Minister of Mines

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

For the Year Ended 31st December

1950

VICTORIA, B.C.
Printed by DON MCDIARMID, Printer to the King's Most Excellent Majesty
1951

BRITISH COLUMBIA DEPARTMENT OF MINES

VICTORIA, B.C.

Hon. R. C. MacDonald, *Minister.*

John F. Walker, *Deputy Minister.*

H. C. Hughes, *Chief Inspector of Mines.*

G. Cave-Browne-Cave, *Chief Analyst and Assayer.*

Hartley Sargent, *Chief, Mineralogical Branch.*

P. J. Mulcahy, *Chief Gold Commissioner.*

To His Honour CLARENCE WALLACE, C.B.E.,
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 1950 is herewith respectfully submitted.

R. C. MACDONALD,
Minister of Mines.

Minister of Mines' Office,
May, 1951.

P. B. FREELAND,
former Chief Mining Engineer,
died December 19th, 1949.

WILLIAM J. LYNOTT,
former Assistant Mining Engineer,
died November 16th, 1949.

RICHARD NICHOL,
Mine-rescue Instructor,
died August 19th, 1950.

BIOGRAPHICAL NOTES. — Mr. Freeland, page 50; Mr. Lynott, page 51; Mr. Nichol, page 49.

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ANNUAL REPORT OF THE MINISTER OF MINES, 1950

Introduction

A Report of the Minister of Mines of the Province of British Columbia has been published each year since 1874.

The Annual Report records the salient facts in the progress of the industry, also much detail about individual mining operations, including those undertaken in the search for, exploration of, and development of mineral deposits, as well as the actual winning of material from mineral deposits.

The Annual Report of the Minister of Mines now contains introductory sections dealing with statistics and Departmental work, followed by sections dealing with Metal-mining (Lode); Placer-mining; Structural Materials and Industrial Minerals; Inspection of Lode Mines, Placer Mines, and Quarries; Coal-mining; and Inspection of Electrical Equipment and Installations at Mines and Quarries, each with its own table of contents.

An introductory review of the mining industry and notes at the first of several of the main sections deal generally with the industry or its principal subdivisions. Notes in the various sections deal briefly with the work done on individual properties during the year or describe a property in more complete detail, outlining the history of past work and the geological setting as well as describing the workings and the mineral deposits exposed in them. Some notes deal with areas rather than with a single mine or property.

The work of the branches of the Department is outlined briefly in the section headed "Departmental Work." This section is followed by notes dealing briefly with the work of the British Columbia or Dominion Government services of particular interest to the mining industry of British Columbia. Information concerning mine operations and some of the activities of the Inspection Branch of the Department of Mines is contained in the section on "Inspection of Lode Mines, Placer Mines, and Quarries," early in the section on "Coal-mining" and in the section on "Inspection of Electrical Equipment and Installations at Mines and Quarries."

The section on "Statistics" consists of tables supplemented by brief notes. A statement of current and past practice in arriving at quantities and calculating the value of the various products is given under "Statistics" (pp. 13 and 14). Quantities and values of the principal mineral products for 1949 and 1950 are given in Table I (p. 15). The average prices for each of the principal metals and coal for each year, beginning with 1901, are given in Table II (p. 16). Other tables record the details of mineral output from year to year for the Province and for the various mining divisions. The numbers employed in various divisions of the mining industry; the expenditures for salaries and wages, fuel, electricity, and process supplies; the dividends disbursed; the quantity of ore mined and the freight and treatment charges incurred are also tabulated, and the lode-metal producers are listed.

The section on "Statistics" is supplemented by data on the production of individual properties found in notes on properties in the succeeding sections, and by data relating to the production of individual coal mines and of coal-mining areas tabulated early in the section on "Coal-mining."

Review of the Mining Industry in British Columbia, 1950

By Hartley Sargent

The mineral production of British Columbia in 1950 had a value of $148,155,060, which is substantially greater than the 1949 value, $133,012,968, and greater than any previous year except 1948, for which the value was $152,524,752. The product of greatest value in 1950 was zinc, valued at $48,882,765, exceeding the value of any single metal in any year except lead, valued at $60,072,542 in 1948. The metals and sulphur, derived from lode-mining operations, accounted for more than 85 per cent of the total value; coal accounted for a little less than 7 per cent, and so did structural materials.

The prices of copper, lead, and zinc, and of most other metals had fallen early in 1949, and remained below the 1949 average in the first half of 1950. About midsummer, prices of all base metals began to increase, reflecting the rearmament programme and the beginning of the Korean War. The prices for antimony, mercury, tin, and tungsten increased sharply and the price of silver increased to 80 cents, U.S., per ounce early in November. The prices for all metals save gold were high at the end of 1950, and the average prices* for silver, copper, and zinc for the year were well above 1949 averages, but the 1950 price for lead was 1.35 cents below the 1949 average, and 3.59 cents below the 1948 average. The prices, especially for lead and zinc, were high in comparison with average prices for years preceding 1947. The 1950 zinc price is the highest average price for that metal for any year.

Canadian base metals sold in the United States market are subject to the following duties: Zinc, 0.75 cents per pound of zinc in ores and concentrates and 0.875 cents per pound of slab zinc; lead, 0.75 cents per pound of lead in ores and concentrates, and 1.065 cents per pound of refined lead; copper, 2 cents per pound of copper in concentrates, matte, blister, or refined copper. The duty on copper was reimposed on July 1st, 1950.

The so-called "freeing of the dollar" at the end of September left the value of the Canadian dollar to be determined by the foreign exchange market. The Canadian dollar then approached parity with the United States dollar, and consequently the value of an ounce of gold in Canadian funds declined. The Canadian price for gold recovered in part later in the year, but remained below the previous fixed price of $38.50. However, the 1950 average price for gold in Canada was higher than the 1949 average.

More placer gold was recovered in 1950 than in 1949. Dredges had recovered most of the placer gold in 1948 and 1949, but in 1950 most of the dredges were inactive. Most of the 1950 production came from the revived underground placer operation at the Noland mine on Spruce Creek in the Atlin Mining Division. Production from Cedar Creek in the Quesnel Mining Division was also greater than in recent years. Hydraulic operations were handicapped to some extent by shortage of water.

The quantity of ore mined at lode mines in 1950 was greater than in any previous year, except the years 1939 to 1942. The gold production of lode mines was not far from that recovered in recent years. The output of gold from the Nelson, Atlin, and Similkameen Mining Divisions declined, but these decreases were nearly offset by increased recovery of gold at Britannia and by the output of the Silbak Premier and Premier Border properties, for which no production was recorded in 1949. Silver production exceeded that of 1949 by about 25 per cent. Important increases in the Portland Canal, Omineca, and Fort Steele Mining Divisions were offset in part by decreases in some other mining divisions. Output of copper was less than in 1949 or 1948, the output of both principal producers having declined. Lead and zinc were produced in greater quantity

* *See* Table II, p. 16.

than in 1949. In the last quarter of 1950 lead was produced at a rate materially higher than the average monthly rate for the year. Both lead and zinc have been produced in considerably greater quantity in some previous years, but the value of the zinc in 1950 exceeds the value in any previous year, while the value of lead and the combined value of lead and zinc have been exceeded only in the year 1948.

Coal mined in 1950 totalled 1,542,404 tons, compared with 1,917,296 tons in 1949. The White Rapids mine in the Nanaimo area was shut down and the output of No. 10 mine, South Wellington, was materially less than in 1949. Increases in output at No. 8 mine at Comox and the Tsable River mine partly offset the decreases at Nanaimo. The Princeton-Tulameen area experienced a more serious decline, having lost a large part of the local market to Alberta coal. The East Kootenay district also produced less coal than in 1949, partly because power shortage and inability to obtain enough railroad cars made it necessary to restrict the output in the early months of 1950.

Coal-producers face severe competition from coal and oil from Alberta, and possibly from gas. The Telkwa coalfield is expected to increase its output because of new industrial demand.

The output of miscellaneous industrial minerals and of structural materials was not very different from that of recent years. Output of clay products was greater than in 1949, but less than 1948. Operation of the new plant of the Clayburn Company at Abbotsford was begun late in May. This plant replaced the brick-making part of the plant at Kilgard, destroyed by fire in January, 1949.

The number employed in all branches of the mining industry in 1950 averaged 16,612. Some of the major expenditures were salaries and wages, $42,738,035; fuel and electricity, $6,775,998; process supplies, $17,500,663; freight and treatment on ores and concentrates of metals, $22,113,431; Dominion taxes, $14,877,802; Provincial taxes, $3,442,932; municipal and other taxes, $540,620; Workmen's Compensation, silicosis, unemployment insurance, and other levies, $1,670,252. Dividends paid amounted to $34,399,330.

Comparison with the statistical records for previous years indicates some interesting trends in the mining industry. The gross value of all mineral products for each of the years 1937, 1941, and 1948 exceeded that of any previous year, that in 1948 being nearly double the 1937 gross value. The value of lode gold rose from second place in 1937 to first place in 1941, but in 1948 and 1950 ranked well below lead and zinc and was about on a level with coal and copper, and not far from structural materials. The total quantity of ore mined was highest for the year 1941, when copper ore amounted to about 3,500,000 tons, silver-lead-zinc ore to about 2,900,000 tons, and gold ore to about 1,350,000 tons. Assignment of ore to such classes is complicated by the fact that some gold-silver ores contain important proportions of lead and zinc, and some copper ores contain an important proportion of zinc. The Silbak Premier in the course of time has changed from a gold-silver to a gold-silver-lead-zinc mine, and Britannia has changed from a copper-gold mine to a copper-gold-zinc mine. In 1948 silver-lead-zinc and gold-copper ores each made up about 44 per cent of the lode-mine ore, and gold ore 12 per cent. In 1950 silver-lead-zinc ore accounted for more than half the total, copper-gold ore for a little more than a third, and gold ore for scarcely a tenth. In 1951 gold ore will account for a still smaller fraction of the ore mined from lode mines.

The increased number of important, widely separated producers of silver, lead, and zinc is an interesting development. Britannia has now become an important producer of zinc, and Silbak Premier of lead and zinc; the Torbrit at Alice Arm is a substantial producer of silver with minor lead; the Silver Standard at Hazelton is an important producer of silver, lead, and zinc; the Reeves MacDonald and Jersey (Canadian Exploration) are substantial producers of zinc, lead, and silver. The properties mentioned are in the Vancouver, Portland Canal, Omineca, and Nelson Mining Divisions. As a consequence of the changes and developments, the four mining divisions mentioned accounted for 36.2 per cent of the silver, 5.7 per cent of the lead, and 16.9 per cent of the zinc produced in 1950, compared with 20.4 per cent of the silver, 0.6 per cent of the lead, and 3.6 per cent of the zinc produced in 1940. In the same period the output of the Slocan and Ainsworth Mining Divisions has also increased substantially.

Facilities for making clay products are greatly improved in the new plants of the Clayburn Company at Kilgard and Abbotsford. Enlargement of the cement plant at Bamberton is in progress, and a plant is to be built at Kimberley to make sulphuric acid for use in making ammonium-phosphate fertilizer. The sulphur will be obtained from by-product iron-sulphide concentrates produced at the Sullivan concentrator. These projects will result in increased output of clay products, cement, and fertilizer. Thus further increase in the output of industrial minerals and structural materials is to be expected. The combined value of miscellaneous industrial minerals and materials—principally fluxes, gypsum, and sulphur—and of structural materials—principally clay products, cement, limestone, sand, and gravel—was approximately $3,690,000 in 1940 and $12,645,000 in 1950. This is a large gain even when compared with the increase in the value of lead and zinc from $28,870,000 in 1940 to $92,270,000 in 1950.

Statistics

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

METHOD OF COMPUTING PRODUCTION

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

Prior to 1925 the average prices for gold and copper are true average prices, but, as a means of correcting for losses in smelting and refining, the prices of other metals were taken at the following percentages of the year's average price for the metal: Silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent. For 1925 and subsequent years the value has been calculated using the true average price and the net metal contents. The procedures adopted for the 1925 Report are still used essentially unchanged, and the same arrangement of tables has been retained, but new tables have been added from time to time.

Beginning with the Annual Report for 1948, production figures, given in notes dealing with individual lode-mining operations, are the assay contents of the products shipped (ore, concentrates, or bullion), no deductions being made for losses in smelting and refining. In previous Annual Reports the production figures given for individual properties are net, after deductions for smelting and refining losses, in accordance with the procedures adopted by the Dominion Bureau of Statistics and the co-operating Provincial Departments of Mines.

METALS

Placer Gold

The data on placer-gold production were very largely obtained from the Gold Commissioners until 1925. The value of placer gold in dollars is now obtained from returns received annually from the operators. At the old standard price, $20.67 per ounce of fine gold, $17 was regarded as a close approximation of the average value per ounce of crude placer gold produced in British Columbia. Dividing the production reported in dollars by 17 gave the equivalent in crude ounces. The average value $17 per ounce is equivalent to a fineness of 822½. Beginning with 1932 the average value per crude ounce has been based on the same fineness but has recognized the varying price of gold. The average price per ounce of crude placer gold for each year is given in Table II.

Lode Metals, Net Contents

From the total assay contents, the net silver, copper, lead, and zinc contents are calculated by making deductions for smelting and refining losses at rates agreed upon with the Dominion Bureau of Statistics and co-operating Provincial Departments of Mines. For the procedure prior to the year 1925, *see* foot-note under Table II, page 15.

Average Prices

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

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

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

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

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

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

In the period 1940–45 and until July 5th, 1946, and beginning again on September 18th, 1949, the Canadian price of gold has been increased by the premium on United States funds.

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

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

Fuel

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

Coal production is given in Table XIV. Up to and including the year 1947, production was recorded in long tons (2,240 pounds). Beginning with 1948, production is given in short tons (2,000 pounds). The quantity of coal produced in the preceding years has been recalculated in short tons. Prices per short ton that give the value previously published when quantities were expressed in long tons, and the price per short ton, used for 1948 and subsequent years, are shown in Table II.

TABLE I.—British Columbia Mine Production, 1949 and 1950

	Quantity, 1949	Quantity, 1950	Value, 1949	Value, 1950	Per Cent Increase (+) or Decrease (—) Quantity	Per Cent Increase (+) or Decrease (—) Value
Metallics			$	$		
Antimony			61,020	216,229		+254.4
Bismuth			210,972	369,138		+75.0
Cadmium			1,364,170	1,535,274		+12.5
Copper lb.	54,856,808	42,212,133	10,956,550	9,889,458	—23.1	—9.7
Gold, lode fine, oz.	288,396	283,983	10,382,256	10,805,553	—1.5	+4.1
Gold, placer crude, oz.	17,886	19,134	529,524	598,717	+7.0	+13.1
Indium oz.			1,550	12,132		+682.7
Iron ore			27,579			—100.0
Lead lb.	263,580,549	307,122,803	41,645,726	44,391,530	+16.5	+6.6
Platinum			7,468	9,239		+23.7
Silver oz.	7,636,053	9,507,225	5,669,769	7,666,151	+24.5	+35.2
Tin lb.			633,047	828,259		+30.8
Tungsten concentrates				281,160[1]		
Zinc lb.	276,324,451	324,263,778	36,604,700	48,882,765	+17.3	+33.5
Totals			108,094,331	125,485,605		+16.1
Fuel						
Coal, (2,000 lb.) tons	1,917,296	1,542,404	12,462,424	10,025,626	—19.6	—19.6
Non-metallics						
Barite, diatomite, and mica			19,783	22,925		+15.9
Fluxes—limestone, quartz tons	108,531	144,325	213,773	268,411	+33.0	+25.6
Granules—slate and rock tons	5,941	7,886	79,661	104,590	+32.7	+31.3
Gypsum and gypsum products			616,490	620,108		+0.1
Iron oxides			23,301			—100.0
Sodium carbonate tons			517			—100.0
Sulphur tons	160,435	143,343	1,546,798	1,421,806	—10.7	—8.1
Totals			2,500,323	2,437,840		—2.5
Clay Products and Other Structural Materials						
Clay Products						
Brick—						
Common No.	3,220,000	3,910,500	95,075	103,840	+22.2	+9.2
Face, paving, sewer brick No.	509,560	1,974,380	24,793	54,503	+288.0	+119.8
Firebricks, blocks			135,391	254,262		+87.8
Clays tons			22,339	32,264		+44.4
Structural tile—hollow blocks			145,512	191,016		+31.3
Drain-tile, sewer-pipe, flue-linings			265,098	428,418		+61.6
Pottery—glazed or unglazed			5,176	5,860		+13.2
Other clay products			9,676	11,335		+17.1
Totals			703,060	1,081,498		+53.8
Other Structural Materials						
Cement			3,029,425	3,088,296		+2.0
Lime and limestone tons	179,400	221,454	1,295,087	1,133,776	+23.4	—12.4
Sand and gravel			3,967,132	3,723,487		—6.1
Stone tons	2,287	26,758	44,345	188,675	+1,070.0	+325.5
Rubble, riprap, crushed rock tons	1,112,272	1,164,049	916,841	990,257	+4.7	+8.0
Totals			9,252,830	9,124,491		—1.4
Total value			133,012,968	148,155,060		+11.4

[1] Tungsten: 1950 sale of products accumulated before 1949.

TABLE II.—AVERAGE PRICES USED IN COMPILING VALUE OF PROVINCIAL PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, AND COAL

Year	Gold,[1] Crude, Oz.	Gold, Fine, Oz.	Silver, Fine, Oz.	Copper, Lb.	Lead, Lb.	Zinc, Lb.	Coal, Short Ton
	$	$	Cents	Cents	Cents	Cents	$
1901	17.00	20.67	56.002 N.Y.	16.11 N.Y.	2.577 N.Y.	....	2.679
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 ,,	....	3.125
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 ,,	4.464
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 ,,	4.018
1932	19.30	23.47	31.671 ,,	6.380 Lond.	2.113 ,,	2.405 ,,	3.795
1933	23.02	28.60	37.832 ,,	7.454 ,,	2.391 ,,	3.210 ,,	....
1934	28.37	34.50	47.461 ,,	7.419 ,,	2.436 ,,	3.044 ,,	....
1935	28.94	35.19	64.790 ,,	7.795 ,,	3.133 ,,	3.099 ,,	....
1936	28.81	35.03	45.127 ,,	9.477 ,,	3.913 ,,	3.315 ,,	....
1937	28.77	34.99	44.881 ,,	13.078 ,,	5.110 ,,	4.902 ,,	....
1938	28.93	35.18	43.477 ,,	9.972 ,,	3.344 ,,	3.073 ,,	....
1939	29.72	36.14	40.488 ,,	10.092 ,,	3.169 ,,	3.069 ,,	....
1940	31.66	38.50	38.249 ,,	10.086 ,,	3.362 ,,	3.411 ,,	....
1941	31.66	38.50	38.261 ,,	10.086 ,,	3.362 ,,	3.411 ,,	....
1942	31.66	38.50	41.166 ,,	10.086 ,,	3.362 ,,	3.411 ,,	....
1943	31.66	38.50	45.254 ,,	11.75 ,,	3.754 ,,	4.000 ,,	....
1944	31.66	38.50	43.000 ,,	12.000 ,,	4.500 ,,	4.300 ,,	....
1945	31.66	38.50	47.000 ,,	12.550 ,,	5.000 ,,	6.440 ,,	....
1946	30.22	36.75	83.650 ,,	12.80 ,,	6.750 ,,	7.810 ,,	....
1947	28.78	35.00	72.000 ,,	20.39 ,,	13.670 ,,	11.230 ,,	4.464
1948	28.78	35.00	75.000 Mont.	22.35 U.S.	18.040 ,,	13.930 ,,	6.000
1949	29.60	36.00	74.250 U.S.	19.973 ,,	15.800 ,,	13.247 ,,	6.500
1950	**31.29**	**38.05**	**80.635 ,,**	**23.428 ,,**	**14.454 ,,**	**15.075 ,,**	**6.500**
Average, 1946–50	29.73	36.16	77.107	19.788	13.742	12.258	....

[1] Unrefined placer gold, average price per ounce, is taken as $17 divided by $20.67 times the price of an ounce of fine gold.

Prices for fine gold are the Canadian Mint buying prices. Prices for other metals are those of the markets indicated, converted in Canadian funds. The abbreviations are: Mont.=Montreal; N.Y.=New York; Lond.=London; E. St. L. =East St. Louis; and U.S.=United States.

Prior to 1925 the prices for gold and copper are true average prices, but the prices of other metals were taken at the following percentages of the year's average price for the metal: Silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent.

For coal *see* last paragraph under "Fuel," page 14.

The bases for the prices listed are discussed in detail on pages 13 and 14.

TABLE III.—Total Production for All Years Up to and Including 1950

Gold, placer	$93,692,241
Gold, lode	376,951,108
Silver	188,156,717
Copper[1]	379,467,354
Lead	569,521,767
Zinc	419,275,568
Coal and Coke	477,908,903
Structural materials	136,989,345
Miscellaneous metals, minerals, and materials	73,228,529
Total	$2,715,191,532

[1] *See* last paragraph under "Average Prices," page 14.

Note.—The total value of placer gold has been adjusted to correct errors in the amounts credited to several of the earlier years. This fact should be kept in mind if the above table is compared with previous publications.

TABLE IV.—Production for Each Year from 1852 to 1950, Inclusive

1852 to 1895 (incl.)	$93,552,273	1923	$41,304,320
1896	7,507,956	1924	48,704,604
1897	10,455,268	1925	61,492,242
1898	10,906,861	1926	67,188,842
1899	12,393,131	1927	60,729,358
1900	16,344,751	1928	65,372,583
1901	19,671,572	1929	68,245,443
1902	17,486,550	1930	55,391,993
1903	17,495,954	1931	34,883,181
1904	18,977,359	1932	28,798,406
1905	22,461,325	1933	32,602,672
1906	24,980,546	1934	42,305,297
1907	25,882,560	1935	48,821,239
1908	23,851,277	1936	54,081,967
1909	24,443,025	1937	74,475,902
1910	26,377,066	1938	64,485,551
1911	23,499,072	1939	65,681,547
1912	32,440,800	1940	75,701,155
1913	30,296,398	1941	78,479,719
1914	26,388,825	1942	75,551,093
1915	29,447,508	1943	65,892,395
1916	42,290,462	1944	54,923,803
1917	37,010,392	1945	63,343,949
1918	41,782,474	1946	71,807,951
1919	33,296,313	1947	113,221,254
1920	35,543,084	1948	152,524,752
1921	28,066,641	1949	133,012,968
1922	35,162,843	1950	148,155,060
		Total	$2,715,191,532

Note.—The total value of placer gold has been adjusted to correct errors in the amounts credited to several of the earlier years. This fact should be kept in mind if the above table is compared with previous publications.

TABLE V.—QUANTITIES AND VALUE OF MINE PRODUCTS FOR YEARS 1941 TO 1950

Description	1941		1942		1943		1944		1945	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Gold, placer, crude ..... oz.	43,775	$1,385,962	32,904	$1,041,772	14,600	$462,270	11,433	$361,977	12,589	$398,591
Gold, lode, fine ..... oz.	571,026	21,984,501	444,518	17,113,943	224,403	8,639,516	186,632	7,185,332	175,373	6,751,860
Silver ..... oz.	12,175,700	4,658,545	9,677,881	4,080,775	8,526,310	3,858,496	5,705,334	2,453,293	6,157,307	2,893,934
Copper[1] ..... lb.	66,435,583	6,700,693	50,097,716	5,052,856	42,307,510	4,971,132	36,300,589	4,356,070	25,852,366	3,244,472
Lead ..... lb.	490,185,657	16,480,042	463,269,005	15,575,104	405,285,476	15,214,417	294,797,469	13,265,886	353,497,689	17,674,884
Zinc ..... lb.	363,302,195	12,392,238	396,857,260	13,536,801	335,137,014	13,405,481	280,356,477	12,055,328	301,737,902	19,431,921
Coal ..... tons, 2,000 lb.	2,018,635	7,660,000	2,170,737	8,237,172	2,040,253	7,742,030	2,165,676	8,217,966	1,700,914	6,454,360
Structural materials	.....	2,845,262	.....	3,143,382	.....	3,039,148	.....	3,025,445	.....	3,401,229
Miscellaneous metals, minerals, and materials	.....	4,372,476	.....	7,769,288	.....	8,559,905	.....	4,002,506	.....	3,092,698
Totals	.....	$78,479,719	.....	$75,551,093	.....	$65,892,395	.....	$54,923,803	.....	$63,343,949

Description	1946		1947		1948		1949		1950	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Gold, placer, crude ..... oz.	15,729	$475,361	6,969	$200,585	20,332	$585,200	17,886	$529,524	19,134	$598,717
Gold, lode, fine ..... oz.	117,612	4,322,241	243,282	8,514,870	286,230	10,018,050	288,396	10,382,256	283,983	10,805,553
Silver ..... oz.	6,365,761	5,324,959	5,707,691	4,109,538	6,718,122	5,038,592	7,636,053	5,669,769	9,507,225	7,666,151
Copper[1] ..... lb.	17,500,538	2,240,070	41,783,921	8,519,741	43,025,388	9,616,174	54,856,808	10,956,550	42,212,133	9,889,458
Lead ..... lb.	347,990,146	23,489,335	306,400,709	41,884,977	332,996,351	60,072,542	263,580,549	41,645,726	307,122,803	44,391,530
Zinc ..... lb.	270,718,128	21,143,086	268,450,926	30,147,039	296,012,941	41,234,603	276,324,451	36,604,700	324,263,778	48,882,765
Coal ..... tons, 2,000 lb.	1,639,277	6,220,470	1,923,573	8,587,380	1,809,018	10,854,108	1,917,296	12,462,424	1,542,404	10,025,626
Structural materials	.....	5,199,563	.....	5,896,803	.....	8,968,222	.....	9,955,890	.....	10,205,989
Miscellaneous metals, minerals, and materials	.....	3,392,866	.....	5,360,321	.....	6,137,261	.....	4,806,129	.....	5,689,271
Totals	.....	$71,807,951	.....	$113,221,254	.....	$152,524,752	.....	$133,012,968	.....	$148,155,060

[1] *See* last paragraph under "Average Prices," page 14.

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

Year	Gold		Silver		Copper		Lead		Zinc		Total Value
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
1887			17,690	17,331			204,800	9,216			26,547
1888			79,780	75,000			674,500	29,813			104,813
1889			53,192	47,873			165,100	6,498			54,371
1890			70,427	73,948							73,948
1891			4,500	4,000							4,000
1892			77,160	66,935			808,420	33,064			99,999
1893	1,170	23,404	227,000	195,000			2,135,023	78,996			297,400
1894	6,252	125,014	746,379	470,219	324,680	16,234	5,662,523	169,875			781,342
1895	39,270	785,400	1,496,522	977,229	952,840	47,642	16,475,464	532,255			2,342,526
1896	62,259	1,244,180	3,135,343	2,100,689	3,818,556	190,926	24,199,977	721,384			4,257,179
1897	106,141	2,122,820	5,472,971	3,272,836	5,325,180	266,258	38,841,135	1,390,517			7,052,431
1898	110,061	2,201,217	4,292,401	2,375,841	7,271,678	874,781	31,693,559	1,077,581			6,529,420
1899	138,315	2,857,573	2,939,413	1,663,708	7,722,591	1,351,453	21,862,436	878,870			6,751,604
1900	167,153	3,453,381	3,958,175	2,309,200	9,997,080	1,615,289	63,358,621	2,691,887			10,069,757
1901	210,384	4,348,605	4,396,447	2,462,008	27,603,746	4,446,963	51,582,906	2,010,260			13,267,836
1902	236,491	4,888,269	3,917,917	1,941,328	29,636,057	3,446,673	22,536,381	824,832			11,101,102
1903	232,831	4,812,616	2,996,204	1,521,472	34,359,921	4,547,535	18,089,283	689,744			11,571,367
1904	222,042	4,589,608	3,222,481	1,719,516	35,710,128	4,578,037	36,646,244	1,421,874			12,309,035
1905	238,660	4,933,102	3,439,417	1,971,818	37,692,251	5,876,222	56,580,703	2,399,022			15,180,164
1906	224,027	4,630,639	2,990,262	1,897,320	42,990,488	8,288,565	52,408,217	2,667,578			17,484,102
1907	196,179	4,055,020	2,745,448	1,703,825	40,832,720	8,166,544	47,738,703	2,291,458			16,216,847
1908	255,582	5,282,880	2,631,389	1,321,483	47,274,614	6,240,249	43,195,733	1,632,799			14,477,411
1909	238,224	4,924,090	2,532,742	1,239,270	45,597,245	5,918,522	44,396,346	1,709,259	8,500,000	400,000	14,191,141
1910	267,701	5,533,380	2,450,241	1,245,016	38,243,934	4,871,512	34,658,746	1,386,350	4,184,192	192,473	13,228,731
1911	228,617	4,725,513	1,892,364	958,293	36,927,656	4,571,644	26,872,397	1,069,521	2,634,544	129,092	11,454,063
1912	257,496	5,322,442	3,132,108	1,810,045	51,456,537	8,408,513	44,871,454	1,805,627	5,358,280	316,139	17,662,766
1913	272,254	5,627,490	3,465,856	1,968,606	46,460,305	7,094,489	55,364,677	2,175,832	6,758,768	324,421	17,190,838
1914	247,170	5,109,004	3,602,180	1,876,736	45,009,699	6,121,319	50,625,048	1,771,877	7,866,467	346,125	15,225,061
1915	250,021	5,167,934	3,366,506	1,588,991	56,918,405	9,835,500	46,503,590	1,939,200	12,982,440	1,460,524	19,992,149
1916	221,932	4,587,334	3,301,923	2,059,739	65,379,364	17,784,494	48,727,516	3,007,462	37,168,980	4,043,985	31,483,014
1917	114,523	2,367,190	2,929,216	2,265,749	59,007,565	16,038,256	37,307,465	2,951,020	41,848,513	3,166,259	26,788,474
1918	164,674	3,403,812	3,498,172	3,215,870	61,483,754	15,143,449	43,899,661	2,928,107	41,772,916	2,899,040	27,590,278
1919	152,426	3,150,645	3,403,119	3,592,673	42,459,339	7,939,896	29,475,968	1,526,855	56,737,651	3,540,429	19,750,498
1920	120,048	2,481,392	3,377,849	3,235,980	44,887,676	7,832,899	39,331,218	2,816,115	47,208,268	3,077,979	19,444,365
1921	135,663	2,804,154	2,673,389	1,591,201	39,036,993	4,879,624	41,402,288	1,693,354	49,419,372	1,952,065	12,920,398
1922	197,856	4,089,684	7,101,311	4,554,781	32,359,896	4,329,754	67,447,985	3,480,316	57,146,548	2,777,322	19,231,857
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
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

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

Year	Gold		Silver		Copper		Lead		Zinc		Total Value
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
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[1]	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[1]	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[1]	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[1]	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[1]	306,400,709	41,884,977	268,450,926	30,147,039	93,176,165
1948	286,230	10,018,050	6,718,122	5,038,592	43,025,388	9,616,174	332,996,351	60,072,542	296,012,941	41,234,603	125,979,961
1949	288,396	10,382,256	7,636,053	5,669,769	54,856,808	10,956,550	263,580,549	41,645,726	276,324,451	36,604,700	105,259,001
1950	283,983	10,805,553	9,507,225	7,666,151	42,212,133	9,889,458	307,122,803	44,391,530	324,263,778	48,882,765	121,635,457
Totals	13,454,066	376,951,108	343,175,186	188,156,717	2,606,730,081	379,467,354	10,229,215,241	569,521,767	7,151,497,924	419,275,568	1,933,372,514

[1] *See* last paragraph under "Average Prices," page 14.

