *B.C. Dept. of Mines,* Bull. No. 4, pp. 42–53.

¶ *Mines Branch, Dept. of Mines, Canada,* Pub. No. 701, pp. 76–80.

ROOFING-GRANULES.

A considerable tonnage of granules for the manufacture of asphalt roofing is used by three manufacturers in British Columbia. A fairly large proportion of this consumption, mostly artificially coloured and natural red granules, is imported from the United States, but natural black and green granules are supplied locally by two producers.

Dark-grey to black slate from McNab Creek, Howe Sound (49° 123° S.W.), and green siliceous rock from Bridal Falls, near Chilliwack (49° 121° S.W.), are quarried by G. W. Richmond, and granules are prepared in his Vancouver plant. At Kapoor (48° 123° S.W.), southern Vancouver Island, O. M. Brown quarries grey-black slate and greyish-green slate from which granules are made in a grinding plant at Victoria. Slate-dust from both operations is also sold to roofing companies for use as a filler for asphalt.

A deposit of red rock which has recently been discovered in the Chilliwack River area (49° 121° S.W.) appears to have promise for the manufacture of natural red granules, which until now have not been produced in British Columbia.

SAND AND GRAVEL.

Deposits of sand and gravel suitable for use as concrete aggregate and for road-surfacing are widespread in British Columbia. Pits are operated by the Provincial Public Works Department, municipalities, and railway companies in many places throughout the Province, but commercial operations are restricted to the lower coastal region.

Natural-bonded moulding-sand for use by iron and non-ferrous foundries in British Columbia is largely imported, apart from occasional small production from deposits near Cranbrook (49° 115° N.W.) and Victoria (48° 123° S.E.). So-called "sharp sand," purchased from various local building-sand producers, is widely used for core-work.

During 1947 the following companies produced sand and gravel for sale in British Columbia:—

Champion & White.—Head office, 1075 Main Street, Vancouver. A sand and gravel pit and washing plant is operated by this company at Hillside, on Howe Sound (49° 123° S.W.). During 1947 about 185,993 cubic yards was produced, an average of sixteen men being employed.

Deeks McBride Co., Ltd.

Company office, 1051 Main Street, Vancouver. H. T. Hamilton, manager; J. Mills, general superintendent. This company operates two sand and gravel pits, one on Seymour Creek (49° 123° S.E.) and the other near Coquitlam (49° 122° S.W.). The Seymour Creek pit was worked continuously throughout the year on a three-shift basis, an average of thirty men being employed. The quarry and plant has a capacity of 600 cubic yards of washed and screened gravel and sand products per day.

At the Coquitlam operation an average of eleven men were employed. The capacity of the crushing, screening, and washing plant is 400 to 500 cubic yards per day.

Highland Sand and Gravel Co.—Company office at the plant, Seymour Creek. W. J. Barrett-Leonard, manager. This company operated its pit and plant on Seymour Creek (49° 123° S.E.) continuously throughout the year on a two-shift basis. The capacity of the operation is about 700 cubic yards per day, and twenty-seven men are employed on the average. A concrete-block plant is also situated at the pit.

Maryhill Sand and Gravel Co., Ltd.—Company office, 902 Columbia Street, New Westminster. J. H. Gilley, manager. The company's sand and gravel pit on the Fraser River, near Coquitlam (49° 122° S.W.), was operated continuously throughout the year.

The washing, screening, and crushing plant has a capacity of about 1,200 cubic yards per day. An average of forty-two men are employed.

Producers Sand and Gravel Co.—Head office, 1902 Store Street, Victoria. J. V. Johnson, manager. A sand and gravel pit and washing plant is operated by this company at Royal Roads (48° 123° S.E.), near Victoria. During 1947 production was 176,352 cubic yards, an average of twenty-nine men being employed.

Road Materials, Ltd.—Office at Lynnmour P.O. J. E. Priest, manager. This company operates a sand and gravel pit and processing plant for road materials near Seymour Creek (49° 123° S.E.). The new plant, which was completed in December, 1946, can turn out twelve products and has a capacity of 120 cubic yards per day. An average of fourteen men are employed.

SILICA.

Deposits of silica in the form of quartz veins and quartzites occur* in many places in British Columbia, but so far no silica sand has been found.

Fairly pure deposits of quartz occur on Banks Island (53° 130° S.E.), Channel Island, near Thurlow P.O. (50° 125° S.E.), Keefers (50° 121° S.W.), Kamloops (50° 120° N.E.), Shuswap Lake (50° 119° N.E.), and Oliver (49° 119° S.E.), and less pure silica at the Blue Bells property near Phillips Arm (50° 125° N.E.) and near Grand Forks (49° 118° S.E.).

Quartzite formations are abundant in parts of the eastern section of the Province. Some of these are very pure and merit attention as possible sources of industrial silica when required.

In 1947 the only silica produced in British Columbia was used for smelter-flux. Siliceous flux was mined at the Fairview mine near Oliver and was quarried near Grand Forks by the Consolidated Mining and Smelting Company of Canada, Limited, to supply the smelter at Trail. The Oliver deposit was worked throughout the year, and some 24,700 tons of silica was shipped. The Grand Forks deposit was only operated for a few months, but about 9,350 tons of flux rock was shipped.

SODIUM CARBONATE.

Sodium-carbonate brines occur in several small lakes on the Green Timber Plateau (51° 121° S.W.) north of Clinton and in a lake near Spences Bridge (50° 121° S.E.). A crystal deposit in the bed of a dry lake near Cherry Creek (50° 120° N.W.) also contains a high proportion of sodium carbonate. These deposits are described in "Saline and Hydromagnesite Deposits of British Columbia," by J. M. Cummings, Bull. No. 4, British Columbia Department of Mines, Victoria.

The brines in a number of the lakes become so concentrated by fall that solid crystal forms with the advent of cold weather. This "winter crystal," which contains about 37 per cent. sodium carbonate and 63 per cent. water of crystallization, is recovered from beneath the ice and shipped to Vancouver for use as sal soda, washing-soda, etc.

For many years there has been a small production of winter crystal from lakes north of Clinton, usually from 100 to 300 tons per year. During the winter of 1946–47, however, some 700 tons of crystal was mined from lakes owned by Mrs. Viola Bishop and shipped to Eastern Canada to supplement meagre supplies of soda ash then available. During the winter of 1947–48 production again was entirely from Mrs. Bishop's lakes and amounted to 163 tons, all shipped to Vancouver.

* *Mines Branch, Dept. of Mines, Canada*, Pub. No. 686, pp. 6, 7, 37–41.

SODIUM SULPHATE.

Sodium sulphate occurs in crystal deposits in the beds of Ironmask Lake (50° 120° N.E.) near Kamloops and in a small dry lake east of Cherry Creek. It is also associated with magnesium sulphate at Basque (50° 121° N.E.) and Spotted Lake near Osoyoos (49° 119° S.E.). These deposits are described in "Saline and Hydromagnesite Deposits of British Columbia," by J. M. Cummings, Bull. No. 4, British Columbia Department of Mines, Victoria. There has been no production of sodium sulphate in the Province.

TALC AND PYROPHYLLITE.

Deposits of talc occur* at Keefers (50° 121° S.W.); on Wolfe Creek (48° 123° S.W.), southern Vancouver Island; on Anderson Lake (50° 122° N.E.); on Mount Whymper (51° 116° S.W.); at Redearth Pass (51° 116° S.W.); and are also reported from several other localities in the Province. During the recent war the deposits at Redearth Pass were opened up by the Wartime Metals Corporation, with the object of producing massive talc of lava grade. A deposit of massive soapstone near Jessica (49° 121° S.E.), 17 miles north-east of Hope, was investigated in 1932 as a possible source of soapstone blocks for alkali-recovery furnaces in kraft mills. The material was tested at several Coast pulp-mills with favourable results.

Talc was produced from the Anderson Lake deposit intermittently from 1917 to 1935 for use in ground form for dusting asphalt-roofing materials. During the same period talc was also mined at intervals from the Wolfe Creek deposit for the same purpose. There has been no production of talc in British Columbia for several years.

Several large bodies of quartz-pyrophyllite rock occur† on Kokshittle Arm (50° 127° S.E.) of Kyuquot Sound. The proportion of pyrophyllite is as high as 90 per cent. in places but in most of the rock ranges from 50 to 75 per cent. Between 1910 and 1914 several hundred tons of quartz-pyrophyllite rock was quarried from a deposit on the Monteith claim and shipped to Victoria for the manufacture of firebrick and sewer-pipe by the British Columbia Pottery Company.

During the late war the deposits were investigated as a possible source of paper-filler. Quartz-pyrophyllite from these deposits has also proved to be a highly satisfactory ingredient of whiteware batches for both slip-cast and dry-press tiles, electrical insulators, and tableware.

MISCELLANEOUS INDUSTRIAL MINERALS.

There has been considerable interest in local supplies of pumice for light-weight aggregate for the manufacture of concrete-block and other products. During the past year pumice has been imported from Washington for this purpose by several producers of block in the Province. Pumice occurs in the Bridge River area (50° 121° N.W.) and on Meager Mountain (50° 123° N.W.), about 30 to 40 miles up the Lillooet River from Pemberton Meadows, but transportation cost from these sources would be high.

Volcanic-ash deposits occur at several places in the Province. One of the most interesting of these is at Last Chance Creek (50° 120° N.W.), about 25 miles north of Savona on the Vidette road. The deposit is extensive and the ash is pure white and very fine-grained. Tests indicate that this material is suitable for cream glazes on ceramicware and as an ingredient of certain ceramic bodies.

A considerable quantity of slag from the old copper smelter at Grand Forks was shipped to Moose Jaw in 1947, where it was used for the manufacture of mineral wool. Small amounts of slag from Grand Forks and Crofton (48° 123° N.W.) on

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* *Mines and Geology Branch, Dept. of Mines and Resources, Canada*, Pub. No. 803, pp. 16, 17, 53–57.

† *Mines and Geology Branch, Dept. of Mines and Resources, Canada*, Pub. No. 803, p. 122.

Vancouver Island have also been used for stucco-dash and for surfacing asphalt roofing. Some granulated slag from the Crofton dump was also employed as aggregate for concrete blocks made in Victoria.

INSPECTION OF LODE MINES, PLACER MINES, AND QUARRIES.

By H. C. Hughes, Senior Inspector of Metalliferous Mines.

CONTENTS.

PRODUCTION.

The output of metal mines for 1947 was 4,986,555 tons. This tonnage was produced from seventy-six mines, of which thirty-four produced 100 tons or more.

FATAL ACCIDENTS.

During 1947 there were nine fatal accidents connected with actual mining operations in underground metal mines, including underground placer mines. This was three more than the number of accidents during 1946. There were also four fatal accidents on the surface—one arising from a slide of gravel at a placer mine, one in making a surface cut, one in connection with road-building, and one in the operation of a truck.

There were 5,369 persons employed below and above ground in metal mines and 960 persons in concentrators in 1947. The ratio of fatal accidents per 1,000 persons employed was 1.42, compared with 1.36 in 1946.

The tonnage mined per fatal accident during 1947 was 554,062 tons, compared with 617,562 tons in 1946.

The tonnage mined per fatal accident during the last ten-year period was 596,479.

The following table shows the mines at which fatal accidents occurred during 1947, with comparative figures for 1946:—

Mining Division.	Mine.	No. of Fatal Accidents.	
		1946.	1947.
Atlin	Polaris-Taku	....	1
Vancouver	Britannia	1	....
Lillooet	B.R.X.	1	....
Lillooet	Pacific Eastern	....	3
Similkameen	Copper Mountain	2	....
Fort Steele	Sullivan	2	3
Nelson	Emerald	....	1
Quesnel	P.M.L. 3517	....	1
Totals		6	9

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On February 10th, 1947, Charles Cecil Aistrop, miner, was instantly killed when struck by a moving skip in the shaft of the Polaris-Taku mine. Aistrop, disregarding instructions and the advice of his partner, was standing on a divider and was putting a bolt through the shaft timbers for a false set just above the 750 level without notifying the hoistman of the fact that he was in the shaft compartment. He was crushed by the descending skip, which was operating in balance while muck was being hoisted.

On April 29th, 1947, Wallace Width, labourer, was almost instantly killed while working on the Norrana No. 1 Mineral Claim on Dry Creek, about 12 miles north of Princeton. Width was ground-sluicing on a steep hillside when he was caught and crushed by a slide of wash and gravel, in which, it is estimated, about 500 tons of material was moved.

On May 19th, 1947, Edward Strom was killed instantaneously, as a result of a blast, while he was doing open-cut assessment-work alone on the Conannex Company's mineral claims, between the Wayside and Congress holdings, in the Bridge River district. There were no witnesses. It is thought that Strom, who was blasting two holes, returned to the scene of the blast, thinking that one shot had misfired, and arrived in time to receive the full effect of the second shot.

On June 21st, 1947, Fred Shaffer, bush labourer, died after being struck on the face and shoulder by the top of a tree that he was falling. The tree was rotten in the centre; in falling it struck another tree and the top broke off. He was employed by the Consolidated Mining and Smelting Company on a road being built up the east bank of the Tulsequah River to the Tulsequah Chief Mineral Claims.

On June 21st, 1947, William Ban Quan, truck-driver, was killed at the trestle dump to the cut for the portal of the new 3700 level at the Sullivan mine. Quan backed his loaded truck away from the power-shovel and over the side of the grade. The truck rolled over, throwing Quan out and pinning him beneath it.

On June 23rd, 1947, Daniel Alexander Gillis, chuteman, was killed in the 3511 drift at the Sullivan mine while directing the movements of a train. Gillis misjudged the clearance between the timber in the drift and a high-back flat car, and was crushed between the post and the car.

On July 19th, 1947, Henry Lloyd Walters, mine labourer, died as a result of a combination of carbon monoxide poisoning and asphyxia from drowning. He was working in a shaft on Placer-mining Lease 3517 at Horsefly. The shaft, reported to be 78 feet deep, was being unwatered by lowering a gasoline-engine and pump down it, in contravention to the provisions of the "Metalliferous Mines Regulation Act." When the water was about 44 feet below the collar of the shaft, Walters went down to open the throttle on the engine. While coming up to the surface, he was overcome by carbon monoxide gas and fell to the water. As a result of this accident, the manager was prosecuted and convicted for an infraction of the "Metalliferous Mines Regulation Act."

On August 19th, 1947, David Harper Brown, surveyor's helper, was instantly killed in the 39105C intermediate drift south in the Sullivan mine at Kimberley. Brown and his partner, A. T. Richardson, were surveying a diamond-drill hole in the intermediate drift when they were caught by a rush of mud and water from 39189 raise. Brown's body was carried down to the drift below, but Richardson managed to hold on to a pipe and remain suspended in the raise, down which the flow ran, and which connected the intermediate drift with the main level.

On September 9th, 1947, Leonard Alfred Cond, miner, was instantly killed when he drilled into a hole containing powder in 42-14 Sub-A drift in the Sullivan mine. The previous shift had commenced loading the round and had placed a stick of powder in each of three holes. This was not reported to the proper authorities so that it could be brought to the attention of the oncoming shift. Cond and his partner were instructed to deepen the round and were doing so when the explosion occurred. The miners responsible had their blasting certificates cancelled and were prosecuted and fined for contravention of the provisions of the "Metalliferous Mines Regulation Act."

On October 22nd, 1947, David Erickson, timberman, was instantly killed by a rush of muck and water from the chute at 42119 raise in the Sullivan mine. The raise was used for storing gravel to be used for concrete underground. Erickson was assisting in drawing the chute and was loosening the packed gravel with a bar when it gave way with a rush, breaking the chute boards, one of which struck him across the abdomen. His body was carried about 400 feet along 4203 drift. It is thought that gravel had hung up farther up the raise, damming off a considerable quantity of water, and gave way suddenly, releasing a flow of water and gravel.

On November 17th, 1947, August Wegener, miner, was instantly killed in the 3970 underhand stope at the Emerald mine near Salmo. Wegener and his partner were drilling large slabs of broken ore over a chute. The blasted material had not settled solidly into the chute, and the water and vibration of the drill caused it to subside suddenly into a recess in the wall. Wegener was taken down with the muck and was covered by material which slid in after the subsidence.

Explosion of Methane Gas at Pacific (Eastern) Mine, Bridge River.*

On August 18th, 1947, an explosion, which resulted in the death of three men, occurred near diamond-drill hole No. 42, 4,500 feet from shaft-bottom, on the 520 level of the Pacific (Eastern) Gold mine. The bodies were recovered about 12.30 p.m. on August 20th, and the inquest was held that evening at 6 p.m. The verdict of the jury was as follows: "We the jury find that Alexander George Geils—Norman Henry Ryan—Vernon Stanford Wright—came to his death accidentally at approximately 8.20 a.m. on Monday, August 18th, 1947, while employed underground at the property of the Pacific (Eastern) Gold Mines, Limited, in the district of Lillooet, B.C. We find that death was due to a combination of concussion and carbon monoxide poisoning from an explosion of gas in the workings.

"It is our opinion that over the week-end shut-down a dangerous condition developed underground that was not recognized and that the three men proceeded to work without proper safety precautions. As the occurrence of methane gas is not common in metal mines, we recommend that the Department of Mines study this accident and that all operators of mining properties be advised of the proper precautions to be observed."

The Pacific (Eastern) Gold mine is in the Bridge River area, on Cadwallader Creek, about 1.2 miles up-stream from the Pioneer mine.

The workings where the accident occurred include a 500-foot adit crosscut, a three-compartment shaft sunk from the end of the adit-crosscut, and a level 520 feet below the adit-crosscut. Stations only have been cut at the 110 and 370 levels. On the 520-foot level a crosscut extends from the shaft approximately 3,900 feet in a south-westerly direction. The last 2,200 feet of this crosscut is caved and inaccessible. At a point 1,700 feet from the shaft-bottom an exploratory drift with short lateral workings extends about 3,300 feet in a south-easterly direction.

The mine is ventilated by an exhaust-fan and by blowing compressed air. A 22-inch fan-pipe extends from the portal to a point in the south-east drift about 1,000 feet from the 520 level crosscut. The exhaust-fan is 700 feet from the crosscut. The workings past the end of the fan-pipe are ventilated by numerous compressed-air jets. The fan is rated at 7,500 cubic feet of air per minute, but delivers only 4,000 cubic feet per minute through the fan-pipe. The compressor is rated at 1,000 cubic feet

* By H. C. Hughes, Senior Inspector of Metalliferous Mines, and J. W. Peck, Inspector of Mines.

per minute actual delivery of free air, and the compressed-air line, 4 inches in diameter, extends to the face of the south-east drift.

The events leading up to the accident, as brought out in the inquest and in sworn statements given by the men, were as follows:—

On Friday, August 15th, the last round was blasted in a short lateral drift off the main drift about 1,000 feet back from the face, and diamond-drill holes Nos. 41 and 42 were completed.

On August 16th the round was mucked out by a mechanical mucking-machine, a storage-battery locomotive being used for haulage; the diamond-drill equipment was dismantled and most of it was removed. The ventilation system, compressor and fan, were shut down about 3.30 p.m. This equipment and the mine remained idle until the morning of Monday, the 18th, as the management had received instructions to abandon that part of the mine.

At 8 a.m. on Monday morning the three men involved were detailed to remove the remainder of the diamond-drill equipment. They entered the workings and were lowered to the 520 level about 8.05 a.m. Evidently they proceeded immediately to the vicinity of diamond-drill hole 42, using the storage-battery locomotive to push two mine-cars and to tow a timber-truck. Three other men, who had been lowered to the 520 level, and the hoistmen heard and felt an explosion at 8.20 a.m. The three men immediately attempted to reach the scene of the explosion. On their way in they started the ventilating-fan but were prevented from going more than 500 feet past the end of the fan-pipe by smoke and gas. As the fan-pipe had been damaged between the fan and the shaft-bottom by the blast, the fan was shut down and the pipe was repaired. It was found impossible to restart the fan because of smoke and gas. The compressor had been started, and the blowing of compressed air began about 8.30 a.m.

All men were withdrawn from the mine, as it was impossible to remain without mine-rescue equipment.

The local Inspector and the Victoria office of the Department of Mines were immediately informed of the occurrence by telephone. A mine-rescue team, consisting of an instructor and four men, equipped with three Gibbs and two Chemox machines, were flown from Nanaimo and arrived at the mine about 5.30 p.m., August 18th. With the aid of these men and the equipment the bodies of Geils, Ryan, and Wright were found about 2.30 a.m., August 19th. The ventilation was re-established at this time and allowed to blow until 8 a.m., August 20th. The mine was then re-entered, using the oxygen equipment, and the bodies were recovered about 12.30 p.m.

From the position of the bodies and the evidence obtained, the accident was reconstructed as follows: The motor had proceeded to diamond-drill hole No. 42. Ryan was driving the motor and was seated at the controller. Wright was on the rear seat of the motor. Geils was riding in the head car. It is believed that the motor was stopped to allow Geils to go ahead, either to open or to close the air-valve. In the meantime Wright got off the motor. The track has a fairly heavy grade at that point, and the motor, not being coupled to the cars, rolled back about 25 feet. The controller was found to be about half-way on in the reverse position, indicating that it may have been used as a brake to prevent the motor from running still farther away from the cars. That this had been common practice was brought out in the evidence. Reversing the controller while the motor was running away from the cars would cause a flash which would ignite an explosive mixture of methane and air. The bodies showed no evidence of having moved after the explosion, and death appeared to have been instantaneous. The exposed parts, hands and face and hair, were badly burned. Two of the men's hats were found about 220 feet back of the motor, badly shattered. The motor was derailed and the mine-cars were upturned. The timber was damaged and some parts of the working caved partially.