TABLE VII.—Value of Gold Production to Date

Year	Placer Gold[1]		Lode Gold[2]		Total
	Quantity	Value	Quantity	Value	
	Oz.	$	Oz.	$	$
1858–1862	580,680	9,871,636			9,871,636
1863–1867	957,855	16,283,592			16,283,592
1868–1872	523,250	8,895,318			8,895,318
1873–1877	530,600	9,020,101			9,020,101
1878–1882	328,230	5,579,911			5,579,911
1883–1887	225,970	3,841,515			3,841,515
1888–1892	148,780	2,529,427			2,529,427
1893	20,950	356,131	1,170	23,404	379,535
1894	23,850	405,516	6,252	125,014	530,530
1895	28,330	481,683	39,270	785,400	1,267,083
1896	32,000	544,026	62,259	1,244,180	1,788,206
1897	30,210	513,520	106,141	2,122,820	2,636,340
1898	37,840	643,346	110,061	2,201,217	2,844,563
1899	79,110	1,344,900	138,315	2,857,573	4,202,473
1900	75,220	1,278,724	167,153	3,453,381	4,732,105
1901	57,060	970,100	210,384	4,348,605	5,318,705
1902	63,130	1,073,140	236,491	4,888,269	5,961,409
1903	62,380	1,060,420	232,831	4,812,616	5,873,036
1904	65,610	1,115,300	222,042	4,589,608	5,704,908
1905	57,020	969,300	238,660	4,933,102	5,902,402
1906	55,790	948,400	224,027	4,630,639	5,579,039
1907	48,710	828,000	196,179	4,055,020	4,883,020
1908	38,060	647,000	255,582	5,282,880	5,929,880
1909	28,060	477,000	238,224	4,924,090	5,401,090
1910	31,760	540,000	267,701	5,533,380	6,073,380
1911	25,060	426,000	228,617	4,725,513	5,151,513
1912	32,680	555,500	257,496	5,322,442	5,877,942
1913	30,000	510,000	272,254	5,627,490	6,137,490
1914	33,240	565,000	247,170	5,109,004	5,674,004
1915	45,290	770,000	250,021	5,167,934	5,937,934
1916	34,150	580,500	221,932	4,587,334	5,167,834
1917	29,180	496,000	114,523	2,367,190	2,863,190
1918	18,820	320,000	164,674	3,403,812	3,723,812
1919	16,850	286,500	152,426	3,150,645	3,437,145
1920	13,040	221,600	120,048	2,481,392	2,702,992
1921	13,720	233,200	135,663	2,804,154	3,037,354
1922	21,690	368,800	197,856	4,089,684	4,458,484
1923	24,710	420,000	179,245	3,704,994	4,124,994
1924	24,750	420,750	247,716	5,120,535	5,541,285
1925	16,476	280,092	209,719	4,335,269	4,615,361
1926	20,912	355,503	201,427	4,163,859	4,519,362
1927	9,191	156,247	178,001	3,679,601	3,835,848
1928	8,424	143,208	188,087	3,888,097	4,031,305
1929	6,983	118,711	145,339	3,004,419	3,123,130
1930	8,955	152,235	160,778	3,323,576	3,475,811
1931	17,176	291,992	146,039	3,018,894	3,310,886
1932	20,400	395,542	181,564	4,261,307	4,656,849
1933	23,928	562,787	223,529	6,392,929	6,955,716
1934	25,181	714,431	297,130	10,250,985	10,965,416
1935	30,929	895,058	365,244	12,852,936	13,747,994
1936	43,389	1,249,940	404,472	14,168,654	15,418,594
1937	54,153	1,558,245	460,781	16,122,727	17,680,972
1938	57,759	1,671,015	557,522	19,613,624	21,284,639
1939	49,746	1,478,492	587,180	21,221,272	22,699,764
1940	39,067	1,236,928	583,416	22,461,516	23,698,444
1941	43,775	1,385,962	571,026	21,984,501	23,370,463
1942	32,904	1,041,772	444,518	17,113,943	18,155,715
1943	14,600	462,270	224,403	8,639,516	9,101,786
1944	11,433	361,977	186,632	7,185,332	7,547,309
1945	12,589	398,591	175,373	6,751,860	7,150,451
1946	15,729	475,361	117,612	4,322,241	4,797,602
1947	6,969	200,585	243,282	8,514,870	8,715,455
1948	20,332	585,200	286,230	10,018,050	10,603,250
1949	17,886	529,524	288,396	10,382,256	10,911,780
1950	19,134	598,717	283,983	10,805,553	11,404,270
Totals	5,121,655	93,692,241	13,454,066	376,951,108	470,643,349

[1] Crude gold.
[2] Fine gold.
Note.—Errors in the value for placer gold credited to several of the earlier years have been corrected. This fact should be kept in mind if the above table is compared with previous publications.

TABLE VIII.—Value of Mine Production by Divisions for Years 1945 to 1950

Mining Division	1945	1946	1947	1948	1949	1950
	$	$	$	$	$	$
Ainsworth	254,429	77,057	242,020	565,648	912,814	1,042,977
Alberni	6,194	112,613	503,699	412,872	35,224	37,704
Atlin	321,227	459,965	868,658	1,096,922	1,467,527	1,646,629
Cariboo	1,033,181	988,815	1,486,961	1,693,656	1,845,807	1,671,699
Clinton	3,368	2,310	7,124	2,596	2,968	724
Fort Steele	42,910,466	54,256,000	80,933,067	110,156,469	82,619,311	91,358,605
Golden	825,803	290,143	279,206	1,155,232	1,472,627	1,837,850
Greenwood	191,767	484,670	593,539	789,523	881,700	769,738
Kamloops	137,184	310,877	577,372	755,958	843,961	823,867
Lillooet	2,412,843	1,394,343	2,962,585	3,531,186	4,205,790	4,379,226
Nanaimo	2,981,253	3,038,045	3,368,234	4,105,205	5,656,627	4,523,757
Nelson	516,283	372,005	1,137,752	2,391,739	3,282,152	6,806,943
New Westminster	677,220	1,028,101	1,229,047	2,007,835	1,837,700	2,012,453
Nicola	27,099	6,967	15,094	13,718	17,937	10,067
Omineca	142,315	70,216	99,622	204,939	786,046	1,647,115
Osoyoos	2,069,351	1,057,802	1,767,818	2,287,295	1,905,267	1,979,665
Peace River	32,342	14,586	32,934	52,124	85,791	88,001
Portland Canal	736,125	410,892	786,837	514,565	1,133,204	3,597,962
Quesnel	14,533	43,731	16,078	18,632	50,086	101,093
Revelstoke	35,904	39,658	42,151	42,964	83,334	83,066
Similkameen	2,205,091	1,634,831	4,898,314	7,353,503	8,414,632	6,679,042
Skeena	37,443	58,841	47,032	129,149	131,246	88,565
Slocan	954,479	628,445	1,300,194	2,475,242	2,738,380	2,551,797
Stikine	348	5,954	2,650	250,404	120,172	2,672
Trail Creek	1,247,960	1,274,603	2,139,817	1,525,519	1,594,489	1,955,806
Vancouver	2,124,478	1,668,492	5,343,934	5,916,470	7,093,622	8,573,582
Vernon	1,338	3,049	46,795	104,867	140,936	80,920
Victoria	1,443,925	2,074,940	2,492,720	2,970,520	3,653,618	3,803,535
Totals	63,343,949	71,807,951	113,221,254	152,524,752	133,012,968	148,155,060

TABLE IXA (1949 AND 1950).—PRODUCTION IN DETAIL OF PLACER GOLD, LODE GOLD, SILVER, COPPER, LEAD, AND ZINC

Division	Year	Tons	Gold—Placer[1]		Gold—Lode[2]		Silver		Copper		Lead		Zinc	
			Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value[3]	Quantity	Value	Quantity	Value
			Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$
Ainsworth	1949	73,678			209	7,524	142,134	105,534			2,165,742	342,187	3,454,136	457,569
	1950	**89,618**			**120**	**4,566**	**95,679**	**77,151**			**2,415,435**	**349,127**	**3,968,110**	**598,193**
Alberni	1949	27	2	59	239	8,604	91	67						
	1950	**30**	**24**	**751**	**220**	**8,371**	**110**	**89**			**449**	**65**		
Atlin	1949	94,006	1,637	48,464	39,373	1,417,428	1,332	989						
	1950	**95,667**	**12,181**	**381,158**	**33,228**	**1,264,325**	**1,123**	**906**						
Cariboo	1949	112,132	9,174	271,601	39,779	1,432,044	4,536	3,368			2,159	341		
	1950	**101,269**	**1,718**	**53,758**	**38,879**	**1,479,346**	**4,531**	**3,654**						
Clinton	1949		9	267										
	1950		**1**	**31**										
Fort Steele	1949	2,298,341	28	829			3,884,157	2,883,987			245,417,726	38,776,001	228,962,999	30,330,728
	1950	**2,680,962**	**22**	**688**			**4,482,000**	**3,614,061**			**279,180,000**	**40,352,677**	**248,400,000**	**37,446,300**
Golden	1949	53,626					35,829	26,603			4,901,401	774,421	4,741,890	628,158
	1950	**57,332**					**55,067**	**44,403**			**4,452,116**	**643,509**	**5,884,843**	**887,140**
Greenwood	1949	9,449			385	13,860	845,685	627,921	54,446	10,874	504,731	79,748	530,238	70,241
	1950	**8,645**	**5**	**157**	**294**	**11,187**	**690,316**	**556,636**			**391,079**	**56,527**	**450,623**	**67,931**
Kamloops	1949		15	444										
	1950	**90**	**22**	**688**			**75**	**60**			**762**	**110**	**58**	**9**
Lillooet	1949	245,981	109	3,227	114,714	4,129,704	27,926	20,735						
	1950	**258,625**	**82**	**2,566**	**112,588**	**4,283,973**	**27,699**	**22,335**						
Nanaimo	1949	24,223	5	148	3,482	125,352	10,473	7,776	482,125	96,294				
	1950	**10,300**	**6**	**188**	**1,719**	**65,408**	**5,021**	**4,049**	**234,035**	**54,829**				
Nelson	1949	193,781			18,276	657,936	39,812	29,560			5,274,085	833,305	12,197,720	1,615,832
	1950	**369,433**	**7**	**219**	**7,869**	**299,416**	**64,435**	**51,957**			**9,751,913**	**1,409,542**	**30,492,565**	**4,596,754**
New Westminster	1949		43	1,273										
	1950		**4**	**125**										
Nicola	1949													
	1950													
Omineca	1949	17,516	615	18,207	1,267	45,612	371,310	275,698			573,755	90,653	1,478,844	195,902
	1950	**21,104**	**969**	**30,321**	**1,958**	**74,502**	**880,472**	**709,969**			**1,654,710**	**239,172**	**2,923,150**	**440,665**
Osoyoos	1949	135,610			48,220	1,735,920	8,383	6,224	157,341	31,426	590	93	600	80
	1950	**126,462**			**47,805**	**1,818,980**	**9,292**	**7,493**	**40,003**	**9,372**	**3,466**	**501**	**498**	**75**
Peace River	1949		12	355										
	1950		**21**	**657**										
Portland Canal	1949	99,612			101	3,636	1,443,544	1,071,831			309,049	48,830	36,748	4,868
	1950	**209,513**			**17,067**	**649,399**	**2,391,766**	**1,928,600**			**3,971,546**	**574,047**	**2,948,012**	**444,413**
Quesnel	1949	55	1,416	41,921	10	360	215	160			3,129	494		
	1950	**8**	**3,031**	**94,842**	**1**	**38**	**731**	**589**			**6,562**	**948**		
Revelstoke	1949	64	14	415	3	108	1,593	1,183			24,427	3,860	10,945	1,450
	1950	**562**	**5**	**156**	**2**	**76**	**8,484**	**6,841**			**112,030**	**16,193**	**39,351**	**5,932**
Similkameen	1949	1,734,469	746	22,086	11,944	429,984	255,938	190,034	35,694,011	7,129,165				
	1950	**1,749,964**	**745**	**23,312**	**8,475**	**322,474**	**173,424**	**139,840**	**25,486,468**	**5,970,970**				
Skeena	1949		10	296										
	1950		**231**	**7,228**										
Slocan	1949	120,500			314	11,304	463,858	344,415			3,704,846	585,366	13,520,382	1,791,045
	1950	**142,719**			**177**	**6,735**	**451,279**	**363,889**			**4,184,153**	**604,777**	**10,451,715**	**1,575,596**
Stikine	1949		4,046	119,784										
	1950		**60**	**1,887**										
Trail Creek	1949	1,523			99	3,564	18,086	13,429	799,328	159,650	221,431	34,986	71,962	9,533
	1950	**1,743**			**147**	**5,593**	**72,966**	**58,836**	**1,830,177**	**428,774**	**281,445**	**40,680**	**7,108**	**1,072**
Vancouver	1949	880,846			9,981	359,316	81,076	60,199	17,669,557	3,529,141	476,716	75,321	11,317,987	1,499,294
	1950	**858,942**			**13,431**	**511,050**	**92,540**	**74,620**	**14,621,450**	**3,425,513**	**714,497**	**103,273**	**18,697,628**	**2,818,667**
Vernon	1949	2	5	148			75	56			762	120		
	1950	**11**			**3**	**114**	**215**	**173**			**2,640**	**382**	**117**	**18**
Victoria	1949													
	1950													
Totals	1949	6,095,441	17,886	529,524	288,396	10,382,256	7,636,053	5,669,769	54,856,808	10,956,550	263,580,549	41,645,726	276,324,451	36,604,700
	1950	**6,782,912**	**19,134**	**598,717**	**283,983**	**10,805,553**	**9,507,225**	**7,666,151**	**42,212,133**	**9,889,458**	**307,122,803**	**44,391,530**	**324,263,778**	**48,882,765**

[1] Crude gold. [2] Fine gold. [1] *See* last paragraph under "Average Prices," page 14.

TABLE IXB.—PRODUCTION VALUE OF PLACER GOLD, LODE GOLD, SILVER, COPPER,[1] LEAD, AND ZINC IN YEARS 1945 TO 1950

Division	1945	1946	1947	1948	1949	1950
	$	$	$	$	$	$
Ainsworth	248,479	69,107	242,020	565,648	912,814	1,029,037
Alberni	63	99,492	467,214	392,583	8,730	9,276
Atlin	318,147	457,602	868,383	1,095,393	1,466,881	1,646,384
Cariboo	950,292	908,622	1,401,214	1,578,154	1,707,354	1,536,758
Clinton	222		288	86	267	31
Fort Steele	37,656,140	48,381,626	72,618,140	100,001,198	71,991,545	81,413,726
Golden	763,883	260,248	236,979	1,120,425	1,429,182	1,575,052
Greenwood	142,489	402,764	521,871	698,564	802,644	692,438
Kamloops	1,362	665	1,871	461	444	867
Lillooet	2,407,569	1,381,993	2,957,103	3,490,465	4,153,666	4,308,874
Nanaimo				30,878	229,570	124,474
Nelson	425,304	317,912	379,880	848,998	3,136,633	6,357,888
New Westminster	317	574	849		1,273	125
Nicola		42	4,791			
Omineca	19,250	20,642	22,094	102,983	626,072	1,494,629
Osoyoos	2,001,678	1,023,909	1,666,351	2,002,341	1,773,743	1,836,421
Peace River	538	272	950	29	355	657
Portland Canal	736,125	410,892	785,612	506,780	1,129,165	3,596,459
Quesnel	13,171	42,704	14,228	17,615	42,935	96,417
Revelstoke	823	302	861	57	7,016	29,198
Similkameen	1,967,074	1,457,031	4,635,551	6,412,504	7,771,269	6,456,596
Skeena	380	332	144		296	7,228
Slocan	954,479	628,445	1,291,675	2,469,242	2,732,130	2,550,997
Stikine	348	5,954	1,900	249,749	119,784	1,877
Trail Creek	5,715	10,215	861,249	200,665	221,162	534,955
Vancouver	1,781,529	1,112,478	4,268,554	4,778,613	5,523,271	6,933,123
Vernon	285	1,229	576	1,500	324	687
Victoria			126,402	230		
Totals	50,395,662	56,995,052	93,376,750	126,565,161	105,788,525	122,234,174

[1] *See* last paragraph under "Average Prices," page 14.

TABLE IXc.—Production and Value of Placer Gold,[1] and of Lode Gold, Silver, Copper, Lead, and Zinc, 1900–50

Division	Gold—Placer[1] [3]		Gold—Lode[4]		Silver		Copper		Lead		Zinc		Division Total
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Ainsworth	212	5,690	4,335	129,885	6,921,548	4,223,487	10,175	1,201	131,260,563	7,175,478	52,518,444	2,868,235	14,403,976
Alberni	1,607	32,908	299,113	11,199,329	160,531	76,999	2,233,880	335,145	112,888	4,473	....	....	11,648,854
Atlin (1898)[1]	679,895	15,775,655	235,110	8,353,486	62,362	38,150	83,161	11,949	109,945	7,036	....	....	24,186,276
Cariboo (1858)[1]	1,934,355	39,673,782	716,928	26,280,649	79,422	41,382	....	....	2,815	371	492	16	65,996,200
Clinton	10,007	238,416	23,388	827,260	31,564	14,214	57,548	5,905	193	7	....	....	1,085,802
Fort Steele	17,243	399,947	2,532	56,964	170,432,013	87,842,748	28,592	6,193	9,363,819,580	525,427,195	6,342,988,515	365,413,689	979,146,736
Golden	467	11,213	74	1,587	1,529,334	930,323	57,378	10,590	110,247,855	5,494,381	135,423,020	6,880,569	13,328,663
Greenwood	4,049	94,964	1,087,108	23,450,710	26,041,508	13,878,982	441,226,021	70,504,065	11,179,459	637,685	11,400,982	576,866	109,143,272
Kamloops	14,463	340,767	47,852	1,607,821	298,108	176,782	6,400,908	1,177,415	369,523	20,851	409,228	26,072	3,349,708
Lillooet (1874)[1]	90,946	1,866,994	2,246,209	78,879,637	589,572	299,140	400	41	62,463	2,542	....	....	81,048,354
Nanaimo	611	14,162	73,586	1,634,360	534,991	310,987	20,996,830	3,365,625	....	....	....	....	5,325,134
Nelson	3,194	80,236	1,302,594	40,965,186	4,305,859	2,351,575	5,685,261	889,008	69,149,191	4,676,083	68,058,468	7,761,480	56,723,568
New Westminster	11,401	237,822	4,311	110,307	13,529	6,072	26,489	6,379	28,425	1,119	12,755	481	362,180
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	50,600	1,345,979	12,058	324,484	3,647,931	2,474,124	6,126,209	1,345,688	8,528,512	686,503	8,579,331	915,489	7,092,267
Osoyoos	190	4,142	1,377,881	40,863,111	545,819	350,215	2,502,585	315,060	256,679	8,106	6,570	355	41,540,989
Peace River	4,150	96,018	....	....	....	....	....	....	....	....	....	....	96,018
Portland Canal	201	4,260	1,956,824	49,495,009	53,073,680	30,402,236	649,677,707	96,796,399	43,971,340	2,535,472	4,975,736	576,007	179,809,383
Quesnel (1858)[1]	628,373	13,130,906	217	7,834	1,257	888	82	17	9,691	1,442	....	....	13,141,087
Revelstoke	5,867	127,438	24,906	652,885	2,865,601	1,159,417	6,277	909	10,648,516	458,828	507,421	28,457	2,427,934
Similkameen	9,706	238,507	135,900	4,657,553	3,245,654	1,736,891	455,474,485	64,516,440	238,577	9,006	64,377	2,616	71,161,013
Skeena	4,160	94,448	414,794	9,979,046	265,198	182,759	7,671,642	1,215,720	39,539	1,287	15,277	490	11,473,750
Slocan	150	3,596	6,983	178,479	41,892,096	25,509,854	219,318	42,287	309,261,731	15,930,693	307,991,427	21,673,165	63,338,074
Stikine	45,721	1,143,184	114	4,120	204	146	....	....	5,810	1,048	....	....	1,148,498
Trail Creek[2]	848	24,176	2,606,096	55,635,528	3,495,538	1,987,264	123,626,526	18,821,398	18,108,153	854,347	158,011,882	5,304,959	82,627,672
Vancouver	182	5,306	355,153	11,068,988	3,982,708	2,210,580	805,938,678	114,136,213	9,995,603	567,893	57,244,650	6,072,162	134,061,142
Vernon	2,171	57,298	5,215	175,753	8,238	4,229	614	89	11,719	1,119	7,015	726	239,214
Victoria	620	15,453	37,081	795,590	780,932	424,088	21,208,627	3,148,167	139,900	6,932	2,961,848	163,158	4,553,388
Provincial totals	3,521,619	75,067,919	12,984,887	367,570,475	325,072,295	176,759,849	2,549,809,368	376,758,133	10,086,793,807	564,600,366	7,151,497,924	418,275,558	1,979,032,300

[1] For certain mining divisions the figures under "Gold—Placer" include production prior to 1900. For those divisions the figures are the total estimated production of placer gold from and including the year noted after the name of the division. The placer gold recorded for the other divisions includes no production prior to 1900.

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

[3] Crude gold.

[4] Fine gold.

TABLE X.—Production in Detail of Structural Materials, 1949 and 1950

Division	Year	Cement	Lime and Limestone	Building-stone	Rubble, Riprap, and Crushed Rock	Sand and Gravel	Brick (Common)	Face, Paving, and Sewer Brick	Fire-bricks, Blocks	Clays	Structural Tile (Hollow Blocks), Roof-tile, Floor-tile	Drain-tile and Sewer-pipe	Pottery (Glazed or Unglazed)	Other Clay Products	Division Totals
		$	$	$	$	$	$	$	$	$	$	$	$	$	$
Ainsworth	1949														
	1950					13,940									13,940
Alberni	1949					26,494									26,494
	1950					28,428									28,428
Atlin	1949					646									646
	1950					245									245
Cariboo	1949				6,495	126,283									132,778
	1950				49,055	80,353									129,408
Clinton	1949				6	2,178									2,184
	1950					693									693
Fort Steele	1949				4,019	274,244									278,263
	1950				5,564	129,447									135,111
Golden	1949				1,200	28,100									29,300
	1950					221,237									221,237
Greenwood	1949				12,094	11,643	1,000								24,737
	1950				22,017	16,384									38,401
Kamloops	1949				179,866	76,161									256,027
	1950				129,091	122,174									251,265
Lillooet	1949				1,369	50,755									52,124
	1950				30,813	39,539									70,352
Nanaimo	1949		1,240,647		869	110,815	79,750								1,432,081
	1950		1,029,448	144,000	1,772	120,668	74,750								1,370,638
Nelson	1949			10,595	2,644	121,579									134,818
	1950			5,000	9,016	153,879									167,895
New Westminster	1949		5,913		332,916	1,073,423	1,500	21,268	63,667	19,447	105,815	212,475		3	1,836,427
	1950		69,893		363,366	784,996	15,000	52,823	187,195	24,902	129,640	384,513			2,012,328
Nicola	1949					6,419									6,419
	1950				134	2,490									2,624
Omineca	1949				47,338	38,666									86,004
	1950				385	70,442									70,827
Osoyoos	1949				18,000	30									18,030
	1950				3,400	17,916									21,316
Peace River	1949				82	4,988									5,070
	1950				43	5,674									5,717
Portland Canal	1949				708	3,331									4,039
	1950				507	996									1,503
Quesnel	1949				1,116	5,072									6,188
	1950					4,568									4,568
Revelstoke	1949				39,742	36,576									76,318
	1950				7,150	46,718									53,868
Similkameen	1949					311,506									311,506
	1950				23,727	80,384									104,111
Skeena	1949		25,753		77,275	27,922									130,950
	1950		12,610		52,287	16,140				300					81,337
Slocan	1949					6,250									6,250
	1950				800										800
Stikine	1949				26	362									388
	1950				70	725									795
Trail Creek	1949				5,617	51,120									56,737
	1950			800	1,250	43,491									45,541
Vancouver	1949			33,150	167,188	958,905	825	3,525	71,724	2,892				9,673	1,247,882
	1950			36,710	270,352	1,092,297	2,870	1,680	67,067	7,062				11,335	1,489,373
Vernon	1949		22,774	600	17,481	99,757									140,612
	1950		10,175	2,165	17,726	50,167									80,233
Victoria	1949	3,029,425			790	513,097	12,000				39,697	52,623	5,176		3,653,618
	1950	3,088,296	11,650		1,732	579,496	11,220				61,376	43,905	5,860		3,803,535
Totals	1949	3,029,425	1,295,087	44,345	916,841	3,967,132	95,075	24,793	135,391	22,339	145,512	265,098	5,176	9,676	9,955,890
	1950	3,088,296	1,133,776	188,675	990,257	3,723,487	103,840	54,503	254,262	32,264	191,016	428,418	5,860	11,335	10,205,989

TABLE XI.—PRODUCTION IN DETAIL OF MISCELLANEOUS METALS, MINERALS,[1] AND MATERIALS, 1949 AND 1950

Division	Year	Antimony[2]	Barite	Bismuth[2]	Cadmium[2]	Diatomite, Mica	Flux (Limestone and Quartz)	Gypsum Products	Iron and Oxides	Platinum, Iridium	Slate and Rock Granules	Sodium Carbonate	Sulphur	Tin[3]	Tungsten Concentrates[4]	Division Total
		$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Cariboo	1949					5,675										5,675
	1950					**5,533**										**5,533**
Clinton	1949											517				517
	1950															
Fort Steele	1949	61,020		210,972	1,364,170			28,000		1,550				633,047		2,298,759
	1950	**216,229**		**369,138**	**1,535,274**			**24,096**		**12,132**				**828,259**		**2,985,128**
Golden	1949		13,145					1,000								14,145
	1950		**17,284**					**24,277**								**41,561**
Greenwood	1949						54,319									54,319
	1950						**38,899**									**38,899**
Kamloops	1949							587,490								587,490
	1950							**571,735**								**571,735**
Nanaimo	1949						45,960		27,579							73,539
	1950						**107,584**									**107,584**
Nelson	1949								10,701							10,701
	1950														**281,160**	**281,160**
Osoyoos	1949						113,494									113,494
	1950						**121,928**									**121,928**
Quesnel	1949					963										963
	1950					**108**										**108**
Similkameen	1949									7,468						7,468
	1950									**9,239**						**9,239**
Trail Creek	1949												1,316,590			1,316,590
	1950												**1,375,310**			**1,375,310**
Vancouver	1949								12,600		79,661		230,208			322,469
	1950										**104,590**		**46,496**			**151,086**
Totals	1949	61,020	13,145	210,972	1,364,170	6,638	213,773	616,490	50,880	9,018	79,661	517	1,546,798	633,047		4,806,129
	1950	**216,229**	**17,284**	**369,138**	**1,535,274**	**5,641**	**268,411**	**620,108**		**9,239**	**104,590**		**1,421,806**	**828,259**	**281,160**	**5,689,271**

1 No value shown for experimental shipments of pyrophyllite from Semlin Siding, Kamloops Mining Division, and talc from Armstrong, Vernon Mining Division.
2 Recovered at smelter, principally from concentrates originating in Fort Steele Mining Division, and in part from other mining divisions.
3 Recovered from Sullivan mine, Fort Steele Mining Division.
4 1950 sales of products accumulated before February, 1949.

TABLE XII.—British Columbia Mine Production, 1895–1950

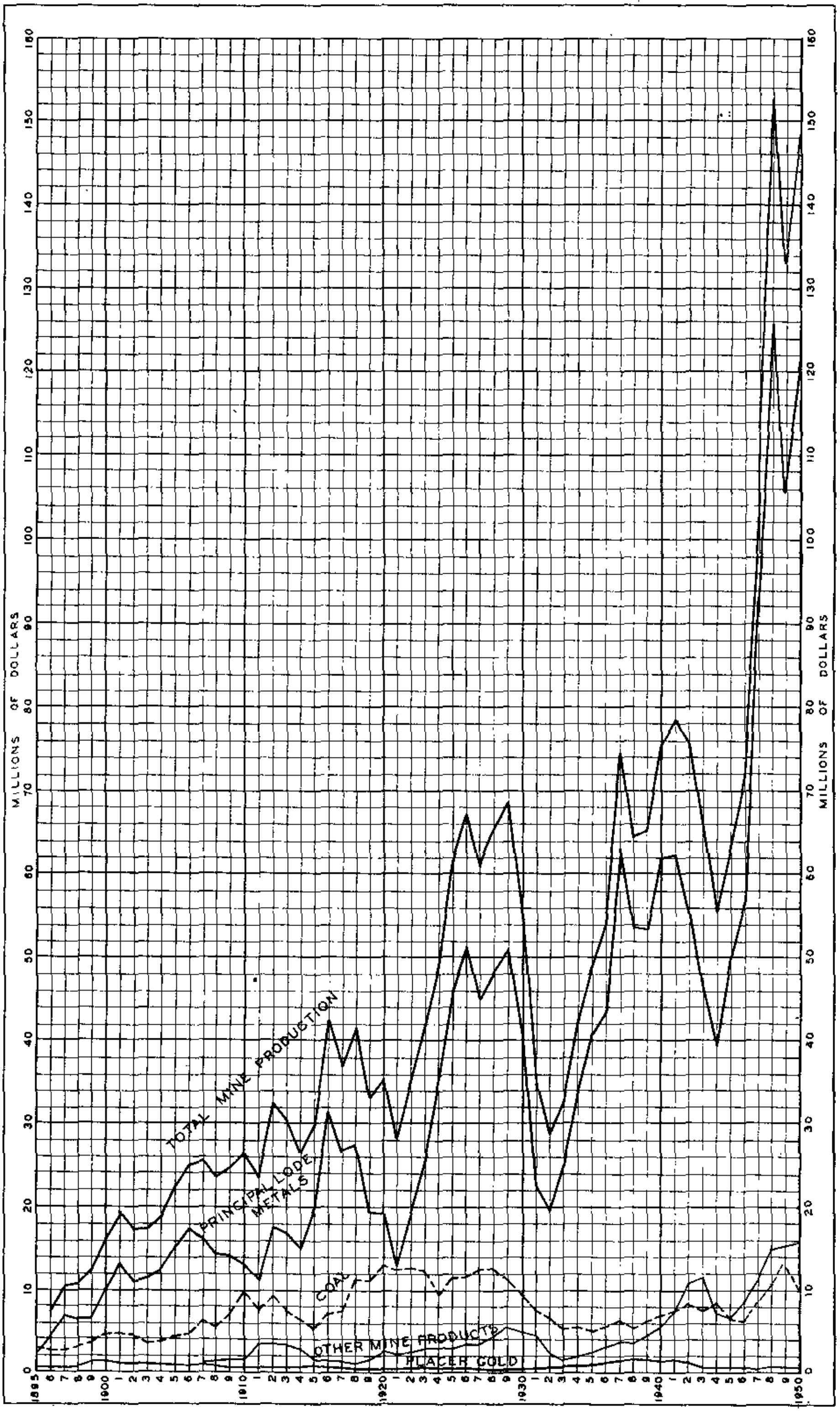

TABLE XIII.—British Columbia Lode-mines Production, 1913–50

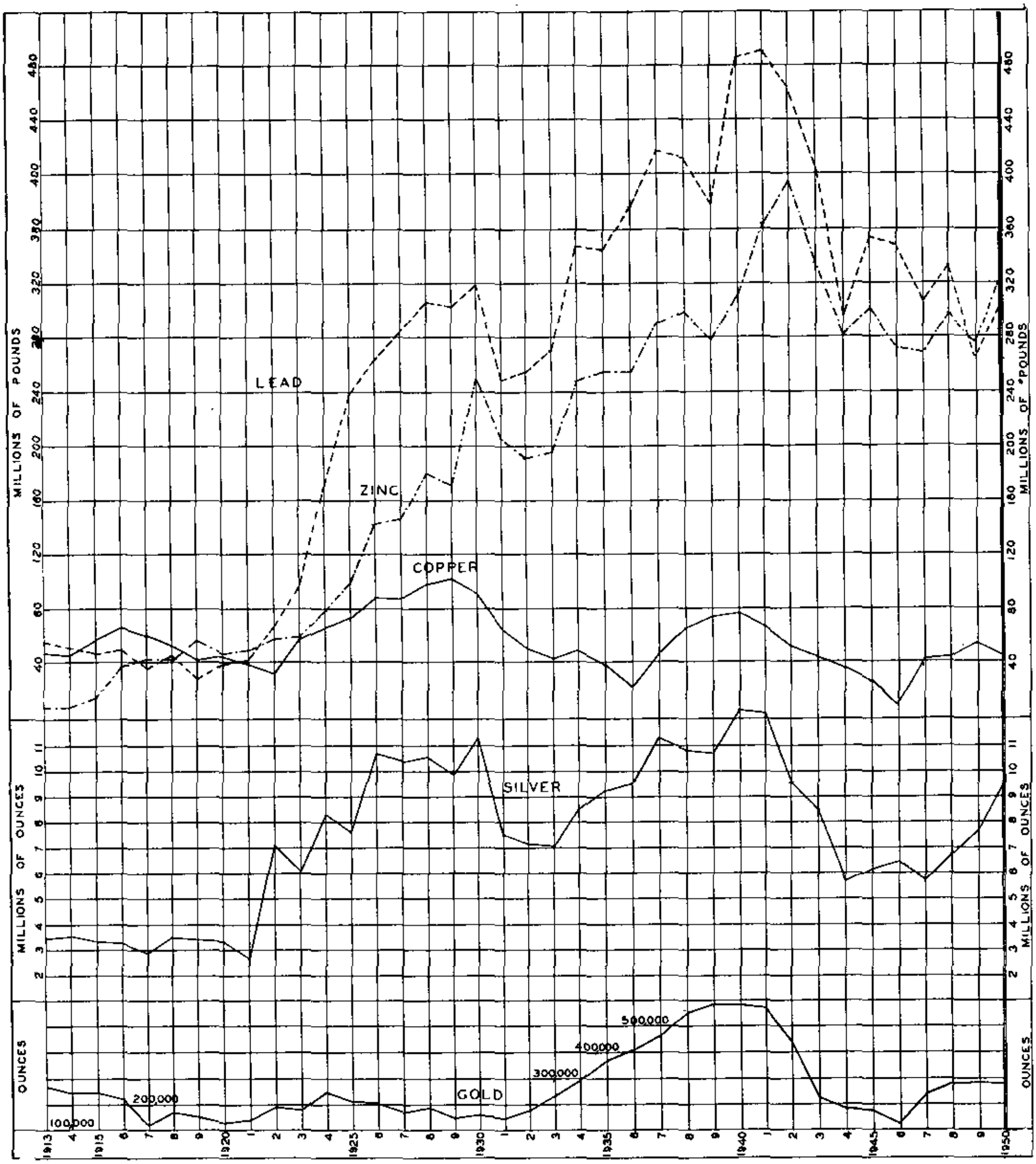

TABLE XIV.—COAL PRODUCTION PER YEAR TO DATE[1]

	Tons (2,000 Lb.)	Value		Tons (2,000 Lb.)	Value
1836–85	3,392,492	$9,468,557	1919	2,539,646	$11,337,705
1886	365,832	979,908	1920	2,906,540	12,975,625
1887	462,963	1,240,080	1921	2,782,074	12,419,975
1888	548,017	1,467,903	1922	2,813,264	12,559,215
1889	649,410	1,739,490	1923	2,747,610	12,266,115
1890	759,517	2,034,420	1924	2,172,269	9,697,630
1891	1,152,589	3,087,291	1925	2,607,945	11,642,610
1892	925,495	2,479,005	1926	2,609,640	11,650,180
1893	1,095,689	2,934,882	1927	2,748,286	12,269,135
1894	1,134,507	3,038,859	1928	2,829,906	12,633,510
1895	1,052,413	2,818,962	1929	2,521,402	11,256,260
1896	1,003,769	2,688,666	1930	2,113,586	9,435,650
1897	988,797	2,648,562	1931	1,912,501	7,684,155
1898	1,272,169	3,407,595	1932	1,719,172	6,523,644
1899	1,463,083	3,918,972	1933	1,416,516	5,375,171
1900	1,612,346	4,318,785	1934	1,508,741	5,725,133
1901	1,635,571	4,380,993	1935	1,330,524	5,048,864
1902	1,565,081	4,192,182	1936	1,508,048	5,722,502
1903	1,308,377	3,504,582	1937	1,618,049	6,139,920
1904	1,404,063	3,760,884	1938	1,466,559	5,565,069
1905	1,550,429	4,152,936	1939	1,655,217	6,280,956
1906	1,699,379	4,551,909	1940	1,867,966	7,088,265
1907	2,016,075	6,300,235	1941	2,018,635	7,660,000
1908	1,879,191	5,872,472	1942	2,170,737	8,237,172
1909	2,247,253	7,022,666	1943	2,040,253	7,742,030
1910	3,136,052	9,800,161	1944	2,165,676	8,217,966
1911	2,456,229	7,675,717	1945	1,700,914	6,454,360
1912	2,944,261	9,200,814	1946	1,639,277	6,220,470
1913	2,393,981	7,481,190	1947	1,923,573	8,587,380
1914	2,028,283	6,338,385	1948	1,809,018	10,854,108
1915	1,804,465	5,638,952	1949	1,917,296	12,462,424
1916	2,334,184	7,294,325	1950	1,542,404	10,025,626
1917	2,407,972	7,524,913			
1918	2,578,514	11,511,225	Totals	121,591,672	$452,235,303

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

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, for Years 1941 to 1950

Description	1941		1942		1943		1944		1945	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Coal used in making coke, short tons	235,809	$717,584	255,862	$866,795	260,334	$983,910	212,883	$1,439,891	230,868	$1,211,584
Coke made in bee-hive ovens, short tons	64,707	$392,473	66,824	$439,464	42,766	$291,843	36,966	$301,201	13,464	$117,369
Coke made in by-product ovens, short tons	86,656	467,440	96,428	608,521	43,895	274,402	47,401	347,245	59,098	434,876
Coke made in gas plants, short tons	8,378	43,758	6,528	54,307	93,714	647,482	88,430	565,393	91,682	577,479
Total coke made, short tons	159,741	$903,671	169,780	$1,102,292	180,375	$1,213,727	172,797	$1,213,839	164,244	$1,129,724
Gas sold and used	....	1,925,270	....	2,165,888	....	2,453,592	....	2,562,610	....	2,721,690
Tar produced	....	63,569	....	86,113	....	96,249	....	56,476	....	83,828
Other by-products	....	1,716	....	22,028	....	18,321	....	19,046	....	20,756
Total production value of coke industry	....	$2,894,226	....	$3,376,321	....	$3,781,889	....	$3,851,971	....	$3,955,998

Description	1946		1947		1948		1949		1950	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Coal used in making coke, short tons	251,954	$1,441,415	284,049	$1,682,602	235,297	$1,440,415	323,899	$1,979,138	333,955	$2,027,470
Coke made in bee-hive ovens, short tons	20,545	$178,556	44,517	$427,330	47,461	$559,735	66,407	$690,045	23,703	$269,728
Coke made in by-product ovens, short tons	50,154	416,267	55,233	527,810	52,478	616,488	89,268	1,018,288	127,477	997,200
Coke made in gas plants, short tons	81,908	619,266	75,656	557,754	56,490	454,697	67,449	496,933	92,704	686,871
Total coke made, short tons	152,607	$1,214,089	175,406	$1,512,894	156,429	$1,630,920	223,124	$2,205,266	243,884	$1,953,799
Gas sold and used	....	3,079,009	....	3,390,713	....	4,520,886	....	4,148,124	....	4,298,161
Tar produced	....	88,947	....	124,885	....	153,130	....	194,728	....	277,138
Other by-products	....	81,798	....	50,965	....	33,790	....	27,406	....	27,944
Total production value of coke industry	....	$4,470,931	....	$5,079,457	....	$6,338,726	....	$6,575,524	....	$6,557,042

TABLE XVII.—Dividends Paid by Mining Companies, 1897–1950

Lode-gold Mines[1]

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	15,826,650
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[2]
Goodenough (leasers)	Ymir	Gold	13,731
Hedley Mascot Gold Mines Ltd.	Hedley	Gold	1,290,553
Island Mountain Mines Ltd.	Wells	Gold	1,465,738
I.X.L.	Rossland	Gold	134,025
Jewel-Denero	Greenwood	Gold	11,751
Kelowna Exploration Ltd. (Nickel Plate)	Hedley	Gold	2,040,000
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[3]
Privateer Mine Ltd.	Zeballos	Gold	1,914,183
Queen	Sheep Creek	Gold	85,000
Relief Arlington Mines Ltd. (Second Relief)	Erie	Gold	308,000[2]
Reno Gold Mines Ltd.	Sheep Creek	Gold	1,433,640[2]
Sheep Creek Gold Mines Ltd.	Sheep Creek	Gold	3,215,625[4]
Silbak Premier Mines Ltd.	Premier	Gold	2,375,000[3]
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[2]
Miscellaneous mines		Gold	108,623
Total, lode-gold mines			$72,969,077

[1] The gold-copper properties of Rossland are included in this table.

[2] Includes "Return of Capital" distributions.

[3] 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.

[4] In recent years, company revenue has included profits from operation of the Lucky Jim zinc-lead mine.

TABLE XVII.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1950—*Continued*

Silver-Lead-Zinc Mines

Company or Mine	Locality	Class	Amount Paid
Antoine	Rambler	Silver-lead-zinc	$10,000
Base Metals Mining Corporation Ltd. (*Monarch and* Kicking Horse)	Field	Silver-lead-zinc	586,143[1]
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	273,053,168[2]
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	1,163,147
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[3]
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[4]	Sandon	Silver-lead-zinc	1,267,600
Silver Standard Mines Ltd.	Hazelton	Silver-lead-zinc	150,091
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			$285,565,820

[1] Includes $466,143 "Return of Capital" distribution prior to 1949.
[2] Earnings of several company mines, and customs smelter at Trail.
[3] Includes $10,504 paid in 1944 but not included in the yearly figure.
[4] These two properties were amalgamated as Silversmith Mines Limited in August, 1939.

TABLE XVII.—Dividends Paid by Mining Companies, 1897–1950—*Continued*

Copper Mines

Company or Mine	Locality	Class	Amount Paid
Britannia M. & S. Co.[1]	Britannia Beach	Copper	$13,274,022
Canada Copper Corporation	Greenwood	Copper	615,399
Cornell	Texada Island	Copper	8,500
Granby Cons. M.S. & P. Co.[2]	Copper Mountain	Copper	28,634,588
Marble Bay	Texada Island	Copper	175,000
Hall Mines	Nelson	Copper	233,280
Miscellaneous mines		Copper	261,470
Total, copper mines			$43,202,259

[1] 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, cannot 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.

[2] 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	14,483,086
Canadian Collieries (D.) Ltd.	394,258
Total	$30,877,344

Miscellaneous, Structural, and Placer Gold

Various	$4,149,655

Aggregate of all Classes

Lode-gold mining	$72,969,077
Silver-lead-zinc mining and smelting	285,565,820
Copper mining	43,202,259
Coal-mining	30,877,344
Miscellaneous, structural, and placer gold	4,149,655
Total	$436,764,155

TABLE XVII.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1950—*Continued*

Dividends Paid Yearly, 1917–50, Inclusive

Year	Amount Paid	Year	Amount Paid
1917	$3,269,494	1936	$10,513,705
1918	2,704,469	1937	15,085,293
1919	2,494,283	1938	12,068,875
1920	1,870,296	1939	11,865,698
1921	736,629	1940	14,595,530
1922	3,174,756	1941	16,598,110
1923	2,983,570	1942	13,627,104
1924	2,977,276	1943	11,860,159
1925	5,853,419	1944	11,367,732
1926	8,011,137	1945	10,487,395
1927	8,816,681	1946	15,566,047
1928	9,572,536	1947	27,940,213
1929	11,263,118	1948	37,672,319
1930	10,543,500	1949	33,651,096
1931	4,650,857	1950	34,399,330
1932	2,786,958		
1933	2,471,735	Total	$373,611,295
1934	4,745,905		
1935	7,386,070		

Dividends Paid during 1949 and 1950

	1949	1950
Base Metals Mining Corporation Ltd.	$120,000	
Bralorne Mines Ltd.	498,800	$498,800
Britannia Mining and Smelting Co. Ltd.		771,135
Canadian Collieries (D.) Ltd.	225,280	168,978
The Consolidated Mining and Smelting Co. of Canada, Ltd.	31,121,502	31,121,647
The Crow's Nest Pass Coal Co. Ltd.	248,472	248,472
Granby Consolidated Mining Smelting and Power Co. Ltd.	787,906	483,085
Highland Bell Ltd.	156,586	156,586
Island Mountain Mines Ltd.	73,550	52,536
Kelowna Exploration Co. Ltd.		300,000
Sheep Creek Gold Mines Ltd.	150,000	150,000
Silver Standard Mines Ltd.		150,091
Others	269,000	298,000
Totals	$33,651,096	$34,399,330

TABLE XVIII.—Salaries and Wages, Fuel and Electricity, and Process Supplies, 1950

Class	Salaries and Wages	Fuel and Electricity	Process Supplies
Lode-mining	$32,441,761	$4,715,215	$12,454,722
Placer-mining	308,374	34,452	57,548
Coal-mining	5,693,002	345,878	1,053,294
Miscellaneous metals, minerals, and materials	1,154,826	307,426	3,036,984
Structural materials industry	3,140,072	1,373,027	898,115
Totals, 1950	**$42,738,035**	**$6,775,998**	**$17,500,663**
Grand totals, 1949	41,023,786	7,206,637	17,884,408
Grand totals, 1948	38,813,506	6,139,174	11,532,121
Grand totals, 1947	32,160,338	5,319,470	13,068,948
Grand totals, 1946	26,190,200	5,427,458	8,367,705
Grand totals, 1945	22,620,975	7,239,726	5,756,628
Grand totals, 1944	23,131,874	5,788,671	6,138,084
Grand totals, 1943	26,051,467	7,432,585	6,572,317
Grand totals, 1942	26,913,160	7,066,109	6,863,398
Grand totals, 1941	26,050,491	3,776,747	7,260,441
Grand totals, 1940	23,391,330	3,474,721	6,962,162
Grand totals, 1939	22,357,035	3,266,000[1]	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, 1935–50	$430,198,564	$80,629,496[1]	$136,998,343

[1] Estimated.

Note.—The above figures, compiled from returns 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 Principal Metals,[4] 1901–50

Year	Tonnage[1]	Number of Shipping Mines	Number of Mines Shipping over 100 Tons	Gross Value as Reported by Shipper[2]	Freight and Treatment	Net Value to Shipper[3]	Gross Value of Lode Metals Produced[4]
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	43,606,452
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
1948	5,655,266	97	51	118,713,859	18,585,183	100,128,727	125,979,961
1949	6,095,441	118	54	99,426,678	19,613,185	79,814,604	105,259,001
1950	**6,782,912**	**112**	**58**	**108,864,792**	**22,113,431**	**86,751,361**	**121,635,457**

[1] Does not include mercury nor tungsten ores.

[2] Data not collected before 1937.

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

[4] Gross value as represented by valuing gold, silver, copper, lead, and zinc at yearly average prices.

TABLE XX.—Average Number Employed in the Mining Industry of British Columbia, 1901–50

Year	Placer-mining	Lode-mining			In Concentrators	In Smelters	Coal-mining			Structural Materials		Miscellaneous	Total[1]
		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	1,803	3,849	2,266	6,115	919	3,158	2,088	874	2,962	900	295	369	16,021
1939	1,252	3,905	2,050	5,955	996	3,187	2,167	809	2,976	652	311	561	15,890
1940	1,004	3,923	2,104	6,027	1,048	2,944	2,175	699	2,874	827	334	647	15,705
1941	939	3,901	1,823	5,724	1,025	3,072	2,229	494	2,723	766	413	422	15,084
1942	489	2,920	1,504	4,424	960	3,555	1,892	468	2,360	842	378	262	13,270
1943	212	2,394	1,699	4,093	891	2,835	2,240	611	2,851	673	326	567	12,448
1944	255	1,896	1,825	3,721	849	2,981	2,150	689	2,839	690	351	628	12,314
1945	209	1,933	1,750	3,683	822	2,834	1,927	503	2,430	921	335	586	11,820
1946	347	1,918	1,817	3,735	672	2,813	1,773	532	2,305	827	555	679	11,933
1947	360	3,024	2,238	5,262	960	3,461	1,694	731	2,425	977	585	869	14,899
1948	348	3,143	2,429	5,572	1,126	3,884	1,594	872	2,466	1,591	656	754	16,397
1949	303	3,034	2,724	5,758	1,203	3,763	1,761	545	2,306	2,120	542	626	16,621
1950	**327**	**3,399**	**2,415**	**5,814**	**1,259**	**3,759**	**1,745**	**516**	**2,261**	**1,916**	**616**	**660**	**16,612**

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

TABLE XXI.—LODE-METAL PRODUCERS IN 1950[1]

Property or Operator	Location of Mine	Mining Division	Owner or Agent	Process	Character of Ore
Ainsmore (Kootenay Florence)	Ainsworth	Ainsworth	Ainsmore Consolidated Mines Ltd., Ainsworth	Flotation	Silver, lead, zinc.
Ayesha	Ainsworth	Ainsworth	W. S. Hamilton and J. F. Millar, Nelson		Silver, zinc, lead.
Belle Aire		Ainsworth	S. Hallgren, Ainsworth		Silver, lead, zinc.
Black Diamond	Ainsworth	Ainsworth	T. and J. Hawes, Ainsworth		Silver, lead, zinc.
B.N.A.	Kaslo Creek	Ainsworth	W. E. Newton, *et al.*, Penticton		Silver, zinc, lead.
Carrie Fraction		Ainsworth	J. G. Isaacs, Ainsworth		Silver, lead, zinc.
Cork-Province	Keen Creek	Ainsworth	Base Metals Mining Corp. Ltd., Vancouver		Silver, lead, zinc.
Daisy Belle	Ainsworth	Ainsworth	W. J. Turner, Ainsworth		Silver, lead, zinc.
Early Bird	Ainsworth	Ainsworth	W. C. Robinson, Ainsworth		Silver, lead, zinc.
Glacier-Surprise	Howser	Ainsworth	J. Gallo and Disereau, Howser		Silver, zinc, lead.
Highland	Ainsworth	Ainsworth	E. Meyer and B. Sterna, Nelson		Silver, lead, zinc.
Highlander	Ainsworth	Ainsworth	Yale Lead and Zinc Mines Ltd., Toronto		Silver, zinc, lead.
Jackson	Retallack	Ainsworth	Selkirk Mining Co. Ltd., Vancouver		Silver, zinc, lead.
Lakeshore	Ainsworth	Ainsworth	Wm. Robinson, lessee, Ainsworth		Silver, lead, zinc.
Laura M	Ainsworth	Ainsworth	Hans A. Hansen, Ainsworth		Silver, lead, zinc.
Libby	Ainsworth	Ainsworth	B. Sterna and E. Meyer, Nelson		Silver, lead, zinc.
Nameless Fraction		Ainsworth	C. A. McLeish and W. McCulloch, Kaslo		Silver, lead, zinc.
Neosha	Ainsworth	Ainsworth	S. Hallgren, Ainsworth; E. Meyer and B. Sterna, Nelson		Silver, zinc, lead.
Nicolet	Ainsworth	Ainsworth	W. R. Glasspoole and T. Lane, Ainsworth		Silver, lead, zinc.
Pilot Bay	Pilot Bay	Ainsworth	H. T. Stearns, Hope, Idaho		Silver, lead, zinc.
Scranton	Woodbury Creek	Ainsworth	Scranton Consolidated Mining Co., Kaslo		Silver, lead, zinc.
Silver Hoard	Ainsworth	Ainsworth	W. E. Lane, Ainsworth		Silver, lead, zinc.
Spokane	Ainsworth	Ainsworth	W. R. Glasspoole and T. Lane, Ainsworth		Silver, lead, zinc.
Spokane-Trinket	Ainsworth	Ainsworth	T. Lane, Ainsworth		Silver, lead, zinc.
Star	Ainsworth	Ainsworth	Lessees per D. H. Norcross, Nelson		Silver, lead, zinc.
Twin	Ainsworth	Ainsworth	Hans A. Hansen, Ainsworth		Silver, lead, zinc.
Utica	Kaslo Creek	Ainsworth	Utica Mines (1937) Ltd., Kaslo		Silver, lead, zinc.
Vigilant	Woodbury Creek	Ainsworth	J. A. Cooper, Ainsworth		Silver, lead, zinc.
Whitewater	Retallack	Ainsworth	Retallack Mines Ltd.; Kootenay Belle Gold Mines Ltd., Vancouver	Flotation	Silver, lead, zinc.
Woodbury	Woodbury Creek	Ainsworth	Dr. L. D. Besecker, Kaslo		Silver, lead, zinc.
Allen, Ed.		Alberni	Ed. Allen, Port Alberni		Gold, silver, copper, lead.
Guppy, W.		Alberni	Walter Guppy, Tofino		Gold, silver, copper.
Privateer	Zeballos	Alberni	Zeballos Leasing Co., Zeballos		Gold, silver, copper.
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., Field	Flotation	Silver, lead, zinc.
Paradise	Invermere	Golden	Sheep Creek Gold Mines Ltd., Vancouver	Flotation	Silver, lead, zinc.
Albion	Greenwood	Greenwood	Granville Mines Corp. Ltd., Nelson		Gold, silver, zinc.
Dynamo	Greenwood	Greenwood	Dynamo Mine Syndicate, c/o M. M. Butorac, Trail		Silver, lead, zinc.
Gold Drop	Beaverdell	Greenwood	Mrs. Pamela R. Horne, Penticton		Silver, lead, zinc.
Highland-Bell	*Beaverdell*	*Greenwood*	*Highland Bell Ltd., Vancouver*		*Silver, gold, lead, zinc.*
Highland Silver	Beaverdell	Greenwood	Cranberry Creek Gold Mining Co. Ltd., Penticton		Silver, lead, zinc.
Humming Bird	Greenwood	Greenwood	Carl A. Anderson, Grand Forks		Gold, silver, zinc, lead.

[1] Includes lode producers of gold, silver, copper, lead, zinc, and siliceous flux.

TABLE XXI.—Lode-metal Producers in 1950[1]—*Continued*

Property or Operator	Location of Mine	Mining Division	Owner or Agent	Process	Character of Ore
Lead King	Kettle River	Greenwood	W. E. McArthur, Greenwood		Silver, zinc, lead.
Maybe	Westbridge	Greenwood	G. E. White, Oliver		Silver, lead, zinc.
Providence	Greenwood	Greenwood	J. S. Kleman and J. Trombley, Greenwood		Silver, zinc, lead.
Providence	Greenwood	Greenwood	E. A. Wanke and O. Johnson, Greenwood		Gold, silver, zinc, lead.
W.S.	Coreyell	Greenwood	W. Schwartzenhauer, Rossland		Silver, lead, zinc.
Zamora	Rock Creek	Greenwood	G. E. White, Oliver		Silver, zinc, lead.
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.
Vananda	Vananda	Nanaimo	Vananda Mines (1948) Ltd., Vancouver	Flotation	Gold, silver, copper.
Alice	Creston	Nelson	R. Welloff and S. Maines, Creston		Silver, lead, zinc.
Arlington	Erie	Nelson	Kenville Gold Mines Ltd., Montreal; F. C. Buckland, Vancouver		Gold, silver, zinc, lead.
Bayonne	Tye	Nelson	D. McDonald and H. Moore, Salmo		Gold, silver, lead, zinc.
Delaware	Creston	Nelson	F. Crawford, Creston		Silver, lead, zinc.
Dundee	Ymir	Nelson	Burgess Bros. & Lundgren, Ymir		Gold, silver, lead, zinc.
Gold Belt	Sheep Creek	Nelson	Gold Belt Mining Co. Ltd., Sheep Creek		Gold, silver.
H.B.	Salmo	Nelson	Cons. Mining & Smelting Co. of Canada, Ltd., Trail		Silver, zinc, lead.
Jersey Zinc	Salmo	Nelson	Canadian Exploration Ltd., Vancouver	Concentration	Silver, zinc, lead.
Kenville	Taghum	Nelson	Kenville Gold Mines Ltd., Montreal	Cyanidation and flotation	Gold, silver, lead, zinc.
Kootenay Belle	Sheep Creek	Nelson	J. R. Thompson, lessee, Sheep Creek		Gold, silver.
Lakeview	Sanca	Nelson	Glenn L. Carpender, Sanca		Silver, zinc, lead.
Molly Gibson	Nelson	Nelson	R. J. Johnson, Trail		Silver, lead, zinc.
Nugget	Sheep Creek	Nelson	A. Endersby, Sr. and Jr., Fruitvale		Gold, silver.
Protection (Goodenough)	Ymir	Nelson	J. Turk, *et al.*, Ymir		Gold, silver, zinc, lead.
Queen	Sheep Creek	Nelson	Sheep Creek Gold Mines Ltd., Vancouver	Cyanidation	Gold, silver, lead, zinc.
Reeves MacDonald	Remac	Nelson	Reeves MacDonald Mines Ltd., Vancouver	Flotation	Silver, zinc, lead.
Reno, Wesko, Ymir	Ymir	Nelson	Anton Kraft and Alex MacDonald, Ymir		Clean-up of mill dumps.
Silver Hill	Crawford Creek	Nelson	J. J. Gray, Toronto (per W. S. Hamilton, Nelson)		Silver, lead, zinc.
Spokane	Bayonne	Nelson	K. K. Laib, Bayonne		Gold, silver, lead, zinc.
Venango	Blewett	Nelson	D. H. Norcross, lessee, Nelson		Gold.
Yankee Girl	Ymir	Nelson	O. W. Gowing, Ymir		Gold, silver, zinc, lead.
Silver Standard	Hazelton	Omineca	Silver Standard Mines Ltd., New Hazelton	Flotation	Silver, lead, zinc.
Fairview and Morning Star	Oliver	Osoyoos	Cons. Mining & Smelting Co. of Canada, Ltd., Trail		Silica, flux, gold.
Oregon (French)	Hedley	Osoyoos	Kelowna Exploration Co. Ltd., Hedley		Gold.
Iota (Islay B)	Hedley	Osoyoos	K. G. Ewer and Wm. Hegan, Penticton		Silver, lead, zinc.
Nickel Plate	Hedley	Osoyoos	Kelowna Exploration Co. Ltd., Hedley	Cyanidation, flotation	Gold, silver.
Big Four	Stewart	Portland Canal	Big Four Silver Mines Ltd., Vancouver		Silver, lead, zinc.
East Gold	Tide Lake	Portland Canal	A. A. Phillips, Stewart		Gold, silver.
Little Joker	Stewart	Portland Canal	John Hovland, Stewart		Gold, silver.
Premier Border	Premier	Portland Canal	Premier Border Gold Mining Co. Ltd., Vancouver (operated by Silbak Premier Mines Ltd.)		Silver, zinc, lead.
Silbak Premier	Premier	Portland Canal	Silbak Premier Mines Ltd., Vancouver	Flotation	Gold, silver, zinc, lead.
Torbrit	Kitsault River	Portland Canal	Torbrit Silver Mines Ltd., Toronto	Flotation and cyanidation	Silver, lead, zinc.
Bear	China Mountain	Quesnel	H. C. Miller, Likely		Gold, silver, lead.
Stannite	Poole Creek	Revelstoke	Stannite Mines Ltd., Vancouver		Silver, lead, zinc.
Copper Mountain	Copper Mountain	Similkameen	Granby Cons. M.S. & P. Co. Ltd., Copper Mountain	Flotation	Copper, gold, silver.

A.U.	Silverton	Slocan	John O. H. Nesbitt and James J. McMow, Silverton		Silver, zinc, lead.
Bosun	Silverton	Slocan	Santiago Mines Ltd., Vancouver, and lessees, New Denver		Silver, lead, zinc.
Galena Farm	Silverton	Slocan	Frank Mills, Pengelly, and Cooper, Silverton		Silver, lead, zinc.
Howard Fraction	Slocan City	Slocan	Herbert L. Harbour, Slocan City		Silver, lead, zinc.
Lucky Jim (Zincton)	Zincton	Slocan	Zincton Unit, Sheep Creek Gold Mines Ltd., Vancouver	Flotation	Silver, zinc, lead.
McAllister	Three Forks	Slocan	Noonday Mines Ltd., Nelson		Silver, lead, zinc.
Metallic	Silverton	Slocan	W. Crowe and A. K. Lotze, Waneta		Silver, lead, zinc.
Monitor (dumps)	Three Forks	Slocan	Leased by Kootenay Belle Gold Mines Ltd., Vancouver		Silver, zinc, lead.
Ottawa	Springer Creek	Slocan	A. Olson and partners, and W. E. Graham, Slocan City		Silver.
Rambler (tailings)	Retallack	Slocan	Leased by Kootenay Belle Gold Mines Ltd., Vancouver		Silver, zinc, lead.
Richmond Eureka (dump)	Sandon	Slocan	Leased by Kootenay Belle Gold Mines Ltd., Vancouver		Silver, zinc, lead.
Ruth Hope	Sandon	Slocan	J. C. Black and C. Higgins, Sandon		Silver, lead, zinc,
Shady Mineral Fraction		Slocan	A. Suran, Sandon		Silver, lead, zinc.
Silver Ridge	Sandon	Slocan	Silver Ridge Mining Co. Ltd., Nelson		Silver, lead, zinc.
Silversmith	Sandon	Slocan	R. Crowe-Swords and Carnegie Mines Ltd., Vancouver		Silver, zinc, lead.
Van Roi	Silverton	Slocan	Van Roi Mines (1947) Ltd., Silverton		Silver, zinc, lead.
Violamac	New Denver	Slocan	Violamac Mines (B.C.) Ltd., 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	J. J. McDonell, Slocan City		Silver, lead, zinc.
Bluebird	Rossland	Trail Creek	Lovitt Mining Co., Rossland		Gold, silver, zinc, lead.
Douglas	Paterson	Trail Creek	Elmer G. and J. S. Godfrey, Northport, Wash.		Silver, lead, zinc.
Midnight	Rossland	Trail Creek	Joe Gill, lessee from Kootenay Central Mines Ltd., Rossland		Gold, silver.
Britannia	Britannia Beach	Vancouver	Britannia Mining & Smelting Co. Ltd., Britannia Beach	Flotation	Copper, gold, silver.
Cambrian Chief	Pender Harbour	Vancouver	Caron Mining Co., Vancouver		Gold, silver, copper.
Mount Vernon	Vernon	Vernon	Verne Proctor and Chas. Christian, Vernon		Gold, silver, lead, zinc.
Silver Star	Vernon	Vernon	R. Wilkie, Kamloops		Silver, lead, zinc.