The existence of small quantities of methane at this property had been known for some time. Tests with a safety-lamp and analyses of air samples up to the time of the explosion had indicated small amounts of methane, not exceeding 0.2 per cent.

However, diamond-drill hole 42, completed on August 15th, 1947, and examined carefully after the bodies were recovered, showed what appeared to be substantial amounts of gas issuing. A test with a safety-lamp at the collar of the hole gave the characteristic reaction for methane, and a rough measurement of the volume gave a flow of about 20 cubic feet per hour. Diamond-drill hole 41 could not be examined after the explosion because of the cave, but it is reported that this and another hole in the immediate vicinity together gave about an equal amount. Only insignificant quantities appeared to be issuing from the other holes which could be examined.

Assuming the above figures to be correct and assuming the gas to be 100 per cent. methane, the amount issuing from the holes would give a sufficient volume to render explosive, at 5 per cent. methane, about 32,000 cubic feet of mine-air or 500 to 600 feet of tunnel. This situation undoubtedly brought about a condition where an explosion could have been started by a spark from the motor. There was no evidence to show that smoking, matches, or other flames were responsible.

Up to August 15th the mine had been operating on a two-shift basis and the ventilation system kept going continually, which meant that the four hours between shifts was quite sufficient to clear the working of explosive mixtures of gases.

We conclude that the unexpected quantities of methane issuing from the diamond-drill holes 41 and 42, together with the fact that the ventilation system was not working for about forty hours over the week-end, was responsible for the explosive accumulation. It is our opinion that the direct cause of the explosion was a spark from the locomotive battery motor.

As a result of our investigation, the following recommendations are submitted:—

When gas has been found issuing from workings or diamond-drill holes, the following procedure must be followed:—

(1) All work in the area shall be suspended, except for such work as is necessary to maintain or increase ventilation, and such ventilation must be maintained continuously.

(2) No electric motor, battery or trolley locomotive, smoking, matches, hob-nailed boots, or anything which may cause or produce a spark or flame shall be allowed in the area.

(3) The local Inspector of Mines and the Chief Inspector of Mines must be notified immediately by telephone or telegraph.

(4) The Department of Mines, on being notified of such an occurrence, shall immediately send an Inspector of Mines to the property, who will, after investigation, impose such restrictions and regulations as he sees fit for the safe working of the area and the prevention of the spread of gases to other parts of the mine.

As a result of this accident, the following Order in Council, as an addition to present ventilation rules, was passed:—

" 1. In any mine-workings where the conditions prescribed by Rule 3 of section 39 of the 'Metalliferous Mines Regulation Act' cannot be obtained by natural ventilation, approved means for mechanical ventilation shall be provided and kept in continuous operation until those workings have been abandoned or until satisfactory natural ventilation has been established therein.

" 2. If the main system of ventilation is shut down for any reason for more than four hours then ventilation must be restored at least four hours before any person enters the mine. In any workings where an inflow of noxious gas is known to occur, auxiliary ventilation to these workings must be maintained continuously, and if for any reason auxiliary ventilation has been interrupted, no person shall be allowed to enter the workings until a period of four hours has elapsed after the ventilation has been restored.

"3. Every owner, agent, or manager, as defined by section 2 of the said Act, who contravenes or does not comply with any of the provisions of these regulations shall be guilty of an offence, and shall be liable, on summary conviction, to a fine of not less than one hundred dollars and not more than one thousand dollars."

DANGEROUS OCCURRENCES.

On January 26th, at the Cariboo Gold Quartz mine, the hoistman had just hoisted and dumped a skip-load of muck. When he lowered the skip, the counter-balance, unknown to him, came out of its boxed guides in the manway compartment. The 3,000-lb. weight tore out about 200 feet of manway platforms before the power kicked off.

On January 28th, at the Big Star group of Spud Valley Gold Mines, Limited, the bunk-house and cook-house were destroyed by a fire, thought to have been caused by an overheated wood-stove in the basement.

On February 24th, at the Polaris-Taku mine, a hoistman inadvertently pulled one of the cages through the limit-switch and to a bulkhead 53 inches above the switch. Ore was being hoisted from the 300 level, using both skips, which are below the cages and were in balance at that point. The hoistman received a signal to hoist men from the 300 level to the Polaris level. On reaching the Polaris level, he received a signal to lower men from that level to the 450 level. He forgot to change the position of the skips but claimed to have shut off the power and applied the brake before the cage struck the bulkhead. The cage must have been travelling at nearly normal hoisting speed of 600 feet per minute when it reached the limit-switch, and this may account for the switch failing to act. An investigation showed no mechanical or electrical defect, although the inside of the switch casing was slightly damp. The switch had been regularly tested every day and functioned perfectly when tested at low speeds after the occurrence.

On May 8th, at the No. 1 jaw-crusher of the Copper Mountain mine crusher plant, premature ignition of an explosive charge resulted in injury to the crusher operator. It was thought that, because blasting was done electrically, stray current might be the cause of the premature ignition. However, no evidence of stray current could be found either shortly after the accident or several months later.

On July 23rd, at the Sullivan mine, a workman was climbing onto a chute platform when a shot exploded in the chute. He was knocked off the ladder and was momentarily stunned, but otherwise was uninjured. The men involved claimed that the warning-whistle was blowing, but it was apparently not working properly just prior to the blast. One of the loading crew had been sent to guard the approach used by the man involved in the blast. He had failed to do this effectively and was given a six-day lay-off.

On August 27th, in a scraper drift on the 1800 level of the Britannia mine, a series of three bulldoze charges exploded while the scraperman and his helper were connecting the blasting leads to the blasting circuit. Examination of the blasting circuit revealed that, when the switch was in the locked-open position, the lock grounded the operating handle, which, in turn, was connected to the blasting circuit. Thus the blasting leads from the switch to the scene of blasting operations were grounded. Test for stray current revealed that there was sufficient stray current from the trolley circuit on the 2200 level to fire an electric blasting-cap on the 1800 level when the leads were connected between the water-line and the rail. There is no trolley circuit on the 1800 level. Indications of stray current could be found by test between the water-line and the ore or drainage ditch in the scraper ditch in the scraper drift. It was evident that, since the blasting switch was grounded to the water-line and the bare ends of the blasting-cap leads were in contact with the ore-body, stray current passed through the caps and exploded them.

On September 4th, at the No. 2 shaft of the Pioneer mine, while adjusting the rope so that one skip would be at 9 level dump while the other would be at the 23 level pocket, the west-side empty skip was accidentally run too far into the 9 level dump. In attempting to back this skip out, considerable rope was kinked, necessitating its removal.

On September 9th, at the 15 level pocket raise of the Pioneer mine, minute amounts of methane gas were found issuing from a 16-inch bootleg. Work in the area was stopped until the flow ceased.

On September 17th, at the Sullivan mine, the night shiftboss was about to enter a stope by the regular entrance. He did not see any of the miners on his way into the working-place and became concerned as to where they were. As he passed the scraper hoist, a bulldoze charge exploded in a draw-hole about 15 feet away. The concussion knocked him down, and he immediately crawled to the side of the hoist for safety, as he did not know how many shots were to follow. On investigation it was found that the warning-whistle had not been turned on and that the miner who was supposed to guard the entrance had failed to notice that the shiftboss had passed him. The miner was given a reprimand and a twelve-day lay-off. His blasting certificate was suspended for three months.

On September 25th, at the Sullivan mine, a fire occurred in the fan-motor at the 3350 ore-dump. An investigation revealed that one fuse in the motor switch-box had blown out, allowing the motor to run in single phase. The current drawn by the motor on single phase was not sufficient to blow the other fuses out but was sufficient to overheat the windings. The fuse-clips holding the fuse had lost their tension and the thermal overcurrent relays were not in proper adjustment. Poor contact caused the fuse to blow out and poor adjustment prevented the thermal overcurrent relays from working. The motor therefore carried an overcurrent sufficient to overheat and ignite the insulation.

On October 5th a small fire of unknown origin broke out at the central station of the main surface tram of the Nickel Plate mine. A passer-by noticed the fire and warned the tram operator, who immediately extinguished the flames. There was no damage done to the building, but the heat affected the tramway cable to the extent that it had to be removed from this service.

On October 19th, at the Pioneer mine, gas was found issuing from a diamond-drill hole 27 feet long on the 2300 level. An analysis of this gas gave 24.66 per cent. methane, 74.81 per cent. nitrogen, 0.05 per cent. carbon dioxide, and 0.48 per cent. oxygen. Drifting in the area was suspended until the hole was concreted.

On October 21st, at the Sullivan mine, the hoisting-cable in the No. 1 pilot shaft broke. On investigation it was discovered that the rope close to the skip had been subjected to severe abuse. This condition had been detected in the morning and had been reported twenty minutes before the rope failed. A complete investigation was made, and definite steps have been taken by the company to see that an accident of this nature will not happen again.

On October 25th, at the Emerald mine, an assistant blaster reported an explosive accident that occurred to him while coming off shift. He claimed that a burning hot wire spitter ignited 80 per cent. powder he was carrying in his hand. The man admitted negligence in carrying a lighted spitter and powder at the same time. There was some question as to the accuracy of his report, and he was replaced by a more competent man.

On November 7th, at the Pioneer mine, a small amount of gas was noticed issuing from a drill-hole in the face of the 2200 level on the "27" vein. Work was suspended until the flow ceased.

On November 22nd, at the Sheep Creek mine, the miner in a shrinkage stope was retreating from a spit round when a shot went off prematurely, knocking him over and breaking his electric lamp. He started to crawl out but, in groping around, touched a hot fuse. He reversed his direction and was able to reach the foot of the stope manway before the rest of the round went off. On investigation it was discovered that he had disposed of an extra primer by inserting it in the collar of one of the loaded holes and cutting off the fuse flush with the collar. Evidently he had inadvertently and unknowingly lit this fuse while lighting the round, and this hole went off before he was able to get to a safe place.

On November 24th, at the Island Mountain mine, the hoistman forgot that the skips were out of balance and pulled one into the sheave-wheel when he lowered the other to a station. The limit-switches worked, but the skip was badly damaged and a few of the guides were torn out. The hoistman involved was disciplined by the company.

EXPLOSIVES USED IN MINES.

The table below shows the quantities of explosives and blasting accessories used in the metal mines and quarries in British Columbia in 1945, 1946, and 1947:—

	1945. Total.	1946. Total.	1947. Total.	1947.	
				Mines.	Quarries.
High explosives (lb.)	3,677,200	3,960,150	5,464,900	5,248,600	216,300
Blasting-caps	1,151,000	1,464,300	1,780,700	1,621,700	159,000
Electric blasting-caps	28,200	4,910	117,650	102,500	15,150
Delay electric blasting-caps	6,200	29,425	55,700	54,100	1,600
Primacord (ft.)	135,000	135,500	258,000	257,000	1,000
Safety-fuse (ft.)	7,315,000	11,625,300	13,722,100	13,038,300	683,800

The table shows a definite trend toward the increasing use of electrical and primacord blasting in 1947.

PROSECUTIONS.

On May 10th two miners at the Polaris-Taku mine committed an infraction of section 39, Rule 25 (*b*), of the "Metalliferous Mines Regulation Act" by failing to guard their working-place adequately during blasting operations. They were convicted, each was fined $10 and costs, and their blasting certificates suspended for a period of three months.

On August 2nd the operator of a placer-mining lease at Horsefly committed an infraction of section 39, General Rule 5, of the "Metalliferous Mines Regulation Act," by operating a gasoline-driven pump in a shaft. A workman, who descended the shaft to adjust the engine while it was running, was overcome by monoxide fumes and lost his life through asphyxiation and drowning. The operator was prosecuted and was fined $100 and costs.

On September 9th, at the Sullivan Mine, two miners committed an infraction of section 39, General Rule 22 (*b*), of the "Metalliferous Mines Regulation Act." The miners, due to circumstances beyond their control, failed to complete the round and blast it before quitting time. They had, however, started to load three holes. When advised that a cross-shift would complete the round, they neglected to report that there was powder in the three holes. As a result, the miner on the cross-shift drilled into the powder and was killed. The miners were prosecuted and fined $50 and costs each, and their blasting certificates were cancelled.

AIR-SAMPLING.

Air samples were taken in all cases where conditions indicated the possibility of noxious gases being present or the oxygen content being below normal. Particular attention was given to the possible presence of methane in the Bridge River area, as the Pacific (Eastern) Gold Mines explosion showed that small flows of this gas, if allowed to accumulate, can bring about dangerous conditions. In general, the analysis showed no dangerous conditions, but indicated the presence of methane locally. In those cases, recommendations were made, and, where necessary, instructions for additional ventilation were issued by the Inspector.

DUST AND VENTILATION.

Problems in ventilation and dust-control have continued to receive attention from operating companies and Government departments.

The increased used of diamond-drill blasting in stopes at some of the larger mines tends to reduce dust counts and also enables blasting operations to be arranged so that workmen are exposed as little as possible to dust and fumes. The increased use of scraper drifts instead of bulldoze chambers has brought up new problems in ventilation and dust-control which are receiving attention. Preliminary work indicates that the use of certain types of detachable bits and increased pressure and volume of water in percussion drilling will reduce dust counts.

The use of aluminium-dust therapy is general in practically all mines in the Province where a hazard from silica-dust exists.

SAFETY AND FIRST AID.

The Mine Safety Associations in the different centres in the Province, aided by Safety Engineers and Inspectors of Mines, continued to foster first aid and safety education in their respective districts.

First-aid and mine-rescue competitions were held at Nanaimo, Princeton, and Fernie, and the newly formed West Kootenay Mine Safety Association held a first-aid competition at Nelson. Participants in the first-aid competitions included teams of women, boys, and girls, as well as teams of men from the various mines in the districts.

As in former years, the Department of Mines supplied most of the financial aid, but the credit for the success of these competitions is largely due to the enthusiasm and efforts of officials and men at the various mines.

The programme of training mine-rescue teams for metal mines was started some years ago but, of necessity, was somewhat neglected during the war; it was vigorously prosecuted in 1947. The necessity for this important work was strongly impressed on all concerned by the Pacific (Eastern) Gold Mines explosion. For some years trained mine-rescue teams have been maintained at Kimberley and Princeton. With the idea of extending this work to other centres, key men from Britannia, Bridge River, and Cariboo were sent to the mine-rescue station at Nanaimo, where they received a complete course in the maintenance and use of all types of mine-rescue equipment. These men are now engaged in training teams in their respective areas. The men so trained will, after passing an examination by the mine-rescue station instructor, receive certificates of competency in this work. It is expected that about 100 new men will be granted certificates this year.

The work of the Department in this effort has met with splendid co-operation from both men and officials.

COAL-MINING.

By James Strang, Chief Inspector of Mines.*

CONTENTS.

* Information about the officers of the Inspection Branch will be found on pp. 47–48.

PRODUCTION.

The total tonnage produced by the coal mines of the Province for the year 1947 was 1,717,476 long tons, being an increase of 253,836 tons or 17.3 per cent. over 1946.

Vancouver Island collieries produced 493,998 tons, a decrease of 53,470 tons or 9.7 per cent. from 1946.

The Northern District produced 14,995 tons, an increase of 1,986 tons or 15.3 per cent. over 1946.

The Nicola-Princeton District produced 46,057 tons, an increase of 5,563 tons or 13.7 per cent. over 1946.

The East Kootenay District produced 1,162,426 tons, an increase of 299,757 tons or 34.7 per cent. over 1946.

The increase in the East Kootenay District was principally due to the opening-up of a strip mine at Michel and to the resumption of strip mining at Corbin. The tonnage from the strip mines amounted to approximately 232,000 tons for the year.

The following table shows the output and *per capita* production daily and for the year 1947 at the various mines:—

OUTPUT AND PER CAPITA PRODUCTION, 1947.

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)	24,897	71	146	2.39	170	110	3.18	226
Comox Colliery (No. 8 mine)	187,676	249	450	1.67	417	337	2.25	557
Tsable River mine	4,255	251	49	0.34	87	44	0.38	97
South Wellington No. 10 mine	214,448	247	248	3.50	865	210	4.13	1,022
Prospect mine	1,593	138	6	1.92	265	5	2.30	318
White Rapids mine	49,518	244	116	1.74	426	105	1.93	471
Chambers' mine	3,332	215	8	1.30	416	6	2.58	555
Loudon mine	1,308	211	5	1.27	261	4	1.55	327
Cassidy mine	1,017	170.	4	1.49	254	3	2.00	339
Lewis mine (Timberlands)	801	254	2	1.57	400	2	1.57	400
Deer Home mine	1,953	223	4	2.19	488	3	2.91	651
Wellington mine (Carruthers)	754	228	2	1.63	372	2	1.63	372
Pacific mine	......	......	......	......	......	......	......	......
Stronach mine	1,880	208	6	1.50	313	5	1.80	376
Furnace Portal mine	566	151	2	1.87	283	2	1.87	283
Tulameen Collieries	41,634	274	70	2.16	594	61	2.49	682
Taylor-Burson mine	2,380	231	4	2.57	595	3	3.43	793
Coldwater mine	2,018	219	5	1.84	403	3	3.07	672
Black mine	25	......	......	......	......	......	......	......
Bulkley Valley Collieries	9,622	216	31	1.43	310	25	1.78	385
Packwood mine	1,548	80	7	2.76	221	5	3.86	309
Peace River mine	3,365	203	13	1.27	258	10	1.65	336
Gething mine	460	53	6	1.43	76	5	1.73	92
Elk River Colliery	316,383	215	349	4.21	906	271	5.42	1,167
Michel Colliery	757,779	237	668	4.72	1,119	469	6.81	1,616
Corbin	88,264	96	198	......	......	......	......	......

COLLIERIES OF VANCOUVER ISLAND INSPECTION DISTRICT.

The output of Vancouver Island collieries was 493,998 tons. Of this amount, 87,037 tons or 17.6 per cent. was lost in preparation for the market, 3,380 tons or 0.68 per cent. was consumed by operating companies as fuel, 402,650 tons was sold in the competitive market, and 931 tons was added to stock. Of the amount sold in the competitive market, 387,184 tons or 96.1 per cent. was sold in Canada and 15,466 tons or 3.9 per cent. was sold in the United States.

Collieries of the Nicola-Princeton District.

Of the gross total of 46,057 tons produced by the collieries of the Nicola-Princeton District, 233 tons was consumed by the operating companies as fuel, 2 tons was in stock, and 45,822 tons was sold in the competitive market.

Collieries of the Northern District.

Out of a total of 14,955 tons produced, 106 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 1,162,426 tons. Of this amount, 115,148 tons or 9.9 per cent. was lost in preparation for the market, 21,574 tons or 1.8 per cent. was consumed by the operating companies as fuel, 156,844 tons or 13.5 per cent. was used in making coke, and 869,070 tons was sold in the competitive market. Of the amount sold in the competitive market, 735,851 tons or 84.6 per cent. was sold in Canada and 133,219 tons or 15.4 per cent. was sold in the United States; 210 tons was taken from stock.

The following table shows the *per capita* production of the various districts for the year 1947:—

Output and per Capita Production in Various Districts, 1947.

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	493,998	1,048	471	838	589
Nicola-Princeton District	46,057	105	438	71	648
Northern District	14,995	57	263	45	333
East Kootenay District	1,162,426*	1,215	956	740	1,257†
Whole Province	1,717,476*	2,425	708	1,694	877†

* Includes output of strip mines at Michel and Corbin, amounting to 232,000 tons.

† In calculating the coal mined per underground employee, the output of strip mines has been deducted from the total output, and the number employed underground does not include those employed in strip mines.

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, 1947.

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 1947.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Vancouver Island District.													
Canadian Collieries (D.), Ltd.—													
Comox Colliery (No. 5 mine)	21,917	1,074	....	22,991	3,119	....	350	3,469	1,563	....	....	1,563	24,897
Comox Colliery (No. 8 mine)	141,116	6,891	....	148,007	36,523	....	2,157	38,680	549	1,538	989	....	187,676
Tsable River mine	3,011	148	....	3,159	150	....	46	196	42	942	900	....	4,255
South Wellington No. 10 mine	164,058	5,790	....	169,848	43,476	....	651	44,127	2,226	2,699	473	....	214,448
Prospect mine	1,202	....	....	1,202	391	....	....	391	....	....	....	....	1,593
White Rapids mine	44,269	1,563	....	45,832	3,378	....	176	3,554	430	562	132	....	49,518
Chambers' mine	3,332	....	....	3,332	....	....	....	....	....	....	....	....	3,332
Loudon mine	1,308	....	....	1,308	....	....	....	....	....	....	....	....	1,308
Cassidy mine	1,017	....	....	1,017	....	....	....	....	....	....	....	....	1,017
Lewis mine (Timberlands)	801	....	....	801	....	....	....	....	....	....	....	....	801
Deer Home mine	1,953	....	....	1,953	....	....	....	....	....	....	....	....	1,953
Wellington mine (Carruthers)	754	....	....	754	....	....	....	....	....	....	....	....	754
Pacific mine	....	....	....	....	....	....	....	....	....	....	....	....	....
Stronach mine	1,880	....	....	1,880	....	....	....	....	....	....	....	....	1,880
Furnace Portal mine	566	....	....	566	....	....	....	....	....	....	....	....	566
Totals, Vancouver Island District	387,184	15,466	....	402,650	87,037	....	3,380	90,417	4,810	5,741	2,494	1,563	493,998
Nicola-Princeton District.													
Tulameen Collieries	41,634	....	....	41,634	....	....	....	....	....	....	....	....	41,634
Taylor-Burson mine	2,380	....	....	2,380	....	....	....	....	....	....	....	....	2,380
Coldwater mine	1,783	....	....	1,783	....	....	233	233	....	2	2	....	2,018
Black mine	25	....	....	25	....	....	....	....	....	....	....	....	25
Totals, Nicola-Princeton District	45,822	....	....	45,822	....	....	233	233	....	2	2	....	46,057
Northern District.													
Bulkley Valley Collieries	9,599	....	....	9,599	....	....	53	53	870	840	....	30	9,622
Packwood mine	1,548	....	....	1,548	....	....	....	....	....	....	....	....	1,548
Peace River mine	3,312	....	....	3,312	....	....	53	53	....	....	....	....	3,365
Gething mine	460	....	....	460	....	....	....	....	....	....	....	....	460
Totals, Northern District	14,919	....	....	14,919	....	....	106	106	870	840	....	30	14,995
East Kootenay District.													
Crow's Nest Pass Coal Co., Ltd.—													
Elk River Colliery	186,391	102,306	....	288,697	24,094	....	3,802	27,896	235	25	....	210	316,383
Michel Colliery	461,196	30,913	....	492,109	91,054	156,844	17,772	265,670	....	....	....	....	757,779
Corbin Collieries (strip mining)	88,264	....	....	88,264	....	....	....	....	....	....	....	....	88,264
Totals, East Kootenay District	735,851	133,219	....	869,070	115,148	156,844	21,574	293,566	235	25	....	210	1,162,426
Coal.													
Grand totals for Province	1,183,776	148,685	....	1,332,461	202,185	156,844	25,293	384,322	5,915	6,608	2,496	1,803	1,717,476
Coke.													
Crow's Nest Pass Coal Co., Ltd.—													
Michel Colliery	41,965	64,558	....	106,523	....	....	....	....	3,971	1,604	....	2,367	104,156

Collieries of British Columbia—Men employed, 1947.