[1] Includes lode producers of gold, silver, copper, lead, zinc, and siliceous flux.

TABLE XXII.—Lode Metal Mines Employing an Average of Ten or More Men during 1950[1]

Name of Mine or Operator	Days Operating		Tons		Average Number Employed	
	Mine	Mill	Mined	Milled	Mine	Mill
Shipping Mines						
Ainsmore Consolidated Mines Ltd.	286	295	......	13,339	22	4
Cork-Province (Base Metals Mining Corp. Ltd.)	365	......	3,776	......	28	......
Utica (Utica Mines (1937) Ltd.)	280	......	220	......	19	......
Whitewater (Retallack Mines Ltd.)	311	311	......	60,110	21	29
Yale Lead and Zinc Mines Ltd.	278	......	20	......	31	......
Polaris-Taku Mining Co. Ltd.	365	365	......	95,667	134	15
Cariboo Gold Quartz Mining Co. Ltd.	365	365	......	60,689	171	15
Island Mountain Mines Co. Ltd.	281	323	......	40,580	111	11
Sullivan (Cons. M. & S. Co. of Canada, Ltd.)	248	248	......	2,680,962	1,595	496
Monarch and Kicking Horse (Base Metals Mining Corp. Ltd.)	272	220	......	45,330	80	8
Paradise (Sheep Creek Gold Mines Ltd.)	252	254	......	12,002	20	12
Highland Bell Ltd.	274	90	8,383	4,107	51	12
Bralorne Mines Ltd.	365	365	......	185,074	467	26
Pioneer Gold Mines of B.C. Ltd.	365	365	......	73,551	234	14
Vananda Mines (1948) Ltd.	243	......	10,300	......	28	......
H.B. (Cons. M. & S. Mining Co. of Canada, Ltd.)	365	......	2,877	......	35	......
Jersey Lead-Zinc (Canadian Exploration Co.)	322	262	......	128,485	169	22
Kenville and Arlington Mines	......	......	......	3,205[2]	18[2]	5[2]
Queen (Sheep Creek Gold Mines Ltd.)	305	107	15,846	15,021	40	3
Reeves MacDonald Mines Ltd.	365	365	......	213,376	108	12
Silver Standard Mines Ltd.	336	336	......	21,104	73	13
Nickel Plate (Kelowna Exploration Co. Ltd.)	279	364	......	123,689	142	70
Fairview (Cons. M. & S. Co. of Canada, Ltd.)	365	......	19,570	......	14	......
Silbak Premier Mines Ltd.	305	305	......	79,167	157	11
Torbrit Silver Mines Ltd.	365	365	......	130,290	137	29
Stannite Mines Ltd.	300	......	366	......	15	......
Copper Mountain (Granby Cons. M.S. & P. Co. Ltd.)	352	352	1,799,852	1,749,964	664	248
Bosun (Santiago Mines Ltd.)	290	......	382	230	10	......
Lucky Jim (Sheep Creek Gold Mines Ltd.)	305	305	......	96,640	79	10
Violamac Mines (B.C.) Ltd.	336	......	3,044	671	42	......
Western Exploration Co. Ltd. (Enterprise, Mammoth, Standard)	352	352	......	12,222	55	19
Britannia Mining and Smelting Co. Ltd.	279	262	......	858,698	616	202
Non-shipping Mines						
Bluebell (Cons M. & S. Co. of Canada, Ltd.)	......	......	......	......	65	......
Big Bull (Cons. M. & S. Co. of Canada, Ltd.)	......	......	......	......	43	......
Tulsequah Chief (Cons. M. & S. Co. of Canada, Ltd.)	......	......	......	......	17	......
Estella Mines Ltd.	......	......	......	......	24	......
Giant (Silver Giant Mines Ltd.)	......	......	......	......	......	([3])
Mastodon (Dr. D. F. Kidd)	......	......	......	......	13	......
Carnation (Kelowna Exploration Co. Ltd.)	......	......	......	......	22	......
B.R.X. (1935) Cons. Mines Ltd.	......	......	......	......	11	......

[1] 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.
[2] Estimated.
[3] Number not reported, work principally construction.

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. 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 44 and 45.

Central Records Offices (Victoria and Vancouver)

The transcripts of all recordings made in Mining Recorders' offices throughout the Province are sent to the office of the Chief Gold Commissioner in Victoria twice each month, and include the names of lessees of reverted Crown-granted mineral claims. These records and maps showing the approximate positions of mineral claims held by record and of placer-mining leases may be consulted by the public during office hours at Victoria and at the office of the Gold Commissioner at Vancouver, 810 Hastings Street West. The maps conform in geographical detail, size, and number to the reference and mineral reference maps issued by the Department of Lands, and the approximate positions of mineral claims held by record and of placer-mining leases are plotted from details *supplied by the locators. Provision has been made to supply the general public, on* request to the office of the Chief Gold Commissioner, with copies of the maps.

Copies of the various Acts, upon payment of the prices listed on page 314, can be obtained from the office of the Chief Gold Commissioner; the King's Printer, Victoria; 810 Hastings Street West, Vancouver; or from the offices of the Gold Commissioners throughout the Province.

Amalgamation of Mining Divisions

(Particulars of Mining Divisions amalgamated since 1942.)

Date	Mining Divisions Amalgamated	New Name	Mining Recorder's Office
Oct. 1, 1949	Revelstoke and Lardeau	Revelstoke	Revelstoke.
Dec. 1, 1949	Kamloops and Ashcroft	Kamloops	Kamloops.
Apr. 1, 1951	Skeena and Portland Canal	Skeena	Prince Rupert.

Purchasing of Gold

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 ounces in weight, from individual placer-miners. The Gold Commissioners throughout the Province are paying a cash price of $31 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	Number of Lots	Paid	Paid per Oz.
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[1]
1947	107	3,502	28.00
1948	100	3,224	28.00
1949	69	2,072	31.00[2]
1950	64	2,095	31.00
Totals	5,188	$136,802	....

[1] Price paid by Gold Commissioners following the reduction of the official Canadian price for fine gold.
[2] Price paid, effective October 1st, 1949, following the devaluation of the Canadian dollar. For the earlier purchases made in 1949, the price paid for gold was $28 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. W. Harding	T. W. Harding	R. MacGregor.
Sub-office	Nanaimo			W. H. Cochrane.
Sub-office	Quatsino			Axel Hansen.
Sub-office	Tofino			R. R. Barr.
Sub-office	Zeballos			H. M. B. Sutton.
Atlin	Atlin	A. E. Roddis	A. E. Roddis.	
Sub-office	Lower Post			J. W. Stewart.
Sub-office	Pouce Coupe			H. O. Callahan.
Sub-office	Squaw Creek			Mrs. F. Muncaster.
Sub-office	Telegraph Creek			Mrs. M. C. Allen.
Sub-office	Tulsequah			T. G. Emery.
Cariboo	Barkerville	W. L. Draper	W. L. Draper.	
Sub-office	Fort McLeod			J. E. McIntyre.
Sub-office	McBride			T. R. Maxwell.
Sub-office	Prince George			G. H. Hallett.
Sub-office	Quesnel			S. Allen.
Clinton	Clinton	W. H. Cope	W. H. Cope.	
Sub-office	Haylmore			W. Haylmore.
Sub-office	Williams Lake			Miss J. Foster.
Fort Steele	Cranbrook	E. L. Hedley	E. L. Hedley.	
Sub-office	Fernie			F. E. P. Hughes.
Golden	Golden	S. M. Carling	S. M. Carling.	
Sub-office	Invermere			T. N. Weir.
Greenwood	Grand Forks	W. E. McLean	W. E. McLean.	Miss E. R. Wilkinson.
Sub-office	Beaverdell			L. F. Crump.
Sub-office	Greenwood			S. W. Dobbie.
Sub-office	Oliver			L. M. McKinnon.
Kamloops	Kamloops	D. Dalgleish	D. Dalgleish	R. A. McDonnell.
Sub-office	Ashcroft			D. H. Bruce.
Sub-office	Chu Chua			G. M. Fennell.
Sub-office	Salmon Arm			W. T. McGruder.

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
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			G. W. McFarland.
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	J. F. McDonald	G. C. Kimberley.	
Sub-office	Chilliwack			E. L. Anderson.
Sub-office	Hope			J. H. Richmond.
Nicola	Merritt	D. Dalgleish (Kamloops)	T. G. O'Neill.	
Omineca	Smithers	K. D. McRae	K. D. McRae.	
Sub-office	Burns Lake			A. Fisher.
Sub-office	Copper River			L. G. Skinner.
Sub-office	Dorreen			W. E. Horwill.
Sub-office	Fort St. James			Norman Henry.
Sub-office	Fort St. John			Miss E. M. Stacey.
Sub-office	Hazelton			C. H. Drake.
Sub-office	Manson Creek			T. C. Hamilton.
Sub-office	Prince George			G. H. Hallett.
Sub-office	Takla Landing			Mrs. G. M. Henry.
Sub-office	Telkwa			T. J. Thorp.
Sub-office	Vanderhoof			George Ogsdon.
Sub-office	Terrace			W. Warner.
Osoyoos	Penticton	T. S. Dalby	T. S. Dalby.	
Sub-office	Hedley			L. A. Doree.
Sub-office	Keremeos			L. S. Coleman.
Sub-office	Oliver			L. M. McKinnon.
Peace River	Victoria	K. B. Blakey.		
Sub-office	Fort St. John			Miss E. M. Stacey.
Sub-office	Pouce Coupe			H. O. Callahan.
Sub-office	Prince George			G. H. Hallett.
Quesnel	Williams Lake	Miss J. Foster	Miss J. Foster.	
Sub-office	Barkerville			W. L. Draper.
Sub-office	Keithley Creek			Mrs. E. Rae.
Sub-office	Likely			L. R. Speed.
Sub-office	Quesnel			S. Allen.
Revelstoke	Revelstoke	W. G. Fleming	W. G. Fleming.	
Sub-office	Beaton			Mrs. L. M. Mapes.
Similkameen	Princeton	Chas. Nichols	Chas. Nichols.	
Sub-office	Hedley			L. A. Doree.
Skeena	Prince Rupert	G. Forbes	G. Forbes.	
Sub-office	Alice Arm			Mrs. E. A. Oliver.
Sub-office	Burns Lake			A. Fisher.
Sub-office	Copper River			L. G. Skinner.
Sub-office	Queen Charlotte			H. R. Beaven.
Sub-office	Stewart			W. S. Orr.
Sub-office	Terrace			W. Warner.
Slocan	New Denver	C. Macdonald (Kaslo).	F. Broughton	Miss M. Butlin.
Sub-office	Slocan			W. E. Graham.
Stikine	Victoria	K. B. Blakey.		
Sub-office	Telegraph Creek			Mrs. M. C. Allen.
Sub-office	Burns Lake			A. Fisher.
Sub-office	Fort St. James			N. Henry.
Sub-office	Fort St. John			Miss E. M. Stacey.
Sub-office	Lower Post			J. W. Stewart.
Sub-office	Pouce Coupe			H. O. Callahan.
Trail Creek	Rossland	E. B. Offin	E. B. Offin.	
Vancouver	Vancouver	J. Egdell	Mrs. D. White (Deputy)	Miss F. Schachter.
Sub-office	Alert Bay			A. J. Dillabough.
Sub-office	Powell River			J. P. Scarlett.
Sub-office	Stuart Island			J. B. Willcock.
Vernon	Vernon	A. E. Wilson	A. E. Wilson.	
Sub-office	Kelowna			E. R. Oatman.
Victoria	Victoria	K. B. Blakey	R. H. McCrimmon (Deputy)	Miss D. T. Arnott.

Gold Commissioners' and Mining Recorders' Office Statistics, 1950

Mining Divisions	Free Miners' Certificates				Lode-mining					Placer-mining				Revenue		
	Individual	Company	Special	Provisional (Placer)	Mineral Claims Recorded	Certificates of Work	Certificates of Improvements	Bills of Sale, etc.	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	Totals
Ainsworth	119	7	2	—	168	416	5	70	67	—	4	—	—	$1,092.75	$4,291.75	$5,384.50
Alberni	112	3	—	1	52	252	—	22	15	—	—	1	—	655.75	3,268.75	3,924.50
Atlin	157	6	—	—	69	217	28	14	15	8	11	127	28	1,176.00	6,944.00	8,120.00
Cariboo	312	14	7	9	50	254	17	17	1	4	75	357	107	2,586.00	20,108.10	22,694.10
Clinton	34	—	—	—	46	124	—	3	—	—	10	15	8	141.50	1,218.75	1,360.25
Fort Steele	148	—	3	4	118	120	7	21	7	2	3	32	2	706.50	4,745.43	5,451.93
Golden	73	4	—	1	86	170	4	45	8	—	—	1	—	662.25	6,270.25	6,932.50
Greenwood	108	1	—	—	73	169	14	20	46	2	3	7	1	546.00	2,923.00	3,469.00
Kamloops	250	—	3	14	266	266	13	58	18	4	7	—	4	1,153.50	6,700.50	7,854.00
Lillooet	254	6	2	3	161	467	4	34	24	—	2	31	12	1,838.00	4,041.45	5,879.45
Nanaimo	99	—	—	—	79	57	4	7	2	—	5	—	4	421.75	1,126.00	1,547.75
Nelson	335	9	3	8	347	525	2	94	15	9	1	11	4	2,376.25	6,055.50	8,431.75
New Westminster	222	4	10	13	259	201	—	43	3	2	11	20	4	1,467.00	3,026.50	4,493.50
Nicola	22	—	1	—	49	140	—	10	—	—	2	2	6	115.75	1,077.50	1,193.25
Omineca	342	7	2	—	388	760	3	52	34	5	26	58	34	2,113.00	15,866.25	17,979.25
Osoyoos	129	—	4	3	88	85	—	6	5	—	—	—	—	718.25	585.00	1,303.25
Peace River	46	—	—	—	17	16	—	2	—	—	2	—	1	220.00	285.00	505.00
Portland Canal	64	1	1	—	59	237	10	25	—	—	—	—	2	612.50	2,659.50	3,272.00
Quesnel	323	11	1	12	48	142	—	9	—	8	37	101	25	2,415.00	7,393.25	8,838.00
Revelstoke	97	2	4	—	129	131	—	29	14	—	11	28	10	660.25	5,745.50	6,405.75
Similkameen	138	3	4	1	104	103	6	28	2	1	1	26	9	976.75	3,737.00	4,713.75
Skeena	86	—	—	1	38	30	4	28	54	—	—	2	5	400.50	2,600.00	3,060.50
Slocan	91	1	1	—	65	417	—	17	—	—	4	21	2	519.50	5,371.50	5,891.00
Stikine	100	—	1	—	143	84	—	34	—	—	13	19	12	476.75	4,672.65	5,149.40
Trail Creek	96	3	2	2	32	10	—	—	11	—	—	1	—	650.25	412.50	1,062.75
Vancouver	1,078	90	19	13	130	172	12	7	—	—	—	2	—	12,635.00	3,058.10	15,693.10
Vernon	168	2	—	9	88	79	2	12	2	1	4	15	—	849.25	1,168.50	2,017.75
Victoria	204	8	4	5	43	37	8	—	8	—	2	6	—	1,987.75	1,024.25	3,012.00
Totals for Province, 1950	5,207	182	74	99	3,195	5,681	143	707	351	46	234	883	280	$40,173.75	$126,376.48	$165,639.98
Totals for Province, 1949	5,605	184	93	165	3,526	5,366	70	649	363	54	225	1,057	305	43,872.00	138,870.43	182,742.43

ANALYTICAL AND ASSAY BRANCH

During 1950 the chemical laboratory in Victoria issued reports on 1,927 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 Analyses	Assays	Radioassays Reported
Bona-fide prospectors	902	854	827	1,486	135
Bona-fide prospectors (grantees)	226	226	211	474	29
Departmental engineers	799	23	276	2,022	34
Totals	1,927	1,103	1,314	3,982	198

Proximate analyses and calorific determinations were made on five coal samples for the Department of Mines.

Work for other Departments included the analysis of nineteen samples of agricultural material for the Department of Agriculture, four samples of anti-freeze for the Purchasing Commission, seven samples of water for the University of British Columbia, three samples of type metal for the King's Printer, two samples for the Department of Lands and Forests, and one each for the Department of Trade and Industry and the British Columbia Research Council.

For the Attorney-General's Department and the Royal Canadian Mounted Police, seventy cases of a chemico-legal nature were undertaken, involving the study of 252 exhibits. These cases included seventeen cases of a toxicological nature, five analyses of blood for alcohol, seven analyses of liquors, four analyses of suspected narcotics, and three analyses of gasoline seized under the "Coloured Gasoline Tax Act." The remaining cases were of a widely varied nature. One case involved the identification of footprints with respect to shoes worn by the accused in a breaking and entering case. Comparison of the prints showed that they could have been made only by the shoes in question.

In co-operation with the Department of Mining and Metallurgy, University of British Columbia, the investigation of possible sources of the metals gallium and germanium, commenced in 1948, was continued. This involved the analysis of four samples of tars and residues for these metals.

At the request of the British Columbia Research Council and in connection with an investigation concerning possible deficiencies of certain trace elements in some specimens of sugar-cane, work was continued on the analysis of a series of sugar-cane juices for these trace elements.

The policy adopted in 1948 of examining all samples for the possible presence of radioactivity was continued throughout 1950. Radioassays were made on 770 samples.

A total of 64 lots of placer gold, amounting to 67.5864 ounces 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 Trail, Chapman Camp, and Victoria in May. Of the five candidates who sat for the examination, one passed the entire examination, three passed supplementals in wet assaying, and one failed supplemental in wet assaying.

INSPECTION BRANCH

Organization and Staff

Inspectors and Resident Engineers

H. C. Hughes, Chief Inspector	Victoria.
Robert B. Bonar, Senior Inspector of Coal Mines	Victoria.
L. Wardman, Electrical Inspector	Victoria.
J. A. Mitchell, Resident Engineer	Victoria.
J. H. Bennett, Resident Engineer	Victoria.
Robert B. King, Inspector and Resident Engineer	Vancouver.
A. R. C. James, Inspector and Resident Engineer	Cumberland.
J. E. Merrett, Inspector and Resident Engineer	Lillooet.
E. R. Hughes, Inspector and Resident Engineer	Princeton.
J. W. Peck, Inspector and Resident Engineer	Nelson.
F. J. Hemsworth, Inspector and Resident Engineer	Prince Rupert.
D. R. Morgan, Inspector and Resident Engineer	Fernie.

On January 31st, 1950, James Strang, Chief Inspector of Mines, retired and was succeeded by H. C. Hughes. At the same time Robert B. Bonar became Senior Inspector of Coal Mines.

Effective April 15th, 1950, A. R. C. James became Inspector and Resident Engineer for the Vancouver Island and Northern Interior coal areas, with headquarters at Cumberland.

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

Board of Examiners for Coal-mine Officials

H. C. Hughes, Chairman	Victoria.
Robert B. Bonar, Secretary	Victoria.
E. R. Hughes, Member	Princeton.

R. B. Bonar, E. R. Hughes, and the Inspector of Mines for 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 coal-miners for a period not exceeding sixty days between regular examinations.

Instructors, Mine-rescue Stations

Richard Nichol*	Nanaimo Station.
Peter Kemp	Nanaimo Station.
Arthur Williams	Cumberland Station.
Thomas H. Cunliffe	Princeton Station.
Joseph J. Haile	Fernie Station.
H. W. Aitchison	Nelson Station.

* Died August 19th, 1950.

Staff Changes

On August 20th, 1950, Peter Kemp was appointed instructor at the Nanaimo Mine-rescue Station, on a temporary basis to replace Richard Nichol.

On August 1st, 1950, H. W. Aitchison was appointed mine-rescue and first-aid instructor in charge of a mobile mine-rescue and first-aid unit, with headquarters at Nelson.

James Strang

James Strang, Chief Inspector of Mines and Chairman of the Board of Examiners for Coal-mine Officials, retired at Victoria on January 31st, 1950.

He was born at Penecuik, Scotland, on January 27th, 1885, and was educated at public and private schools, graduating from Heriot Watt Technical College, Edinburgh. He had a first-class coal-miner's certificate from Great Britain and was assistant manager of the Preston Grange Colliery at Midlothian. He came to Canada in 1910 and was employed as surveyor, overman, and manager of the Extension mines at Nanaimo, holding the latter position for eight years. He joined the staff of the British Columbia Department of Mines on December 15th, 1926, as Inspector of Mines and Secretary of the Board of Examiners for Coal-mine Officials. He took over the position of Chief Inspector on April 30th, 1947, and also became Chairman of the Board of Examiners.

He was a member of the Canadian Institute of Mining and Metallurgy and served as a member of the Ryan Safety Trophy Committee for British Columbia.

He took a keen interest in his work and was outstanding in his ability to appreciate the miners' and operators' problems and to work with them. The same attitude was maintained toward his staff and associates in the Mines Department. He took a great interest in mine-rescue and first-aid work and, during his tenure as Chief Inspector, was responsible for promoting mine-rescue training in metal mines to the extent that, before he retired, nearly every metalliferous mining area had a nucleus of men trained in mine-rescue. He gained a host of friends in both the industry and in the Department, who wish him and Mrs. Strang many years of continued health and happiness.

John MacDonald

John MacDonald was born in Cowdenbeath, Scotland, on December 28th, 1884. He commenced work in the mine when he was 11 years of age, working his way up through the various underground jobs until, at the age of 16, he was coal-getting at the face.

In 1902, at the age of 18, he went to the United States, where for three years he worked in the mines of southern Illinois. He then returned to Scotland and was engaged as a general underground contractor at Kelty Colliery near Cowdenbeath for the next four years.

He came to British Columbia in October, 1910, and settled at Merritt. He obtained work at the Middlesboro Collieries of the Nicola Valley Coal and Coke Company, and remained at this group of mines for ten years, being promoted successively to fireboss, shiftboss, and overman. During this period he undertook a long course of studies in mining engineering through the International Correspondence School of Scranton, Pa., and qualified for a first-class certificate of competency in October, 1919.

In July, 1920, he joined the staff of the Department of Mines and was appointed Inspector of Mines for the East Kootenay District, with headquarters at Fernie, where he remained until 1937. At the end of that year he was transferred to the Vancouver Island District and was stationed at Nanaimo. He remained there until his retirement on December 31st, 1949. He was a member of the Canadian Institute of Mining and Metallurgy and was president of the East Kootenay Mine Safety Association while in Fernie and the Vancouver Island Mine Safety Association while in Nanaimo. His enthusiasm for his work and his long and varied experience in the coal-mining industry made him a valued member of the Mines Department staff, and he gained a host of friends and well-wishers, both in industry and in the Department.

Richard Nichol

Richard Nichol, mine-rescue instructor at Nanaimo, died of a heart attack while on holidays on August 19th, 1950. He was born in Ayrshire, Scotland, in 1888. After working for some years in the coal mines of his home district, he came to the United States and worked for a few months in the mines at Des Moines, Iowa. He came to Nanaimo in 1910, and for the next twenty-five years he worked as a miner in the Nanaimo mines of the Western Fuel Company and its successor, Canadian Collieries (Dunsmuir) Limited.

He undertook a course in mine-rescue work, obtaining his certificate in 1918, and was a regular member of mine-rescue teams for many years. In June, 1935, he joined the staff of the Department of Mines as instructor at the Nanaimo Rescue Station, a position which he held up to the time of his death. During this period Mr. Nichol assisted in the direction of rescue and recovery work following the explosions at No. 10 mine, South Wellington, in 1940, and at the Pacific Eastern mine in the Bridge River district in 1947.

In the past few years he rendered valuable service by instructing metal-mine personnel in many parts of the Province in mine-rescue work and in the use of the Chemox apparatus. He took a great interest in this work and was outstanding in his knowledge of mine-rescue equipment and procedure. Teams trained under him at Nanaimo attained a degree of proficiency equal to the best. He also undertook the training of metal-mine teams in other areas in the Province. During his residence in Nanaimo Mr. Nichol took part in many civic activities. He was for some years a member of the Harewood Volunteer Fire Brigade, and during World War II took a prominent part in A.R.P. work. His genial personality and ability gained him the friendship and respect of all those with whom he was associated, both in industry and in the Department.

MINERALOGICAL BRANCH

Field work by officers of the Mineralogical Branch consists principally of geological mapping and examination of mineral deposits. The results are published partly in the Annual Report of the Minister of Mines and partly in a series of bulletins. The Mineralogical Branch supplies information regarding mineral deposits and the mineral industry in response to inquiries received in great number. The activities of the Branch also 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.

Staff

Engineers on the permanent staff of the Mineralogical Branch are now classified as Assistant Geologists, Associate Geologists, Geologists, or as Mineral Engineers—Grade 1 or Grade 2.

J. T. Fyles, M. C. Robinson, and G. G. L. Henderson were appointed to the staff. They and W. R. Bacon were granted leave of absence to continue postgraduate studies during the winter of 1950–51. John S. Stevenson left the staff to become associate professor of mineralogy in the Department of Geology at McGill University. W. H. Mathews, of the Department of Geological Sciences, University of California, Berkeley; W. H. White, of the Department of Geology, University of British Columbia; and H. W. Nasmith undertook field work for the Department of Mines in 1950.

P. B. Freeland

Philip Broke Freeland was born in Charlottetown, P.E.I., on November 30th, 1878. As a child he went to England with his parents and was educated there. On graduating from the Cambourne School of Mines, Cornwall, in 1901, he went to Arizona and spent four years there working as assayer at the Sultan mine, Grey Eagle mine, and Rapid Transit mine.

He first came to British Columbia in 1906 and worked for a year as sampler at the Hall mine smelter at Nelson.

From 1907 to 1910 he worked for the Canadian Pacific Railway as transitman, in 1911 as locating engineer on Sooke Water Supply, in 1912 as mining engineer for Cartwright and Matheson on a reconnaissance survey from Bella Coola to Fort George, and in 1912 and 1913 as engineer in charge of Kallapa mine, V.I. In 1913 he was engineer in charge of construction at the Scott Goldie quarry, Burrard Inlet.

From 1914 to 1917 he was employed by the Granby Company at Phoenix as mining engineer and surveyor.

In May, 1917, he joined the staff of the Department of Mines as one of the original group of Resident Engineers. From 1917 to 1935 he was Resident Mining Engineer for the Southern Mineral Survey District, No. 4. The headquarters for the district were at Grand Forks until 1931, when they were moved to Penticton. In 1932 Mr. Freeland became Resident Mining Engineer for the Central Mineral Survey District, No. 3, also; the headquarters for the combined districts were at Penticton.

In 1935 he moved to Victoria as consultant to the Department of Mines and was appointed Chief Mining Engineer in 1937.

He retired from the staff of the Department of Mines as Chief Mining Engineer on March 30th, 1943.

He joined the Canadian Institute of Mining and Metallurgy in 1918 and served as councillor from 1946 to 1948.

He was one of the original members of the Association of Professional Engineers, and served as member of Council from 1938 to 1940, and in 1943; as vice-president in 1941; and as president of the association in 1942.

His death occurred at 1050 St. Patrick Street, Victoria, on Monday, December 19th, 1949, aged 71.

He is survived by his wife in Victoria and a sister and two brothers in England.

William J. Lynott

William J. Lynott was born in Vancouver on December 12th, 1913. He was educated in Brockville, Ont., and in Vancouver, graduating from the University of British Columbia in 1941 with the degree of B.A.Sc. in geological engineering. He spent four years in the Royal Canadian Air Force as an aeronautical engineer. In July, 1945, he joined the staff of the Department of Mines and for the winters 1946–47 and 1947–48 was granted leave of absence to complete postgraduate work at Princeton University for his M.A. and Ph.D. degrees. In September, 1948, he joined the faculty of St. Louis University, St. Louis, Mo., as an instructor in geology and remained there until his death on November 16th, 1949.

Field Work

Field work was undertaken by eleven engineers assisted by eleven temporary assistants.

W. R. Bacon began geological mapping in an area tributary to Pender Harbour and Seechelt Inlet, on the Mainland coast.

J. M. Black mapped an area near Hazelton, including Glen and Nine Mile Mountains. He also completed field work at Atlin in an area that includes McKee, Spruce, and Pine Creeks.

J. T. Fyles continued geological mapping in the Cowichan Lake area.

M. S. Hedley completed field work for the detailed geological mapping of an area in the Slocan Mining Division extending from Sandon southwesterly toward Silverton. He also examined properties in the East Kootenay District.

G. G. L. Henderson began geological mapping of an area near Windermere. The area includes Windermere Creek and extends southeasterly to the Kootenay River.

S. S. Holland continued detailed geological mapping in an area southeast of Barkerville, working between Cariboo Hudson mine and Yanks Peak.

J. W. McCammon made detailed examinations of a mica deposit near Armstrong, an asbestos deposit near Sidmouth, of part of the gypsum belt near Windermere, and of the clay deposit at Blue Mountain northeast of Whonnock. He also made briefer examinations of other deposits of industrial minerals.

M. C. Robinson continued detailed geological mapping in the Standard mine area near Silverton. This area adjoins the one mapped by Hedley.

J. S. Stevenson made a detailed examination of the Sunloch and Gabbro copper properties at Jordan River on Vancouver Island and made preliminary studies in the Boundary area.

W. H. Mathews devoted August and part of September to field studies in an area that includes Fort St. John in the Peace River District. This work, designed to obtain information on ground-water possibilities and to assist in soil classification, was undertaken primarily to assist the Department of Agriculture.

H. W. Nasmith, in collaboration with P. G. Odynsky, of the Water Rights Branch of the Department of Lands, made studies bearing on ground-water in the area near the confluence of Haslam Creek and Nanaimo River.

W. H. White did field work for the Department of Mines in June and July. He studied the metal content of twigs from trees growing over and near areas of copper mineralization at Phoenix and Highland Valley, and of silver-lead-zinc mineralization on La Forme Creek north of Revelstoke, and examined the Mastodon silver-lead-zinc property on La Forme Creek.

GRUB-STAKING PROSPECTORS

Grub-staking of prospectors by the Department of Mines continued in 1950. As in previous years, a maximum grub-stake of $300 per man was provided, plus an additional amount of up to $200 if travelling expenses were paid.

STATISTICS

Field Season	Approximate Expenditure	Men Grub-staked	Samples and Specimens Received at Department Laboratory	Mineral Claims Recorded
1943	$18,500	90	773	87
1944	27,215	105	606	135
1945	27,310	84	448	181
1946	35,200	95	419	162
1947	36,230	91	469	142
1948	35,975	92	443	138
1949	31,175	98	567	103
1950	26,800	78	226	95

Samples and specimens sent in by grub-staked prospectors are examined by an engineer before spectrographic analysis and assay. The information given a prospector about a sample includes its mineralogy and the analysis by spectrograph, as well as the assay. Also, all samples are tested for radioactivity.

On two properties, grub-staked prospectors reported they were able to secure capital for development work in 1951. Several other properties were examined by representatives of mining companies, and a large amount of exploratory work may be done on one of the properties.

The grub-stake programme was supervised by J. A. Mitchell and J. H. Bennett, assisted by D. H. Rae during the summer.

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 in 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 302.

PUBLICATIONS

Annual Reports of the Minister of Mines, bulletins, and other publications of the Department, with prices charged for them, are listed on pages 299 to 301.

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 in Vancouver, and in the offices of the Inspectors of Mines in Nelson and Prince Rupert, as well as in public libraries listed on page 302.

MAPS SHOWING MINERAL CLAIMS, PLACER CLAIMS, AND PLACER-MINING LEASES

From the details supplied by the locators, the approximate positions of mineral claims held by record and of placer-mining leases are shown on maps that may be inspected in the Central Records Offices of the Department of Mines in Victoria and in Vancouver.* Copies of these maps may be obtained on request, as outlined on page 301. The boundaries of surveyed claims and leases are shown on the reference maps and other maps of the British Columbia Department of Lands and Forests.

JOINT OFFICES OF THE BRITISH COLUMBIA DEPARTMENT OF MINES AND THE DEPARTMENT OF MINES AND TECHNICAL SURVEYS, 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 in 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.

* The office was moved in the summer of 1950 from 305 Federal Building to 808–810 Hastings Street West.

Topographic Maps and Air Photographs

Topographic mapping and air photography are carried on by the Surveys and Mapping Service of the British Columbia Department of Lands and Forests and by services of the Dominion Government Departments of Mines and Technical Surveys and of National Defence.

Aircraft in the service of the Dominion and Provincial Governments have flown over virtually the whole of British Columbia to obtain vertical air photographs. Information on the type of air photographic coverage and on topographic mapping of various types to the end of 1950 is included in the Annual Report of the Deputy Minister of Lands for 1950. In that Report coverage by air photographs and by topographic maps is indicated on a series of base maps which also show the reference grid and the lettering and numbering system by means of which reference to any part of the Province may be made.

In 1950 the Topographic Division of the British Columbia Department of Lands and Forests had five survey parties in the field, obtaining control for standard topographic maps at 1 mile to the inch with 100-foot contours. They obtained control for fifteen map-sheets having an area of 4,813 square miles. A sixth party obtained additional control on three sheets on Vancouver Island.

In 1950 the Dominion Topographic Survey and the Army Survey Establishment, working in conjunction, had fourteen parties in the field. Field work was completed on fourteen 1-mile sheets covering an area of about 4,000 square miles and on fifteen 4-mile sheets having an area of about 50,000 square miles.

Interim maps showing planimetry, based on air photographs and existing ground control, are being compiled by the map compilation division of the Air Survey Division *of the Surveys and Mapping Service of the British Columbia Department of Lands and* Forests. These maps record much topographic information and show the centres of vertical air photographs in the area covered. They are a very valuable source of topographic information in advance of the more detailed standard topographic maps.

Complete information about topographic maps, interim maps, and air photographs for British Columbia made by the Dominion or Provincial service may be obtained from the Topographic Division and the Geographic Division of the Department of Lands and Forests. Air photographs may be bought or, under some circumstances, may be borrowed from the Air-photo Library of that Department.

Department of Mines and Technical Surveys

The Dominion Government Department of Mines and Technical Surveys, created by an Act of Parliament introduced in November, 1949, took over most of the branches and functions related to mining of the former Department of Mines and Resources. The Mines Branch, Geological Survey of Canada, and Surveys and Mapping Branch are the three branches of the Department of the most direct interest to the mining industry. Brief reference to the work of the Surveys and Mapping Branch in British Columbia is made in the preceding note headed " Topographic Maps and Air Photographs." A note on the Geological Survey of Canada follows this paragraph and is followed by a note on the Mines Branch.

GEOLOGICAL SURVEY OF CANADA

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

A branch office of the Geological Survey of Canada is maintained at 808–810 Hastings Street West, Vancouver. Maps and reports on British Columbia can be obtained there. W. E. Cockfield is in charge of this office.

Field Work by the Geological Survey of Canada in British Columbia, 1950

J. E. Armstrong continued geological mapping in the Vancouver North area (longitude 123° to 123° 30′, latitude 49° 15′ to 49° 30′); co-operated with Provincial and Federal departments in soil surveys and the interpretation of Pleistocene geology and its relation to ground-water supply; investigated the water-supply problem on Cape Mudge Indian Reserve, Vancouver Island; and supervised the work of other Geological Survey parties in the lower Mainland and on southeastern Vancouver Island.

W. L. Brown commenced a study of the Pleistocene geology and ground-water conditions in the New Westminster area (longitude 122° 30′ to 123°, latitude 49° to 49° 15′).

H. S. Bostock visited areas in northern British Columbia in connection with the geological examination of construction sites pertaining to the Yukon River power and storage project, and supervised the work of other Geological Survey parties assisting this project.

R. L. Christie continued geological mapping in the Bennett area (longitude 134° to 136°, latitude 59° to 60°).

W. E. Cockfield made preliminary studies of dam-sites on Shuswap River near Mabel Lake, on Columbia River near Mica Creek, and on Fraser River at Moran; with W. L. Brown, investigated the water-supply of three Indian Reserves near Hazelton and the foundations for proposed fishways at Moricetown Falls on Buckley River; and visited several mining properties.

R. de Wit examined some Devonian sections in the Rocky Mountains west of Hudson Hope.

S. Duffell continued geological mapping of the Whitesail Lake area (longitude 126° to 128°, latitude 53° to 54°).

Hans Frebold commenced a stratigraphic and palæontological study of the Jurassic system as represented by the Fernie group of the Rocky Mountains.

J. G. Fyles commenced an investigation of Pleistocene geology and ground-water conditions in the Horne Lake area (longitude 124° 30′ to 125°, latitude 49° 15′ to 49° 30′), Vancouver Island.

H. Gabrielse continued geological mapping of the McDame Creek area (longitude 128° to 130°, latitude 59° to 60°).

E. Hall continued his work at Columbia River dam-sites, examining and correlating drill cuttings and cores for the Dominion Water and Power Bureau.

J. W. Hoadley completed geological mapping of the Zeballos area (longitude 126° 30′ to 127°, latitude 49° 45′ to 50°).

J. A. Jeletzky continued detailed stratigraphic studies of the fossiliferous Mesozoic formations along the northwest coast of Vancouver Island.

A. G. Jones continued geological mapping of the Revelstoke area (longitude 118° to 119°, latitude 50° to 51°).

B. A. Latour visited various coal areas and held interviews with Provincial authorities in an effort to obtain information that would assist in more complete computation of the coal reserves of the Province.

G. B. Leech commenced geological mapping of the St. Mary Lake area (longitude 116° to 116° 30′, latitude 49° 30′ to 49° 45′).

H. W. Little continued geological mapping of the Nelson area (longitude 117° to 118°, latitude 49° to 50°).

J. E. Reesor commenced geological mapping of the Dewar Creek area (longitude 116° to 116° 30′, latitude 49° 45′ to 50°).

J. A. Roddick commenced geological mapping of the Coquitlam area (longitude 122° 30′ to 123°, latitude 49° 15′ to 49° 30′).

H. W. Tipper continued geological mapping of the Nechako area (longitude 124° to 126°, latitude 53° to 54°).

Publications of the Geological Survey

The following reports relating to British Columbia published by the Geological Survey were received by the British Columbia Department of Mines during 1950:—

- Paper 50-9: Preliminary Map, Zeballos, British Columbia, by J. W. Hoadley.
- Paper 50-19: Salmo Map-area, British Columbia, by H. W. Little.
- Paper 50-37: Stratigraphy of the West Coast of Vancouver Island between Kyuquot Sound and Esperanza Inlet, British Columbia, by J. A. Jeletzky.
- Geological Survey Bulletin No. 16: The Groundhog Coalfield, British Columbia, by A. F. Buckham and B. A. Latour.

MINES BRANCH

The Mines Branch has branches dealing with mineral resources, mineral dressing and process metallurgy, physical metallurgy, radioactivity, and fuels and explosives. Publications of the Mines Branch pertaining to British Columbia received in 1950 include tabular pamphlets dealing with coal mines, gold mines, stone quarries, petroleum refineries, and milling plants in Canada, and the reports listed below:—

- Mines Branch Special Report 828: The Mining Laws of Canada, by Arthur Buisson.
- Mines Branch Special Report 829: The Canadian Mineral Industry in 1948.
- Memorandum Series 107: The Peat Moss Industry in Canada, by A. A. Swinnerton.
- Memorandum Series 108: Notes on Antimony Deposits and Occurrences in Canada, by W. R. McClelland.
- Memorandum Series 109: Determination of Uranium in Ores, Review of Chemical Methods, by F. T. Rabbitts.
- Memorandum Series 111: Recent Investigations into the Beneficiation of Canadian Gypsum, by A. R. MacPherson.

The Mineral Dressing and Process Metallurgy Division investigates the milling of ores and industrial minerals from many deposits and also tests clays and other ceramic materials. In addition to the results of tests on samples of clays submitted by the British Columbia Department of Mines, the Department has received the following reports on work performed by the Mineral Dressing and Process Metallurgy Division, in 1950, on British Columbia ores:—

Investigation No.	Title
MD2581.	Flotation Concentration Tests on a Sample of Lead-Zinc Ore from the Cronin Babine Mines Limited, Smithers, B.C.
MD2622.	Recovery of Copper, Cobalt, and Gold from an Arsenical Concentrate from Kelowna Exploration Company, Nickel Plate Mine, Hedley, B.C.
MD2640.	Table Concentration and Flotation Tests on a Sample of Silver-Lead-Zinc Ore from the Highland Bell Mine at Beaverdell, B.C.
MD2725.	Jigging and Flotation Tests on a Lead-Zinc Ore from Violamac Mines Limited, New Denver, B.C.

Metal-mining (Lode)

CONTENTS

DRAWINGS

GENERAL REVIEW

The quantity of ore mined, the quantity of each metal and its value, the average number employed, for 1950 and preceding years, and other data are tabulated under " Statistics," in the section that begins on page 13. The tables are listed on page 5.

During 1950 there were further advances in the price of all metals except gold. The prices for copper, lead, and zinc rose materially in the second half of the year after the outbreak of hostilities in Korea in July. The price of zinc reached an all-time high; the price of copper rose to the highest level since 1917. The high prices stimulated search for new base-metal properties and accelerated the development of known ones, some of which had lain idle for years.

Gold, silver, copper, lead, and zinc produced at British Columbia lode mines in 1950 had a gross value of $121,635,457. The total quantity of ore mined amounted to 6,782,912 tons and came from 112 mines, of which fifty-eight produced 100 tons or more. The average number employed in the lode-mining industry in 1950, including mines, concentrators and smelters, was 10,822.

In 1950 twenty-four mills were operated; of these, Highland Bell and Violamac came into production for the first time, and Sheep Creek was closed. At the year-end mills were being operated at only seven* gold mines, and economic conditions were becoming increasingly difficult for gold-mining. Kelowna Exploration Company Limited brought the Oregon claim (French mine) into production, trucking 2,740 tons of ore to the company's mill at Hedley. A sink-float plant was put into operation at the Whitewater mill and construction was started on one near Sandon, both to treat ore from mines and old dumps in the Slocan area. Of the mills in operation, five accepted ore on a custom basis. Roasting and cyanidation of gold-bearing concentrates was undertaken at the Polaris-Taku, the first time this practice has been adopted in British Columbia. At the end of 1950, mills were being built at the Silver Giant, Cork Province, and Yale Lead & Zinc properties.

The principal producer of silver, lead, and zinc is the Sullivan mine, whose concentrates are shipped to the company's smelter at Trail. The Trail smelter recorded custom receipts of 15,922 tons of crude ore from eighty-four properties in British Columbia. It also recorded the receipt of 17,833 tons of lead concentrates and 73,523 tons of zinc concentrates. Shipments to the Tacoma smelter included the copper concentrates produced at the Britannia and Copper Mountain mines, and gold-bearing concentrates from the Polaris-Taku, Bralorne, and Nickel Plate mines. Crude ore was shipped to the Tacoma smelter from the Cambrian Chieftain and the Little Billie. Lead concentrates from Silbak Premier went principally to the smelter at East Helena, but a small quantity went to Tacoma.

Exploration and development were carried on in many parts of the Province, notably at the Sunloch- Gabbro property, Southern Vancouver Island, in the Pend d'Oreille-Salmo and Slocan-Ainsworth areas, at the Mastodon property north of Revelstoke, and near Hazelton. After many years of inactivity, work was resumed at the Rocher Déboulé copper property near Hazelton and the Estella silver-lead-zinc property near Wasa.

The Consolidated Mining and Smelting Company continued underground development work at the Big Bull and Tulsequah Chief properties near Tulsequah, at the Bluebell near Riondel, and at the H.B. near Salmo. Shipments of ore were recorded from the latter. The company also continued with its diamond-drilling programme at the Big Ledge property on Pingston Creek.

Few new discoveries were recorded, but more reverted Crown-granted claims were leased than in previous years, thus indicating a renewed interest in properties that had lain idle for varying periods.

* Includes Silbak Premier, where the value of silver, lead, and zinc combined exceeded that of gold.

Because of materially increased prices, interest was aroused in several magnetite deposits chiefly to provide iron ore for export.

To facilitate the search for properties, The Consolidated Mining and Smelting Company established an exploration office in Prince Rupert, Kennco Explorations (Canada) Limited opened an office in Prince George, and Hudson Bay Mining and Smelting Company maintained a base at Teslin Lake.

In addition to long-established methods, chemical testing of soil samples and of tree samples, to detect the presence of copper and zinc, was applied in prospecting areas covered by overburden.

Helicopters were used for the first time in the Province for exploration and for transportation of supplies and personnel. Helicopter Exploration Company Limited used a helicopter to inspect ground, carry prospectors, and service camps. Rico Copper Mines Limited used a helicopter to transport supplies and personnel to their upper camp.

Recent improvements in mining practices are being widely adopted. The use of tungsten carbide bits spread rapidly and in many mines light air-leg rock drills were used in preference to the heavier leyners and stopers which have been standard equipment for many years. Recently developed, short-period delay electric blasting-caps have also been introduced.

NOTES ON METAL MINES

ATLIN (59° 133°)*

Helicopter Exploration Co. Ltd. Company office, 844 Hastings Street West, Vancouver. Karl J. Springer, president. This company pioneered a new type of prospecting in the Atlin district during the 1950 field season. A Hille 360 helicopter was used for transportation and for close inspection of geological features in mountainous areas otherwise difficult of access. The company reports that the helicopter proved good for reconnaissance and geological mapping, for short hauls, and for transportation over difficult terrain. Disadvantages reported were the short operational range and the small pay-load. D. M. Cannon was in charge of a crew of eight men.

Gold

Golden View† (59° 133° N.W.) Eight Golden View claims are recorded in the name of N. Matson. Adjoining these on the west, south, and east are nine claims held by Transcontinental Resources Limited, and south of these are four claims held by L. G. White. These claims are on the lower part of the slope on the south side of Little Spruce Creek. Showings about 1½ miles southwest of Spruce Creek at an altitude of about 3,900 feet were being explored in 1950. A trail that leaves Spruce Creek, about 100 yards below the mouth of Little Spruce Creek, extends about 3 miles southerly to the showings.

Prospectors looking for sources of the placer gold of Atlin district creeks early in this century found quartz veins in the valley of Little Spruce Creek and explored some of them by shafts and adits. The presence of old claim posts and evidence of old trenches near the showings suggest that most of the veins now being explored on the Golden View claims were found at that time. In the summer of 1949 Mr. Matson found outcrops of quartz veins containing visible gold and started trenching to explore the veins. He continued this work in 1950.

Tan and green rocks near the veins are altered rocks near the contacts between a massive greenstone series and some serpentinized intrusives. Most of the minerals have been replaced by carbonate. Much silica has also been introduced, and quartz veins as much as an inch wide are very common.

Small flakes of native gold are found in specimens from what is called the Main vein which is exposed in one pit. This zone, strike northwesterly and dip southwestward, consists of several nearly parallel veins of white, grey, and watery-looking quartz in a sheared zone 1 foot wide. The veins contain small flakes of malachite, azurite, and a dark metallic mineral. The wallrock of the zone and between the veins is altered carbonate rock. A sample taken across the zone where it is 9 inches wide assayed: Gold, 0.52 oz. per ton; silver, 0.76 oz. per ton. Numerous faults cut the rocks at this point, and the zone appears to be displaced by one of them.

About one claim-length to the southeast are two trenches about 90 feet apart, in which is exposed a vein zone, nearly on the strike of the Main vein. This vein also strikes northeasterly but dips southeastward. From one trench, a sample taken across the zone where it is 20 inches wide assayed: Gold, 0.25 oz. per ton; silver, 0.2 oz. per ton. Another sample taken across the vein where it is 14 inches wide assayed: Gold, 0.04 oz. per ton; silver, 0.1 oz. per ton.

A second vein zone about 500 feet north of the Main vein can be followed in ten trenches for about 200 feet. This zone, strike northwest and dip southwest, consists as a rule of two quartz veins each generally less than 6 inches wide separated by as much as

* By F. J. Hemsworth, except as noted.
† By J. M. Black.

2 feet of carbonate rock. The quartz contains small grains of chalcopyrite. Four samples were taken from this zone, including the wallrock between the veins. Samples Nos. 1 and 2 from near the southeast and Samples Nos. 3 and 4 toward the northeast assayed as follows:—

Sample No.	Width	Gold	Silver
	Inches	Oz. per Ton	Oz. per Ton
1	24	0.02	Trace
2	36	0.01	Trace
3	18	*Nil*	*Nil*
4	16	0.01	Trace

About a claim-length south of the Main vein are two quartz veins about 300 feet apart. These strike west-northwesterly and dip steeply northeastward. One of these is as much as 10 inches wide and a sample from it, where it is 8 inches wide, assayed: Gold, 0.14 oz. per ton; silver, *nil.*

Boulder Creek (59° 133° N.E.)

Tungsten

Black Diamond

The Black Diamond group of four claims is held by N. S. Fisher and O. Olsen, of Atlin. The property is on the west side of Boulder Creek, 3 miles north of Surprise Lake and 16 miles by motor-road from the town of Atlin. The claims cover a rectangular area that has its northeast corner near the Boulder Creek dam and extends up a gently rolling slope between elevations of 4,000 and 4,600 feet. The property is above timberline, but there is a moderate supply of fair timber near Surprise Lake.

The tungsten mineralization occurs as wolframite and ferberite in a lenticular quartz vein which outcrops near the centre of the claims at an elevation of 4,300 feet. The vein strikes north 30 degrees east and dips 60 degrees to the west, and is exposed in six open-cuts over a distance of 230 feet. When examined in July, 1950, the open-cuts were partly filled, due to caving, but the vein appeared to be from 6 to 30 feet wide. Some granite is included in the latter width.

The claims were located in 1939 by MacLeod White, who was superintendent for The Consolidated Mining and Smelting Company of Canada, Limited, who were then placer-mining on Boulder Creek. Surface stripping and trenching were done in 1939, 1940, and 1941 on three showings, which were named the South, the North, and the Wolframite. The South showing is on ground now forming part of the Black Diamond group. The North showing is 1½ miles to the northeast at an elevation of 5,200 feet, and the Wolframite is 1½ miles to the north of the Black Diamond group at an elevation of 5,800 feet.

The first work done on the ground was in 1903 during the Atlin gold-rush. An open-cut was dug on the vein on the Black Diamond ground, and an 8-foot shaft was sunk on the vein on the North showing. At that time gold was the objective. In 1939 The Consolidated Mining and Smelting Company, while placer-mining on Boulder Creek, found wolframite with the placer gold in the sluice-boxes. The old workings were then examined and wolframite and ferberite were discovered in the quartz veins. In 1942 Fisher and Olsen leased the Boulder Creek Placers from the Consolidated Company. Some further stripping and trenching were done on the South vein, and in 1943 a small shipment of cobbed ore was made to the Prince Rupert Sampling Plant. This lot of 0.8985 ton assayed: Gold, 0.31 oz. per ton; tungstic oxide, 15.20 per cent*; and small percentages of tin, bismuth, lead, and copper. No other shipments have been made from the lode claims. In 1949 a quantity of black-sand concentrate from the placer clean-up

* *Minister of Mines, B.C.,* Ann. Rept., 1943, p. 52.

was reconcentrated in Atlin and yielded 3 tons of cleaned concentrate that was shipped to Derby and Co., Ltd., of London, England. The shipment included coarse concentrates that weighed approximately 1,300 pounds, and fine concentrates that weighed approximately 4,700 pounds. The coarse concentrates assayed: Tungstic oxide, 46.88 per cent; tin, 7.42 per cent. The fine sands assayed: Tungstic oxide, 49.01 per cent; tin, 10.75 per cent. The tungsten minerals recovered in the placer operation come from broken-down vein matter and are concentrated on the bedrock by stream action. The source of the tin is not known. It may have been a constituent of the igneous rocks of the area or of the veins or stringers of quartz.

Granite outcrops on Boulder Creek from the placer camp northward. The contact with the overlying Gold series of sediments and volcanics is about half a mile south of the South showing. The country rock adjacent to the vein is coarse-grained grey granite. A granite porphyry dyke outcrops 50 feet west of the vein. A similar dyke is exposed on the footwall side of the vein in the lower open-cuts. Wolframite and ferberite occur disseminated and in small masses throughout the vein quartz. Pyrite, chalcopyrite, and galena are scattered through the vein. The tungsten minerals appear to be concentrated on the hangingwall side.

Because the open-cuts were caved, no samples were taken by the writer. Twenty samples taken by The Consolidated Mining and Smelting Company engineers in 1941, over a length of 230 feet and across an average vein width of 9.3 feet, indicated an average grade of 0.60 per cent tungstic oxide.*

McDAME CREEK (59° 129° S.W.)†

Gold

Davis

This property, owned by Gerald Davis, of Wrangell, Alaska, is on the south side of upper McDame Creek, close to the east end of McDame Lake. Several quartz veins, striking east and dipping vertically, are exposed by surface cuts. The veins are from 2 to 3 feet wide and consist mostly of milky quartz, but narrow bands of pyrite and marcasite occur, usually along the walls. In places the sulphides are leached, leaving rusty, vuggy quartz. The vugs often contain visible gold.

During the summer of 1950 Gerald Davis built a bridge across upper McDame Creek and transported a 5-ton mill, a Lister diesel engine, and other equipment to the property. It is reported that he mined and milled some ore during the winter.

TAKU RIVER (58° 133° N.W.)†

Gold

Polaris-Taku (Taku River Gold Mines Ltd.)

Company office, 1500 Royal Bank Building, Vancouver; mine office, Tulsequah. W. B. Milner, president. G. W. Robinson, manager, was transferred from the mine to the Vancouver office in November, 1950. He was succeeded by P. W. MacMillan, acting manager, who in turn was succeeded by J. A. Willcox as resident manager. Alaska Coastal Airways carries passengers and express to the property by aeroplane from Juneau, Alaska. Freight is brought in from Taku Arm by river boat during the summer months.

The mine was operated continuously throughout the year. Ore broken amounted to 87,670 tons; 12,212 tons from development, 9,405 tons from stope preparation, and 66,053 tons from stoping. Shrinkage stoping produced 57,580 tons, and open stopes 8,473 tons. Oreshoots on the eastward extension of the "B" vein, on the 450 and 600 levels, were the main source of ore during the year.

* Unpublished report on Tungsten group, by MacLeod White, P.Eng.
† By F. J. Hemsworth.

For 1950, development footage was 6,256 feet (5,200 feet lineal advance and 1,056 equivalent feet of slash), consisting of 3,987 feet of drift, 73 feet of crosscut, and 2,196 feet of raise. Total diamond drilling was 17,733 feet, of which 1,258 feet was drilled from the surface and 16,475 feet from underground.

Early in 1950 a report of the mine was prepared by Alex. Smith, geologist. The work done for this report included a complete relogging of all diamond-drill core and geological mapping of all the mine workings. From this information a revised set of geological maps was made and an exploratory diamond-drill programme planned.

The flotation mill was operated continuously throughout 1950, treating 95,667 tons of ore and producing 10,566 tons of concentrate with a gross content of 35,904 ounces of gold.

The 20-spindle Edwards roaster and accompanying cyanide plant, which were run for a short test period in 1949, were operated from September, 1950, after some additions and changes in the equipment and circuits were made. At the end of the year the roaster was treating just over 8 tons of concentrate per day. This is only a quarter to a third of the concentrates produced in the flotation plant. The concentrate has a sulphur content of 20 to 21 per cent, which is not quite sufficient to maintain the roast without using some oil. The oil consumption has been reduced by increasing the pyrite content of the feed and keeping it as high as is consistent with economic recovery in the flotation plant. Other changes that contributed to a saving in oil were the installation of dry, chromalloy rabbles in place of the water-cooled rabbles, and the addition of further insulation on the roaster.

The weight loss by the concentrate in passing through the roaster is usually about 25 per cent, which gives the calcine treated in the cyanide plant an assay of about 5 ounces of gold per ton. Some difficulties with the antimony in the cyanide circuit were anticipated but did not materialize. The concentrate seldom contains more than 2 per cent antimony, which is reduced to approximately 0.4 per cent in the washed calcine. The recovery of gold from the calcine in the cyanide plant has been from 90 to 92 per cent. Occasionally a higher or a lower recovery is made, depending upon the nature of the roast.

Production: Ore milled, 95,667 tons. Metal recovered, cyanide-plant recovery and gross content of concentrates shipped: Gold, 33,228 oz.; silver, 1,182 oz.; copper, 23,759 lb.

Gold-Silver-Copper-Lead-Zinc

Big Bull (The Consolidated Mining and Smelting Company of Canada, Limited)

J. C. MacLean, superintendent. The mine is on the north side of the Taku River, 5 miles east by road from the Polaris townsite. In 1950 development work was carried out from the new shaft on two levels, 150 feet and 300 feet below the adit level. Total advance for the year was 3,752 feet, consisting of 2,595 feet of drift, 633 feet of crosscut, 471 feet of raise, and 53 feet of subdrift. Diamond drilling totalled 6,580 feet, all from underground stations. Work was carried on throughout the year. The number of men employed averaged forty-three.

A pile trestle bridge across the Tulsequah River was washed out in the flood and a new one of more substantial construction was built.

Tulsequah Chief (The Consolidated Mining and Smelting Company of Canada, Limited)

J. C. MacLean, superintendent; Rod Douglas, resident engineer. The Tulsequah Chief is on the east side of the Tulsequah River, 4 miles north of Polaris townsite. In 1950 work was started in May, and development was carried on continuously for the remainder of the year. A new low-level adit, named the 5400 tunnel, was driven 2,395 feet. This adit crosscut is 500 feet lower and 300 feet north of the 5900 tunnel. Diamond drilling totalled 632 feet. A new dry, power-house, and blacksmith-shop were constructed. The average number of men employed was seventeen.

Copper

B.W.M.

The B.W.M. copper property, owned by George Bacon and Ralph Wolverton, consists of eleven claims, the B.W.M. Nos. 1 to 11, divided into two groups, the Bacon group, and the Daisy group. The claims are on the upper slopes of a mountain that rises above the north side of King Salmon Lake, in the Taku River area of the Atlin Mining Division. King Salmon Lake, at the head of the south fork of the King Salmon River, is about 1,800 feet above sea-level and is about 2 miles long and a quarter of a mile wide. The lake is a good landing site for aircraft with floats and, by air, is about 30 miles from Tulsequah and about 80 miles from Atlin.

The mountains on the north and south sides of the lake reach elevations of around 5,000 feet. The slopes are fairly steep, but the country is not as rugged as the area to the west. The slopes are wooded with small spruce and jack pine. Timberline is at about 4,000 feet elevation.

A good pack-trail has been built from the north side of the lake to the showings, a distance of about 2 miles. The trail switchbacks up the mountain to a flat, at 4,000 feet elevation, where a tent camp had been erected beside a small stream. The claims are on a knoll at the top of the mountain, between elevations of 4,000 and 4,500 feet.

The easiest means of access to the B.W.M. property is by aircraft to King Salmon Lake, but it may be reached from Tulsequah by river boat for 20 miles up the Taku River to the mouth of its tributary, the King Salmon River, thence by trail 20 miles to the property. The Taku River is navigable for small, flat-bottomed power-boats during the summer months. Another route is overland from Telegraph Creek, a distance of about 125 miles. The construction of a road from Tulsequah, Atlin, or Telegraph Creek would be a difficult and costly undertaking.

Most of the area covered by the claims is underlain by green volcanic rock, probably an andesitic tuff. This greenstone has been intruded by granitic stocks of the Coast Range Intrusives. The granite outcrops as small hills and knolls. Both the greenstone and the granite are cut by younger feldspar porphyry dykes.

The greenstone shows some carbonate and chlorite alteration but is too fine grained to be further identified in the field. At the top of the mountain, the greenstone has been eroded until only a thin layer remains overlying the granite. At lower elevations the layer of greenstone becomes progressively thicker.

Quartz stringers, mineralized with chalcopyrite, cut the greenstone and altered granite over a large area. The quartz is vuggy, with calcite, limonite, and chalcopyrite filling the vugs. The iron oxide (limonite) gives the outcrop a distinctive rusty colour so that the surface boundaries of mineralized areas are readily observed. The outcrop, a rusty zone, is about 1,500 feet long and ranges in width from about 70 to 350 feet. The zone is shaped like a boot, with the toe pointing uphill on a general strike of north 50 degrees west.

George Bacon and Ralph Wolverton discovered the large, rusty-coloured outcrop and located the claims while prospecting for The Consolidated Mining and Smelting Company in 1947. Some trenching and sampling were done that summer, but the ground was allowed to lapse. In 1949 the showing was relocated by Bacon and Wolverton. In June, 1950, Hudson Bay Exploration and Development Company optioned the property. Supplies and a diamond drill were flown to King Salmon Lake from the company's head-quarters at Teslin, Y.T. Pack-horses were brought overland from Telegraph Creek, and camps were established at the lake and at the claims. Some surface prospecting was done and two holes were drilled. Nine hundred and forty-three feet of drilling had been completed when a forest fire burned over the area, destroying the base camp and interrupting the work. The core recovered from the diamond-drill holes showed fewer quartz stringers and less copper mineralization than had been expected. After the fire had burned out, the company removed the equipment and dropped the option.