Mine.	White Men.																		Indians.			Japanese or 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)	6	4	10	52		52				19	7	26	30	16	46	3	1	4											8	8	110	36	146
Comox Colliery (No. 8 mine)	20	11	31	169		169				71	24	95	65	58	123	12		12											20	20	337	113	450
Tsable River mine	5	1	6	28		28				5		5	6	4	10																44	5	49
South Wellington No. 10 mine	10	4	14	101		101				81	17	98	17	13	30	1	4	5													210	38	248
Prospect mine	1		1	4		4								1	1																5	1	6
White Rapids mine	7		7	54		54				21	7	28	22	4	26	1		1													105	11	116
Chambers' mine	1		1	5		5					1	1																	1	1	6	2	8
Loudon mine		1	1	4		4																									4	1	5
Cassidy mine	1	1	2	2		2																									3	1	4
Lewis mine (Timberlands)				2		2																									2		2
Deer Home mine	1		1	2		2					1	1																			3	1	4
Wellington mine (Carruthers)				2		2																									2		2
Pacific mine																																	
Stronach mine	1		1	4		4					1	1																			5	1	6
Furnace Portal mine				2		2																									2		2
Totals, Vancouver Island District	53	22	75	431		431				197	58	255	140	96	236	17	5	22											29	29	838	210	1048
Nicola-Princeton District.																																	
Tulameen Collieries	4	1	5	37		37	14		14	3	3	6	3	5	8																61	9	70
Taylor-Burson mine	1		1	2		2								1	1																3	1	4
Coldwater mine		2	2	2		2	1		1																						3	2	5
Black mine		2	2	4		4					8	8		12	12																4	22	26
Totals, Nicola-Princeton District	5	5	10	45		45	15		15	3	11	14	3	18	21																71	34	105
Northern District.																																	
Bulkley Valley Collieries	2	2	4	15		15	4		4	2	1	3		2	2				2	1	3										25	6	31
Packwood mine				5		5					2	2																			5	2	7
Peace River mine	1	1	2	4		4	4		4	1	1	2		1	1																10	3	13
Gething mine				4		4	1		1		1	1																			5	1	6
Totals, Northern District	3	3	6	28		28	9		9	3	5	8		3	3				2	1	3										45	12	57
East Kootenay District.																																	
Crow's Nest Pass Coal Co., Ltd.—																																	
Elk River Colliery	15	11	26	149		149				59	37	96	48	27	75		3	3													271	78	349
Michel Colliery	28	30	58	232		232	200		200		116	116	7	49	56	2	4	6													469	199	668
Corbin Collieries, Ltd.		3	3											195*	195																	198	198
Totals, East Kootenay District	43	44	87	381		381	200		200	59	153	212	55	271	326	2	7	9													740	475	1215
Grand totals for Province	104	74	178	885		885	224		224	262	227	489	198	388	586	19	12	31	2	1	3								29	29	1694	731	2425

* Strip mining—men all on surface.

Note.—U=Underground; A=Above ground; T=Total.

LABOUR AND EMPLOYMENT.

During 1947, 2,425 persons were employed in and about the coal mines of the Province, an increase of 120 over 1946. As the men in the mines now receive holidays with pay, it is considered advisable to take the maximum working-days in the year as 290 instead of 300. In the Vancouver Island District about 16 per cent. of the working-days were lost, principally due to the men working a forty-hour week instead of forty-eight hours. For the same reason about 16 per cent. of the working-days in the Nicola-Princeton District were lost. In the East Kootenay District the mines worked about 77 per cent. of the working-days, the remainder being lost principally through the mines being idle every Saturday.

COMPETITION OF COAL PRODUCED OUTSIDE OF BRITISH COLUMBIA.

During 1947 the shipment of Alberta coal to British Columbia totalled 899,403 short tons. Coke shipped was 52,439 tons and briquettes 32,421 tons. The following table shows the amount of Alberta coal brought into British Columbia during past years:—

Year.	Short Tons.	Year.	Short Tons.
1938	238,435	1943	963,000
1939	239,227	1944	678,960
1940	311,232	1945	868,396
1941	304,928	1946	982,413
1942	652,222	1947	899,403

Of the 1,332,461 tons of British Columbia coal marketed, 181,968 tons was sold for domestic and industrial uses in Alberta, Saskatchewan, Manitoba, and Ontario; 326,062 tons was sold for railroad use in Canada; 9,066 tons was sold for railroad use in the United States; 124,153 tons was exported to the United States; and 39,437 tons was sold for ships' bunkers. The tonnage used for domestic and industrial purposes in the Province was 651,775 tons.

ACCIDENTS IN AND AROUND COAL MINES.

During 1947, 2,425 persons were employed in and around coal mines. Two fatal accidents occurred during the year, as compared with four during 1946. The number of fatal accidents per 1,000 persons employed was 0.82, compared with 1.73 in 1946, 2.05 in 1945, 1.06 in 1944, 2.80 in 1943, 4.23 in 1942, 1.47 in 1941, 2.08 in 1940, 0.67 in 1939, and 3.37 in 1938. The average for the ten-year period was 2.01.

The number of fatal accidents per 1,000,000 tons of coal produced during 1947 was 1.16; during 1946 the figure was 2.73; in 1945, 2.39; in 1944, 1.55; in 1943, 4.33; in 1942, 5.15; in 1941, 2.21; in 1940, 3.65; in 1939, 1.35; and in 1938, 7.63. The average for the ten-year period was 3.30 per 1,000,000 tons raised.

The following table shows the collieries at which the fatal accidents occurred during 1947 and comparative figures for 1946:—

Name of Company.	Name of Colliery.	1947.	1946.
Canadian Collieries (D.), Ltd.	No. 5 mine, Comox Colliery	....	2
Canadian Collieries (D.), Ltd.	No. 10 mine, South Wellington	1	....
Crow's Nest Pass Coal Co., Ltd.	Elk River Colliery	1	1
Crow's Nest Pass Coal Co., Ltd.	Michel Colliery	....	1
Totals		2	4

The following table shows the various causes of fatal accidents in 1947 and their percentages of the whole and comparative figures for 1946:—

Cause.	1947.		1946.	
	No.	Per Cent.	No.	Per Cent.
By falls of roof and coal	1	50.00	1	25.00
By mine-cars and haulage	1	50.00	3	75.00
Totals	2	100.00	4	100.00

The following table shows the number of tons of coal mined for each fatal accident in their respective classes in the years 1947 and 1946:—

Cause.	1947.		1946.	
	Number of Fatal Accidents.	Tons of Coal mined per Fatal Accident.	Number of Fatal Accidents.	Tons of Coal mined per Fatal Accident.
By falls of roof and coal	1	1,717,476	1	1,463,640
By mine-cars and haulage	1	1,717,476	3	487,880
Totals	2	858,738	4	365,910

The number of tons of coal mined per fatal accident during 1947 was 858,738 tons, compared with 365,910 tons in 1946. The average for the ten-year period was 308,328 tons.

The following table shows the fatalities from various causes in coal mines during the year 1947 compared with 1946, according to Inspection Districts:—

District.	Number of Deaths from Accidents.		Totals.	
	Falls of Roof and Coal.	Mine-cars and Haulage.	1947.	1946.
Vancouver Island	1	....	1	2
Nicola-Princeton	....	....	....	....
East Kootenay	....	1	1	2
Northern	....	....	....	....
Province, 1947	1	1	2	....
Province, 1946	1	3	....	4

RATIO OF ACCIDENTS.

District.	Accident Death-rate.			
	Per 1,000 Persons employed.		Per 1,000,000 Tons of Coal mined.	
	1947.	1946.	1947.	1946.
Vancouver Island	0.95	1.89	2.02	3.65
Nicola-Princeton	....	....	....	....
East Kootenay	0.82	1.84	0.86	2.31
Northern	....	....	....	....
Province, 1947	0.82	....	1.16	....
Province, 1946	....	1.73	....	2.73

The details regarding the occurrences of fatal accidents in coal mines during 1947 are as follows:—

The fatal accident which occurred to James Merner, miner, at No. 10 mine, South Wellington, on the morning of May 16th, 1947, was caused by a fall of coal and rock that came away from a slip which extended from the top of the coal into the roof. James Merner and his son were working at the face of a crosscut off No. 2 Right, No. 1 Diagonal counter-slope. Merner was preparing to put up a set of timber after two shots had been fired, when about 3 tons of coal and cap-rock came away from a hidden slip and buried him.

A fatal accident occurred to Samuel Fowler on May 7th, 1947, at No. 10 mine, Elk River Colliery, when he was struck by a two-car trip on No. 6 incline, No. 10 mine. Fowler was apparently kneeling on the incline, examining a leak in the compressed-air line, and did not seem to realize a trip of cars was coming down. The rope-rider did not notice Fowler until the trip was about 10 feet away from him and was unable to signal the hoistman in time to stop the trip. Fowler suffered multiple fractures and damaged kidneys. He was removed to the Fernie Hospital, but died on May 13th. Mr. Fowler was a capable official and was expected to have a promising career ahead of him.

EXPLOSIVES.

The following table shows the quantity of explosives used in coal mines during 1947, together with the number of shots fired, tons of coal produced per pound of explosive used, and the average pounds of explosive per shot fired (these quantities include all the explosives used for breaking coal and for rock-work in coal mines):—

VANCOUVER ISLAND DISTRICT.

Colliery.	Quantity of Explosives used in Pounds.	Coal mined (Tons).	Total Number of Shots fired.	Tons of Coal per Pound of Explosive used.	Average Pounds of Explosive per Shot fired.
Comox Colliery (No. 5 mine)	5,238	24,897	8,950	4.75	0.58
Comox Colliery (No. 8 mine)	58,930	187,676	86,750	3.18	0.68
Tsable River mine	6,425	4,255	1,150	0.66	5.58
South Wellington No. 10 mine	68,250	214,448	73,000	3.14	0.93
Prospect mine	500	1,593	800	3.02	0.62
White Rapids mine	20,000	49,518	31,500	2.47	0.63
Chambers' mine	1,600	3,332	3,400	2.08	0.44
Loudon mine	1,800	1,308	2,400	0.72	0.75
Cassidy mine	350	1,017	500	2.90	0.70
Lewis mine (Timberlands)	1,400	801	2,800	0.57	0.50
Deer Home mine	1,500	1,953	2,200	1.30	0.68
Wellington mine (Carruthers)	700	754	860	1.08	0.81
Stronach mine	3,600	1,880	3,000	0.52	1.20
Furnace Portal mine	500	566	750	1.13	0.66
Totals for district	170,793	493,998	218,060	2.89	0.73

NICOLA-PRINCETON DISTRICT.

Tulameen Collieries	12,800	41,634	20,500	3.23	0.62
Taylor-Burson mine	1,300	2,380	1,150	1.81	1.13
Coldwater mine	1,000	2,018	1,000	2.01	1.00
Black mine	....	25	....	....	....
Totals for district	15,100	46,057	22,650	3.05	0.66

NORTHERN DISTRICT.

Bulkley Valley Collieries	2,425	9,622	3,895	3.96	0.62
Packwood mine	750	1,548	1,400	2.06	0.32
Peace River mine	3,300	2,365	3,300	0.70	1.00
Gething mine	250	460	350	1.84	0.71
Totals for district	6,725	14,995	8,945	2.22	0.75

EAST KOOTENAY DISTRICT.

Elk River Colliery	10,363	316,383	13,693	31.48	0.75
Michel Colliery	72,425	757,779	82,169	10.46	0.88
Corbin	....	88,264	....	....	....
Totals for district	82,788	1,162,426	95,862	14.04	0.86
Totals for Province	275,396	1,717,476	345,517	6.20	0.79

QUANTITY OF DIFFERENT EXPLOSIVES USED.

	Lb.
Monobel of different grades	269,085
Permissible rock-powder	6,311
Total	275,396

MACHINE-MINED COAL.

During the year 1947 mining-machines produced approximately 912,000 tons or 53 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	....	24	20	4
Nicola-Princeton	....	7	....	7
East Kootenay	....	33	16	17
Northern	...	3	....	3
Totals	....	67	36	31

In addition to the above, 136 air-picks are used in the mines of the Crow's Nest Pass Coal Co.

SAFETY-LAMPS.

There were 2,363 safety-lamps in use in the coal mines of the Province. Of this number, 185 were flame safety-lamps of the Wolf type and 2,178 were approved electric safety-lamps of various makes.

Approved Safety-lamps—Electric and Flame.

The following is a list of approved safety-lamps, electric and flame:—

- The Wolf lamp, flame type.
- The Koehler lamp, flame type.
- The Edison electric lamp (cap) as approval No. 18 of the United States Bureau of Mines, and all Edison cap-lamps up to and including Model P carrying the approval certificate No. 26 of the United States Bureau of Mines. The use of these lamps is subject to bulbs being the same as have been approved for use with these lamps by the United States Bureau of Mines.
- The Wheat electric lamp and having approval No. 20 as issued by the United States Bureau of Mines.
- The Wolf electric lamp No. 830C.
- The electric lamp manufactured by the Portable Lamp and Equipment Company under approval No. 27 of the United States Bureau of Mines.
- M.S.A. single-cell trip-lamp carrying United States Bureau of Mines approval No. 1009, approved for use on haulage trips in mines.

ELECTRICITY.

Electricity is used for various purposes on the surface at seven mines and underground at three. The total horse-power used in and about the mines amounted to approximately 15,363.

Detailed information as to how and where this power is used is given in the report of the Electrical Inspector of Mines.

VENTILATION.

In the reports of the District Inspectors detailed information is given regarding the amount of ventilation in the main airways and working-splits of the various mines. In any instance where the methane content in the air at the working-faces is such that it can be detected on the flame of a safety-lamp, the use of explosives is prohibited until either more air is sent along the working-faces or the flow of methane lessens.

In no case where blasting was prohibited was it found that the quantity of air passing per minute had fallen below the minimum requirements stated in General Rule 2 of the "Coal-mines Regulation Act," but rather that the flow of methane in that area had increased.

METHANE DETECTION.

The Burrell methane detector and the M.S.A. detector are the principal instruments used in detecting percentages of methane less than can be shown on the flame of a safety-lamp.

The flame safety-lamp is used regularly by firebosses and other mine officials for everyday tests of methane in the working-places and airways.

The Inspectors in the various districts have encouraged both firebosses and miners to make careful tests with the safety-lamp, and as a result most firebosses and many miners are able to estimate closely the percentage of methane indicated by very small gas-caps on the flame of the safety-lamp.

Practically all workmen underground use the electric safety-lamp, but there are certain instances where a miner must also have a flame safety-lamp in his working-place. It is therefore necessary that every candidate who applies for a coal-miner's certificate should be able to test for gas with the flame safety-lamp and also to know when the lamp is safe to use.

MINE-AIR SAMPLES.

Mine-air samples are taken regularly in the main return airways and in the return airways of the various splits. Although the results of the analyses of these samples are not immediately available, they form a valuable record of the composition of the air travelling through the mines and offer a means of checking the accuracy of other means of methane testing. During 1947 over 150 samples were taken.

INSPECTION COMMITTEES.

The provisions of the "Coal-mines Regulation Act," section 101, General Rule 37, require that an inspection committee of workmen shall inspect the mines regularly on behalf of the workmen and make a true report of the conditions found. This rule is fully observed at all the larger mines in the Province, and the reports of these committees are forwarded to the Inspector, who finds them of great value. The members of these committees are practical miners and take a keen interest in the safe operation of the mines.

COAL-DUST.

During 1947 the sampling and analysing of the dust from the roof, sides, and floor of the mine roadways was well maintained, over 900 samples being analysed.

The incombustible content of the dust on the roadways must not fall below 50 per cent., and in practically all cases this requirement was lived up to. Wherever the Inspector considers that further treatment with limestone dust is required, this is ordered immediately.

DANGEROUS OCCURRENCES.

On July 3rd, at No. 10 mine, South Wellington, while a trip of twelve loaded cars was being hoisted up the Main slope the coupling-pin between the fifth and sixth cars came out, allowing seven loaded cars to run back down the slope a distance of 50 feet. One car was damaged and several sets of timber were displaced. No person was injured as a result of this break-away.

On July 3rd, at No. 8 mine, Cumberland, J. Lewis, lampman, noticed a red glow in the vicinity of the main hoisting shaft about 2.15 a.m. Upon investigation he found an outbreak of fire at a point approximately 50 feet down the shaft from the surface. Along with the hoistman, H. Chadwick, Lewis immediately got the fire-hose in action and extinguished the fire in a short time. Later investigation by the Electrical Inspector of Mines and the District Inspector showed that a short circuit of the 2,200-volt cable caused the fire. The electric cable had been pierced by a cage-guide lag screw in the shaft, and had also been damaged at a point 700 feet along the main South level. The two injuries caused a short through the armour of the cable at the point where the lag screw had pierced it, thus setting fire to the timber in the shaft.

On December 30th, in the shaft-bottom of No. 8 shaft, Cumberland, a 7½-horse-power motor became overheated and burst into flame. This motor operated the endless-rope haulage used for transporting cars to the shaft-bottom. It was reported that the rope had stranded, causing it to jam on the roadway and throw an overload on the motor. No injuries resulted to anyone.

BUMPS.

No major bump occurred in any of the mines, but several of a minor nature occurred in No. 1 East, Elk River Colliery. Little or no material damage was done, and no injuries resulted to anyone.

OUTBURSTS OF GAS.

There were no outbursts of gas reported during 1947.

PROSECUTIONS.

During 1947 there were two prosecutions for infractions of the "Coal-mines Regulation Act," as follows:—

Date.	Colliery.	Occupation of Defendant.	Offence charged.	Judgment.
April 24	Michel (Crow's Nest Pass Coal Co., Ltd.)	Miner	Jumped in a man-trip car while the car was in motion	Fined $7 and costs.
April 24	Michel (Crow's Nest Pass Coal Co., Ltd.)	Miner	Jumped in a man-trip car while the car was in motion	Fined $7 and costs.

GOVERNMENT MINE-RESCUE STATIONS.

During the year 1947 the mine-rescue stations at Cumberland, Nanaimo, Princeton, and Fernie were kept fully maintained with modern equipment, with a trained instructor at each station. Each station is equipped with several sets of McCaa and Gibbs two-hour oxygen machines, Burrell all-service gas-masks, inhalators, methane and carbon-monoxide gas testing-machines and a complete supply of first-aid equipment. Several of the new Chemox one-hour oxygen machines are now placed in each of the stations, and by 1948 it is hoped to have a complete set of these machines at each station in addition to the sets placed in several of the metal-mining districts. Several of the larger metal-mining companies have complete sets of machines at the mines.

Training in the use of mine-rescue machines is given at the stations to all who apply for it, and, in addition to this, fully trained teams are given a regular monthly practice-training, not only to keep them familiar with the use of the machines, but to teach them the value and need of team-work in mine-rescue operations. Teams trained at mines that are so situated that it would be difficult for the men to come to the station for examination are visited by one of the instructors regularly.

The Inspector of Mines and instructor for the district conduct the examinations and arrange the course of instruction at these mines.

A certificate of competency in mine-rescue work is granted to each man who takes the full training course and passes the examination set by the Department of Mines.