Two series of trenches have been dug to crosscut the surface of the outcrop. The A series comprises three cuts: A-1 is 90 feet long, A-2 is 10 feet, and A-3 is 30 feet. These cuts were started from the west side at the upper end of the outcrop. From the east end of A-3, similar mineralization, which was not trenched, continues for 150 feet to the eastern extremity of the outcrop. At the time of the examination, parts of the trenches were caved, but chip and grab samples were taken to determine the nature of the mineralization. The samples were small and should not be considered representative of the average for the orebody.

A sample from the 90-foot width exposed in trench A-1, which shows greenstone cut by quartz stringers carrying chalcopyrite and limonite, assayed: Gold, *nil;* silver, 0.4 oz. per ton; copper, 0.9 per cent. A sample from the 40-foot width exposed by trenches A-2 and A-3 assayed: Gold, *nil;* silver, 0.4 oz. per ton; copper, 0.4 per cent.

The B series of trenches extends from the west side, across the lower part of the outcrop, near the narrowest part of the showing, about 500 feet from the A series. A sample along the trench, across a width of 30 feet, assayed: Gold, *nil;* silver, 0.1 oz. per ton; copper, 0.6 per cent. From the end of the section sampled to the other wall of the mineralized zone measured 100 feet, making a total width of 130 feet at this point.

Two diamond-drill holes were drilled from the east edge of the outcrop, on a bearing of south 70 degrees west, to crosscut the mineralized zone. No. 1 hole, 425 feet long, was about halfway along the outcrop, just north of the B trenches, and was inclined downward to the west at an angle of 50 degrees. No. 2 hole, higher up the hill, just below the A trenches, was drilled to a depth of 518 feet, inclined 45 degrees downward on a bearing of south 70 degrees west.

PORTLAND CANAL*

Tide Lake (56° 130° S.E.)

Gold-Silver

East — The property is owned by Julia K. Phillips and was worked by A. A. Phillips and associates of Stewart. The claims are 1 mile north of Tide Lake. Access from Stewart is by motor-road for 19 miles to the Big Missouri camp-site, thence by the Forty Nine Trail for about 15 miles to the property.

A complete description of the geology and the mine workings may be found in the Annual Report of the British Columbia Minister of Mines for 1946, pages 68 to 72.

In 1950 new work consisted of 100 feet of drifting and 35 feet of stoping. Some additional discoveries of rich pockets of high-grade ore were made. Ore was trammed to the portal, where it was washed and sorted. Large pieces of electrum were pounded off with a hammer and placed in 5-gallon cans. The remainder of the ore was sacked and packed by horses to the Big Missouri camp; from there it was trucked to the dock at Stewart. The 5-gallon cans were packed to Summit Lake and flown to Stewart.

Owing to the steepness of the hillside adjacent to the portal, there was no storage space for broken ore, and most of the fines have been lost in the dump. It is planned to attempt to provide ore storage space next summer.

Production: Ore mined, 18 tons. Gross content: Gold, 791 oz.; silver, 1,677 oz.; lead, 651 lb.; zinc, 334 lb.

Salmon River (56° 130° S.E.)

Gold-Silver-Lead-Zinc

Silbak Premier Mines Limited — Company office, 911 Birks Building, Vancouver; mine office, Premier. D. L. Pitt, managing director; J. C. McCutcheon, manager; S. F. MacDonald, mill superintendent; A. Kirby, Jr., mine superintendent. J. C. McCutcheon resigned in October, 1950, and S. F. MacDonald acted as manager for the remainder of the year.

* By F. J. Hemsworth.

The mine was worked 305 days in 1950. The main development consisted of exploration adjacent to existing workings, and some drifting easterly and northerly from the present workings. Development footage totalled 6,083 feet, consisting of 2,060 feet of drifts, 1,296 feet of crosscuts, and 2,727 feet of raises. Drifting and raising from the various stopes was classified as ore-breaking, and is not included in the foregoing development footages.

Diamond drilling was the most important means of prospecting for new orebodies. During the latter part of the year two machines were worked on two shifts, and additional short holes were drilled with an X-ray machine. The total diamond-drill footage was 28,388 feet. Several small orebodies were found.

An average of 250 tons per day throughout the year was milled in the Premier mill.

Production: Ore milled, 79,167 tons.* Gross content of concentrates shipped: Gold, 16,246 oz.; silver, 133,754 oz.; lead, 3,164,172 lb.; zinc, 3,266,623 lb.; cadmium, 34,647 lb.

Indian Mines (1946) Ltd. Company office, 709 Credit Foncier Building, Vancouver. T. E. Blossom, secretary. The Indian mine is on the west side of Cascade Creek, across the valley from the Premier mine. An agreement was reached whereby Silbak Premier will mine and mill ore from the Indian property. The Silbak Premier company is to receive a management fee and a percentage of the profits.

The construction of a 2-mile aerial tram-line, between the two mines, was almost completed in 1950. The lower terminal and all the towers on the line were erected. It is planned to complete the tram-line in the spring of 1951. Ore from the Indian mine is to be transported over the tram-line and treated at the Premier mill.

Silver-Lead-Zinc

Silver Tip (Silver Tip Gold Mines Limited) Company office, 211 Pemberton Building, Victoria; mine address, Stewart. George Winkler, managing director. The Silver Tip group consists of eight mineral claims, six Crown-granted and two held by location. The claims adjoin Silver Creek and Williams Creek, on the south slope of Mount Dilsworth, 21 miles north of Stewart. From the Big Missouri camp-site on Joker Flats, the trail, 1½ miles long, leads to the Silver Tip cabin at an elevation of 3,450 feet.

Development work has been done intermittently at this property for over thirty years. Most of the early work was done on a shear zone (the Butte Zone) on the Bella Coola claim. Here a series of quartz porphyry dykes intrudes sheared tuffs with erratic mineralization along slip planes adjacent to the dykes.

In recent years work has been concentrated on a series of narrow quartz-carbonate veins that outcrop adjacent to Silver Creek. The veins, striking easterly and dipping toward the south at 30 to 40 degrees, are in fractures in silicified tuffs and locally contain short concentrations of sulphide mineralization. Open-cuts have been made on the Silver Creek vein, on the west side of Silver Creek, and on the May P.J. vein on Porphyry Creek, a tributary entering Silver Creek from the east.

In 1949 ore from the surface open-cut on the May P.J. vein was sorted and sacked and was shipped to the Trail smelter. The shipment amounted to 9.3 tons and contained: Gold, 4 oz.; silver, 693 oz.; lead, 3,070 lb.; zinc, 4,328 lb.

Underground workings on the May P.J. vein consist of a 240-foot crosscut to the vein and a drift on the vein to the east. The crosscut portal is at an elevation of 3,500 feet and is 95 feet lower than the surface outcrop.

In 1950 the drift to the east on the May P.J. vein was continued and 190 feet of drifting and crosscutting were completed. Near the close of the season a cross-vein was intersected and was followed a short distance in a drift. This cross-vein, which strikes

* This includes 7,629 tons of ore mined in Premier Border mine.

north 60 degrees east, is probably an extension of the Blind vein which was cut in the crosscut tunnel 60 feet from the portal.

The development was contracted by three hand-steel miners under the direction of W. R. Tooth.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1947, p. 82.]

Gold-Silver-Lead

Unicorn Mines Limited Company office, 475 Howe Street, Vancouver. John Hovland, managing director. The Unicorn workings are 19 miles by road and half a mile by trail north of Stewart. In 1950 No. 3 tunnel was advanced 30 feet to a point 600 feet from the portal. This tunnel is being driven parallel to and a short distance east of the Unity shear zone. Three short crosscuts to the west from the tunnel have cut the Unity zone. The zone has an indicated width of 20 feet and is irregularly mineralized with pyrite and a small amount of galena. These sulphides are reported to carry a little gold and silver. The company plans to extend No. 3 tunnel to cut the "A" zone and to explore the intersection of the two shear zones.

BEAR RIVER (56° 129° S.W.)

Gold-Silver

Red Cliff Yale Lead & Zinc Mines Limited diamond drilled the Red Cliff group during the summer of 1950. The claims are on the west side of the Bear River, near the mouth of American Creek. The trail, 2 miles long, joins the Bear River road 12 miles from Stewart. The showings consist of shear zones containing silicified volcanic rock mineralized with pyrite. In 1940 a shipment of 34 tons of ore contained 82 ounces of gold and 36 ounces of silver. In 1950 about 2,000 feet of diamond drilling was done. A number of short holes were drilled on the upper showing on the north bank of Lydden Creek. A crew of eight men was employed under the supervision of Jack McBeth.

Silver-Lead-Zinc-Copper

Heather and Enterprise (George Enterprise Mining Company) Company office, Pemberton Building, Victoria. W. B. George, manager. The property consists of two groups of claims, the Heather group on the south side of the Bear River and the Enterprise group on the north. The property is 8 miles by trail and 12 miles by road from Stewart. In 1950 Mr. and Mrs. W. B. George and two men continued development work. On the Heather group, trails were cut and the tunnel was extended 17 feet to a total length of 50 feet from the portal. Above the tunnel three open-cuts were excavated. On the Enterprise group two open-cuts were dug.

Silver-Lead-Zinc

Big Four Silver Mines Ltd. Angelo Bugnelli, John Lehto, and Dave Menechello sorted and shipped ore from the Prosperity mine dumps. The ore was packed by horses down the Marmot River trail to the wharf at Marmot Bay. Production: Ore shipped, 28 tons. Gross content: Silver, 7,418 oz.; lead, 11,558 lb.; zinc, 10,425 lb.

MARMOT RIVER (55° 129° N.W.)*

Gold-Silver-Lead-Zinc

Gold Drop (Gold Drop Mines Limited).—J. O. LeFrançois, manager. The Gold Drop group is south of the Marmot River, about 2½ miles by tractor-road from the

* By F. J. Hemsworth.

Marmot wharf. In 1950 a tunnel was driven 17 feet on the Key vein on the Telluride No. 1 claim. Six men were employed for part of the season.

ALICE ARM*

Silver-Lead

Torbrit Silver Mines Limited (55° 129° N.W.) Registered office, 309 Royal Bank Building, Vancouver; executive office, 350 Bay Street, Toronto; mine office, Alice Arm. G. B. Tribble, manager; A. M. Cormie, mine superintendent; R. W. Burton, mill superintendent. Capital: 3,000,000 shares, $1 par value. The Torbrit camp and mill are on the west bank of the Kitsault River, 17 miles by road from the town of Alice Arm. The 1000 level or main haulage level of the mine is connected to the mill by a narrow-gauge railway 3,200 feet long. Silver, lead, and zinc are recovered in a flotation concentrate, and additional silver recovered in the cyanide section of the mill is refined and shipped to the market as bullion.

In the mine, ore broken totalled 142,226 tons. Most of this ore was mined from shrinkage stopes on the 1000 and 1150 levels, but some was recovered from pillars above the 1300 level. For pillar recovery 40-foot holes were drilled with leyner machines and tungsten-carbide bits attached to sectional steel.

The following is a summary of the work done during 1950:—

Level	Advance	Ore	Waste
Drifting	Feet	Tons	Tons
1000	641	4,102	2,819
1150	8	118	———
1300	35	257	———
Total drifting	684	4,477	2,819
Raising			
1000	217	221	2,986
1000–1150 shaft raise	96	———	1,457
1150	220	608	———
1300	———	———	———
Total raising	533	829	4,443
Stope Drifting			
1000	335	1,667	40
1150	12	40	———
1300	———	———	———
Total stope drifting	347	1,707	40
Stope Raising			
1000	1,502	3,823	246
1150	127	436	———
1300	———	———	———
Total stope raising	1,629	4,259	246
Stoping			
1000	———	85,894	———
1150	———	40,773	———
1300	———	4,287	———
Total ore stoped	———	130,954	———
Total development	3,193	———	———
Total ore broken	———	142,226	———
Total waste broken	———	———	7,548

Total diamond drilling for the year was 3,970 feet, all drilled from the 1000 level.

A new shaft was raised from the 1000 level to the surface. The shaft was enlarged and timbered for three compartments. A headframe and a hoist-room were erected,

* By F. J. Hemsworth.

and a 53- by 36-inch double-drum electric hoist was installed. At the end of the year, preparations were complete for sinking, with the object of developing two new levels below the main-haulage tunnel.

Other new work included an addition to the dam on Clearwater Lake designed to double the water-storage capacity, at the source, of water for power-plant operation; further snowshedding between mine and mill; and the installation of a new 45-horse-power heating boiler.

During 1950 the quantity of ore milled averaged 357 tons per day. Change in the reagent used resulted in improvement in the recovery of silver and lead and in the grade of silver-lead concentrate produced. Experimental work is being continued, and there are indications of a further improvement in recovery. In March, 1950, four scavenger cells were added to the flotation circuit to enable it to handle peak loads of 400 tons per day.

Production: Ore milled, 130,290 tons. Flotation concentrates amounting to 4,032 tons were shipped to the Trail smelter, and additional silver amounting to 350,076 ounces was sold as bullion. Gross content of concentrates and bullion shipped: Silver, 2,293,238 oz.; lead, 1,004,194 lb.; zinc, 190,852 lb.

Galena

(55° 129° N.W.) The claims lie on the east side of the Kitsault valley, 1 mile from the Kitsault River tractor-trail. The trail to the property branches off the main trail at a point 3 miles north of the Torbrit shaft. In the fall of 1950 an option was taken on the Galena and Galena No. 1 claims by W. E. McArthur, Jr., and T. McArthur. Some surface stripping, trenching, and sampling were done.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1948, p. 75.]

OBSERVATORY INLET (55° 129° S.W.)*

Copper

Anyox (The Consolidated Mining and Smelting Company of Canada, Limited).—During the summer of 1950 five men were employed for two months doing detailed geological mapping of the surface and studying the old workings on the Hidden Creek property at Anyox.

MAYO MOUNTAIN (54° 128° N.W.)†

Gold-Silver-Lead-Zinc

Beaver

The Beaver group of seven claims, owned by S. R. Ling and L. W. Jorgensen and in 1950 optioned to Lake Expanse Gold Mines Limited through D. M. Cannon, is on Mayo Mountain northwest of Terrace. Exploration work was in progress on these claims in July, 1950, under the direction of H. M. Mather.

Access to the property is from the north end of Kitsumgallum Lake by a logging-road running northerly for about 2 miles to a small pole camp and thence by trail across the Little Beaver River and up its valley for about 4 miles from the camp. The trail then climbs very steeply to the top of the ridge and follows the top of the ridge westerly to the claims. The total distance from the pole camp is about 9 miles.

The claims are on the ridge of Mayo Mountain, and the workings are in a saddle just east of the highest point on the mountain. In July, 1950, a vein had been traced by open-cuts for about 1,000 feet. It is in sedimentary rocks of the Hazelton group; the strike of these rocks is about north 35 degrees east and the dip is about 40 degrees to the south. Tuff, argillite, and quartzite were observed. Within a mile southwesterly from the western

* By F. J. Hemsworth.
† By J. H. Bennett.

end of the workings, numerous grey dykes can be seen, and what appear to be masses of granitic rock.

The average strike of the vein is north 80 degrees east, and the dip about 75 degrees northerly. The vein filling is quartz, well mineralized with arsenopyrite, galena, and, in places, sphalerite. Spectrochemical analysis of the sphalerite showed an appreciable content of cadmium. The wallrock is not mineralized and shows little alteration.

The vein, in the open-cuts, varies in width from 18 to 24 inches; the average width is close to 24 inches. One shaft has been sunk 22 feet, about midway along the workings. Ladders had been removed, and the shaft could not be entered, but it could be seen that the vein is narrower in the bottom of the shaft than on surface. All the way down to the bottom the vein is well mineralized with arsenopyrite and galena.

Three samples were taken along the vein in the open-cuts. Results are tabulated below:—

Sample No.	Width	Gold	Silver	Lead	Zinc
	Inches	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
1	24	0.22	0.3	0.5[1]	0.1[1]
2	24	0.49	16.6	3.9	Trace
3	19	0.22	3.4	2.3	*Nil*

[1] Spectrochemical results.

DORREEN (54° 128° N.E.)*

Gold-Copper-Lead-Zinc

Fiddler (Dorreen Gold Mines Limited) Company office, 553 Granville Street, Vancouver; mine office, Dorreen. Alex Mackenzie, president; P. E. Peterson, manager. In 1949 this company started construction of a 5-mile road to the property from Dorreen, a small town on the Canadian National Railway 125 miles east of Prince Rupert. In 1950 the road was completed and a flotation mill was constructed on Knauss Creek, a tributary of Fiddler Creek. The mill is about half a mile from the mine portal and will be connected to it by an aerial tramway and a truck-road.

The main vein is bedded and dips 30 degrees in argillaceous limestone. A description of the geology and underground workings may be found in the Annual Reports of the British Columbia Minister of Mines for 1916 and 1925 under the name "Fiddler group." No mining has been done since 1926.

During 1950, in preparation for mining, an air-line was laid from the 500-cubic-foot compressor, at the mill, to the mine portal. In addition to the usual mining equipment, a slusher hoist and scraper were purchased and will be used to move ore and waste in the 30-degree raises.

The mill is designed to treat 30 tons of ore a day. From the coarse-ore bin the ore will be fed through an 8- by 24-inch crusher to the fine-ore bin and from it to a 5- by 4-foot ball mill. The ball-mill discharge will flow through an hydraulic gold-trap to the classifier. The classifier overflow will pass over blanket tables to conditioner cells then to an 8-cell mechanical flotation unit and to a 10-foot Forrester-type flotation cell. There are four settling-tanks and a furnace for drying the concentrates. The mill has been completed except for concentrate storage bins and the concrete floor.

Power for mill machinery and air compression is supplied through individual Pelton-type water-wheels. The water-main, constructed of 12-inch diameter wood-stave pipe, is 2,500 feet long. The difference in elevation between the intake at the dam on Knauss Creek and the water-wheels is 220 feet.

* By F. J. Hemsworth.

Because of heavy snow and cold weather, construction was stopped at the end of November, 1950. The management decided to wait for more favourable weather to complete the aerial tram and mill. Production is planned for early in 1951. The average number employed was eight.

HAZELTON (55° 127° S.E. AND S.W.)*

Glen and Nine Mile Mountains Area

Silver-Lead-Zinc-Gold

Location and Access.—This report describes the geology and some of the mineral deposits of an area that includes the Silver Standard mine and numerous prospects. During two months of 1950 the writer mapped the area and investigated the orebodies at the Silver Standard mine. The area is in Omineca Mining Division, north of New Hazelton, and extends northeastward from the confluence of the Skeena and Bulkley Rivers to Shegunia River and the ridge that trends southward from the summit of Nine Mile Mountain.

New Hazelton is on the Canadian National Railway and on the highway between Prince George and Prince Rupert. Most of the area is fairly accessible by road (*see* Fig. 1). A narrow winding road extends from a highway near New Hazelton to the Silver Standard mine and a branch road goes up the valley of Two Mile Creek for several miles and passes within half a mile of the workings on the American Standard property. From the upper end of the branch road a trail leads to the prospects at the north end of Nine Mile Mountain. This trail follows the route of a former wagon-road, most of which would have to be rebuilt before it could be used for wheeled vehicles. A road extends across the southern part of the area and another road goes up the Skeena valley to Shegunia River.

History.—In this area, near what was to become the route of the Grand Trunk Pacific Railway, later the Canadian National Railway, prospectors started to search for new mines about the beginning of the century. Overburden effectively covers most of the area, and it was not until 1908 that veins were first found. These were near the top of Nine Mile Mountain above timberline, where rocks were well exposed. In 1909 veins were found on Four Mile Mountain. In 1910 a forest fire burned over a large part of the area, and veins were found on the southwest slope of Nine Mile Mountain and on Glen Mountain. It is from the veins found at that time on Glen Mountain that ore is now obtained. Exploration and development were started in 1910, and after the railway between New Hazelton and Prince Rupert was completed in 1913 ore was shipped from several properties.

Ore was shipped from the Silver Standard between 1913 and 1917, when a gravity mill was built on Two Mile Creek. The mill was operated during part of 1918, 1919, 1920, and three months of 1922. Some work was done at the mine in 1938 and 1947. The present company, Silver Standard Mines Limited, started exploration and development in 1947. A flotation mill was built in 1948 and has been operated continuously since September, 1948, except for a few weeks during the first winter when the waterlines froze.

From 1910 to 1918 the American Boy property was explored and developed, and from 1913 to 1916 ore was shipped to a smelter. From 1917 to 1918 ore was concentrated at the Silver Standard mill. Exploratory work was done in the years 1927 and 1937. In 1950 a new company, American Standard Mines Limited, started to explore the same veins.

Ore was shipped from the Silver Cup property on Nine Mile Mountain in the periods 1914 to 1916 and 1925 to 1927. In 1927 an aerial tramway was built, and a flotation

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

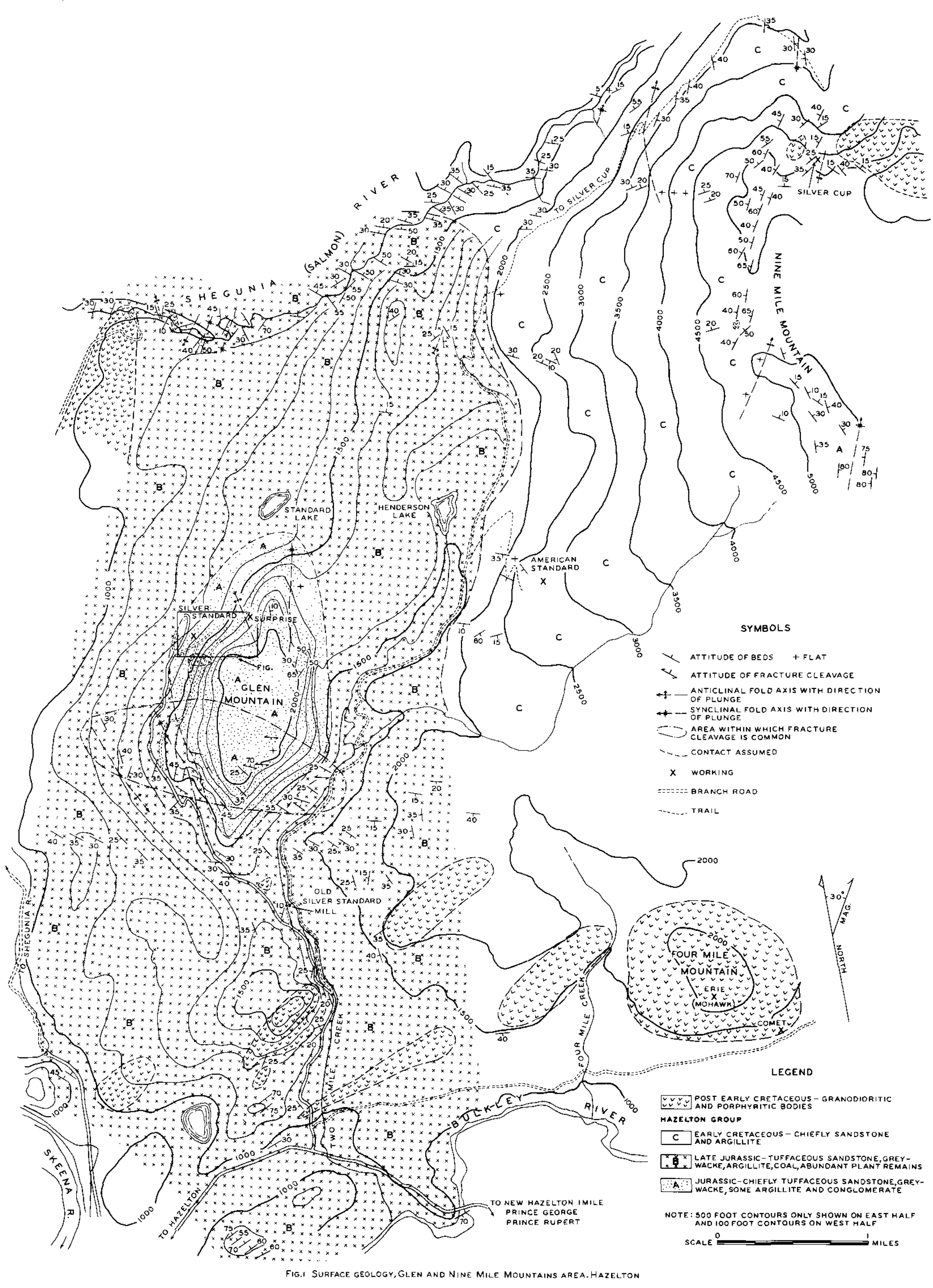

FIG. 1 SURFACE GEOLOGY, GLEN AND NINE MILE MOUNTAINS AREA. HAZELTON

mill completed in 1929 was operated for seven months of that year. The mine and mill were then closed. The mill was designed to recover a lead concentrate and a zinc concentrate, but low recoveries led to the use of a circuit that produced only a combined concentrate containing most of the lead and silver and much of the zinc. Some ore has been shipped since the mine was closed.

The veins on the Sunrise property, which adjoins the Silver Cup on the east, were explored after 1909, and some ore was shipped in 1915. Additional work was done on the surface and underground in 1920. In 1923 and 1927 a crosscut adit was driven to explore ground below some of the showings. In 1937 additional veins were found by stripping.

From the Lead King property, which is east of the Sunrise, 5 tons of ore was shipped in 1909. Since that time some of the veins have been stripped and some underground work has been done.

On Four Mile Mountain, exploration of veins on the Erie or Mohawk property was started in 1909 and continued until 1914. Further exploratory work and development were done in 1920, 1925, 1927, 1928, 1929, and ore was shipped in the years 1913, 1925, 1928, and 1929.

The Surprise claims, which adjoin the Silver Standard on the north, have been explored by trenches and a crosscut adit. This work was completed in 1917, and little has been done since.

Other veins on Nine Mile Mountain and Four Mile Mountain have been explored, and a few tons of ore shipped from them but none of them were being developed in 1950.

The gross contents of the ore and concentrates shipped from the properties of the area, up to the end of 1950, are set forth in the following table. The tonnage includes ore shipped crude and ore milled. The metal contents are the contents of crude ore and concentrates shipped. The table includes all production, except for a few shipments amounting to a few tons only.

	Tons	Gold	Silver	Lead	Zinc	Remarks
		Oz.	Oz.	Lb.	Lb.	
American Boy	363	16	14,351	76,419	15,740	Zinc from 254 tons.
Erie	45	......	5,175	11,763		
Mohawk	141	2	16,041	35,826	38,396	Zinc from 123 tons.
Silver Cup	5,144	20	112,941	501,062	270,183	Zinc from 4,910 tons.
Silver Pick	26	15	6,727	925	1,843	Zinc from 16 tons.
Silver Standard	56,501	4,538	1,917,603	3,614,210	7,036,736	Zinc from 55,329 tons.
Sunrise	74	......	8,268	66,115	....	
Totals	62,274	4,591	2,081,106	4,306,320	7,362,898	Zinc from 60,632 tons.

The totals do not include the metal content and tonnage of waste discarded before ore was shipped and the metal content of tailings from ore milled. These omissions tend to balance one another. The average grade calculated from the totals is about: Gold, 0.07 oz. per ton; silver, 33.4 oz. per ton; lead, 3.5 per cent; zinc, 6.0 per cent.

The properties have been described in the Annual Reports of the British Columbia Minister of Mines for the years during which they were developed. The geology of the area is described in publications of the Geological Survey of Canada. Of these, Memoir 110, by O'Neill, published in 1919, summarizes much of the information then available. Memoir 223, by Kindle, published in 1940, describes the mineral occurrences, and Preliminary Map 44-24, with explanatory notes by Armstrong, published in 1944, outlines the geology.

A topographic map of the area made in 1949 at a scale of 2 inches to the mile with 100-foot contours was enlarged to 4 inches to the mile to form a base for the writer's geological mapping in 1950. Near the Silver Standard mine some of the area was mapped with a plane-table on a scale of 1 inch to 100 feet.

General Description.—The western part of the area slopes gently upward from the Skeena River, at about 750 feet altitude, to about 1,500 feet. Glen Mountain, altitude 2,000 feet, and a few lesser hills rise above the general level. Most of the eastern part of the area has a fairly uniform slope from about 1,500 feet altitude to the top of Nine Mile Mountain, a curved ridge in the Babine Range with its crest at 4,500 to 5,000 feet altitude. Shegunia River has entrenched itself in these slopes and has cut bedrock canyons over 200 feet deep. In the extreme northeastern part of the area, cirques have been cut into the north slope of Nine Mile Mountain. At the southern boundary the Bulkley River is deeply entrenched and has cut canyons as much as 200 feet into bedrock.

Shegunia River is a fast mountain stream with many rapids and falls. Water power could be developed at a canyon at the end of the road from Hazelton. The Bulkley River is a large potential power source.

Most of the area is covered by a few feet of overburden, and rock exposures are few, except along the Bulkley and Shegunia Rivers, the top of Nine Mile Mountain, and a few road cuts. Several fair stands of timber had been logged off and some of the remaining ones are being logged now. Timberline is between 4,000 and 5,000 feet altitude.

General Geology.—Most of the area is underlain by members of a thick series of sedimentary and volcanic rocks called the Hazelton group. The remainder of the area is underlain by numerous bodies of granitic rock (*see* Fig. 1).

Most of the exposed beds of the Hazelton group are some shade of grey, and a minor proportion are very dark grey to black. Generally the grey beds are several feet thick. They are sandstones but as a rule are tuffaceous, containing some ash, glass fragments, and crystals. Some beds contain angular fragments of dark rocks and much tuffaceous material and resemble greywacke. The darker beds as a rule are not more than a few inches thick, though some are several feet thick; some are shaly and some are carbonaceous. There has been widespread addition of carbonates, and many beds have had pyrite introduced and weather to a rusty colour.

Subdivision of the Hazelton group is made difficult because of lack of contrast between members and because of the scarcity of outcrops. However, a tentative subdivision into three parts has been made.

The first part, Subdivision A, includes mainly tuffaceous sandstone and greywacke, some pebble conglomerate, and comparatively few dark argillaceous laminæ. No fossils have been found in it. This subdivision is exposed on Glen Mountain and in the workings of the Silver Standard mine.

Subdivision B includes a greater proportion of dark shaly beds interbedded with tuffaceous sandstone and greywacke and numerous coal beds. Many of the dark beds contain abundant plant remains. The members of this subdivision are exposed south and southwest of Glen Mountain and along the lower part of the Shegunia River, where several coal seams crop out. Much of the low ground of the area is probably underlain by members of Subdivision B, which erode more readily than the massive sandstones which predominate in Subdivisions A and C.

Subdivision C includes mostly sandy beds, less tuffaceous than those of Subdivision A, and a small proportion of shaly beds. Ripple-marked sandstone is common. Fossil shells have been found at several points, but only a few fragments of plant fossils were seen. The members of this subdivision are exposed in the eastern part of the area, on Nine Mile Mountain, and the upper part of the Shegunia River.