During 1947, in addition to the regular teams in training, forty-four men took the full training course and were granted certificates of competency:—

Cert. No.	Name.	Where trained.	Cert. No.	Name.	Where trained.
1258	David Gilbert Brown	Fernie.	2180	William Jones	Kimberley.
1259	Eric Singleton	Coal Creek.	2181	William Cairns	Kimberley.
1260	H. J. D. Bambrick	Copper Mountain.	2182	Paul Joseph Kozak	Kimberley.
1261	H. Brenner	Copper Mountain.	2183	James Dixon	Kimberley.
1262	Stephen Eror	Copper Mountain.	2184	Willie Harvey Webber	Kimberley.
1263	K. C. Fahrni	Copper Mountain.	2185	John Andrew McSporran	Kimberley.
1264	L. T. Kirby	Copper Mountain.	2174A	Guy Venzi	Michel.
1265	William Mogus	Copper Mountain.	2175A	Larion Savilow Ivanoff	Michel.
2166	J. C. McKim	Copper Mountain.	2176A	Gordon Douglas Zarko	Natal.
2167	John E. McMynn	Copper Mountain.	2177A	Walter Rosier	Natal.
2168	A. G. Pratt	Copper Mountain.	2178A	Fred Apponen	Michel.
2169	Gordon A. Savage	Copper Mountain.	2179A	Paul Joseph Challa	Natal.
2170	David Todd	Copper Mountain.	2180A	Nevalino Bonin	Natal.
2171	Steve Starcenic	Princeton.	2186	Leonard Brett	Fernie.
2172	Kenneth M. White	Princeton.	2187	William Verkerk	Fernie.
2173	W. O. Waugh	Princeton.	2188	Kenneth Frederick Kniert	Fernie.
2174	John MacDonald Douglas	Kimberley.	2189	Harold L. McAvany	Pioneer.
2175	Maurice Roland Mattson	Kimberley.	2190	Herbert W. Aitchison	Bralorne.
2176	Kenneth George Davies	Kimberley.	2191	John M. McDougall	Wells.
2177	Carl Wodworth Collins	Kimberley.	2192	Norman H. Patience	Wells.
2178	John Will Stewart	Kimberley.	2193	William Hart	Bralorne.
2179	Frank-Hollick	Kimberley.	2194	Emile R. LeBlanc	Britannia Beach.

SUPERVISION OF COAL MINES.

During 1947 twenty companies operated twenty-six mines, employing 1,694 men underground. In the supervision of underground employees there were seven managers, fifteen overmen, and seventy-six firebosses and shotlighters, or one official for every seventeen 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.

FIRST-, SECOND-, AND THIRD-CLASS CERTIFICATES AND MINE-SURVEYORS' CERTIFICATES.

The Board of Examiners, which was formed on July 10th, 1919, consists at present of James Strang, Chief Inspector of Mines, chairman; Robert Bonar and John MacDonald, members.

The meetings of the Board are held in the office of the Department of Mines in Victoria. The examinations are held in accordance with the amended rules of the Board of Examiners, and approved by the Minister of Mines on September 28th, 1929.

Examinations are held at least once a year and oftener if necessary. One examination was held in 1947, on May 14th, 15th, and 16th.

The total number of candidates at the examination was as follows: For first-class certificates, 1 (1 passed); for second-class certificates, 2 (1 passed, 1 failed); for third-class certificates, 9 (8 passed, 1 failed); for mine-surveyors, 2 (0 passed, 2 failed).

The following is a list of the candidates who were successful in the various classes:—

First class: William Johnstone.

Second class: Harry Corrigan.

Third class: Leonard Brett, Joseph Knowles, James M. Clarkson, James Walsh, Jr., John M. McGuchio, Robert K. Taylor, Harold Howarth, and Allison D. Chapple.

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 1947 there were 82 candidates for coal-miners' certificates; of these, 81 passed and 1 failed to qualify.

In addition to the certificates granted above, substitute certificates were issued to those who had lost their original certificates.

The Board of Examiners desires to thank the different coal-mining companies for the use of their premises for holding examinations where necessary.

The Inspector of Mines in each district has authority under the "Coal-mines Regulation Act" to grant, after a satisfactory examination, a provisional certificate as a coal-miner to 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.

NOTES ON COAL MINES.

VANCOUVER ISLAND INSPECTION DISTRICT.

By John MacDonald.

Canadian Collieries (Dunsmuir), Ltd.

J. A. Boyd, president, Montreal, Que.; H. R. Plommer, vice-president, Nanaimo; P. S. Fagan, comptroller, Nanaimo; S. V. Isaacson, treasurer, Nanaimo; R. K. Smart, general superintendent, Nanaimo; E. O. T. Simpson, assistant general superintendent, Cumberland; J. A. Quinn, district superintendent, Cumberland. During 1947 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. As has been the case in the past few years, operations in general and development-work in particular at No. 8 mine at Cumberland were seriously retarded by a scarcity of skilled labour.

NANAIMO (49° 123° S.W.).

No. 10 Mine, South Wellington.—W. Frew, manager; J. Wilson, overman; A. Hannah, T. Jordan, F. Bell, W. Roper, J. Frew, H. Kirkpatrick, J. McArthur, F. Johnson, and T. McCann, firebosses. This mine is in the Cranberry District, about half a mile south of the old No. 5 mine and approximately 7 miles south of Nanaimo. No additions were made to the surface plant during the year. A full description has appeared in previous Annual Reports.

This mine is in the Douglas seam and continues to be the chief producing mine in the Vancouver Island District. In 1947 production was 214,450 long tons over a working period of 247 days, with an average crew of 190 men employed underground and 37 on the surface. Although the major portion of this tonnage has come from pillar-extraction, a notable percentage of the total has come from the new workings in Nos. 1 and 1½ headings, which were driven to explore and develop a virgin area that was by-passed in the first working. Further prospecting has revealed the existence of coal at an elevation of 25 feet above the original workings, but definite information regarding the extent of this new section is not yet available. The coal in the new section is fairly regular, averaging 7 feet in thickness, and is of a much harder quality than that of the lower part of the seam. Principal development-work done during the year included 5,000 feet of drivage in the new workings on the high side of the main haulage-road and 2,000 feet in No. 1 Diagonal Slope district where another presumably barren area is being explored. As operations are still on a three-shift per twenty-four-hour basis, the pillars are being drawn back at a fairly rapid rate, with a high percentage of recovery being maintained in the face of admittedly adverse conditions in many areas.

First-aid requirements have been kept up to the usual high standard. In addition to the main first-aid station adjacent to 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-five employees 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. Training consists of assembling the apparatus and working out practical problems at the experimental mine adjacent to the mine-rescue station at Nanaimo. It may be mentioned in passing that the No. 1 mine-rescue team from this mine, accompanied by the instructor from the Nanaimo station, received a call to proceed to Bridge River district following an explosion in the Pacific (Eastern) mine on August 18th. Three men were lost in the disaster. The team was successful in exploring the mine and recovering the bodies on the morning following the explosion.

No blowouts occurred during the year, and only one dangerous occurrence was reported. This was caused by a coupling-pin coming loose while a trip of twelve loaded cars was being hoisted up the Main slope. Seven cars ran back a distance of 50 feet before being stopped by the drag. No one was injured, and damage was confined to one car and the displacement of several sets of timber.

As pillar-extraction is general all over this mine, frequent grading and repairs are necessary to keep the roadways in satisfactory condition. Considering existing circumstances, 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 99,000 cubic feet of air a minute passing in the main returns for the use of ninety men. Eighteen samples of air were collected in the main return airways, the methane content of these varying from 0.05 per cent. in the main West return to 0.19 per cent. in the main East return. One hundred and twenty-three samples of dust were gathered from the various roadways; all the samples were well above the minimum standard of incombustible content as set by the Coal-dust Regulations. One hundred and thirty tons of limestone-dust was used to combat the coal-dust hazard on the roadways, and 20 tons for tamping purposes during blasting operations. Searches were made regularly for matches and other prohibited articles, but none was found. Ninety-five accidents were reported and investigated. One of these was fatal while the others were classed as being of a minor nature, in spite of the fact that several of them involved the loss of a considerable amount of working time.

White Rapids Mine, Extension.—A. Newbury, manager; J. T. Brown, overman; A. Bennett, J. Marrs, T. McCourt, and A. Kirkham, 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 49,518 long tons over a working period of 244 days, with an average crew of ninety-eight men employed underground and ten on the surface.

No additions were made to the surface plant during the year, but several important changes were made underground. These included a new transformer-station in No. 1 Right level off the Diagonal slope, a new pumping-station in No. 2 Left level off the Diagonal slope, and the installation of a larger hoist at the top of the above slope to handle the gradually increasing output from this section. New development-work included 725 feet of driving in the Diagonal slope proper and 1,000 feet of driving in the preparation of three new long-wall faces in this district. A description of the seam and general method of working has appeared in previous Annual Reports.

The main first-aid station is 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 on each shift by the " chunker " and are available for the men engaged on the various walls. Eighteen employees are qualified to render first aid to the injured. One mine-rescue team has trained regularly once each month at the mine-rescue station at Nanaimo; this training is along similar lines to that reported for the No. 10 mine teams.

General working conditions have been found fairly satisfactory during the course of inspection. The quantity of air passing in the main return at the last inspection in December amounted to 30,000 cubic feet a minute for the use of fifty men. Five samples of air were taken in the main return airway at suitable intervals, and analyses showed that none of these exceeded 0.13 per cent. methane. Seventy-two samples of dust were gathered where required, all of which were well above the minimum standard of incombustible content as set by the Coal-dust Regulations. Forty-nine accidents, all of a minor nature, were reported and investigated.

Prospect Mine, Extension.—M. Brodrick, fireboss. This mine was operated in the Wellington seam at Extension, on the southern end of the Harewood Ridge. Owing to the broken nature of the ground in this area, it was found necessary to abandon this mine; all available coal that could be mined with safety had been extracted, and the material had been recovered by July 18th. All openings to the mine were securely closed off by filling or caving. Production in 1947 amounted to 1,592 long tons over a working period of 136 days, with an average crew of six men employed. General working conditions were usually found satisfactory in the course of inspection. One minor accident was reported and investigated.

Granby No. 2 Mine, Cassidy.—M. Brodrick and L. Dickie, firebosses. Under lease from the owners of the property, Canadian Collieries (Dunsmuir), Limited, repaired the old slope for a distance of approximately 300 feet from the portal. At this point the water-level of the old mine was reached and operations were temporarily suspended pending the introduction of suitable power facilities. The work was undertaken by Canadian Collieries with a view to exploring a portion of their own property lying to the south-east of the old Granby property. A crew of six men was engaged for a period of two months in the latter part of the year. No accidents were reported from this operation.

Twenty-three accidents of a minor nature were reported from the various surface departments in the Nanaimo area during the year, all of which were investigated.

Chambers' No. 4 Mine, Extension.

R. H. Chambers and associates, operators; R. H. Chambers, fireboss. This mine is in the Extension district and is operating in the barrier pillar originally left in to separate the former Extension No. 1 and Extension No. 3 mines. Roadways have now been driven to the inby extremity of this pillar and extraction of the smaller pillars thus formed is under way. Production in 1947 amounted to 3,373 long tons over a working period of 215 days, with an average of eight men employed. General working conditions were found fairly satisfactory in the course of inspection. One accident of a minor nature was reported and investigated.

Deer Home No. 2 Mine, Extension.

R. Hamilton and associates, operators; R. Hamilton, overman. This mine, in the vicinity of the old Vancouver slope in the Extension district, is being operated in isolated parts of the Wellington seam, which were left when the old Extension No. 3 mine was abandoned. The recovery of some of these small pillars has entailed a considerable amount of driving, through gob areas in many cases. Production in 1947 amounted to 1,971 long tons over a working period of 223 days, with a crew of four men engaged. General working conditions have usually been found fairly satisfactory in the course of inspection. No accidents were reported during the year.

Furnace Portal Mine, Harewood.

J. Biggs, operator and fireboss. This mine is on Harewood Ridge, and is operating in a small area of outcrop coal left in by former operators. Production in 1947 amounted to 564 long tons over a working period of 151 days, with a crew of three men employed. General working conditions have always been found satisfactory in the course of inspection. No accidents were reported during the year.

No. 5 Mine, Cassidy.

J. McKellar and associates, operators; L Dickie, fireboss. This mine is in the Cassidy district, and is operated in a small area of the Douglas seam lying to the south of the abandoned Granby No. 2 mine. Production in 1947 amounted to 907 long tons over a working period of 170 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 during the year.

Old No. 8 Mine, Timberlands.

J. R. Wilson and G. Lewis, operators; J. R. Wilson, fireboss. This mine is operating in the Wellington seam, in a small section of outcrop that was left when the Wellington mine was abandoned by Canadian Collieries (Dunsmuir), Limited. Production in 1947 amounted to 749 long tons over a working period of 254 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 during the year.

Loudon's No. 5 Mine, Wellington.

(49° 124° S.E.) W. Loudon and associates, operators; W. Loudon, fireboss. This mine is on the opposite side of the ridge from the old No. 9 mine in the Wellington district, and operates in the upper Wellington seam. The Main level is connected to the No. 9 mine abandoned workings and a good current of natural ventilation is generally available either to or from No. 9 slope, depending on outside temperatures as to its direction of travel. Production in 1947 amounted to 1,073 long tons over a working period of 211 days, with a crew of four men engaged. General working conditions have always been found satisfactory in the course of inspection. No accidents were reported 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 in the immediate vicinity of the Loudon mine and also operates in the upper Wellington seam adjacent to the old No. 9 mine abandoned workings. Production in 1947 amounted to 681 long tons over a working period of 228 days, with a crew of two men engaged. Working conditions have usually been found satisfactory in the course of inspection. No accidents were reported during the year.

Pacific No. 3 Mine, Wellington.

(49° 124° S.E.) F. John and D. Caldwell, operators; F. John, overman. This was a new prospect slope in the same area as the Loudon mine. Sinking operations were carried on from January to April, inclusive, when the slope was permanently abandoned because of drainage difficulties. No coal was produced during the period. Two men were engaged.

Stronach No. 2 Mine, Wellington.

(49° 124° S.E.) C. Stronach, operator; H. Gilmour, fireboss. This mine is in a section of the upper Wellington seam adjoining the old No. 9 mine, to which it is connected by several levels driven off from the right of the Main slope. Production in 1947 amounted to 1,664 long tons over a working period of 208 days, with a crew of six men engaged. General working conditions have usually been found satisfactory during the course of inspection. No accidents were reported during the year.

Comox.

By John MacDonald.

Canadian Collieries (Dunsmuir), Ltd.

No. 8 Mine, Comox Colliery, Cumberland.—(49° 124° N.W.) J. S. Williams, manager; A. W. Watson, overman; D. Morgan and W. Johnstone, shiftbosses; W. Bennie, A. Dean, F. Coates, J. Queen, P. Queen, J. W. Smith, J. Weir, M. Brown, T. Robertson, A. Maxwell, D. Waddington, T. Shields, J. Vaughan, R. O'Brien, A. Jones, L. Cooper, and J. Cochrane, 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 to date all production has come from the upper, or No. 2, seam. In the new rock slope section, where the lower, or No. 4, seam was reached at the end of December, 1946, a second outlet was driven back a distance of 900 feet to connect with the original No. 4 seam workings near the foot of the air-shaft. Two levels are now being driven in a southerly direction to prove up the seam, but these were still in faulted ground at the end of the year.

A general description of the surface plant and method of working has appeared in previous Annual Reports, and no material changes have been made during 1947, with the exception of an addition to the wash-house to accommodate an additional 100 men and the erection of a new blacksmith-shop in a more convenient location in the mine yard. Nine long-walls, each with an average length of 300 feet and a seam-thickness varying from 36 to 42 inches, were in operation during the year. Production in 1947 amounted to 166,506 long tons over a working period of 249 days, with an average of 325 men employed underground and 28 on the surface.

General conditions have been found fairly satisfactory during the course of inspection, excepting on several occasions where heavy roof-movements were responsible for an abnormal outflow of gas in certain places. Under such circumstances, all blasting was immediately prohibited pending the effective removal of all visible gas-caps from the general body of the air. At the last inspection in December the fan was producing a total quantity of 236,000 cubic feet of air a minute, under a water-gauge of 6.6 inches, for the use of 330 men and 7 horses engaged in the full three shifts of twenty-four hours. Thirty-two samples of air were collected in the main returns, the methane content of these varying from 0.38 per cent. in the North side return to 0.70 in the No. 2 main South return. Two hundred and sixteen samples of dust were gathered from the various roadways; all the samples were above the minimum standard of incombustible content as set by the Coal-dust Regulations. One hundred and thirty-two 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 sixty accidents were reported and investigated. Five of these were serious, while the others were classed as minor.

No. 5 Mine, Comox Colliery, Cumberland.—(49° 125° S.E.) S. Lawrence, manager; J. Christie, overman; T. Eccleston and A. Somerville, shiftbosses; R. O'Brien, J. Vaughan, A. Jones, C. Williams, L. Hutchinson, M. Brown, J. Cochrane, F. Dixon, L. Cooper, and M. Frobisher, firebosses. This mine is approximately 1½ miles from Cumberland and has been operated entirely in the No. 2 seam for the past few years. Three long-wall faces were in operation until the end of March, at which time the Right side wall off the Main slope had to be abandoned on account of broken ground. In the month of April a decision was reached to close this mine, as it was found economically impossible to operate the remaining small area of coal available in view of the excessively long haulage involved. Active production ceased on April 11th, the mine being permanently abandoned as at July 3rd, at which date all material had been withdrawn. It is interesting to mention that the sinking of No. 5 shaft was begun in 1894 and completed in 1895 to the No. 4 seam, a total depth of 590 feet. Three seams were operated at various times during the life of this mine. The No. 1 seam was opened up in 1898 and abandoned in 1924, while the No. 4 seam workings were abandoned in 1906. In 1923 a rock tunnel was driven across the measures from the No. 1 seam to the No. 2 seam, but production from this seam did not begin until 1927. During its life this mine was temporarily closed down for various periods, totalling approximately six years of inactivity.

General working conditions were found fairly satisfactory in the course of inspection, considering the length of haulage roadways that required almost constant repairs. At the last inspection in April a total quantity of 174,000 cubic feet of air a minute was passing in the main returns for the use of 200 men in the full three-shift period of twenty-four hours. From January to April, inclusive, production amounted to 24,528 long tons over a working period of 71 days, with an average of 200 men employed underground and 25 on the surface. Eight samples of air were collected in the main returns, the methane content of these varying from 0.09 per cent. in No. 1

fan return airway to 0.76 per cent. in the main East return. Forty-five samples of dust were gathered from the various roadways; all the samples were above the minimum standard of incombustible content as set by the Coal-dust Regulations. Twenty-eight tons of limestone-dust was used to combat the coal-dust hazard on roadways and face-lines, and for tamping purposes in blasting operations. Thirty-four accidents were reported and were investigated. One of these was serious, while the others were classed as minor. Searches for matches, etc., were made frequently, but no articles of a prohibited nature were found.

Tsable River Prospect Mine.—(49° 124° N.W.) S. Lawrence, manager; T. Eccleston, W. Herd, and A. Somerville, firebosses. This mine is in the Tsable River area, approximately 5 miles west of Buckley Bay on the Island Highway. During the year the power-line was completed from Union Bay to the sub-station, near the mine, where the main transformers are located. The feeder lines were then led from the sub-station to suit the various surface units. These include one 75-horsepower electric hoist situated on the tipple—the hoist at present is used to haul the coal out of the prospect slope—two small Canadian Ingersoll-Rand compressors having a total capacity of 1,600 cubic feet of air a minute, and a 10-horsepower-motor generator set for charging the lamps in the lamp-cabin.

Development-work during the year was confined principally to the new main haulage-slope. This was driven up a distance of 700 feet through rock from No. 1 Right level to the surface, where a more convenient location has been chosen for the permanent tipple and surface plant. When this rock tunnel reached a point 200 feet from the surface, it struck wet sand which flowed into the roadway, creating a cavity 10 feet in diameter above the timbers. Continued wet weather in the latter part of the year caused this sand and clay, etc., to cave right through to the surface, a distance of 40 feet vertically above the tunnel-face. As it was found impossible to carry on repairs from underground, the management installed a drag-line scraper on the surface to excavate the soft overburden, the upper part of the slope being secured by temporary timbers. At present the upper 200 feet of tunnel is being secured by means of 12- by 12-inch timber sets. From No. 1 Right level down, the slope has been driven in the seam for a distance of 300 feet. No. 1 Right level and counter were each extended a distance of 200 feet. Average seam-thickness is 78 inches of coal with 18 inches of rock in three separate bands. The present proposal is to develop the area by driving four slopes in the seam, with levels and counters turned off from both sides at 300-foot intervals.

Apart from the abnormal conditions encountered in the new slope, general working conditions have been found satisfactory in the course of inspection. A good supply of first-aid material is kept in readiness at all times and four of the employees are qualified to render first aid to the injured. Production in 1947 amounted to 4,259 long tons over a working period of 251 days, with a crew of twenty men employed underground and four on the surface as at the end of the year. Nine accidents, all of a minor nature, were reported and investigated. Twelve accidents of a minor nature were reported from the various surface departments of the colliery, all of which were 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 mines were examined frequently and generally found in good order.

NICOLA-PRINCETON INSPECTION DISTRICT.

By E. R. Hughes.

Only three producing collieries were operated in this district during 1947. They were Tulameen Collieries, Limited, at Princeton; Taylor-Burson Coal Company, Limited, at Princeton; and Coldwater Coal Mines, at Merritt. Twenty-five tons of coal were taken from the Black mine by the Granby Consolidated Mining, Smelting, and Power Company, Limited, to be used in a test at the Granby steam-electric plant at Princeton. A small amount of prospect-work was done on the Hayes and Vittoni coal claim near Blakeburn, and the Burr brothers had some prospecting done on Lot 300, approximately 6 miles south of Princeton.

No fatal accidents occurred in the coal mines of this district during the year. Twenty-three compensable accidents were reported, and of these none were classed as serious.

There were no prosecutions under the "Coal-mines Regulation Act" during the year, nor were there any dangerous occurrences to report.