The transition from Subdivision A, predominantly of tuffaceous sandstone beds, to Subdivision B, containing many shaly beds with plant fossils, appears to be gradational and likewise no break is known between Subdivisions B and C. The contacts between the three subdivisions identified are drawn arbitrarily on the map as far as the incomplete exposures permit. The contact between Subdivisions B and C is not shown on the southern part of Figure 1 because, except for a very few outcrops of altered sedimentary rocks, the outcrops are mainly of granitic rock.

Specimens of fossil flora and fauna were collected in this area by the writer in 1948 and were examined by B. F. Howell and E. Dorf of Princeton University.

Regarding the flora, Dorf comments that the presence of specimens of *Czekanowska* indicates equivalence to Kootenay flora elsewhere and that the remaining species in the collection are common to both Kootenay and Blairmore flora. He concludes that the specimens came from beds that probably are of Late Jurassic age. All these specimens of flora are from beds now included as part of Subdivision B.

In the fauna, Howell identified specimens of *Aucella* cf. *gigas* Crickmay, and *Aucella* cf. *catamorpha* Crickmay. From the presence of these forms he concluded that the beds they came from are probably of Early Cretaceous age but may possibly be Late Jurassic in age. The specimens of fauna came from beds now included as part of Subdivision C.

No erosion interval is known, and sedimentation may have continued from Jurassic into Early Cretaceous times.

The granitic rocks are as a rule light grey or green. They are mostly quartz and feldspar porphyries and include what is probably altered granodiorite and some hornblende porphyry. Most of these rocks are altered, with carbonate and sericite replacing feldspar. Pyrite is common in these rocks.

The granitic rocks are more resistant to erosion than the sedimentary rocks and in places outcrop, although the surrounding sedimentary rocks do not. Some of the outcrops of granitic rock near contacts with sedimentary rocks form bluffs, and it is likely that other lines of bluffs are close to a contact with unexposed sediments. The bluffs can be observed on aerial photographs, and the outlines of some of the bodies shown on Figure 1 are based partly on such observation. As shown on Figure 1, some of the bodies are elongate.

Near the bridge in the lower canyon of Shegunia River, a body of granitic rock is exposed. A distinctive pattern, caused by a slight difference in the vegetation growing on this intrusive, is seen on aerial photographs continuing southward from Shegunia River. This difference in growth may indicate that the intrusive body also continues southward.

The contacts between granitic and sedimentary rocks are generally not exposed, so the relationship between the two rocks is not seen. A contact crossed by the south drift on 6 vein, 1300 level, underground at the Silver Standard mine, is faulted. In a few places where members of the Hazelton group are exposed near a contact the attitude of the beds is much the same as that of beds farther from the contact, and apparently there is a little disruption or contortion at these contacts.

Some dykes are exposed near the contact of the Silver Cup granitic body, but elsewhere very few dykes were seen. None were seen in the workings of the Silver Standard mine, but cores from two holes drilled southeastward near a granitic body exposed underground (*see* Fig. 2) include some granitic rock that probably comes from dyke-like bodies.

Most of the granitic bodies are exposed in the western and southern parts of the area, which are the lower parts.

All the granitic bodies presumably are of the same age and younger than Subdivision C of the Hazelton group.

Structural Geology.—The members of the Hazelton group have been gently folded and the fold axes are indicated on Figure 1. Generally the dips are moderate to low, but on the ridge of Nine Mile Mountain dips steeper than 45 degrees are common. Along the lower part of the Shegunia River some of the beds are crumpled and in a few places are overturned.

In the northern two-thirds of the area, the folds trend slightly east of north except at Glen Mountain, where the axes trend slightly west of north. As a rule the folds in the western part plunge gently southward and those in the eastern part plunge gently northward. The anticline and syncline southwest of the Silver Standard mine (*see* Fig. 1) seem to die out toward the south, and possibly all the folds are short. Between the folds of the east and of the west of this part of the area, the beds in the north dip northwards and those in the south dip southwards.

In the southern third of the area, the fold axes trend northeasterly, parallel to the elongation of the granitic bodies. This suggests that similar forces controlled the shape of the folds and of the intrusives.

The tuffaceous sandstones and greywackes of Subdivision A appear to be encircled by the beds of the overlying more argillaceous Subdivision B which dip under the beds of Subdivision C on upper Shegunia River and Nine Mile Mountain. This distribution suggests that the group has been domed, the dome being elongate with the long axis trending northward and the apex near Glen Mountain. The presence of intrusive bodies near by suggests that one of these could have caused the uplift and that the small exposures of granitic rock of Glen Mountain may be offshoots from a larger mass not yet uncovered.

The lack of recognizable contacts between the three subdivisions of the Hazelton group makes it difficult to determine the relationship of the dome to the folds. The apparent lack of folds north and south of the apex of the dome may indicate that the distribution of the members of the Hazelton group is a result largely of the doming and not of the folding.

No major faults were seen. Numerous faults are exposed in the Silver Standard mine, but the displacement on most is only a few inches or a few feet. Others are exposed in the lower part of the Shegunia River; some of these are normal and others reverse, but the movement on each seems to be only a few feet.

Fracture cleavage is fairly well developed in the rocks of the southern part of Glen Mountain. The cleavage planes are from a fraction of an inch to a few inches apart and are most common in the thinner shaly members of the series. The cleavage planes (*see* Fig. 1) as a rule strike southeasterly and dip steeply, nearly vertical.

Veins.—Many quartz and carbonate veins cut the sedimentary and granitic rocks. Most of those known are on Glen and Nine Mile Mountains, and most of these strike northerly to northeasterly and dip eastward with little variation. Possibly the forces responsible for the vein fractures acted nearly uniformly over the whole area. The veins cut all types of country rock, but most of those seen are in the massive members of the Hazelton group or in granitic rocks, or follow contacts between these two types. Veins may be common in the more argillaceous parts of the group, but since those members do not outcrop extensively, few veins were seen in the area underlain by this part of the group.

Some of the veins consist of quartz and carbonate with only minor amounts of metallic materials. Other veins contain a considerable proportion of metallic minerals, chiefly sulphides and sulpho-salts, and all the ore has come from such veins. The sulphides are sphalerite, pyrite, arsenopyrite, galena, pyrrhotite, chalcopyrite, and the sulpho-salts are tetrahedrite, jamesonite, and minor amounts of a few others. The same minerals are found in most of the mineralized veins, except that tetrahedrite and jamesonite as a rule are not found in the same veins. In veins on Glen Mountain tetrahedrite is common and jamesonite uncommon, whereas in veins on Nine Mile and Four Mile Mountains, jamesonite is common and tetrahedrite much less common. This change indicates a proportionate decrease in copper and an increase in lead in the eastern veins. A similar decrease in zinc relative to the amount of lead is noticeable in the veins of the American Standard property as compared with the veins of the Silver Standard. These

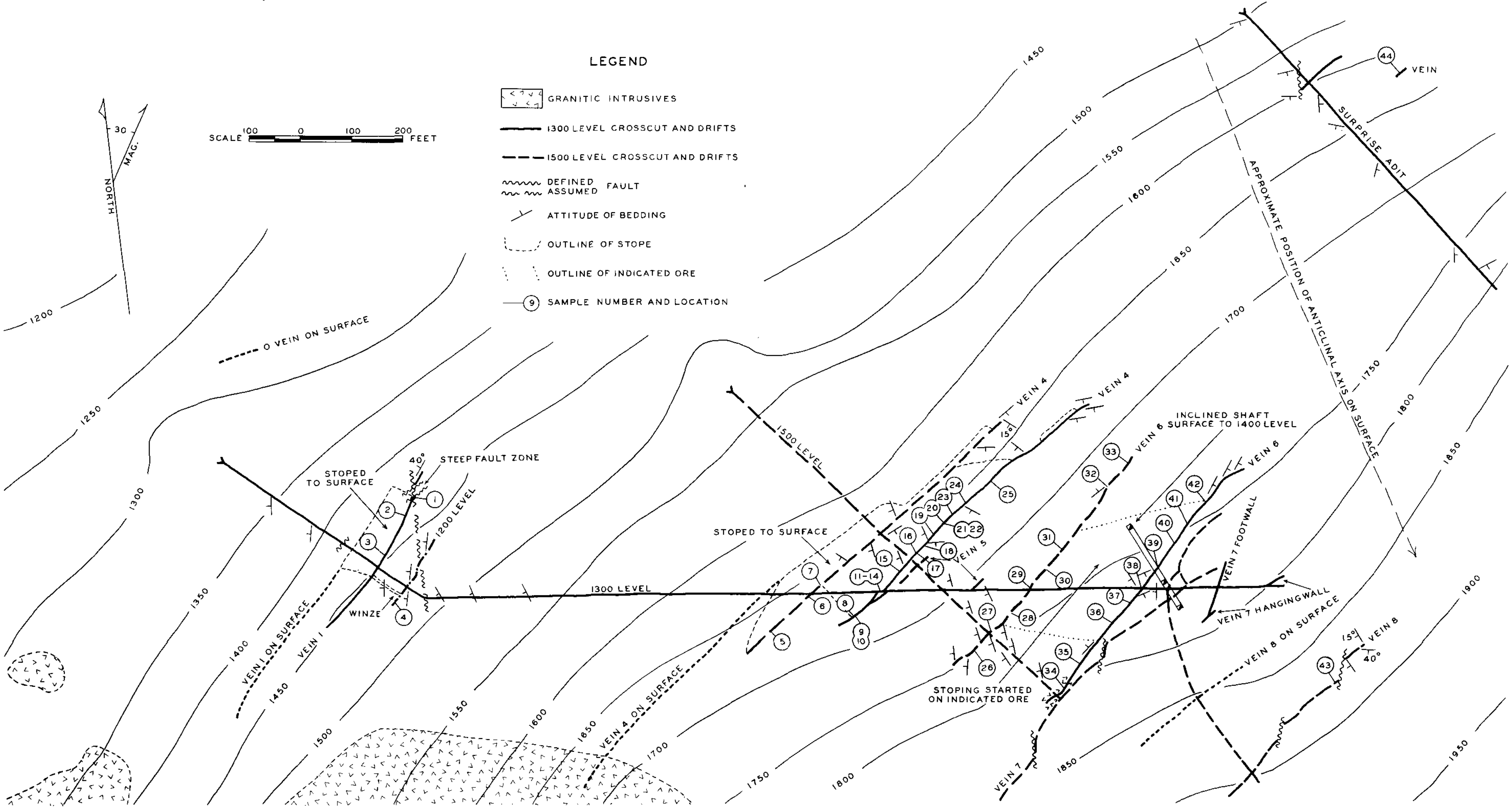

FIG.2. PLAN OF SILVER STANDARD MINE AND SURPRISE ADIT

changes, based on information which is far from complete, indicate that the proportion of lead in veins increases, relative to copper and zinc, toward the east.

[References: *Geol. Surv., Canada,* Prelim. Map 44-24.]

Descriptions of Properties

Silver Standard (Silver Standard Mines Limited) (55° 127° S.W.) Company office, Suite 213, 602 Hastings Street West, Vancouver. R. W. Wilson, managing director; H. B. Gilleland, general superintendent. Capital: 3,500,000 shares, 50 cents par value. The company owns the Crown-granted claims Almo (L. 2259), Leadville (L. 2260), Standard (L. 2261), Silver Standard (L. 2262), Skagway (L. 2263), Glen Mountain (L. 2264), Canadian King (L. 2409), Canadian Queen (L. 2410), Black Prince (L. 2411), Speculator (L. 2412), Swiftwater (L. 2413), Clearwater (L. 2414), Canadian Queen Fraction (L. 2415), King Fraction (L. 2417), and holds by location thirty-two claims. The mine is north of the communities of Hazelton and New Hazelton and is reached from them by about 1½ miles along the highway and about 4½ miles along a narrow winding road (*see* Fig. 1).

These claims cover much of Glen Mountain and some of the low ground around it. The main workings are at the north end of the mountain and the main adit level is near the foot of the northwest slope.

The camp, including office, dry, store-house, power-house, bunk-house, residence, and flotation mill, is slightly lower than the portal of the main haulage level. The mill treats about 60 tons of ore daily. Power is developed by a diesel plant. Water is pumped from a small creek that flows out of Standard Lake toward Skeena River. About eighty men are employed at the property.

During 1950 the mine was worked 281 days and 8,799 shifts were worked underground, and 1,715 cases of powder, 38,900 blasting-caps, 345,000 feet of fuse, and 871 electric delay caps were used. Ore drawn: Vein 1, 1,381 tons; vein 4, 12,606 tons; vein 6, 12,938 tons; vein 7, 1,002 tons. In addition, 902 tons came from development headings and 875 tons was drawn from the surface stockpile and the old tailings pile at Two Mile Creek, making a total of 29,722 tons, of which 8,618 tons was sorted out as waste and the remainder was milled. The mill was operated 97 per cent of the time.

Development work consisted of 2,019 feet of drift, 154 feet of crosscut, 428 feet of raise, and 143 feet of winze. Of the drifts, 40 per cent has been classified by the management as being in ore. Diamond drilling underground totalled 2,888 feet and on the surface totalled 2,602 feet.

Production, 1950: Ore milled, 21,104 tons. Concentrates: Lead, 1,687 tons; zinc, 2,973 tons. Gross content of concentrates: Gold, 1,958 oz.; silver, 897,420 oz.; lead, 1,741,800 lb.; zinc, 3,439,000 lb.; cadmium, 44,470 lb.

From 1913 to 1917 crude ore was shipped and from 1918 to 1922 ore was concentrated. Ore shipped or milled to the time operations ceased in 1922 amounted to 14,338 tons, and the products shipped contained: Gold, 1,118 oz.; silver, 595,668 oz.; lead, 1,208,792 lb.; zinc, 1,640,768 lb. Since 1947, when the mine was reopened, the production has been: Ore milled, 42,163 tons. Gross content of concentrates: Gold, 3,420 oz.; silver, 1,321,935 oz.; lead, 2,405,418 lb.; zinc, 5,395,968 lb.; cadmium, 64,945 lb.

Most of the production has come from four veins, numbered 7, 4, 1, and 6.

The property was first developed by an inclined shaft on vein 7 (*see* Fig. 2) from the surface at 1,735 feet altitude down to the 1400 level at about 1,420 feet altitude. Intermediate levels 1600 and 1500 were developed, and ore was stoped above 1500 level mostly from a footwall split of vein 7. A winze was sunk 90 feet to a sublevel below the 1400 level.

N.B.—Data *re* samples, indicated on Figure 2, are tabulated on page 93.

In the next stage of development, a crosscut adit was driven to connect with the 1500 level. This crosscut exposed vein 4, from which some ore was stoped above the level. The next major development was driving the 1300 crosscut adit which, when work was stopped in 1922, had been driven beyond vein 1 but not as far as vein 4. In 1947 this crosscut was advanced to vein 4 and since then has been driven past vein 6 and both footwall and hangingwall veins of vein 7. In 1950 a winze was sunk in the footwall of vein 1 for 125 feet and drifting was started on the 1200 level.

In the early period of exploration, veins 1, 4, 7, and 8 were well exposed by numerous trenches and rock cuts and the 9, 10, and Black Prince veins were exposed by a few trenches and rock cuts. In the recent period some of the trenches have been cleaned out and veins 0 and 00 have been exposed by new trenches.

The rocks exposed in the workings are part of Subdivision A of the Hazelton group (*see* p. 84), except for the granitic intrusive penetrated by the southwest end of the 1300 level drift on vein 6. Other intrusive rocks are exposed at the surface, southwest of the workings.

Figure 2 shows the veins and the workings as of September 15th, 1950. This plan is drawn from company data with some information added by the writer. Each of the two granitic bodies whose outline is cut off at the edge of the plan have an areal extent outside the map-area about equal to that within the map-area. Not shown on the map are: Vein 00, about 500 feet west of vein 0; vein 9, about 500 feet east of vein 8; vein 10, about 600 feet east of vein 8; and Black Prince vein, about 1,500 feet east of vein 8. Vein 4 extends southwestward about 75 feet beyond the edge of the map-area.

Most of the Hazelton group rocks are tuffaceous and argillaceous sandstones and greywackes. They are in beds a few feet thick and are massive, grey, and fine grained, and have a smooth, blocky fracture. Interbedded with these are very thin beds of about the same composition but of a variety of colours, ranging from light grey to nearly black and some of a slight greenish tinge; some are graphitic. Many of these thin beds are lenticular and pinch out in a few feet. They are common only in the western part of the workings.

Many of the beds have been altered by the introduction of carbonate and pyrite.

Intense alteration within a few feet of the veins, the result of the replacement of some of the minerals by carbonates, has changed the colour of many of the beds from the prevailing grey to light grey or cream or ivory. Different beds after alteration appear so much alike that bedding is obscure, particularly near veins, and since most of the workings are drifts along veins it is difficult to recognize or trace the beds.

In addition to the granitic rocks indicated on Figure 2, there are granitic rocks southeast of the drift on 6 vein, 1300 level. These rocks, cored by holes drilled from the drift, are probably in dyke-like bodies. The granitic rocks are sericitized and carbonatized, and the rocks of the Hazelton group near them are also altered.

The beds are on the west limb of an anticline (*see* Fig. 2), the axis of which is east of the Silver Standard workings, and are near the apex of the dome mentioned on page 86. Most of the beds dip westward and southward at angles less than 20 degrees. Steeper dips are uncommon, except in the west near vein 1 where the beds dip as much as 50 degrees. Beds dipping eastward were seen in a few places, but some of these are in local folds (drag) near fractures and others probably are in gentle rolls on the gently dipping limb of the anticline. These attitudes are chiefly those measured in isolated exposures and are not based on the position of any bed or group of beds. However, it was possible to trace a distinctive group of dark beds for 200 feet to where it dipped below the workings, and its attitude was seen to conform with the attitude of individual beds near by.

Another group of beds includes many with a slight green tinge and others that are pale grey. This group grades into grey beds both above it and below it and could not be traced with certainty. However, similar beds are found between veins 6 and 4 on 1500 level and between veins 4 and 1 on 1300 level, and the indicated westward dip also corresponds to the dip of individual beds.

Many fractures cut the beds of the Hazelton group, including some that contain the veins being explored and mined. The fractures and the veins they contain extend southward into the granitic rocks.

The principal vein fractures are subparallel, strike northeastward, and dip southeastward. Most of them are straight, but some are curved and tend to strike more to the east in the northeastern part of their length. Their dips range from 80 degrees to 35 degrees but are mostly about 60 to 70 degrees; the only principal fracture known that dips less than 40 degrees is the one that contains vein 6. Several of the fractures have been explored for lengths of several hundred feet, and vein 4 fracture continues for more than 2,000 feet.

These fractures contain up to an inch or two of gouge. Grooves and striations on the walls pitch at all angles. Some of the fractures are single, but some form multiple zones of fracturing. The fractures offset the beds with a net displacement of a few inches to several feet. The grooves and striæ and the number of fractures within some zones suggest that there have been several movements in the same zone but not all in the same direction. In some cases the movement appears to be normal and in others reverse.

Minor slips in the walls have about the same strike but dip less steeply than the fractures.

From the principal fractures many lesser ones diverge into the walls, most commonly into the footwall, but some into the hangingwall. These fractures strike northerly, most of them dip steeply, and as a rule they contain veins, which decrease in width away from the principal fracture. Few of them have been followed more than a few feet from the main fractures.

The third type of fracture most common in the eastern workings also strikes northward but offsets the principal vein fractures to the left. Most of these fractures dip eastward, and some contain a small amount of vein matter.

A fourth type includes fractures that dip very gently and in part follow bedding planes. As a rule the movement on them is a few inches and is not consistently in one direction. These fractures are common only in the eastern workings; most of them were formed at about the same time as the introduction of vein matter, but some are younger than the veins.

A fault zone that appears to strike east-northeastward offsets vein 1 a few feet, about 160 feet northeast of the main crosscut, where it is also cut by several northerly striking faults. Although the vein is apparently offset only a few feet northeast of the fault zone, the vein is markedly different, and the vertical movement in the fault zone may be considerably greater than the apparent horizontal offset.

Numerous minor slips, many of them filled with chlorite, cut the Hazelton group rocks.

The principal fractures, and the splits from them, contain the veins that are being mined. The principal veins consist mainly of milky white quartz that is generally massive and fractured. Some younger veinlets, as much as 2 inches wide, cut the main veins, and in them quartz crystals have grown from both walls toward the unfilled interiors. The other principal gangue minerals are massive white calcite and buff siderite, which occur in most veins. Calcite crystals occur in the open veinlets with the quartz crystals. A few particles of orange scheelite were noted in vein 1 on 1200 level, and near it some grey potash feldspar. Some chlorite occurs in fractures about up to an eighth of an inch wide, cutting the veins and wallrock.

The veins vary in width from a fraction of an inch to as much as 12 feet, but widths of 1 to 3 feet are most common. Some parts of the vein fractures contain no vein material, only gouge.

Metallic minerals commonly present in the veins include sphalerite, pyrite, arsenopyrite, galena, pyrrhotite, tetrahedrite, and chalcopyrite in approximate order of abundance. A minor amount of a lead bismuth mineral, probably cosalite, occurs in vein 8 on 1500 level, and a small particle of ruby silver was seen in vein 7 on 1300 level. Metallic minerals are as a rule in pockets and irregular veinlets which tend to be parallel to the vein walls, and to be either near one wall of the vein or where the quartz is fractured. The sulphides as a rule are massive, but crystals of pyrite and arsenopyrite are fairly common, and crystals of sphalerite have been found.

Splits in the veins are common, and the veins contain many inclusions, some of which are irregular and angular and others thin slabs oriented parallel to the vein walls. As a rule the wallrock in inclusions and within 2 feet of the veins is partly replaced by pyrite and arsenopyrite.

The proportion of vein minerals present varies widely. Quartz is generally by far the most abundant constituent and in some parts of some veins is the only mineral apparent. Elsewhere the metallic minerals form a considerable proportion of the vein material. In some sections iron sulphides predominate. In other sections, sphalerite and galena are the abundant metallic minerals, and in some parts of vein 6 galena and sphalerite with some tetrahedrite make up most of the vein.

The veins are called 00, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and Black Prince. Veins 2, 3, and 5, where exposed underground, are only a few inches wide. The only ore mined from them was a pocket in vein 5 above 1500 level. Veins 00, 0, 9, 10, and Black Prince are exposed only at the surface. Some of them are being explored by diamond drilling. Stopes on veins 1, 4, 6, and 7 have provided most of the ore. Some ore has been mined from vein 8 at the surface. A more detailed description of the productive veins follows.

Vein 1, 1300 Level.—South of the main crosscut the vein is slightly less than a foot wide and contains some sphalerite and galena. North of the crosscut to the fault zone, the vein is generally 2 to 3 feet wide and well mineralized and has been stoped up to the surface. North of the fault it is generally 8 to 9 inches wide and toward the northeast face splits into several stringers.

Vein 1, 1200 Level.—The vein southwest of the winze is about a foot wide and is fairly well mineralized, particularly with sphalerite. Northeast of the winze a vein zone with many stringers curving off into the footwall is exposed. In one of these stringers some orange scheelite and some grey potash feldspar were seen.

Vein 4, 1300 Level.—Near the crosscut the vein is as much as 12 feet wide, including a horse of wallrock, and has been stoped up to 1500 level for a length of 400 feet. Most of the vein matter in the stope was 3 to 4 feet wide and moderately well mineralized. Northeast of this main stope the vein is less than a foot wide, and only a section 80 feet long has been stoped for 20 feet above the level. Near the northeast face the vein swings easterly and splits into several stringers, each only about an inch wide. At the north face of the drift the displacement on each of the vein fractures is only an inch or so, and the hangingwall has moved relatively upwards. The vein southwest of the central stope curves westward and splits into several stringers in which arsenopyrite and chalcopyrite are common.

Vein 4, 1500 Level.—The vein near the crosscut has an average width of about 2 feet and is moderately well mineralized. Much of it has been stoped below the level and above to the surface. For 120 feet northeast of the northeast section of the stope below the level the vein is about a foot wide and is abundantly mineralized; some of it has been stoped above the level. At the northeast face the vein is 6 inches wide. Southwest of the southwest end of the stope below the level the vein is about a foot wide, and some of it has been stoped above the level. At the southwest face the vein is 6 inches wide, and the principal sulphides present are iron-bearing. Some of the ore mined in the earlier period of operations came from the stope on vein 4 above this level.

Vein 5, 1300 Level.—This vein is less than 6 inches wide, and on 1500 level most of it is a few inches wide. Some ore has been mined above the level from a pocket that contains much sphalerite and tetrahedrite, some parts of which probably were several feet wide.

Vein 6, 1300 Level.—For about 255 feet northeast and 130 feet southwest of the crosscut the vein is fairly straight and dips gently, in places only 35 degrees. It is abundantly mineralized with sphalerite, galena, and tetrahedrite, and averages about 30 inches wide.

At and near the crosscut the walls include a group of thin dark- and light-coloured beds; the individual beds were not correlated in both walls of the fracture but the group was, and it appears that the hangingwall has moved downward about 5 feet relative to the footwall and that the net horizontal movement has been slight. This displacement is the result of a series of movements, some of which may have been greater than the net movement.

In this section many slips divide the gently dipping hangingwall into large blocks that are apt to fall into the stopes. Because of this condition the system of mining in this part of the vein has been changed from shrinkage to cut and fill.

Southwest of this section for 100 feet the vein is narrow, and in places only gouge is seen between the fracture walls. In the next 25 feet to the southwest, the vein is as much as 6 feet wide and is sparsely mineralized at a fault contact with a granitic body. The vein fracture continues into the granitic rock but curves westward and splits. At the southwest end of the drift the main vein is 18 inches wide and contains iron sulphides but little galena and sphalerite.

Northeast of the straight central section, for about 75 feet, the vein curves easterly, narrows, and splits. The normal dip of the beds is westward, but along this curving section the beds in the walls dip 25 to 70 degrees eastward, and the numerous veins that diverge into the footwall tend to follow the bedding. The stringers in the footwall are narrow and have not been mined.

Vein 6, 1500 Level.—For 30 feet northeast and southwest of the crosscut the vein is from a few inches to several feet wide and contains a little sphalerite and galena. Near the southwest face it swings more westerly and splits. From about 30 to 260 feet northeast of the crosscut the vein, about 18 inches wide, is straight and well mineralized and has been prepared for stoping. For 75 feet farther northeast the average width of the vein decreases and some parts of the fracture contain no vein matter. Beyond, to the northeast face, the vein is continuous, but numerous veins split off into the footwall. The quartz in the veins is more watery looking than elsewhere in the mine. At the face of the drift the vein fracture contains some gouge but no vein matter.

Vein 7, Main Vein of Old Reports.—This vein (main vein of old reports) includes a single vein that, followed northeasterly, splits into a footwall stringer zone and a hangingwall vein. Much of the ore mined in the early period of production came from the footwall branch and some from the hangingwall branch of this vein, all from above the 1500 level. The old stopes are near the inclined shaft and northeast of the junction of the hangingwall and footwall branches. The two branches extend from the 1300 level to the surface, but were not examined above the 1500 level as the old ladders have not been replaced. As the outlines of the old stopes are not known accurately, they are not shown on Figure 2.

Vein 7, 1300 Level.—At the crosscut and continuing northward the footwall branch is a vein zone about 10 feet wide and consists of numerous quartz stringers, most of which are about an inch wide separated by several inches of wallrock. South of the crosscut the stringers converge to form a vein that joins the hangingwall vein and, there, is 2 feet wide. Near the junction the vein contains abundant sphalerite.

At the crosscut the hangingwall zone is a few inches wide and contains little vein material.

The footwall vein zone is exposed in the winze between the 1300 and 1400 levels and, as on 1300 level, comprises many stringers. The beds in the walls appear to be undisplaced, so probably movement on the fractures, other than the separation of the walls, has been slight.

Vein 7, 1400 Level.—The hangingwall vein is straight, and has a sharply defined hangingwall with gouge on it. The vein is a few inches wide and is sparsely mineralized, mostly with iron sulphides. The footwall vein zone consists of many stringers, mostly of sparsely mineralized white quartz, although pockets containing sphalerite and galena occur. Some of the stringers in the footwall zone can be traced for 100 feet.

Vein 7, 1500 Level.—The hangingwall branch on this level is, as a rule, a few inches wide and sparsely mineralized. For a length of 80 feet it was stoped above the level. From this branch many veins split off into the footwall, and the most important of these is the footwall branch.

From the footwall branch, which leaves the hangingwall branch about 40 feet south of the shaft, came much of the ore mined in the early period of mining, and it has been stoped above the level for a length of 150 feet. This vein, which has been followed northeastward for 250 feet, is, as a rule, abundantly mineralized. It is as much as 7 feet wide, but northeast of the stoped section is less than a foot wide. At the southwest end of the old stope, preparations are being made to mine ore above the level. Many veins split from the footwall branch, but as a rule are only a few inches wide.

The single vein, south of the junction of the two main branches, has been followed for nearly 500 feet; it is as much as 6 feet wide and dips about 70 degrees eastward, except near the southwest end of the drift, where it dips about 40 degrees. For most of the explored length the vein consists only of white quartz. Such mineralization as is to be seen is sparse and usually consists only of iron sulphide.

Vein 8, 1500 Level.—The southern part of this vein is filled with quartz which, near the crosscut, encloses many angular inclusions of wallrock. Mineralization is sparse and usually consists of iron sulphides alone. Toward the northeast other sulphides are seen, and at the fault shown on Figure 2 the vein is abundantly mineralized. The fault contains some quartz and galena. Northeast of it the vein is less than a foot wide and contains some ore sulphides. At the north face it appears as if the hangingwall had moved upwards slightly along the vein fracture.

Ore was mined from vein 8 at the surface, altitude 1,875 feet, and ore has been found on vein 1 on the present lowest level, the 1200 level, altitude 1,175 feet, a total vertical range of 700 feet. On vein 4, ore is continuous for a vertical range of 340 feet, from the surface down to the 1300 level, below which the vein has not been explored except by two diamond-drill holes. The vertical range in which ore is now known to occur in other veins is less than 340 feet.

The economic minerals, galena, sphalerite, and tetrahedrite, generally form a minor part of the vein matter. They are brittle and tend to crumble and fall from the face or back of the workings, and the management has found that the recovery is greater than is indicated by the assays of samples taken from the face or back.

Because of the irregular distribution of the ore minerals in the veins, the results obtained from assaying vein cores from diamond-drill holes are not reliable in estimating the grade of the veins unless several such intersections are available.

The positions of samples taken by the writer from veins 1, 4, 6, and 8 are indicated on Figure 2, and the assay data are tabulated below.