The Similkameen Valley Mine Safety Association held its annual field-day competitions at the Athletic Park, Princeton, on Saturday, June 7th. The mine-rescue and first-aid events were keenly contested, and an excellent standard of work was exhibited. Four teams competed in the mine-rescue event, which was won by the Princeton team, captained by James Fairley. During the field-day luncheon the Hon. R. C. MacDonald, Minister of Mines, presented Ryan Trophy regional plaques to representatives of the Tulameen Colliery and the Copper Mountain mine for having achieved the lowest accident rating respectively of any coal and metalliferous operation in British Columbia during the year 1946.

PRINCETON (49° 120° S.W.)

Tulameen Collieries, Ltd. Head office, 716 Hall Building, Vancouver. Thomas M. Wilson, manager; David M. Francis, overman; Thomas Bryden, Arthur Hilton, Frank Bond, and William Forsyth, firebosses. The only mine operated by this company during the year was the Pleasant Valley No. 4 mine, situated about 2 miles west of Princeton.

Pleasant Valley No. 4 Mine.—This mine was opened during 1946 and is developing an area of the main Princeton seam lying between the abandoned Pleasant Valley No. 3 mine and the old Tulameen Nos. 2 and 3 mines. The seam was reached in a cross-measure rock slope driven 700 feet southward on a pitch of 25 degrees from the south end of the old Pleasant Valley Colliery tipple. After contact was made with the seam the Main slope was continued in the same southerly direction for a distance of 1,050 feet from the portal where, because of the progressive thinning of the seam, the slope was turned eastward in the hope that the seam would be found to contain more coal. After continuing the slope to a point 1,300 feet from the portal, and under a cover of 850 feet, the seam thinned down to 3 feet 5 inches, including 11 inches of impurities, and the slope development was discontinued.

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 the coal in the Princeton field develops spontaneous heat necessitates the speedy isolation of affected areas.

The No. 1 South section developed an area lying between the Main slope and the water-filled workings of the abandoned Pleasant Valley No. 2 mine. Thin coal was encountered in the lower workings, and, because of this, advance in the No. 1 South level was discontinued at a point 920 feet from the Main slope. Nos. 4, 5, and 6 Left rooms had been advanced to the barrier pillar required to be left between the new workings and the inundated workings of the Pleasant Valley No. 2 mine. Pillar-drawing operations proceeded satisfactorily, and at the end of the year approximately 70 per cent. of the coal in this panel had been extracted. An explosive mixture of methane was found in the idle workings at the upper end of No. 3 incline during the inspection on November 14th, and blasting was prohibited on the return side of this area until the gas had been diluted and removed. Improvements were made to the airway, making adequate ventilation available for the removal of the methane, and the workings continued to be free of any further visible gas-caps during the remainder of the year.

In the No. 1 North section an area is being developed between the Main slope and the Tulameen River. At a distance of 1,100 feet from the Main slope the No. 1 North level had reached the barrier pillar required to be left between the new workings and the Tulameen River. Two inclines were driven up the pitch from No. 1 North level for a distance of 400 feet, and a connection was made with the return airway. Thus both this section and the No. 1 South section now have separate ventilation systems. From No. 2 incline seven rooms have been started, and when these advance as far as the Tulameen River barrier, the development of No. 1 North panel will have been completed. Below No. 1 North level, and advancing toward the Tulameen River, two levels have been started from the Main slope, and a second slope has been driven from the junction of No. 1 North level with the Main slope; this counter-slope was advanced 500 feet south-east and was stopped because of thin, inferior coal. Two levels were started to the north from the counter-slope at 340 feet and 415 feet respectively down the counter from the junction with the Main slope.

Most of the coal mined at this colliery is sold locally, with the smaller sizes being used at the Granby Company's steam-electric plant near Princeton. The average daily output during December was approximately 200 tons, with the employment of fifty-seven men underground and thirteen on the surface.

Taylor-Burson Coal Co., Ltd.

Taylor No. 1 Mine.—James Fairley, fireboss, Princeton. This mine is situated on the North Half of Lot 88, 4 miles west of Princeton, and a half-mile north of the presently inactive Jackson mine. This half-section of coal land is held under the provisions of the "Coal Act." Near the outcrop the seam pitches 55 degrees south-eastward and is believed to be the larger of the two seams found at the Jackson mine. The Main slope has been driven 450 feet in a north-easterly direction on a pitch of 25 degrees. Three levels have been turned off the slope. No. 1 level was driven north-east 110 feet and a ventilation raise was put through to the surface. No. 2 level was driven north-east 220 feet and a raise was driven to the surface; No. 2 level is presently used as a travelling-road into the mine. No. 3 level was driven north-easterly 200 feet when surface gravel and a flow of water were encountered; a concrete stopping was built near the face of the level to prevent the seepage from entering the workings. From the face of the slope No. 3 level was also driven in a south-westerly direction for a distance of 200 feet. At this point the face was 100 feet from the southern boundary of the Taylor-Burson Company's coal licence on the North Half of Lot 88 and further advance was discontinued.

Loaded coal-cars are hauled up the slope in single-car trips by means of a small gasoline-hoist, then lowered to the tipple where a shaker screen has been built. A portable compressor has been installed, and a puncher-type machine is used to cut the coal. Ventilation is by natural means. Four men were employed continuously throughout the year.

Burrs' Prospect.—This is a new prospect operated by the Burr brothers, Princeton, on coal land owned by them on Lot 300, situated 6 miles south of Princeton. Coaly material intermixed with clay and shale was exposed during road-construction on the Hope–Princeton Highway. This lead was followed underground with the hope that a commercial seam would be found. An adit was driven southerly for 80 feet into the hillside where the outcrop was discovered, and a smaller adit was driven about 20 feet into the sloping west bank of the highway. The latter adit was afterwards stowed with rock from the face to the portal. Bed-rock was not exposed in the road cut nor in the adits. Most of the coaly material found was ground fine, but occasionally a lump as big as a man's fist was found. The intermixed clay and coaly material was irregular in its continuity and ranged from 5 feet to an inch in thickness. The chances of finding coal of value in the overburden are negligible, and exploration so far has not extended to bed-rock. Two men were employed during August and September.

Granby Consolidated Mining, Smelting, and Power Co., Ltd.—A. S. Baillie, president and general manager, Copper Mountain; W. I. Nelson, assistant general manager, Copper Mountain.

Granby Colliery, No. 1 Mine.—Thomas M. Wilson, mine manager. This mine is about 6 miles west of Princeton, near the Hope–Princeton Highway. Because of high operating costs and labour troubles this mine ceased operations on December 4th, 1943, after producing 464,368 tons of coal during the preceding seven years. The mine was developed from two diagonal slopes, the North diagonal and the South diagonal, this system providing for the development of a large triangular area of unworked coal between the slopes. The entrances were sealed and the water was allowed to rise in the workings.

During the month of June the seals were removed and ventilation was restored to the accessible parts. A small crew was engaged in repairing and rehabilitating the slopes, and in pumping water from the lower workings. The mine was again closed in September, before repairs had been completed and without any coal being produced.

Black Coal Mine.—This small mine, situated in the Finlay Creek district, 6 miles south-west of Princeton and about half a mile south of the Jackson mine, has been worked intermittently for many years. In 1943 a total of 2,254 tons of coal was produced, but during 1944, 1945, and 1946 there was no production. In July, 1947, the Granby Company reopened the mine for the purpose of running a test of the coal at their steam-electric plant at Princeton. Twenty-five long tons of coal was produced for this purpose.

The measures at the Black mine dip easterly on a pitch of approximately 50 degrees. The strata outcropping near the Main adit have a thickness of 82 feet 6 inches, in which is an aggregate thickness of 47 feet of coal, and in which four seams have been partly developed. Southward from the portal the seam is overlain by gravel varying in thickness from a few feet to more than 60 feet. The possibility of removing the gravel overburden and recovering the stripped coal by mechanical means has been considered in the past, but the Granby Company were the first to do any serious work on the project. For several weeks a gasoline-shovel was engaged in digging two test-pits; the results of this work gave information regarding the amount of waste that must be removed before coal production can be started.

During December the Marwell Construction Company, Limited, of Vancouver, took over the property with the intention of operating it as a strip mine. Clearing of a camp-site on the flat 1,300 feet north-east of the mine portal and building of bunkers were started that month. The equipment in use at the end of the year included two gasoline-shovels, two tractors, and eight trucks. It is expected that coal production will commence in February, 1948.

Coalmont (49° 120° S.W.)

Hayes and Vittoni Prospect.

Joe Delprato, fireboss. This prospect, between Blakeburn and Coalmont, is 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 vary in thickness from 3 feet to 5 feet 6 inches, including bands of clay and shale. Most development has been done in the No. 1 tunnel, which has been advanced to a point 90 feet from the portal. Work was suspended at the end of June and was not resumed before the end of the year. Two men were employed.

Merritt (50° 120° S.W.)

Coldwater Coal Mines.

C. E. Thomas, operator; A. D. Allan, overman; Robert Murray, fireboss. This property, formerly operated by the Middlesboro Collieries, Limited, is situated about 1 mile south of the City of Merritt. Present activity is confined to Coldwater Hill, about half a mile east of the old Middlesboro Colliery office. In December five men were employed.

Coldwater No. 2 Mine.—Splitting pillars off the Main slope and unwatering the old workings was the only work done during the year. The limit of pillar-splitting had been reached during August in the workings then above water-level. Any further such extraction would serve only to weaken the remaining pillars and would result in the caving of the main haulage-road. Thus, it was decided to defer further pillar-work until it is intended to abandon the mine. Pumping during the first nine months of the year lowered the water-level to the entrance of No. 6 Right level, and it was kept at that elevation to the end of the year.

Coldwater No. 3 Mine.—This mine is in the No. 3 seam, which underlies the No. 2 seam. The original No. 3 mine was abandoned in July, 1914, but a small amount of prospecting-work was done from the outcrop by Middlesboro Collieries, Limited, during the autumn of 1941, when a connection was made through to 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.

A new level, advanced parallel to the original Main level but at a lower elevation, made a ventilation connection with the old Main level. The new slope was advanced during the latter three months of the year to a point 50 feet from the portal, and from that point a level was advanced 70 feet, with ventilation connections to the level above. The coal is hand-mined and loaded into cars which are trammed to the bottom of the slope and hauled up the slope to the surface with a small hand-operated windlass.

EAST KOOTENAY INSPECTION DISTRICT.

By R. B. Bonar.

Crow's Nest Pass Coal Co., Ltd.

H. P. Wilson, president, Fernie; Thomas Balmer, vice-president, 305 Great Northern Railway Building, Seattle, Wash.; Thomas G. Ewart, secretary and assistant to the president, Fernie; Angus L. McPhee, treasurer, Fernie; Thomas H. Wilson, general manager, Fernie; H. Wilton Clark, general superintendent, Fernie; Harold A. White, chief engineer, Fernie; B. L. Montgomery, mining engineer, Fernie. Capital, $6,212,666.66. Value of plants and equipment, $8,368,377.64. This company operates the Elk River and Michel Collieries.

Elk River Colliery.—(49° 114° S.W.) James Littler, manager; John Caufield, afternoon-shift supervisor. Underground operations are under the direct daily supervision of three overmen, two shiftbosses, and ten firebosses.

During the annual holiday period, July 12th to 27th, the outside haulage-road connecting the new No. 3 mine to the rotary dump near the portal of No. 4 mine was regraded and triple-tracked. Subsequently, this road, some 750 feet in length, was covered with an all-wooden snowshed, except that the portion of the shed connected to No. 3 mine portal was of steel construction as a preventive against the spread of fire. Included in the above shed, as an integral part, is an overman's cabin and motor-shed for the new underground battery locomotive. The rock-dump near the portal of No. 9 mine was completed during the year.

No. 1 East Mine.—Carmichael McNay, overman; Thomas Reid and John Chester, firebosses. The operation at this mine consists entirely of the extraction of the pillars formed in the earliest working of the mine. The coal, being fairly soft, allows pneumatic picks to be used to advantage by the miners. The coal is hand-loaded into cars which are then hauled to the partings where the 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. They are then lowered on the surface incline to the level of the old Coal Creek tipple. From there the coal is hauled to the Elk River preparation plant, about 4,000 feet away, by a steam locomotive.

This mine, although of limited life, still was the largest producer of coal during the year at the Elk River Colliery. It is estimated that this mine will be closed sometime in the fall of 1948.

The mine was singularly free from bumps of a major nature, but experienced several of a minor nature which did little or no material damage.

Very little methane is given off by the pillars during their extraction. The ventilation in general throughout the year was good, although considerable coal-dust, held in suspension at and near the working-faces, was evident at times, especially in the Nos. 5 and 6 East sections. This condition is due to the low velocity of the ventilating-current and the numerous old roads encountered in the extraction of the pillars. The total volume of air passed by the fan amounts to 92,000 cubic feet per minute, of which 63,000 cubic feet is supplied to the actual working-places for a total working force of seventy-five men and nineteen horses, while 29,000 cubic feet circulates through the abandoned workings.

No. 4 Mine.—Daniel Chester, overman; James Bushell, shiftboss. This mine is on the retreat; all the production of the single shift employed comes from splitting and slabbing pillars, extraction being about 50 per cent.

The Main level development was stopped owing to the very disturbed nature of the seam and the high ash content of the coal. This coal was quite crushed in nature and gave off a considerable amount of methane and fine coal-dust. At present the operation is confined to splitting and slabbing the pillars on the high side of the main entry. Pneumatic picks and Meco shaker-conveyers are used to advantage. No blasting is necessary. From the loading-points on the entry the coal trips are hauled by horses to the mine portal which is 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.

No. 9 Mine.—Daniel Chester, overman; William Waller, James Corrigan, and John Sweeney, firebosses. On account of the continued faulted nature and reduced thickness of the coal on the high side of the Main level, all work to the rise has been stopped, with the exception of a small pillar-drawing section. All work at the face of the Main haulage-level, which encountered the faulted ground noted above, has been temporarily suspended pending the outcome of exploratory work of two slopes which are being driven close to and approximately parallel to the fault.

The coal is mined by radial-punching machines, blasted down, and then 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, where it is dumped onto a cross-belt that carries it to the outside retarding conveyer.

The ventilation in general throughout the year was found to be good. The friable nature of the coal and the method of mining have necessitated using large amounts of inert dust to combat the coal-dust hazard.

No. 10 Mine.—Daniel Chester, overman; Ralph Larner and Albert Littler, firebosses. In November, 1947, active production of coal in this mine was stopped on account of the low output per man-shift and the high ash content of the coal. Mining had been carried out under considerable difficulty, caused by the immediate overburden, which consisted of coal and rashings averaging about 10 feet in thickness. Pillar-extraction was well under way at the time of the closure and, notwithstanding the heavy roof that required extensive lagging, approximately 80 per cent. recovery was made.

All material is being taken out of the mine, and it will be sealed off by stoppings in the two rock raises from No. 9 mine.

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 small amounts of gas were found on a few occasions, it could invariably be attributed to a local disarrangement of the brattice.

No. 3 Mine.—James Anderson, overman; Kenneth Kniert, David Brown, and Roger Girou, firebosses. The development of this mine has progressed rapidly, to the extent that it will soon have the largest output of coal of any mine at the colliery. The seam has an average thickness of about 14 to 15 feet and has a fairly low ash content, but is of a very friable and contorted nature due, in all probability, to lateral displacement and flowage caused by orogenic forces.

In the four inclines being driven to the rise off the Main haulage-level a series of small down-throw faults, with 2 to 10 feet displacement, have been encountered and have retarded progress in that direction considerably. The coal is mined by the use of pneumatic picks and then loaded by hand onto Meco shaker-conveyers which deliver the coal to the main belt for transportation to the loading-point on the Main haulage-level. Very little blasting of the coal is required.

Driving the main return airway to the surface and the installation of the main fan were completed early in the year. This fan is of the aerodyne type, with rotor blades adjustable to eight different positions, and has a rated capacity of 100,000 cubic feet per minute against a water-gauge of 2 inches.

During the year 1947, 363 lb. of Polar CXL-ite, 10,000 lb. of Polar Monobel No. 4, and 13,693 electric detonators were used at the colliery in coal and rock blasting. No misfired shots were reported.

To neutralize the coal-dust hazard, 168 tons of limestone-dust were applied to the underground workings and the tamping of shots. As a check on the efficacy of the above application of inert dust, samples of mine-dust were collected regularly in each mine every month and analysed; all the samples were above the minimum requirements of incombustible content as set by the Coal-dust Regulations.

Monthly inspections were made by the miners' Inspection Committee, and a copy of each inspection report was sent to the office of the district Inspector through the courtesy of the committee members. All report-books kept at the various mines in accordance with the "Coal-mines Regulation Act" were examined regularly and were found to be in order.

Michel Colliery.—(49° 114° N.W.) William Chapman, manager; Abel Hampton, afternoon-shift supervisor. Underground operations are under the immediate daily supervision of three overmen, one shiftboss, and twenty-two firebosses.

During the year there were five mines active at the colliery, of which "A" East, "A" West, and "A" South mines operated in "A" seam, and " B " East and " B " South mines operated in " B " seam.

"A" East Mine.—William Gregory, overman; Henry Beard, Thomas Holley, Robert Barass, Sr., Thomas Owen, and Thomas Taylor, firebosses. This mine operates on the Michel side of the syncline, and all the present work is below the Main haulage-level, except for the extraction of the main pillars above the level inby No. 5 slope.

In the No. 5 Slope section, splits are driven at regular intervals from No. 1 Left room to the Main level, and the pillar coal so formed is subsequently extracted, on the retreat, by using Meco shaker-conveyers equipped with a swivel pan. This device allows the top portion of the conveyer to be angled into the pillar, thus making a longer face-line possible on which the working force may be concentrated. In driving the splits short-wall cutters and duck-bill loaders are used extensively. In the pillar-drawing sections pneumatic picks are usually sufficient to break down the coal, only an occasional shot being required. The bad roof encountered in this section has proved a handicap to mechanization, and requires the closest supervision by officials and the closest attention of all concerned to enable the coal to be mined with efficiency and safety.

While mechanization has proved advantageous in this seam, it has also aggravated the coal-dust situation. 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 the handling of the coal and to coal sloughing off the faces. The transporting conveyers, belts, and loading-points also contribute largely to this hazard. Liberal and frequent application of inert dust by hand is the method used at present to keep the dust-hazard to a minimum. Recent research concerning the inflammability of alternate layers of coal and inert dust suggests that the solution to this perplexing problem lies in some form of mechanical distribution by which the inert dust may be applied thinly but often.

The Nos. 6 and 10 Incline sections were depleted during the year, and subsequently all material was withdrawn.

Due primarily to the caved condition of the return airways and also to the proximity of the abandoned workings of " B " East mine above, considerable difficulty was encountered in maintaining efficient ventilation in this mine during the year. It was necessary on several occasions to prohibit blasting temporarily in certain working-places, and in two instances protracted prohibition was necessary.

"A" South Mine.—Harry Corrigan, overman; Harry Batchelor and Roger Pasiaud, firebosses. This mine is operating on the Sparwood limb of the syncline, where inclinations of 30 degrees and more are common. In the No. 4 Raise section, which was the only section active during the year, duck-bill loaders are being experimented with. Rooms on the strike of the seam are driven to the right and left off the raise, using the duck-bill loaders. The 23 feet of intervening pillar between rooms is blasted down and recovered on the retreat. To facilitate the blasting, narrow cross-cuts at suitable intervals outby the retreating duck-bills are driven about half-way into the pillars and then holed back into the gob.

The coal is transported by the duck-bill loaders to the Main Raise chute, which in turn delivers it to a flight-retarding conveyer that loads it directly into mine-cars on the main entry.

No. 10 Incline section is still inactive and under repair because the timber throughout the section is showing signs of advanced decay due to dry-rot.

The ventilation in general throughout the year was good, gas found in a few instances during inspections being due to local disarrangements of the brattice.

The fire area in No. 10 Incline section, which was sealed off in May, 1946, was quiescent during the past year.

"A" West Mine.—Harry Corrigan, overman; Harry Sanders, Frederick Simister, Thomas Krall, Reginald Taylor, and Daniel Bobchuk, firebosses. In this mine the development-rooms are driven in pairs to the left and right off No. 2 Belt-road on the approximate strike of the seam. When a pair of rooms have reached the predetermined boundary, splits are driven from them to the next pair of rooms above, thus forming pillars that are subsequently extracted by the use of Meco shaker-conveyers equipped with swivel-pans, in the same manner as noted in the "A" East mine report. The coal from these conveyers is delivered onto a cross-belt in one of the rooms for transportation to the main belt on No. 2 Belt-road, which in turn delivers it to a series of belts on No. 4 Incline that transport the coal to the main loading-point on the Main haulage-level.

The development-work in the rooms and splits is done by means of short-wall cutters and duck-bill loaders. Although blasting is necessary in this narrow work, the extraction of the pillars is successfully accomplished by the use of pneumatic picks, with only the occasional shot being required. The ventilation during the year was found to be satisfactory.

"B" South Mine.—Irving Morgan, overman; John Whittaker, David Thewlis, Frederick Nash, Henry Eberts, James Robson, Sidney Hughes, Thomas Slee, and Benjamin Volpatti, firebosses.

This mine operates on the Sparwood side of the syncline, where inclinations of 30 degrees and more are encountered. The seam averages about 5 to 6 feet in thickness, is of good quality, and has a fairly strong shale roof in most sections, which allows machinery to be used to advantage.

Little coal was produced in the slope section during the year, but work was done preparatory to full-scale operation in the near future.

No. 3 Raise section was the principal source of tonnage during the year. Rooms are driven off this raise, on a slight inclination, on the centres necessary to form 300-foot long-walls, which are cut by long-wall cutters and are mined on the retreat. The coal, where the pitch is suitable, slides down the face-lines to a loading-chute 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 tandem, 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 punchers and then blasted down. It is loaded by hand into chutes, which deliver it to the room conveyers. The pillars between adjoining rooms are mined by the retreating long-wall method, small barrier pillars being left where required by roof conditions. The distance between barrier pillars is usually about 100 feet, but may be greater if roof conditions are favourable.

Very little methane is given off by the coal in the No. 3 Raise section, due probably to its proximity to the outcrop. The ventilation in general throughout 1947 was found to be good and is accomplished by means of a 4-foot single-inlet Sirocco fan, assisted materially at times by natural ventilation through the several openings driven to the outcrop.

No. 300 Raise was started this year, and the section is being rapidly developed so as to offset the reduction in output expected from No. 3 Raise section as its reserves are depleted.

"B" East Mine.—William Gregory, overman; John McInnis and Frank McVeigh, firebosses. Production from this mine is from barrier, main entry, and sacrifice pillars left during the first working and is attended by the usual difficulties accompanying such work. The output per man-shift is quite high because mining is assisted by the crushing of the pillars and the generally good roof. No blasting is required, the output being obtained by the use of pneumatic picks. The pillars are either split or slabbed and then recovered on the retreat by the use of a swivel-pan attached to a Meco shaker-conveyer. The coal is hand-loaded onto the conveyers, which transport it to loading-points on the main entry, where it is loaded directly into the mine-cars.

It is not unusual in the splitting of the pillars for the coal to be subjected to considerable squeezing. This often causes what is known locally as small bumps and releases abnormal volumes of methane. The closest attention of the officials in charge is required to combat successfully the hazards created by the release of methane and by the liberation of considerable amounts of fine coal-dust in mining the crushed pillar.

During the year 1947, 498 lb. of Polar CXL-ite, 300 lb. of Polar monobel No. 14, 71,627 lb. of Polar monobel No. 4, and 81,711 electric detonators were used at the colliery in coal and rock blasting. No misfired shots were reported.

Monthly examinations were made by the miners' Inspection Committee, and through the courtesy of the committee members a copy of each report of inspection was sent to the office of the district Inspector. 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 Strip Mine.—Ivan Donkin, foreman. This is a strip-mining operation, located about 1½ miles east of Michel, on a coal-seam outcrop on the east side of the valley. It is reached by a gravel road, about 2½ miles long, with a 10-per-cent. grade from the main highway. The total haul from the mine to the Michel Colliery tipple is about 5 miles.

After extensive prospecting of the seam during 1946 and preliminary work during January, 1947, the mine came into active production on February 5th. The seam on the outcrop dips about 50 degrees to the west, but drill-holes indicate that it will flatten out considerably as the stripping proceeds to the west. The seam, which reaches a thickness of 90 feet in places, is of variable quality and rather friable. The coal is hauled by trucks operating on two shifts.

Corbin Colliery, Corbin.

(49° 114° N.W.) Walter Almond, acting manager. Early in July the Hillcrest Mohawk Collieries, Limited, office at Bellevue, Alta., commenced mining operations at the Big Showing strip mine. The coal was loaded by a 1-yard shovel into trucks and transported to the old Corbin Colliery tipple for weighing and screening. It was then conveyed by trucks to the Canadian Pacific Railway spur at McGillivray, where it was either loaded into railway cars or added to the stock-piles. About sixty trucks were used in the above operation.

Operations were suspended on November 26th, having then fulfilled their purpose of assuring a reserve supply of coal at the Trail plant of the Consolidated Mining and Smelting Company of Canada, Limited. The total output for 1947 amounted to 89,120 long tons.

NORTHERN INSPECTION DISTRICT.

By Charles Graham.

Telkwa (54° 127° N.E.).

Bulkley Valley Collieries, Ltd.

A. H. Dockrill, overman; Robert Gourley, fireboss. The property is on Goat Creek, about 7 miles from Telkwa. All coal is hauled to the railroad by truck. The market is confined to the district between Prince George and Prince Rupert. The slope has been driven through the fault mentioned in the 1946 Report, and the coal-seam has been reached.

The diamond-drilling, under the direction of Dr. Victor Dolmage, which had been carried on in 1946, was resumed. Hole No. 4 was started, but the drilling programme was abandoned before reaching bed-rock and the drill removed from the property.

No gas was observed, and the mine was in safe working condition.

BOWRON RIVER (53° 121° N.W.).

Bowron Coal Co., Ltd. D. Wells, president. The property is on Bowron River, about 40 miles east of Prince George, and was reported on in 1946. No mining was done during the year. A rough road was built from Hansard to the property, a distance of about 21 miles. A diamond-drill was taken in and one hole was drilled in the west bank of the river, a short distance north of the prospect tunnel, driven in the outcrop known as the upper seam. The hole was drilled to a depth of 73 feet. The log of the hole is attached.

Bore-hole No. 1.

Location: 65 feet down-river from old coal tunnel and on the same side of the river.

	Thickness. Ft.	In.	Total Depth. Ft.	In.
Surface soil	6	6	6	6
Gravel	0	6	7	0
Coal with gravel	3	1	10	1
Slate	0	7	10	8
Coal	**0**	**6**	11	2
Slate	0	5	11	7
Coal	**4**	**5**	16	0
Slate	0	6	16	6
Coal	**3**	**0**	19	6
Slate	0	6	20	0
Coal	**6**	**6**	26	6
Slate	0	5	26	11
Coal	**1**	**0**	27	11
Slate	1	6	29	5
Sandstone	1	0	30	5
Slate	1	1	31	6
Coal	**9**	**5**	40	11
Slate	1	3	42	2
Coal	**0**	**3**	42	5
Slate	0	3	42	8
Slate with streaks of coal	1	8	44	4
Sandstone with streaks of coal	1	8	46	0
Coal and slate	3	0	49	0
Grey shale	0	5	49	5
Slate	0	3	49	8
Slate and coal	0	4	50	0
Grey shale	1	0	51	0
Slate with streaks of coal	2	6	53	6
Grey shale	0	8	54	2
Coal and slate	0	10	55	0
Slate	3	0	58	0
Sandstone	2	0	60	0
Coal	**2**	**0**	62	0
Slate and coal	3	0	65	0

	Thickness. Ft.	In.	Total Depth. Ft.	In.
Grey and dark shales with coal streaks	8	0	73	0
End of hole.				

November 23rd, 1947. Signed by O. R. CHRISTOFFERSON.

Two coal-seams are shown in the bore-hole. Disregarding the 3 feet 1 inch of coal and gravel between 7 feet and 10 feet 1 inch, the upper seam, between 11 feet 7 inches and 26 feet 6 inches, includes three layers of coal separated by two layers of slate. The aggregate thickness of the coal is 13 feet 11 inches and of the slate is 1 foot. Probably this is a new seam not indicated in previous reports.

Between 31 feet 6 inches and 40 feet 11 inches the core indicates a thickness of 9 feet 5 inches of clean coal. This appears to be what was known previously as the upper seam.

The hole was stopped at 73 feet depth in order to move the drill across the river. The hole did not reach the depth at which the two lower seams, indicated in the west bank of the river, would be intersected.

Peace River, Hudson Hope (56° 122°).

All coal from the Hudson Hope mines is hauled by truck to Dawson Creek, Fort St. John, and Fort Nelson. The long truck-haul prohibits rail shipments from Dawson Creek to compete with coal originating close to railways.

Peace River Coal Mines, Ltd. Lloyd Gething, managing director; A. D. Chapple, fireboss. The property is on Larry Creek, on the west slope of Portage Mountain, at the upper end of Peace River canyon, about 18 miles from Hudson Hope. The two entries to the south-east were driven in far enough to form a panel of six rooms. Entry driving was then stopped, and the rooms are now being worked. No further work was done on the main slope. The number of men employed underground was four. The mine was free from gas and in safe working condition.

King Gething Mine. King Gething, operator and fireboss. The property is on the east side of Portage Mountain, about 12 miles from Hudson Hope. A slope was started on the west bank of King Creek to open up the seam previously worked in the east bank of the creek. Only three men were employed, and very little was done during the year.

Packwood Mines. J. Reschke, operator; George Murray, manager. The property is on the southern spur of Butler Range, about 23 miles from Hudson Hope. An entry is being driven, on the strike of the seam, about due north. The seam pitches about 43 degrees. The seam is about 5 feet thick and has two thin rock bands in the top 6 inches. An air-compressor, driven by a 100-horsepower diesel engine, has been installed. The air is being used for a puncher coal-cutter and for drilling the floor in the main entry for height.

Only four men were employed underground. The mine was free from gas and in safe working condition.

Inspection of Electrical Equipment and Installations at Mines and Quarries.

By L. Wardman.

CONTENTS.

GENERAL.

Inspections and Investigations.

During the year 1947 the electrical installations at twenty-seven metal mines, seven coal mines, and eleven quarries were inspected. Several of these installations were inspected twice, making a total of forty-three inspections of metal mines, seven inspections of coal mines, and fourteen inspections of quarries.

Four dangerous occurrences, as well as one non-fatal accident, were investigated.

Canadian Electrical Code, Part V.

The standards and essential requirements as prescribed in the fourth draft of the Canadian Electrical Code, Part V, as well as those in Parts I and II of the Canadian Electrical Code, the regulations in the " Coal-mines Regulation Act " and the " Metalliferous Mines Regulation Act " were used as a guide where applicable in the inspection of metalliferous mines, coal mines, and quarries.

The rules in the Canadian Electrical Code, Part V, cover underground installations and to some extent surface installations.

Copies of the fifth draft of the Canadian Electrical Code will be available early in 1948, and may be obtained from the office of the Chief Inspector of Mines, Victoria. It will be used in conjunction with the " Metalliferous Mines Regulation Act."

A new set of rules similar to those in the Canadian Electrical Code, Part V, have been incorporated in the " Coal-mines Regulation Act."

SUMMARY OF REPORTS ON INSPECTIONS.

The following is a summary of and comments on the conditions that were observed:—

Supply-stations and Equipment.

Several transformer-station installations were not properly fenced; several that were fenced were not locked; several had no curbs for retaining oil and were not of fire-proof construction.

As it is customary in supply-stations to have exposed wiring and bare bus-bars carrying high voltage, it is essential that these stations be enclosed when so constructed, and that the door of such enclosures be securely locked to prevent entry of unauthorized persons.

Owing to the inflammability of transformer oils of the mineral type and the corrosive action of transformer oils of the non-inflammable type, it is essential that means for disposal of the oil in case of leakage be incorporated in the construction of the transformer-station.

Because of the seriousness of fire underground, transformer-stations must be of fire-proof construction.

Considerable improvement has been made in the construction of transformer-stations during 1947.

Cables and Wiring.

The installations of armoured cable were on the whole fairly good. However, at one mine the armoured cables were hung down the shaft in the cage compartment. This is strictly against regulations. Cables in shafts must be installed in the manway in such a position and such a manner as to reduce the possibility of injury to the cable to a minimum.

A fire in a shaft originating with a damaged electrical cable is discussed on page 271. It is not always possible to perceive all the potential hazards; however, careful consideration should be given to selecting a location for the cable where it will be least subject to injury.

The continuity of the armouring on some cables in several mines had been destroyed by corrosion. It is essential to repair damaged places by covering them with a suitable metal sleeve securely bonded to the good armour.

Where cables or wiring enter terminal boxes or switch-boxes, it has been found that fittings are often not used to secure the cable. Suitable clamps or fittings should be used at such places to secure the cable and prevent strain on the conductor connections. If necessary, these fittings should be such that the cable may be sealed.

For temporary installations, portable and transportable equipment, it is often necessary to use cable without an armour covering. It has been found during the course of inspection that sufficient protection is not always provided for such cables. Protection may mean locating the cable where it will be least subject to injury or providing mechanical protection.

On a few occasions low insulation resistance has been observed. It is well to test the insulation resistance of cables periodically, as by so doing deterioration of the insulation may be discovered before the cable breaks down.

It is required that a ground detecting device be installed on all ungrounded circuits to indicate any grounds that may occur.

Several sub-feeders were found to have no overcurrent protection. Overcurrent protection is required where a cable is reduced in cross-section or where a sub-feeder is connected to a main feeder.

Switch Gear.

Switch gear is occasionally found to be located in damp places or in a saturated atmosphere. It is possible that such conditions did not exist when the equipment was installed but have come into existence later. Such conditions impair the efficient operation of the switch gear and will lead to an early breakdown of the insulation.

The switch gear should be installed in a dry location if possible or it should be protected from moisture and should have a water-proof casing. A heating element placed inside of switch gear will help to prevent condensation from a saturated atmosphere.

Grounding of the non-current-carrying metal parts of switch gear, particularly on temporary circuits, is often neglected. It is essential that such parts be grounded to prevent injury to persons coming in contact with them should a fault occur.

The marking of switch gear to indicate the circuits and equipment controlled is frequently neglected. It is essential that switch gear be clearly marked to indicate the circuits and equipment controlled and so eliminate the possibility of inadvertent operation of wrong switches, and possible injury to persons and damage to equipment.

It has been general practice to attach switch gear to shaft timbers. Usually when the switch gear was installed the shaft was dry, but subsequently the shaft became wet and the switch gear is subject to unfavourable conditions. The rules of the Canadian Electrical Code, Part V, prohibit switch gear for circuits over 300 volts being attached to shaft timbers.

Hoists.

Several hoists had improperly adjusted brakes and Lilly controller, or had the Lilly controller out of operation entirely.

A Lilly controller, if in adjustment, normally has the following safety features:—

(1) Warns the operator of overspeeding and automatically stops the hoist if speed is allowed to increase.

(2) Warns the operator of the retardation zone and stops the hoist if speed is not reduced.

(3) Prevents overwinding and underwinding.

It is essential that the brakes be properly adjusted to operate smoothly when automatically applied.

Locomotives.

Several injuries to workmen have been caused by locomotives moving under power when the electrical circuit has been completed accidentally. Other injuries have been caused by the operator walking alongside the locomotive when moving the train.

To prevent, if possible, such accidents, several companies have installed dead-man controls on their locomotives.

Eighty-five trolley locomotives and seventy-eight battery locomotives were in use in and about mines during 1947.

Dangerous Occurrences.

Investigations were made to determine, if possible, the cause of one blasting accident, one premature ignition of a bulldoze charge, and three fires of electrical origin.

It was thought that the blasting accident might have been caused by stray electrical current passing through the blasting-cap leads. However, no evidence of stray current could be found either shortly after the accident or several months later.

The premature ignition of the bulldoze charge was caused by return current from the trolley circuit. In electrical blasting it is essential that the rules governing such blasting be observed in order that accidents may be prevented.

Less than half an ampere of current will detonate most blasting-caps.

One fire of electrical origin was caused by a short circuit through the armour of a damaged 2,200-volt cable. The cable was clamped to the dividers directly behind the cage guides in a shaft, and was pierced by a lag screw driven through a guide and divider. The cable was also damaged farther along on the main level by some unknown cause. The two injuries caused a short circuit, and the heat created set fire to the timbers in the shaft.

The other electrical fires occurred in two small motors when the insulation ignited due to overcurrent. Defective thermal overcurrent relays in the magnetic switch allowed overcurrent to flow, causing one fire. There is no evidence from which to determine the cause of the second fire. It is known, however, that repeated attempts were made to start the motor after it had stalled and this would overheat the windings.

Further details of these incidents may be found in the Chief Inspector's report on dangerous occurrences.

ELECTRICAL POWER.

Metalliferous Mines.

Electrical power was used on the surface at thirty-five metalliferous mines which operated during all or part of 1947, and underground at twenty-two of these mines.

The average amount of electrical power consumed per hour at those mines in operation at the end of 1947 amounted to 45,300 horse-power; of this power, approximately 38 per cent. was purchased, while the remainder was produced by company-owned plants.

The total connected load at these mines is approximately 56,600 horse-power.

Quarries.

Electrical power is used at eight quarries. Power is produced for two of these quarries by company-owned plants, while for the remainder it is purchased.

Coal Mines.

Electrical power is used on the surface at seven coal mines and underground at three.

A breakdown of the horse-power used in coal mines under the various uses is given below:—

	Average Horse-power.
Above ground—	
Winding or hoisting	1,922
Ventilation	1,210
Haulage	1,702
Coal washing and screening	2,637
Miscellaneous	6,817
Total	14,288
Underground—	
Haulage	585
Pumping	480
Miscellaneous	10
Total	1,075
Approximate total horse-power used above and below ground	15,363

These figures are less than the 1946 figures owing to No. 5 mine, Canadian Collieries (Dunsmuir), Limited, being abandoned.

ELECTRICAL INSTALLATIONS.

The following paragraphs give a brief general description of electrical installations not described in the 1946 Annual Report and also details of additions and changes to existing installations.

LODE MINES.

Taku River (56° 133° N.W.).

Polaris-Taku (Taku River Gold Mines, Ltd.). Additions to the electrical installation in 1947 were as follows:— A total of 87 horse-power was added to the crushing plant; of this, 60 horse-power is used for crushing and the remainder for conveyer screen and fan motors. A new distribution centre takes care of this addition. A new Fairbanks-Morse 312-kva. 440-volt alternator and exciter, together with necessary panels, meters, and regulators, were installed in the power-house.

A new Canadian Ingersoll-Rand air-compressor driven by a 125-horsepower synchronous motor was installed in the compressor-room. The compressor distribution centre was revised to supply power to this unit.

A new 15-horsepower Canadian General Electric pump motor was added to the power-house pumping installations.

The mill distribution centre was reconstructed to accommodate future additions by installing a 1,200-amp. main circuit-breaker and replacing the power-lines with 750,000 circular mill rubber-covered double-braid cable.

A new distribution centre for the flotation units, consisting of five 60-amp. switches and three 30-amp. switches, fed from the main distribution centre supplies: five 7½-horsepower Canadian General Electric cell motors, one 5-horsepower Canadian General Electric blower motor, one 2-horsepower Canadian General Electric Denver pump motor, and one 3-horsepower Canadian General Electric sump motor.

Improvements have been made to the crusher plant and mill lighting systems. Two new 10-kva. 440/110-volt transformers have been installed.

The construction of an underground supply system is in progress. Three 100-kva. 2,300/460-volt step-up transformers located near the power-house will supply the 4,400-volt underground electrical system. A 3-conductor, No. 6 gauge, paper-insulated, lead-sheathed, armoured cable will feed three 50-kva. 2,300/460-volt transformers on the 450 level. Three 35-kva. 2,300/460-volt transformers will be installed on the 750 level.

The present changes increase the concentrator load to 400 horse-power, the crushing plant load to 210 horse-power, and the air-compressor load to 400 horse-power.

Smithers (54° 127° N.E.).

Duthie Mines (1946), Ltd.—This mine was closed in 1947. The reconstruction of the electrical system was discontinued early in the year.

Princess Royal Island (53° 128° S.W.).

Pugsley Mine (Surf Inlet Gold Mines, Ltd.).—This mine closed down in 1947.

Cariboo (53° 121° S.W.).

Cariboo Gold Quartz Mining Co., Ltd.—The capacity of the generating plant was increased by adding a new General Electric 150-kw. 460-volt 3-phase alternating current generator driven by a 240-horsepower Vivian diesel engine.

Canusa Cariboo Gold Mines, Ltd.

The electrical equipment at the mine was installed in 1947 and consists of a 190-horsepower Petters diesel engine direct-connected to a 150-kva. 440-volt Westinghouse generator supplying power to a 100-horsepower electric-hoist motor and a 20-horsepower pump motor. Power is carried underground to the pump at 440 volts through 300 feet of 600-volt, 3-conductor, No. 2 B. & S. gauge, rubber-covered, lead-sheathed, armoured cable.

Bridge River (50° 122° N.W.).

Pioneer Gold Mines of B.C., Ltd.—Installation of a new Ingersoll-Rand 2-stage angle compound air-compressor driven by a 375-horsepower 2,200-volt English Electric motor was commenced in 1947. This unit will be run on purchased power supplied through two 60,000/2,300-volt General Electric transformers of 500-kva. capacity.

Bralorne Mines, Ltd.—The installation of an electric trolley system on the 800 level was completed. One 6-ton locomotive will be used. Thirty houses, two bunk-houses, and additions to two drys and a cook-house were wired for lighting.

Pacific (Eastern) Gold Mines, Ltd.—This company ceased operations in the latter part of 1947. Aside from the installation of two 2,200-volt fan motors and armour cable to supply them, no changes were made in the electrical installations.

Congress Gold Mines, Ltd.—Operations at this mine were suspended in February, 1947.

Wayside Mine.—A new 2,300-volt line was installed from the power plant to the mill. This line is not yet in use. The light-wiring in the mine was installed in conduit.

Copper Mountain (49° 120° S.W.).

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

Several changes and additions were made to the electrical installations in 1947. A new hoist installed underground to replace the old No. 2 shaft hoist is driven by the former 250-horsepower hoist motor. To the original safety equipment were added slack-brake switches, track-limit switches, brake safety-switch, and clutch safety-switch. In the crushing plant one of the old crushers was replaced with a new one.

It is driven by a 125-horsepower 2,300-volt wound-rotor motor. The control gear consists of a General Electric CR7022Y1 automatic controller and a type F.K. 142TPST 5,000-volt 400-amp. oil circuit-breaker with undervoltage release, overload trips, and magnetic lock. A start-stop button at the crusher-operator's platform permits ease of control. The crusher motor and control gear replaced a 100-horsepower Westinghouse wound-rotor motor and control gear.

Three 500-kva. 13,000/2,300-volt transformers were added to the main transformer bank, raising the capacity to 3,000 kva.

Some changes have been made in the underground power cables. Several cables have been removed from old workings—namely, the 36 block—to more recently opened workings. All cables are supported on five-sixteenths galvanized steel wire.

Several new transformer-stations are to be made in the 32-34, 7-10, and 7-20 blocks for supplying scraper hoists. Altogether there are, at this date, six banks of transformers supplying scraper hoists.

Hedley (49° 120° S.E.).

Hedley Mascot Gold Mines, Ltd.—Except for the installation of 1,000 feet of overhead power-line from the 3700 to the 4300 level, no major changes were made to the electrical installations at this property.

Nickel Plate (Kelowna Exploration Co., Ltd.). The following new installations were completed in 1944: A new double-drum hoist driven by a 125-horsepower 440-volt motor with magnetic control was installed underground. In the mill a 125-horsepower 2,300-volt Canadian Westinghouse motor was installed to drive a new ball-mill. A 3-horsepower 440-volt motor drives a Dorr classifier which operates with the ball-mill. Feed-control is effected by means of an electronic device, as follows: A microphone picks up the sound from the ball-mill and transmits it to a control unit which starts or stops the feed in accordance with the intensity of sound emitted by the ball-mill.

Three Dorr agitators and two thickeners were installed, requiring a total of 12 horse-power.

A new 11 by 12 drum filter with associated equipment, driven by four English Electric 440-volt motors, was added to the filtering equipment.

A new low-pressure Canadian Pneumatic compressor, driven by a 25-horsepower 440-volt Canadian Westinghouse motor, was installed.

Fairview (49° 119° S.W.).

Fairview (Consolidated Mining and Smelting Co. of Canada, Ltd.). Power is purchased from the West Kootenay Light and Power Company to operate two air-compressors, each driven by a 75-horsepower 550-volt induction motor, a locomotive-battery charging unit and to supply lighting for the camp. Two 150-kva. 6,900/575-volt single-phase English Electric transformers step down the voltage for the compressors and charging unit. One 15-kva. and one 5-kva. 6,900/230–115-volt transformers supply the lighting circuits.

Nelson (40° 117° S.E.).

Kenville Gold Mines, Ltd. In 1947 a new mill was built on this property, and the following electrical equipment was installed: Crushing, one 25-horsepower 440-volt motor and one 30-horsepower 440-volt motor; sorting, three 7-horsepower 440-volt motors; conveying, six 21-horsepower 440-volt motors; cyanide plant, twenty-one 98-horsepower 440-volt motors and one 125-horsepower 2,200-volt motor; refinery, one 5-horsepower 440-volt motor. The switch gear for the above is grouped to form two distribution centres.

Two new compressors were installed in the compressor-house. One is a Canadian Ingersoll-Rand driven by a 200-horsepower 2,200-volt motor; the other is a Sullivan driven by a 300-horsepower 2,200-volt motor, which is not yet connected for operation.

The connected load is: Air-compressors, 207½ horse-power; mine-fans, 15 horse-power; concentrator, 223 horse-power; crushing plant, 83 horse-power; lighting, 175 horse-power; workshops, 32½ horse-power; miscellaneous, 15 horse-power.

Euphrates Mine.—This mine was not operated in 1947.

SHEEP CREEK (49° 117° S.E.).

Gold Belt Mining Co., Ltd.—This mine was closed down early in 1947.

Emerald (Canadian Exploration Co., Ltd.). Operation of this mine and mill was commenced again in 1947. At the mine a new transformer-station was built to house two General Electric 100-kva. 2,200/440–220-volt transformers and one General Electric 10-kva. 2,200/440–220-volt transformer. Two locomotive-battery charging units, consisting of one 7½-horsepower and one 10-horsepower Hertzner unit, were installed, and the camp lighting was improved. At the mill two transformer units were installed to supply power to the crushing plant.

The connected load is: Air-compressors, 200 horse-power; crushing plant, 75 horse-power; concentrator, 450 horse-power; lighting, 53.6 horse-power; tram, 50 horse-power.

Two 1½-ton battery locomotives are used for tramming.

SITKUM CREEK (49° 117° N.E.).

Alpine.—A new 5-kw. 110/120-volt 60-cycle single-phase alternating-current Sheppard diesel, model No. 7D, lighting plant was installed at the mine to replace the old lighting plant.

KASLO-THREE FORKS (50° 117° N.E.).

Zincton Mines, Ltd. Thirteen hundred feet of 3-conductor, No. 2 gauge, 600-volt, rubber-insulated, lead-sheathed, armoured cable was installed along 9 level from the portal to the hoist-room. This cable feeds a 40-horsepower 1,200-r.p.m. 440-volt 3-phase Crocker Wheeler hoist motor, installed in 1947, a 20-horsepower 440-volt scraper hoist motor, and a 10-horsepower 440-volt pump motor.

SANDON (49° 117° N.E.).

Ruth Hope and Coronation.—The battery-charging unit was moved from the surface to a more favourable location in the main adit. No other changes were made to electrical installations.

Silver Ridge.—New electrical equipment as described below was installed at this mine in 1947: One 62.5-kva. Palmer direct-connected diesel-engine-driven generator for power; one 12-kva. direct-connected gasoline-engine-driven generator for lighting; one 15-horsepower motor driving a Coppus TM8 fan; one 1½-ton Atlas battery locomotive and charging unit.

BEAVERDELL (49° 119° S.E.).

Highland Bell, Ltd.—A 40-horsepower diesel-driven electric generator supplies power for camp lighting, workshop equipment, and battery charging. A new 15-kva. 4-wire 110–220-volt 3-phase alternating current Fairbanks-Morse generator was installed in 1947. Two battery locomotives are used for haulage.

GOLDEN (51° 116° S.E.).

Base Metals Mining Corp., Ltd. To produce power for milling operations, this company operates a diesel-driven electric-generating plant, consisting of two 420-horse-power type Y Fairbanks-Morse diesel engines, direct-connected to a Westinghouse alternating-current generator. No electrical power is used underground. The connected load is: Crushing plant, 85 horse-power; concentrator, 482 horse-power; surface hoist, 15 horse-power; pumps, 50 horse-power; workshops, 15 horse-power; lighting, 25 horse-power; miscellaneous, 15 horse-power.

One 180-horsepower diesel-driven Canadian Ingersoll-Rand 2-stage 1,000-c.f.m. compressor and one 145-horsepower Gardner Denver portable 500-c.f.m. compressor were installed in 1947.

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

Dentonia Mines, Ltd. Power is purchased from the West Kootenay Power and Light Company to supply the connected load listed below: Air-compressors, 150 horse-power; mine-pump, 7.5 horse-power; concentrator, 105 horse-power; crushing plant, 25 horse-power; workshop, 1 horse-power; lighting, 15 horse-power. The above motors are supplied through two 150-kva. Westinghouse transformers. Underground installations consist of one 7½-horsepower pump motor. A battery locomotive is used for tramming.

KIMBERLEY (49° 115° N.W.).

Sullivan (Consolidated Mining and Smelting Co. of Canada, Ltd.).—During 1947 the installation of the 800-horsepower Ward-Leonard amplidyne-controlled Bertram Nordberg hoist in No. 1 shaft was completed. A single-drum hoist driven by a 150-horsepower alternating-current wound-rotor motor was installed in the 33503 winze. Several 20-horsepower slusher hoists and several small fans and pumps were installed. The following are revised figures for the connected load:—

Mine underground: Hoists, 1,875 horse-power; scraper hoists, 830 horse-power; pumps, 615 horse-power; fans, 415 horse-power; M.G. sets, 1,135 horse-power; crusher, 150 horse-power; workshops, 215 horse-power; lighting, 125 horse-power; miscellaneous, 675 horse-power.

Mine surface: Air-compressors, 3,230 horse-power; M.G. sets, 920 horse-power; crushing plant, 790 horse-power; workshops, 350 horse-power; lighting, 75 horse-power; miscellaneous, 750 horse-power.

Concentrator: Crushers, 840 horse-power; ball-mills, 4,000 horse-power; classifiers, 200 horse-power; flotation, 2,200 horse-power; pumps, 1,740 horse-power; filters, 400 horse-power; lighting, 200 horse-power; workshops, 300 horse-power; tin smelter, 550 horse-power; miscellaneous, 2,600 horse-power.

One battery and fifty-two trolley locomotives are used for tramming. This number will be increased when the new 3701 tunnel is completed.

HOWE SOUND (49° 123° N.E.).

Britannia Mining and Smelting Co., Ltd.—New electrical equipment installed consisted of four Ingersoll-Rand 3-drum scraper hoists powered with 30-horsepower 440-volt motors, and 700 feet of 6,600-volt 3-conductor No. 6 gauge, rubber-insulated, wire-armoured cable.

TEXADA ISLAND (49° 124° N.W.).

Little Billie (Vananda Mining Co., Ltd.). Construction of the new power plant was continued in 1947. In addition to the 375-horsepower Fairbanks-Morse diesel engine and generator unit, a new 100-horsepower squirrel-cage motor driving a 500-c.f.m. Bellis Morcom compressor was installed. An International diesel engine and generator and a Petters diesel engine driving a Sullivan compressor were moved into the new power-house. The outdoor transformer-station containing two Packard 100-kva. 2,200/440-volt transformers was completed. The installation of a hoist driven by an 80-horsepower electric motor was commenced.

ZEBALLOS (50° 126° S.W.).

Privateer Mine, Ltd.—The installation of a new air-compressor belt, connected to a 150-horsepower motor, was completed. This raises the air-compressor load to 350 horse-power. A new centrifugal pump, driven by a 20-horsepower Westinghouse motor, was installed at the shaft-bottom.

Central Zeballos Gold Mines, Ltd.—Operations at this property were discontinued in 1947.

Spud Valley Gold Mines, Ltd.—Operations at this property were discontinued in May, 1947.

DUNCAN (48° 123° N.W.).

Twin J Mines, Ltd.—Operations at this property were discontinued in September, 1947.

QUARRIES.

COQUITLAM (49° 122° S.W.).

Maryhill Sand and Gravel Co., Ltd. This company operates a sand and gravel quarry on the Fraser River near Coquitlam. Electrical power is purchased from the British Columbia Electric Railway Company. Three 150-kva. 2,300/440-volt Packard transformers step the voltage down for all motors except two pump motors of 150 and 175 horse-power respectively which operate at a potential of 2,200 volts.

The connected load is: Shuttle loaders, 30 horse-power; crushers, 230 horse-power; screening plant, 100 horse-power; cable to conveyer loader, 5 horse-power; conveyers, 432.5 horse-power; lighting, 10 horse-power; miscellaneous, 286.5 horse-power. The average power consumption per hour is 600 horse-power.

Deeks McBride Co., Ltd. This company operates a sand and gravel pit near Coquitlam. Power is purchased from the British Columbia Electric Railway Company for operation of a drag-line shovel crushing and screening plant. The connected load is: Drag-line shovel, 130 horse-power; crushers, 290 horse-power; screening and washing plant, 25 horse-power. Power consumption is approximately 330 kw. per hour.

NORTH VANCOUVER (49° 123° S.E.).

Highland Sand and Gravel Co. This company operates a sand and gravel quarry near Coquitlam. Power is purchased from the British Columbia Electric Railway Company for operation of a crushing and screening plant. Three 100-kva. 12,000/440-volt transformers supply the various motors. The connected load is: Crushers, 165 horse-power; belts and screens, 40 horse-power; bucket elevator and rocker screen, 30 horse-power; rock shaker screen, 5 horse-power; pumps, 35 horse-power; hoist, 60 horse-power; grizzly, 7.5 horse-power; miscellaneous, 6 horse-power. The average hourly power consumption is 252 horse-power.

Road Materials, Ltd. This company operates a sand and gravel quarry and processing plant for road material. All equipment is electrically powered. The main units are: Crusher, 45 horse-power; quarry drag-line, 15 horse-power; dryer, 35 horse-power; mixer, 10 horse-power; processing plant drag-line, 10 horse-power.

Deeks McBride Co., Ltd. This company operates a sand and gravel plant on Seymour Creek. Power is purchased from the British Columbia Electric Railway Company for crushing and screening purposes. All motors operate at 440 volts potential. The connected load is: Crushers, 90 horse-power; screening and washing, 215 horse-power; lighting (approximately), 1 kw. The average power consumption is approximately 515 kw. per hour. A new 60-horse-power crusher is in the process of installation. It will replace a 30-horsepower crusher now in use.

VANCOUVER ISLAND.

Bamberton Quarry and Cement Plant. (48° 123° N.W.) Extensive alterations are being made to this plant, which necessitate major changes in the electrical system. To supply the rock crushing and conveying equipment motors on the water-front, a new 300,000 circular mill double-steel tape-armoured cable feeder extending from the lower sub-station to a 400-amp. 550-volt distribution-panel controlling the crusher and conveyer motors was installed. This feeder serves the following motors: One 20-horsepower General Electric 550-volt conveyer; two 10-horsepower Wagner 550-volt conveyers; one 7½-horsepower General Electric 550-volt conveyer; one 75-horsepower General Electric 550-volt derrick; one 125-horsepower Fairbanks-Morse 550-volt crusher.

To supply the new coal and gypsum conveying system, a 350,000 circular mill double-steel tape-armoured cable which formerly supplied the coal plant was transferred to a new 400-amp. 550-volt distribution-panel. A sub-centre fed from this panel supplies the main coal conveyer-belt and an elevator and screw conveyer. The main distribution-panel supplies: One 2-horsepower General Electric 550-volt coal tripper; one 10-horsepower General Electric 550-volt conveyer; one 5-horsepower General Electric 550-volt conveyer; one 25-horsepower General Electric 550-volt conveyer; one 3-horsepower General Electric 550-volt conveyer; one 30-horsepower General Electric 550-volt elevator; one 20-horsepower General Electric 550-volt conveyer.

Fed from existing distribution centres are two General Electric 550-volt 110-horse-power motors and one English Electric 550-volt 125-horsepower motor. A new 360-c.f.m. Holman compressor driven by a 75-horsepower electric motor was installed in the upper quarry.

COAL MINES.

CUMBERLAND (49° 125° N.E.).

No. 5 Mine (Canadian Collieries (D.), Ltd.).—This colliery was abandoned in 1947, and all electrical equipment and salvable cable were removed from the mine.

No. 8 Mine (Canadian Collieries (D.), Ltd.—A new air-compressor driven by a 500-horse-power 2,200-volt 3-phase 25-cycle alternating current motor was installed in the compressor-house. Construction of a new charging-station on the main North level, 500 feet from the shaft, was commenced. The battery locomotive from No. 5 mine will be used in the main North level when the charging-station is completed.

Tsable River (49° 124° N.W.).

Tsable River Prospect Mine (Canadian Collieries (D.), Ltd.).

To transmit power for mining operations, a power-line was built from Union Bay to the property, a distance of 12 miles. Power is supplied from the Canadian Collieries Puntledge River power plant. With the exception of the main transformer-station, which houses a 1,000-kva. 13,000/2,200-volt 3-phase 25-cycle transformer, bus-bars, and totally enclosed distribution-panels, the electrical equipment at present in use is only temporarily installed. The connected load is: Two air-compressors, 300 horse-power; one hoist, 75 horse-power; one pump, 75 horse-power; M.G. set, 25 horse-power.

Three 20-kva. 2,200/440-volt transformers supply the 440-volt motors, while two 10-kva. 2,200/230–115-volt transformers supply the lighting circuits.

Nanaimo (49° 123° S.W.).

White Rapids Mine (Canadian Collieries (D.), Ltd.).

New electrical installations at this mine consist of a combined underground transformer-station and distribution-room, a new hoist, and a new pumping unit. It was originally planned to install three 75-kva. 2,200/440-volt single-phase 60-cycle transformers in the transformer-station. However, as delivery of these transformers could not be effected for several months, three 50-kva. 2,200/440-volt single-phase 25-cycle transformers, spares from Cumberland, were installed. The hoist is driven by a 150-horsepower 2,200/440-volt motor having magnetic control. The pumping unit is driven by a 50-horsepower 440-volt Westinghouse ventilated-type motor.

Approximately 1,100 feet of 2,300-volt 3-conductor, No. 0 gauge, rubber-insulated, wire-armoured cable transmits power from the surface to the hoist-room, and approximately 400 feet of 2,300-volt 3-conductor, No. 0 gauge, rubber-covered, wire-armoured cable extending from the transformer-room to the pumping unit supplies the pump. To accommodate this installation a new panel was added to the main switch-board in the air-compressor room.

East Kootenay.

Elk River Colliery (Crow's Nest Pass Coal Co., Ltd.).—(49° 114° S.W.) One Ingersoll-Rand high-pressure air-compressor driven by a 450-horsepower motor was transferred to Michel Colliery.

Michel Colliery (Crow's Nest Pass Coal Co., Ltd.).—(49° 114° N.W.) A new Ingersoll-Rand low-pressure air-compressor driven by a 600-horsepower 2,200-volt motor was installed, as well as the Ingersoll-Rand air-compressor from Elk River Colliery.

Princeton (49° 120° S.W.).

Pleasant Valley No. 4 Mine (Tulameen Collieries, Ltd.).—This company purchases power from the Granby Consolidated Mining, Smelting, and Power Company, Limited, for operating motors on the surface. No electrical power is used underground. Two 150-kva. 13,000/440-volt transformers supply power to the motors. One 5-kw. 440/110-volt transformer supplies the lighting circuits. The connected load is: Two air-compressors, 231 horse-power; hoist, 100 horse-power; screen, 10 horse-power; pumps, 8 horse-power; M.G. set, 3 horse-power.

BRITISH COLUMBIA DEPARTMENT OF MINES
LIST OF PUBLICATIONS.

The publications listed are available for distribution except as noted. Recent publications for which no charge is made may be obtained from the Department's offices at Victoria, Vancouver, and Nelson.

PRICES.

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.

Year.	Paper Bound.	Cloth Bound.	Year.	Paper Bound.	Cloth Bound.
1874–1896	......	....	1925	50c.	....
1897	50c.	....	1926	50c.	....
1898–1900	......	....	1927	Free	....
1901	50c.	....	1928	Free	$1.00
1902–1906	....	....	1929	Free	....
1907	50c.	....	1930	Free	....
1908	50c.	....	1931	50c.	1.00
1909	50c.	....	1932	....	....
1910	50c.	....	1933	Free	1.00
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.	....	1947	Free	1.00

* 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. (By John S. Stevenson and Staff of Department of Mines.) Revised.

Bulletin No. 11: Fraser River Tertiary Drainage-history in relation to Placer-gold Deposits. II. (By Douglas Lay.)

Bulletin No. 12: Reconnaissance in the Area of Turnagain and Upper Kechika Rivers. (By M. S. Hedley and Stuart S. Holland.)

Bulletin No. 13: Supplementary Report on Bedwell River Area. (By H. Sargent.)

Bulletin No. 14: Coal Analyses of British Columbia. (By James Dickson.) 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.) Revised, 1948.

Part III: Central Southern British Columbia. (By M. S. Hedley and K. De P. Watson.)

Part IV: South-western British Columbia—exclusive of Vancouver Island. (By J. S. Stevenson.) Revised, 1946.

Part V: Vancouver Island. (By J. S. Stevenson.) Revised, 1946.

Part VI: North-eastern British Columbia and Cariboo and Hobson Creek Areas. (By S. S. Holland.) Revised, 1946.

Bulletin No. 21: Notes on Placer-mining in British Columbia. (By Officers of the Department.)

Bulletin No. 22: Geology of the Whitewater and Lucky Jim Mine Areas. (By M. S. Hedley.)

Bulletin No. 23: Calcareous Deposits of the Georgia Strait Area. (By W. H. Mathews.)

Bulletin No. 24: Geology and Coal Resources of the Carbon Creek-Mount Bickford Map-area. (By W. H. Mathews.)

Bulletin No. 25: The Squaw Creek-Rainy Hollow Area. (By K. DeP. Watson.)

SPECIAL REPORTS.

Special reports on certain properties were advertised in the Annual Reports 1936 to 1941, inclusive, as available on application. A list of those still available will be supplied on request. The text of a report is either in mimeographed or typewritten form, and ozalid prints can be made of maps or other drawings. Copies of reports still available will be supplied at 10 cents per page of typewritten or mimeographed copy, excepting that the charge for any mimeographed report shall not exceed 25 cents. Additional charges will be made for prints of maps. Requests for these Special Reports, accompanied by the proper sum, should be addressed to the Chief Mining Engineer.

NOTICES *RE* PUBLICATIONS.

Applications are invited from those who wish to receive notices when new publications become available.

MAPS SHOWING MINERAL CLAIMS AND PLACER LEASES.

Prints of maps showing the approximate positions of placer-mining leases and mineral claims held by record are available on request to the Chief Gold Commissioner at Victoria, B.C. These maps conform to the reference and mineral-reference maps issued by the Lands Department in size and geographical detail and correspond as to numbers. Full sheet, $1; half-sheet, 50 cents; quarter-sheet, 25 cents.

PROSPECTORS' SETS.

On request, collections, each consisting of about fifty specimens, including rocks and minerals, are supplied to prospectors and to schools teaching subjects relating to mining or prospecting. Because it is difficult to obtain the material for these sets, only requests from those actively prospecting in the Province and from schools in British Columbia can be considered. A charge of 50 cents plus 2 cents sales tax is made for each set; the price should be remitted with a request addressed to the Chief Mining Engineer.

LIST OF LIBRARIES.

All Department publications are being sent to the following Government departments and Legislative, University, and Public Libraries:—

CANADA.

Government Departments—
- Department of Secretary of State, Ottawa—Library.
- Department of Mines and Resources, Ottawa—Library of the Bureau of Geology and Topography.
- Department of Mines, Halifax, Nova Scotia.
- Department of Lands and Mines, Fredericton, New Brunswick.
- Department of Mines, Quebec, Quebec.
- Department of Mines, Toronto, Ontario.
- Department of Mines and Natural Resources, Winnipeg, Manitoba.
- Department of Natural Resources, Regina, Saskatchewan.
- Department of Lands and Mines, Edmonton, Alberta.

Legislative Libraries—
- Library of Parliament, Ottawa.
- Legislative Library, Halifax, Nova Scotia.
- Legislative Library, Fredericton, New Brunswick.
- Legislative Library, Quebec, Quebec.
- Legislative Library, Toronto, Ontario.
- Legislative Library, Winnipeg, Manitoba.
- Legislative Library, Regina, Saskatchewan.
- Legislative Library, Edmonton, Alberta.

University Libraries—
- Dalhousie University, Halifax, Nova Scotia.
- Acadia University, Wolfville, Nova Scotia.
- Laval University, Quebec, Quebec.
- McGill University, Montreal, Quebec.
- Queen's University, Kingston, Ontario.
- University of Toronto, Toronto, Ontario.
- University of Manitoba, Winnipeg, Manitoba.
- University of Saskatchewan, Saskatoon, Saskatchewan.
- University of Alberta, Edmonton, Alberta.
- University of British Columbia, Vancouver, B.C.

Public Libraries—
- Public Library, Halifax, Nova Scotia.
- Public Library, Montreal, Quebec.
- Public Library, Toronto, Ontario.
- Public Library, Edmonton, Alberta.
- Public Library, Calgary, Alberta.
- Public Library, New Westminster, B.C.
- Public Library, Nelson, B.C.
- Public Library, Prince Rupert, B.C.
- Public Library, Prince George, B.C.
- Public Library, Vancouver, B.C.
- Public Library, Victoria, B.C.

ENGLAND.

British Columbia House, Regent Street, London, England.
Canada House, London, England.

SOUTH AFRICA.

Public Library, Johannesburg, South Africa.

AUSTRALIA.

Public Library, Sydney, Australia.

UNITED STATES.

Government Departments and Legislative Libraries—
- Library of Congress, Washington, D.C.
- Bureau of Mines, Washington, D.C.
- United States Geological Survey, Washington, D.C.
- California State Division of Mines, Ferry Building, San Francisco, California.
- Oregon State Bureau of Mines, Salem, Oregon.
- Washington State Division of Mines and Geology, Olympia, Washington.
- Idaho State Bureau of Mines, Boise, Idaho.

University Libraries—
- Columbia University, New York, N.Y.
- University of California, Berkeley, California.
- 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." These Acts are under the administration of the Department of Lands and Forests, Victoria, B.C.

A mineral claim is a piece of land not exceeding 1,500 feet square and fifty-one and sixty-five one-hundredths acres in area. The angles must be right angles unless the boundaries, or one of them, are the same as those of a previously recorded claim.

No special privileges are allowed for the discovery of new mineral claims or districts.

A mineral claim is located by erecting two "legal posts," which are stakes having a height of not less than 4 feet above ground and squared 4 inches at least on each face for not less than a foot from the top. A tree-stump so cut and squared also constitutes a legal post. A cairn of stones not less than 4 feet in height and not less than 1 foot in diameter 4 feet above the ground may also be used as a legal post. Upon each of these posts must be written the name of the claim, the name of the locator, and the date of location. On No. 1 post, in addition, the following must be written: "Initial post. Direction of Post No. 2 [*giving approximate compass-bearing*]. feet of this claim lie on the right and feet on the left of the line from No. 1 to No. 2 posts." Numbered metal identification tags must be attached to both posts at the time of staking.

The location-line between Nos. 1 and 2 posts must be distinctly marked—in a timbered locality by blazing trees and cutting underbrush, and in bare country by monuments of earth or rock not less than 2 feet in diameter at the base, and at least 2 feet high—so that the line can be distinctly seen.

Mineral claims must be recorded in the Mining Recorder's office for the mining division in which they are situate within fifteen days from the date of location, one day extra being allowed for each 10 miles of distance from the recording office after the first 10 miles. If a claim is not recorded in time it is deemed abandoned and open for relocation, but if the original locator wishes to relocate he can only do so by permission of the Gold Commissioner of the district and upon the payment of a fee of $10. This applies also to a claim abandoned for any reason whatever. A free miner can hold, by location, during any period of twelve months, eight mineral claims within a radius of 10 miles, and may acquire others by purchase.

Mineral claims are, until the Crown grant is issued, held practically on a yearly lease, a condition of which is that during such year assessment-work be performed on the same to the value of at least $100, or a payment of such sum be made to the Mining Recorder. Such assessments must be recorded before the expiration of the year, or the claim is deemed abandoned. If, however, the required assessment-work has been performed within the year, but not recorded within that time, a free miner may, within thirty days thereafter, record such assessment-work upon payment of an additional fee of $10. The actual cost of the survey of a mineral claim, to an amount not exceeding $100, may also be recorded as assessment-work. If, during any year, work is done to a greater extent than the required $100, any further sum of $100—but not less—may be recorded and counted as further assessments; such excess work must be recorded during the year in which it is performed. All work done on a mineral claim between the time of its location and recording may be counted as work done during the first period of one year from the recording. As soon as assessment-work to the extent of $500 is recorded and a survey made of the claim, the owner of a mineral claim is entitled to a Crown grant on payment of a fee of $25, and giving the necessary notices required by the Act. Liberal provisions are also made in the Act for obtaining mill-sites and other facilities in the way of workings and drains for the better working of claims.

"PLACER-MINING ACT."

In the "Placer-mining Act" "mineral" is defined as in the "Mineral Act," but includes only mineral occurring in any natural unconsolidated material, excluding mineral in place.

Under the "Placer-mining Act" a free miner may locate, in any period of twelve consecutive months, one placer claim or leasehold in his own name and one placer claim or leasehold for each of three free miners for whom he acts as agent on any separate creek, river-bed, bar or dry diggings. Other placer claims or leaseholds may be acquired by purchase.

Placer Claims.

Placer claims are of three classes, as follows:—

"Creek diggings": any mine in the bed of any stream or ravine:

"Bar diggings": any mine between high- and low-water marks on a river, lake, or other large body of water:

"Dry diggings": any mine over which water never extends.

Every placer claim shall be as nearly as possible rectangular in form, and marked by four legal posts at the corners.

A placer claim must be recorded in the office of the Mining Recorder for the mining division within which the same is situate, within fifteen days after the location thereof, if located within 10 miles of the office of the Mining Recorder by the most direct means of travel. One additional day shall be allowed for every 10 miles additional or fraction thereof. The number of days shall be counted inclusive of the days upon which such location was made, but exclusive of the day of application for record.

Placer-mining Leases.

Leases of unoccupied Crown lands approximately 80 acres in extent may be granted by the Gold Commissioner of the district after location has been made by staking along a "location-line" not more than one-half a mile (2,640 feet) in length. In this line one bend, or change of direction, is permitted. Where a straight line is followed two posts only are necessary—namely, an "initial post" and a "final post." Where there is a change of direction a legal post must be placed to mark the point of the said change. The leasehold is allowed a width not in excess of one-quarter mile (1,320 feet), and the locator, both on his "initial post" and in his notice of intention to apply, which is posted at the office of the Mining Recorder, is required to state how many feet are included in the location to the right and how many feet to the left of the location-line.

That section of the Act dealing with the staking of placer-mining leases follows:—

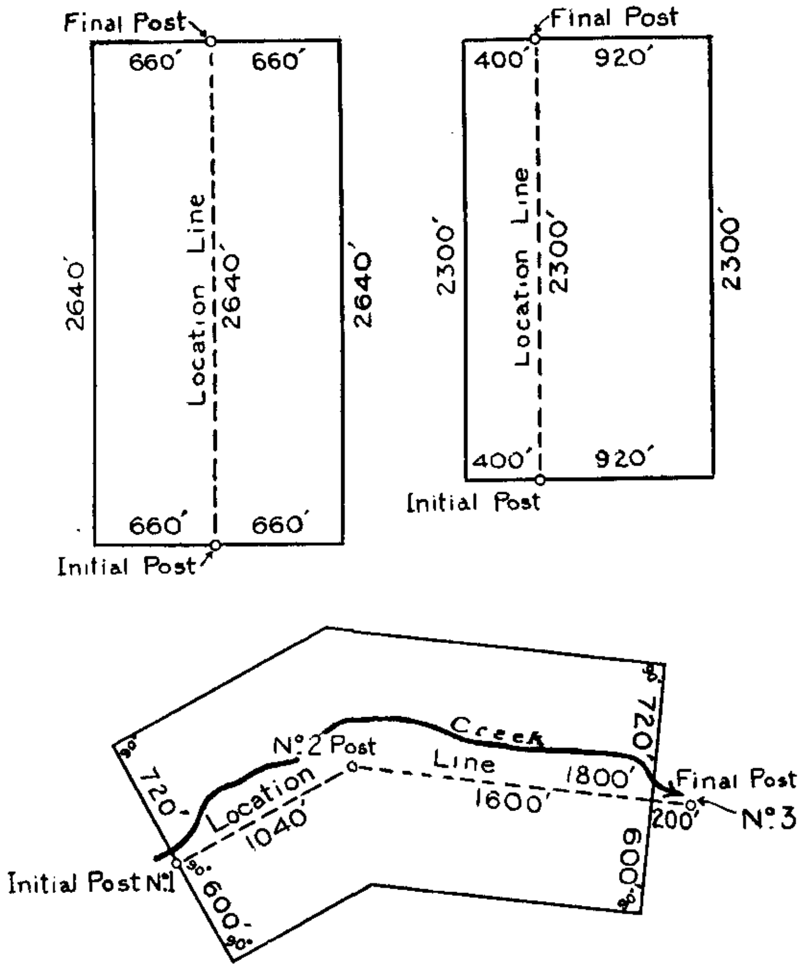
"105. (1) For the purpose of locating a placer leasehold, a line to be known as the 'location-line' shall be marked on the ground by placing a legal post at each end, one post to be known as the 'Initial Post' and the other as the 'Final Post.' The direction of the location-line may change at not more than one point throughout its length, and an intermediate legal post shall be placed at the point at which the direction changes. The total length of the location-line, following its change of direction (if any), shall not exceed two thousand six hundred and forty feet.

"(2) Upon the initial post and the final post shall be written the words 'Initial Post' and 'Final Post' respectively, together with the name of the locator and the date of the location. On the initial post shall also be written the approximate compass-bearing of the final post, and a statement of the number of feet of the leasehold lying on the right and on the left of the location-line, as viewed from the initial post, not exceeding in the aggregate a width of thirteen hundred and twenty feet, thus: 'Direction of Final Post, . feet of this claim lie on the right and feet on the left of the location-line.' In addition to the foregoing, where there is a change of direction in the location-line as marked on the ground, the number '1' shall be written on the initial post; the number '2' shall be written on the intermediate post; and the number '3' shall be written on the final post. There also shall be affixed to the initial post a notice to the following effect, namely: 'Application will be made under the "Placer-mining Act" for a lease of the ground within this location.'

"(3) The location-line shall at the time of location be marked between the legal posts throughout its length so that it can be distinctly seen; in a timbered locality, by blazing trees and cutting underbrush, and in a locality where there is neither timber nor underbrush, by placing legal posts or monuments of earth or stones not less than two feet high and not less than two feet in diameter at the base, so that the location-line can be distinctly seen.

"EXAMPLES OF VARIOUS METHODS OF LAYING OUT PLACER LEASEHOLDS.

"Showing Areas secured with Location-lines of Various Lengths.



"(4) Where, from the nature or shape of the surface of the ground, it is impracticable to mark the location-line of a leasehold as provided by this section, the leasehold may be located by placing legal posts as witness-posts, as near as possible to the location-line, and writing on each witness-post the distance and compass-bearing of some designated point on the location-line from the witness-post; and the distances and compass-bearing so written on the witness-posts shall be set out in the application for the lease and in any lease granted thereon.

"(5) The locator shall, within thirty days after the date of the location, post a notice in Form I in the office of the Mining Recorder, which notice shall set out:—

"(a) The name of the intending applicant or each applicant if more than one, and the numbers of their free miners' certificates:

"(b) The date of the location:

"(c) The number of feet lying to the right and left of the location-line, and the approximate area or size of the ground.

The words written on the initial post and final post shall be set out in full in the notice; and as accurate a description as possible of the ground to be acquired shall be given, having special reference to any prior locations it may join, and the general locality of the ground to be acquired."

Another provision is that there must be affixed to the "initial post" and to the "final post" a numbered metal identification tag furnished by the Mining Recorder with each free miner's certificate issued. These tags must be attached to the posts or placed in a container within a cairn, at the time of location.

The annual rental on a placer-mining lease is $30, and the amount to be expended annually on development-work is $250.

Authority also has been given for the granting of special placer-mining leases in locations other than has been defined. Copies of regulations governing the granting of special placer-mining leaseholds may be obtained upon application to the office of the Chief Gold Commissioner, Department of Mines, Victoria, B.C.

For more detailed information the reader is referred to the complete "Placer-mining Act," which may be obtained from the King's Printer, Victoria, B.C.

TABLE OF FEES, "MINERAL ACT" AND "PLACER-MINING ACT."

Individual free miner's certificate, annual fee	$5.00
Company free miner's certificate (capital $100,000 or less), annual fee	50.00
Company free miner's certificate (capital over $100,000), annual fee	100.00
Recording mineral claim	2.50
Recording certificate of work, mineral claim	2.50
Recording abandonment, mineral claim	10.00
Recording abandonment, placer claim	2.50
Recording any affidavit	2.50
Records in "Records of Conveyances" (for each claim or lease)	2.00
For each additional claim or lease in the same document	.50
Filing documents, "Mineral Act"	.25
Filing documents, "Placer-mining Act"	1.00
Recording certificate of work, placer-mining lease	2.50
For Crown grant of mineral rights under "Mineral Act"	25.00
For Crown grant of surface rights of mineral claim under "Mineral Act"	10.00
For every lease under "Placer-mining Act"	5.00

COAL, PETROLEUM, AND NATURAL GAS.

Limestone, marble, etc., are disposed of by lease under the provisions of the "Land Act," coal is disposed of under the provisions of the "Coal Act," and petroleum and natural gas under the "Petroleum and Natural Gas Act." These Acts are under the administration of the Department of Lands and Forests, Victoria, B.C.

"METALLIFEROUS MINES REGULATION ACT."

This Act is designed to provide for the safe working of metalliferous mines, metallurgical works, and quarries. It contains practical regulations which govern the main phases of mining, such as surface arrangements, fire-protection, use and storage of explosives, hoisting, haulage, ventilation, mine-rescue work, etc.

In preparing the present Act, passed in 1948, the former Act was entirely rewritten and rearranged to make it conform to modern mining practice.

In the new Act, provision regarding explosive gases in metal mines has been made. A new rule allows the use of internal-combustion engines of the diesel type underground under conditions which make this form of power unobjectionable.

Provisions have been made for training and maintaining mine-rescue teams at the larger metal-mining centres. The new Act also provides for the appointment of electrical, mechanical, and metallurgical inspectors; for protection of public and private property from damage resulting from mining operations; and for appointing workmen's safety committees.

The Inspectors of Mines are empowered to enter and inspect any part of any mine, metallurgical works, or quarry, and to inspect any plant or equipment, or anything relating to the safety of persons employed in or about quarries, metalliferous mines, or metallurgical works. They are also empowered to require the remedy of conditions affecting the safety of employees, to make provisions safeguarding those employed, and, if need be, to order the closing of a mine or part of a mine, or the stopping of all work connected with it.

"COAL-MINES REGULATION ACT."

This Act, like the "Metalliferous Mines Regulation Act," is designed to provide for the safe working conditions by practical regulations.

The Act has been completely revised and rewritten, and several additions and changes have been made to bring it into conformity with modern practice. The additions and changes include: Rules providing for precautions against coal-dust underground and in cleaning plants; a new section governing surface coal-stripping operations; revised rules governing electrical installations; and provisions for the use of internal-combustion engines of the diesel type underground, where the equipment and the conditions maintained render this form of power unobjectionable.

The powers of Inspectors under this Act are similar to those provided under the "Metalliferous Mines Regulation Act."

EXPLOSIVES.

Dominion Order in Council No. 2903, requiring a permit to maintain a magazine or purchase explosives on the authority of a Provincial Mines Inspector, has been repealed.

"MINES RIGHT-OF-WAY ACT."

This Act provides for access to mining property. It provides for the obtaining of a right-of-way for any road, railway, aerial, electric, or other tramway, surface or elevated cable, electric or telephone pole-line, chute, flume, pipe-line, drain, or any right or easement of a like nature.

"IRON AND STEEL BOUNTIES ACT."

The Lieutenant-Governor in Council may enter into an agreement with any person whereby the Crown will pay to that person, out of the Consolidated Revenue Fund, bounties on pig-iron and steel shapes when manufactured within the Province, as follows:—

(a) In respect of pig-iron manufactured from ore, on the proportion produced from ore mined in the Province, a bounty not to exceed three dollars per ton of two thousand pounds:

(b) In respect of pig-iron manufactured from ore, on the proportion produced from ore mined outside the Province, a bounty not to exceed one dollar and fifty cents per ton of two thousand pounds:

(*c*) In respect of steel shapes of commercial utility manufactured in the Province, a bounty not to exceed one dollar per ton of two thousand pounds.

Bounty, as on pig-iron under this Act, may be paid upon the molten iron from ore which in the electric furnace, Bessemer or other furnace, enters into the manufacture of steel by the process employed in such furnace; the weight of such iron to be ascertained from the weight of the steel so manufactured.

Bounty on steel shapes under this Act shall be paid only upon such steel shapes as are manufactured in a rolling-mill having a rated productive capacity per annum of at least twenty thousand tons of two thousand pounds per ton. The total amount of bounties paid under clauses (*a*) and (*b*) is limited to $200,000 in any one year or $2,000,000 in the aggregate; and the total amount of bounties paid under clause (*c*) is limited to $20,000 in any one year or $200,000 in the aggregate.

"INDIAN RESERVES MINERAL RESOURCES ACT."

This Act validates an agreement between the Dominion and the Province whereby mineral rights on Indian reserves, upon surrender by the Indians, shall be administered by the Province, subject to the laws of the Province. A free miner wishing to prospect on Indian reserves must obtain the approval of the Gold Commissioner for the mining division in which the reserve is situated and also of the Indian Agent for such reserve.

"PROSPECTORS' GRUB-STAKE ACT."

In this Act "grub-stake" means money, food supplies, clothing, powder, tools, or any other thing necessary to the business of prospecting. "Prospector" means any person who is a British subject and who is the holder of a valid free miner's certificate; who has been honourably discharged from any of His Majesty's Services or has been resident in the Province during the year preceding any application for a grub-stake.

Information regarding grub-stakes may be obtained from the Department of Mines, Victoria, B.C., or from any Mining Recorder, Mining Engineer, or Inspector of Mines of the Department.

No grub-stake granted to one applicant shall exceed $300 in value in any one year, but the grub-stake may be increased, if an applicant is required to travel to or from the area in which he is to prospect, by an amount sufficient to cover such travelling expenses. The total in no case shall exceed $500 in any year. Applicants are required to identify some of the commoner rocks and minerals.

Provision has been made for the establishment and operation of one or more mining training camps at suitable locations within the Province.

"TAXATION ACT."

(Procedure in applying to lease a Reverted Crown-granted Mineral Claim.)

"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.

Mines are subject to a tax at the rate of 4 per cent. on income derived from mining operations.

For further particulars *see* the "Mining Tax Act," also the "Public Schools Act," which are obtainable from the King's Printer, Victoria, B.C.

The Federal Government now collects the income tax for the Provincial Government.

ROYALTIES.

All minerals mined from lands covered by records of mineral claims and placer claims and by placer-mining leases issued after the 1st day of May, 1948, are subject to payment of such royalties as may be fixed by regulation made by the Lieutenant-Governor in Council from time to time. The amounts of royalties to be paid have not yet been set. Properties subject to the payment of royalties are exempt from payment of the 4-per-cent. tax under the " Mining Tax Act."

" FOREST ACT."

In 1939 the " Provincial Parks Act " was repealed and the administration of Provincial parks brought under the " Forest Act." Under this Act the Lieutenant-Governor in Council may constitute any portion of the Province a Provincial park and may also extend, reduce, or cancel any park created before or after the amendment to this Act.

The Act provides for three classes of parks to be known as " A," " B," and " C " Class parks.

Lands included in Class "A" and Class " C " parks are reserved from pre-emption, sale, lease, or licence under the " Land Act " and with respect to mining are so reserved unless the consent of the Lieutenant-Governor in Council is obtained, and then only subject to further provisions of the Act.

No holder of any mineral claim in a Class "A" or Class " C " park may obtain a Crown grant of the surface rights of a mineral claim.

All mineral claims in any Class "A" or Class " C " park shall be subject to such terms and conditions and restrictions, including cutting and use of timber, as the Lieutenant-Governor in Council may from time to time prescribe.

The restrictions on prospecting and mining in Class "A" and Class " C " parks do not apply in the case of Class " B " parks.

Where, in the opinion of the Minister of Lands, the safety of life and property is endangered through the hazardous condition of the forest-cover or the occurrence or spread of forest fire, the Minister may declare a district closed for travel and prospecting so long as the hazard exists.

LIST OF PRICES CHARGED FOR ACTS.

	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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