Sample No.	Width	Gold	Silver	Lead	Zinc
	Inches	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
Vein 1, 1300 Level					
1	27	0.36	24.0	0.6	20.9
2	21	0.07	3.1	0.3	9.4
3	19	0.61	9.6	0.3	7.5
Vein 1, 1200 Level					
4	12	0.42	16.7	2.7	19.0
Vein 4, 1300 Level					
8	36[1]	0.06	6.5	2.0	5.5
9	26	0.09	31.5	5.2	3.0
10	40[2]	Trace	0.4	([3])	([3])
12	48[2]	0.04	6.6	1.0	1.8
11	42[4]	0.01	*Nil*	([3])	([3])
13	36[1]	0.03	0.5	([3])	0.32
14	54	0.08	21.2	0.58	1.8
15	36	0.01	1.4	([3])	0.9
16	36[1]	0.06	1.1	([3])	1.6
17	33[2]	0.01	9.8	2.8	([3])
18	20	0.05	7.4	0.9	([3])
19	42	0.02	18.2	4.2	4.0
20	10[1]	0.21	106.7	3.2	11.0
21	46	0.14	13.3	1.1	11.9
22	19[2]	0.04	1.1	([3])	([3])
23	57	0.06	12.9	0.3	4.7
24	24	0.15	52.6	1.5	9.7
25	24	0.17	9.2	0.3	2.0
Vein 4, 1500 Level					
5	12	0.07	0.8	0.2	2.3
6	11	0.12	41.2	8.9	4.5
7	16	0.33	20.6	3.1	8.6
Vein 6, 1300 Level					
34	38	0.06	1.6	([3])	5.8
35	16	0.13	25.8	2.7	14.2
36	12	0.27	204.8	3.0	30.4
37	30	0.20	238.8	23.9	24.4
38	48	0.09	47.8	3.2	21.8
39	20	0.28	122.7	25.9	20.0
40	25	0.18	120.2	19.5	19.1
41	6	0.07	60.1	11.3	0.6
42	15	0.12	132.9	24.8	9.5
Vein 6, 1500 Level					
26	44	0.05	1.7	([3])	([3])
27	22	0.03	1.3	([3])	([3])
28	12	0.02	21.3	1.6	([3])
29	13	0.41	96.1	6.9	33.3
30	14	0.16	89.3	5.2	12.9
31	36	0.13	73.0	5.5	21.3
32	9	0.14	56.3	12.3	20.0
33	24	0.03	15.0	([3])	([3])
Vein 8, 1500 Level					
43	12	0.08	32.6	5.0	17.2

[1] Footwall section of vein. [2] Hangingwall section of vein. [3] Less than 0.3 per cent. [4] Mineralized country rock.

Some of the sphalerite and galena are in a very fine-grained mixture which is a dull greyish brown and has a brown streak. The mixture generally contains much more sphalerite than galena.

Some of the silver may be in the galena, either in solid solution or in small amounts of ruby silver, but nearly all the high silver assays are associated with tetrahedrite, which tends to be associated with sphalerite and to occur as veins or pockets in sphalerite. The sphalerite concentrate contains an appreciable amount of cadmium but little silver.

The gold present may be associated with arsenopyrite, inasmuch as some samples high in arsenic also have a higher than average gold content. The ratio of gold to silver decreases eastward from vein 1 to vein 6. The average gold-silver ratios in the samples taken by the writer are as follows:—

Location	Gold		Silver
Vein 1	1	to	42
Vein 4 (1500 level)	1	to	120
Vein 4 (1300 level)	1	to	244
Vein 6 (1500 level)	1	to	365
Vein 6 (1300 level)	1	to	685

This change in ratio is an expression of a decrease in the proportion of gold present in the more easterly veins, even where they contain a much greater proportion of metallic minerals. The presence of scheelite and feldspar in vein 1 indicates that it may have formed at a temperature higher than that of the veins east of it.

An examination of the company assay plans indicates that within some stopes oreshoots of higher than average grade were separated by parts of the vein of lower than average grade. The higher-grade oreshoots rake gently southwestward at an angle slightly steeper than the trace of the beds of the Hazelton group on the walls of the vein fracture. It is possible that the shape of the oreshoots was partly controlled by the distribution of the beds of the wallrock. It was not found possible to correlate the richer oreshoots with the presence or absence of any groups of beds.

As a rule the oreshoots are in the straight sections of the veins. Where the veins curve away from this direction, either to the east or west, the veins become narrow or split and are below ore grade. At minor rolls or changes in attitude the grade of the ore may be higher or the vein may be wider than in straight sections.

The oreshoots on veins 1, 4, 6, and 7 are all in a belt that trends eastward. This belt is not recognizable as a geological feature and its significance is unknown, but it is nearly parallel to the alignment of granitic bodies and may be related to the contact of the granitic body or bodies south of the mine.

The productive veins are near the centre of a domed area on the west limb of an anticline and are nearly normal to the attitude of the beds. No major veins have been found on the east limb of the anticline.

In most of the veins the ore is mined in shrinkage stopes, but in vein 6, which has a weak blocky hangingwall that needs support, the ore is being mined by cut and fill methods. Ore is mined above 1500 level and above 1300 level and is dropped through ore-passes and chutes to the 1300 level. On this level it is trammed to the coarse-ore bin near the portal.

About 100 tons is mined per working-day. On being withdrawn from the coarse-ore bin, the run-of-mine ore is washed and passes over picking-belts where about a quarter of the total is discarded as waste. The picked ore is crushed and goes to the fine-ore bin. The mill, with a capacity of about 60 tons of ore per day, includes a ball mill, classifier, a flotation unit cell which recovers 50 to 70 per cent of the lead, and two banks of flotation cells which produce the remainder of the lead and the zinc concentrates. The concentrates are trucked to New Hazelton for shipment by rail to the Trail smelter.

The mill feed has been assaying about: Gold, 0.10 oz. per ton; silver, 45.0 oz. per ton; lead, 4.5 per cent; zinc, 8.0 per cent. About 95 per cent of the gold, 98 per cent of the silver, 99 per cent of the lead, and 96 per cent of the zinc are recovered in the mill in lead and zinc concentrates. The lead concentrate assays about: Gold, 1.0 oz. per ton; silver, 500 oz. per ton; lead 50 per cent; zinc, 10 per cent. The zinc concentrate assays about: Gold, 0.10 oz. per ton; silver, 30 oz. per ton; lead, 1.0 per cent; zinc, 50 per cent and contains most of the cadmium from the ore.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1914, pp. 194–197; 1948, pp. 77–80. *Geol. Surv., Canada,* Mem. 223, pp. 28–35 (1940).]

Surprise

(55° 127° S.W.) The three claims of this group, Wonderful (L. 3710), Surprise (L. 3711), and Shamrock (L. 3712), are owned by Glen Mountain Mines Limited, with office at 202 Pacific Building, Vancouver. The claims adjoin the Silver Standard property on the north and are reached by an old wagon-road, now in poor condition, which extends from near the portal of the 1500 level of the Silver Standard mine to the portal of the main adit on the Surprise group (*see* Fig. 2). The adit is a crosscut, at about 1,500 feet altitude, driven in 1912 to explore for the northeast extensions of the Silver Standard mine veins. Since that time little work has been done. One other adit, 20 feet long, was found about 350 feet east of the main adit portal at an altitude of about 1,625 feet.

The rocks in the adits and in the few exposures at the surface are mostly massive grey tuffaceous sandstone and greywacke interbedded with dark thin argillaceous beds. Most of the beds dip gently southward and eastward, though in a few minor rolls in the main crosscut, beds dipping westward are seen. The beds are on the eastern limb of a northerly trending anticline.

Three northeasterly striking veins exposed in the main crosscut consist largely of white quartz, some carbonate and pyrite. The widest vein is about 6 inches wide and dips steeply near the crosscut. It has been followed in drifts from the main crosscut; toward the north the vein flattens and follows a bedding-plane slip. The width decreases to about an inch where the vein flattens out. Southwest of the crosscut the vein contains some sphalerite, but 20 feet from the crosscut it is cut off by a northerly striking fault.

In the other adit a vein 4 inches wide has about the same strike but a steeper dip than the bedding. The vein contains sphalerite and galena, and a sample (No. 44) from it assayed: Gold, 0.01 oz. per ton; silver, 2.88 oz. per ton; lead, 1.5 per cent; zinc, 1.8 per cent.

The fractures, occupied by veins, strike nearly parallel to the beds of the Hazelton group and not as on the Silver Standard property, nearly normal to the beds. The stresses that caused fractures to form on the Silver Standard property may have been relieved to a large extent by movements along numerous bedding planes on the Surprise property. For this reason only a few discontinuous fractures may have formed crossing the bedding planes.

National Exploration Ltd.

(55° 127° S.W.) Company office, 714 Hall Building, 789 Pender Street West, Vancouver. T. Oates, in charge of exploration. Capital: 3,000,000 shares, no par value. This company holds by record sixty claims, some southwest and the others northeast of the Silver Standard mine. The claims are below 1,500 feet altitude in an area with few outcrops. Geophysical exploration was started in 1950, using an electrical method. Oates reported that two anomalies were found on the southwest claims and one on the northeast claims.

American Boy* (American Standard Mines Limited)

(55° 127° S.W.) Registered office, 1009 Credit Foncier Building, Vancouver. L. B. Gatenby, manager. Capital: 3,000,000 shares, $1 par value. This company holds by record forty claims on the lower part of the west slope of Nine Mile Mountain. From 1910 to 1918 veins on this property were explored and developed. From 1913 to 1916, 109 tons of crude ore was shipped, and in 1918, 254 tons of ore, mined in 1917, was concentrated at the Silver Standard mill. The production is shown on

* By J. M. Black and F. J. Hemsworth.

page 83. Exploration continued in 1927 and 1937. A new company, American Standard Mines Limited, was formed in 1950 and optioned from J. H. Sargent sixteen claims, including the American Boy group, and acquired an additional twenty-four claims.

The workings are between 2,500 and 2,900 feet altitude on a fairly uniform slope with few rock outcrops. The road up Two Mile Creek valley passes within half a mile of an old camp that was used in the earlier periods of exploration of this property.

Work was started by the new company in September, 1950, and a pack-trail between the road and camp was widened to permit tractor and jeep travel. An office, bunk-house, cook-house, powder-magazine, dry, and compressor-house were built, and a log cabin was renovated for additional accommodation. A diesel engine and a 260-cubic-foot compressor were installed. Mapping and sampling of the old workings were completed. A drift adit (altitude 2,850 feet) on vein 3 was extended 76 feet, and at approximately the same altitude an adit was started on vein 1. Veins 1 and 4 were traced along their strike by surface stripping.

The rocks near the workings are part of Subdivision C of the Hazelton group and include gently dipping tuffaceous and limy sandstones, and some argillites. Five veins, striking northward and dipping eastward at moderate to steep angles, have been explored.

Vein 1 was explored by several rock cuts and was developed from two inclined shafts. Vein 4, from which most of the ore was mined, was also explored by rock cuts and was developed from an inclined shaft. Veins 2, 3, and 5 were explored and developed by trenches, rock cuts, and adits, and vein 5 also by a shaft. In August, 1950, at the time of examination by the writer, the shafts were partly flooded and the portals of the adits were caved or in poor condition, so the underground workings were not entered. Most of the trenches and open-cuts also were caved or overgrown, and the only veins well exposed were 1 and 4. The surface and underground workings and the veins exposed in them are described by Kindle* in a report that also gives the assays of his samples.

Vein 1 is as much as 4 feet wide at the surface and consists of white quartz, rusty carbonate, some galena, and lesser amounts of sphalerite and tetrahedrite.

Vein 4, which was developed by an inclined shaft and by drifts 100 feet and 160 feet down the dip, provided most of the ore from stopes near the shaft. In trenches north of the shaft the vein is about a foot wide and consists mostly of milky white quartz and buff carbonate, and as a rule it contains pyrite and arsenopyrite near the walls and galena, sphalerite, and tetrahedrite in the central part. It also contains numerous inclusions of wallrock.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1917, pp. 104–106. *Geol. Surv., Canada,* Mem. 223, pp. 23–27 (1940).]

Silver Cup (55° 127° S.W.) This property includes one Crown-granted claim (L. 366) owned by L. W. Patmore and four claims (L. 364, L. 365, L. 367, and L. 3469) leased from the Crown by K. A. Wilson. Encircling these claims are eleven claims held by location, nine by V. J. Schwerdt and two by L. Jestly.

The claims are in and near the most westerly cirque on the north slope of Nine Mile Mountain, and are reached by the trail from the end of the road up Two Mile Creek valley. The claims are about 13 miles by this route from New Hazelton.

From 1909 to 1916 the main vein zone was explored and developed by four adit levels and crude ore was shipped. Additional development was carried on about ten years later, and an aerial tramway and mill were built. The mill was operated for part of 1929. For production *see* page 83.

The rocks are sandy and shaly beds of Subdivision C of the Hazelton group cut by numerous dykes and offshoots of a granitic body exposed to the east. The beds dip

* *Geol. Surv., Canada,* Mem. 223, pp. 23–27 (1940).

gently northward and eastward and are near the axis of an anticline plunging northeastward. The main vein zone that has been developed strikes northeasterly and dips moderately to steeply southeastward, and is about parallel to the anticlinal axis and about 250 feet west of it.

The main vein zone has been developed by four adits, at about 4,575, 4,700, 4,770, and 4,800 feet altitude, all interconnected by raises. Farther up the slope, to the southwest, at about 4,900 feet altitude, near the upper edge of the cirque, an open-cut exposes the vein zone. Farther southwest at about 5,000 feet altitude, on the broad ridge, behind the cirque, other cuts nearly on the projected extension of the vein zone expose vein material. The zone has not been traced down the slope northeast of the 4575 level, where the sloping floor of the cirque is covered with talus.

The portals of all the levels are filled with rubble and ice, although in the summer months the ice at the portal of 4700 level melts so that this level can be entered. It is the only one that was examined by the writer.

On the 4,700-foot level the vein zone has been followed by drifting for about 500 feet. The zone, which is as much as 2 feet wide, comprises several closely spaced quartz veins, separated by sheared wallrock. The individual veins are as much as several inches wide and contain jamesonite, galena, arsenopyrite, sphalerite, and pyrite. Toward the southwest the zone follows a contact between sediments and granitic rock and near the face of the drift swings into the granitic rock. In the southern part of the drift the zone is a few inches wide and is sparsely mineralized. Most of the ore that was mined came from stopes above this level near the portal.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1928, pp. 152–155. *Geol. Surv., Canada,* Mem. 223, pp. 8–11 (1940).]

Sunrise, Lead King, Silver Pick (55° 127° S.E.) These are the old names for several properties located just east of the east margin of Figure 1. The Sunrise property of six Crown-granted claims (L. 593, L. 594, L. 595, L. 596, L. 597, L. 599) is owned by T. E. Wilson. Extending west to the Silver Cup property, south and east to the old Lead King property are thirty-seven claims held by location. The owners of these claims, with the number owned by each, are P. Stewart (seven), V. J. Schwerdt (six), C. A. Schwerdt (eight), G. A. Jestly (eight), and J. G. Brown (eight). The ground covered by the claims for about 2½ miles eastward includes the upper part of the north slope of Nine Mile Mountain, including three cirques. The claims in the western cirque are reached from the trail to the Silver Cup property, and the claims in and near the two eastern cirques are reached by trails that extend eastward from the Silver Cup trail near the entrance to the western cirque. By this route the eastern claims are 14 to 16 miles from New Hazelton.

Sunrise.—This property is underlain by part of the granitic body that extends westward to near the Silver Cup property. Several vein zones and veins are exposed between 4,800 and 5,200 feet altitude on the steep face of a cirque.

After veins were discovered here in 1909, they were explored by trenches and four adits at intervals until 1937. The adits, driven southward under the principal showings, are 125, 30, 750, and 110 feet long respectively. Some ore was mined and shipped, and the production is shown on page 83.

The veins are simple and lenticular or are stringer veins, as a rule lenticular, in zones comprising several stringers separated by wallrock. The simple veins have a maximum width of 4 feet. The vein zones are as much as 12 feet wide, but of this width as a rule only about 2 feet is vein matter. The veins and zones strike northeasterly and dip southeastward or strike easterly and dip gently southward.

The veins consist of quartz, altered wallrock, galena, jamesonite, sphalerite, arsenopyrite, pyrite, and tetrahedrite. In parts of the veins the metallic minerals form the greater part of the vein matter. Some of the veins have been traced for about 300 feet.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1920, pp. 85, 86. *Geol. Surv., Canada,* Mem. 223, pp. 11–16 (1940).]

Lead King, Silver Pick.—The showings on these claims are between 4,500 and 5,500 feet altitude in the second cirque, east of the Silver Cup cirque, and on the ridge to the east. Veins were found here in 1909 and during the following years were explored, but in recent years have not been explored. For production *see* page 83.

The claims are underlain by the eastern part of the granitic stock, which extends eastward from the Silver Cup property, and by sandy beds of the Hazelton group. They are cut by fractures which strike northerly and dip eastward and by others which strike easterly and dip southward. Veins in these fractures consist largely of quartz and a considerable proportion of jamesonite, galena, sphalerite, and cosalite, and some stibnite and arsenopyrite.

Numerous veins, much like those exposed farther west, are naturally exposed and some have been traced by open-cuts and trenches. Two shafts, about 50 feet deep, have been sunk on two of the veins. The veins which have a maximum width of 3 feet strike northerly and dip eastward or strike easterly and dip southward. The veins consist of quartz and of a considerable proportion of jamesonite, galena, sphalerite, and cosalite, and some tetrahedrite, arsenopyrite, and stibnite.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1923, pp. 106, 107. *Geol. Surv., Canada,* Mem. 223, pp. 16–21 (1940).]

Four Mile Mountain

(55° 127° S.W.) The principal showings on this mountain are on what were known as the Erie or Mohawk and Comet properties. The workings are on seven Crown-granted claims of which two (L. 4836 and L. 4837) are owned by W. Giebe, one (L. 5048) is owned by J. B. Curtin, two (L. 1538 and L. 4453) are leased by J. B. Curtin, and two (L. 1542 and L. 3578) are leased by A. D. Beirnes. South and west of these, six claims have been located by C. J. Curtin and two by R. Allen.

Erie (Mohawk).—The showings on this property are near the top of Four Mile Mountain between 2,000 and 2,200 feet altitude, about 5 miles east of Hazelton. A road along the north bank of the Bulkley River passes within half a mile of the workings. A branch road leaves the road east of Four Mile Creek, and a car can be driven on it to within about 200 yards of the main workings.

This property was explored and developed, starting in 1909, by trenches and open-cuts and then by underground work, including two shafts and an adit level. This work was completed about 1929, and little has been done in recent years. Production figures for crude ore shipped are given on page 83.

Much altered sandy and tuffaceous rocks are intruded by numerous dark-grey and green tongues and offshoots of a granitic body that forms the core of the mountain. The contacts between the sediments and the granitic rocks are irregular in attitude, and fracturing is common along them. The fractures commonly continue from the contact zone into the altered sediments, but most fractures that extend into the granitic rocks die out within a few feet of the contact. The fractures, which contain the veins of economic importance, strike northeasterly. In the fractures are veins of quartz, carbonate, jamesonite, sphalerite, galena, tetrahedrite, pyrite, arsenopyrite, and argentite, with the first four mentioned predominant.

Four veins, strike northeasterly and dip southeasterly, have been explored by surface and underground workings. Three of these, exposed in the main adit level, were examined by the writer. The main adit level comprised a crosscut for 450 feet eastward to vein 1, a drift northeastward on vein 1 for 275 feet, a crosscut southeastward for 100 feet to vein 2 and a drift, parallel to the drift on vein 1, on veins 2 and 3 for 640 feet. The fourth vein, reported to be about 1,200 feet northeast of the portal of the level, was not seen.

Vein 1 has been followed on the surface and underground for 300 feet. It ranges in width from a few inches to 4 feet and in places consists of two or more subparallel branching veins, most sections of which are sparsely mineralized. In a few narrow places, however, the metallic minerals constitute as much as 50 per cent of the vein matter. Toward the north end of the drift the vein branches near a tongue of intrusive rock. The branch followed enters the intrusive rock and pinches out in a few feet.

A crosscut was driven to the southeast from the end of the drift on vein 1. At 100 feet it crossed the No. 2 vein zone. Vein 2, exposed underground only, has been followed for 440 feet and for much of this distance is along the contact between intrusive and altered sediments. The average width of vein matter is less than a foot, and in places vein matter is absent. The vein, as it approaches a tongue of intrusive 430 feet from the southeast end of the drift along it, splits, and the branch followed into the intrusive pinches out.

Eighty feet northeast of the end of vein 2 beyond the intrusive, vein 3 appears and has been followed by the drift for 120 feet, to where it is cut off by a cross fault at an intrusive contact. Vein 3 has an average width of 6 inches and is sparsely mineralized.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1923, pp. 106, 107. *Geol. Surv., Canada,* Mem. 223, pp. 35–38 (1940).]

Comet.—Showings on these claims are about 5 miles east of Hazelton on the south slope of Four Mile Mountain between 1,200 and 1,300 feet altitude. The workings are a few hundred feet north of the road that extends up Bulkley River valley north of the river.

The property was explored between 1920 and 1930 by two pits and three adits. The main adit level, which includes a crosscut and three drifts, was not entered because the portal is caved. The other two adits, 52 and 10 feet long respectively, can be entered and were examined.

The area is underlain by feldspar porphyry, probably a phase of the main intrusive body of Four Mile Mountain, and by quartzitic sediments. In the intrusive and in the sedimentary rocks, six veins and some lenticular stringers have been explored. The veins exposed strike northerly to northeasterly and dip moderately to steeply eastward. The veins, in addition to quartz, contain carbonate, jamesonite, sphalerite, pyrite, and galena, and are less than a foot wide.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1928, p. 158. *Geol. Surv., Canada,* Mem. 223, pp. 39–41 (1940).]

Gold-Silver-Cobalt-Uranium

Victoria* (Western Uranium Cobalt Mines Limited)

Company office, 604 Hall Building, Vancouver. James Mackee, president; W. F. McGowan, manager. The Victoria group is on the northwest slope of Rocher Déboulé Mountain and is reached by 5 miles of trail from Denis Comeau's ranch. The ranch is 6½ miles by road south of South Hazelton. A detailed description of the Victoria property is contained in the Annual Report of the British Columbia Minister of Mines for 1949.

In 1950 a 125-cubic-foot LeRoi compressor was installed. No. 00 adit, on No. 1 vein, was advanced 50 feet. No. 0 adit was cleaned out to permit sampling. The crosscut, at elevation 5,150 feet, begun in 1949, was advanced 225 feet to intersect the downward extension of the No. 1 vein, and the vein was drifted on for 22 feet to the east. Surface stripping, sampling, and detailed mapping completed the work for the season. Because no permanent camp has been built, the property was closed down for the winter.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 82–93.]

* By F. J. Hemsworth.

Gold-Silver-Copper-Cobalt

Rocher Déboulé* (Western Uranium Cobalt Mines Limited)

The company bought the old Rocher Déboulé mine in 1950 and is reopening it. The mine is on Rocher Déboulé Mountain, 10 miles by road from Skeena Crossing, a station on the Canadian National Railway, 15 miles south of Hazelton. The mine was last worked between 1915 and 1918, when shipments of ore containing copper and some gold and silver were made to the smelter at Anyox. A series of veins occupies fissures in granodiorite. Four veins have been opened up and are named as follows: The Calcite (No. 1) vein, the No. 2 vein, the Tramway (No. 3) vein, and the No. 4 vein. The veins are parallel, striking north 70 degrees east and dipping at about 60 degrees to the north. From 4,167 feet elevation to 5,302 feet elevation the veins are developed by extensive underground workings on five levels. Western Uranium Cobalt Mines has removed slide rock that covered the portal of the lowest level (now called No. 1) and has retimbered and cleaned out the level for its entire length. The company has also cleaned out and retimbered the No. 2 and No. 3 crosscut adits.

The mine camp is on Juniper Creek at an elevation of 4,100 feet. In 1950 a compressor-house, dry, blacksmith-shop, and four other buildings were constructed. A surface incline railway, 1,800 feet long, was built from No. 1 level at elevation 4,167 feet to No. 4 level at elevation 5,150 feet.

SMITHERS (54° 127° N.E.)*

Gold-Silver-Lead-Zinc

Duthie, Mamie, etc. (Sil-Van Consolidated Mining and Milling Company)

Company office, Room 213, 602 Hastings Street West, Vancouver. R. R. Wilson, president; R. W. Wilson, managing director; H. B. Gilleland, general superintendent. Capital, 3,500,000 shares, no par value. It is reported that the company has acquired seventy-one claims on the southern slope of Hudson Bay Mountain, 15 miles by road from Smithers. The property includes the Duthie mine on the Canary and Hummingbird groups, and the Mamie, Victory, Coronado, Homestake, Silver Lake, and Silver Creek groups. The Duthie camp is used as a base of operations.

In 1950 a compressor was installed at the upper Duthie camp and the 4100 Hummingbird adit was started. A portable compressor was hauled by tractor and set up at the Mamie camp. The adit drift, elevation 4,427 feet, on the Mamie vein was extended. A crew of about ten men was employed for the latter part of the year.

Glacier Gulch, Coronation, and Biff (Glacier Gulch Mining Co., Ltd.)

Company office, 2671 Broadway West, Vancouver. L. W. Bodie, president; C. A. Munro, manager. This company owns the Glacier Gulch Nos. 3 and 4, Coronation, and Biff Nos. 1, 2, and 3 mineral claims on Hudson Bay Mountain, 6 miles by road from Smithers. The claims lie on both sides of Glacier Creek, below the Lake Kathlyn Glacier. The mine camp is at an elevation of 2,540 feet. Work was started in July, 1950. A bunk-house, office, dry, powder-magazine, and compressor-house were built, and repairs were made to the old camp buildings.

Development was concentrated on the No. 3 vein which outcrops on the steep south slope of the gulch. A shipment amounting to 29 tons of silver-lead-zinc ore was made from this vein in 1937. The vein is exposed by several open-cuts and by short tunnels at elevations of 3,100 and 2,900 feet. In September, 1950, three diamond-drill holes were drilled to explore for the downward extension of the No. 3 vein at the camp level. Two holes indicated the vein, and a crosscut was started at elevation 2,600 feet. This

* By F. J. Hemsworth.

crosscut exposed a new vein, called the No. 1 vein, which strikes north 40 degrees west. The No. 1 vein was followed by the new level, and junction with the No. 3 vein was expected at 240 feet. A crew of twelve men was employed.

Cronin Babine Mines Limited Company office, 744 Hastings Street West, Vancouver; mine office, Smithers. R. L. Clothier, managing director; Haddon Agnew, manager. A detailed report on the Cronin mine may be found in the Annual Report of the British Columbia Minister of Mines for 1949, pages 94 to 98. Work done in 1950 was confined to road construction. The road built leaves the Chapman Lake road at a point 3 miles west of Chapman Lake and follows the route of the old sleigh-road. When the road is completed, the company plans to install a mill on the property.

TAHTSA LAKE (53° 127° N.E.)*

Silver-Lead-Zinc

Emerald (Emerald Glacier Mines Limited) Company office, 675 Hastings Street West, Vancouver. G. H. Rainville, president; Jack Scott, manager. The Emerald group is on Sweeney Mountain, about 10 miles northeast of Tahtsa Lake. Considerable underground work was done on this property by The Consolidated Mining and Smelting Company of Canada, Limited, from 1927 to 1931. At that time access to the mine was by a trail from the Tahtsa River. In the fall of 1950 the Emerald Glacier company started a road from the west end of François Lake to follow the Nadina River to Nadina Lake, thence southwest past Twinkle Lake, across Sibola Creek and the Whiting River, and to the mine. The last 5 miles will require several switchbacks, as the mine is at 6,000 feet elevation. At the end of the year about 15 miles of road remained to be completed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1945, p. 68.]

OMINECA (56° 125° S.E.)*

Lead

Beveley (The Consolidated Mining and Smelting Company of Canada, Limited).—The Beveley is a lead prospect owned by The Consolidated Mining and Smelting Company. It is about 1 mile north of the Osilinka River, in the Tenakini Range, at an elevation of 5,000 feet. A geological study of a bedded replacement deposit in limestone was made by five men who mapped the deposit on a scale of 200 feet to the inch during a two-month period.

CARIBOO†

Wells-Barkerville Area (53° 121° S.W.)

Gold

Cariboo Gold Quartz Mining Company, Limited Company office, 1007 Royal Bank Building, Vancouver. W. B. Burnett, president; G. A. Gordon, general manager; L. T. Vear, mine superintendent; J. Boulding, mill superintendent. Capital: 2,000,000 shares, $1 par value. The Cariboo Gold Quartz mine is half a mile south of the town of Wells, which is 51 miles by road from Quesnel on the Pacific Great Eastern Railway.

New development work comprised 1,789 feet of drifting, 2,308 feet of crosscutting, 233 feet of raising, 88 feet of shaft sinking, and 15,528 feet of diamond drilling.

The Tailings zone, west of No. 1 shaft, supplied most of the ore mined. Lesser amounts were obtained from the No. 1, Rainbow, and Goldfinch zones. In the Goldfinch zone, which is near the B.C. shaft, mining was confined to above the 1500 level

* By F. J. Hemsworth.

† By J. E. Merrett, except as noted.

on both the 52 and 53 veins. Work on the 52 vein is almost completed, while on the 53 vein mining continues to above 1400 level subdrift.

Ore from the quartz veins is mined by cut-and-fill and shrinkage stoping methods. The replacement ore is mined in a rill stope followed by filling.

Drifting and diamond drilling from the 2000-188 crosscut under Jack of Clubs Lake toward Island Mountain mine has disclosed a strong fault zone parallel and close to the west shore of the lake. This fault, which has been named Jack of Clubs fault, was also intersected on two horizons in Island Mountain mine. The attitude of the fault varies considerably at its different intersections but, in general, the strike is to the northeast and the dip moderate to the northwest.

Diamond-drill holes from the 2000-188 crosscut into the Baker or limestone formations have encountered minor quantities of methane gas. Adequate ventilation has been maintained to prevent dangerous accumulations of this gas.

Approximately 400 feet of drifting was done on 1800 level toward the Tailings zone. It is intended to connect the workings in this section to the workings on 2000 level.

In order to maintain adequate ventilation and prevent icing in the headframe and main adit, a Sheldon 36-inch 86 V 20, belt-driven fan was installed on 1600 level. The fan blows 16,000 cubic feet of air per minute under 2⅞ inches water-gauge pressure. The circulation is now controlled to produce upcast air in the shaft and outcast air in the main adit.

In an effort to conserve fuel, the cooling water from the power-house diesel engines is circulated through the mill. During January, when the outside temperature dropped to —50 degrees Fahrenheit, a temperature of 50 degrees Fahrenheit was maintained in the mill.

The average number of men employed during 1950 was 186, and the average number employed underground was 97.

Production: Ore milled, 60,689 tons. Content of bullion: Gold, 22,070 oz.; silver, 2,153 oz.

Island Mountain Mines Company Limited*

Company office, 744 Hastings Street West, Vancouver; mine office, Wells. F. W. Guernsey, president; J. A. Pike, mine manager; G. G. Sullivan, general superintendent; T. Bethune, mine superintendent; J. Stone, mill superintendent. Capital: 1,100,000 shares, 50 cents par value. This company, a subsidiary of the Newmont Mining Corporation of New York, owns claims on the south and southeast slopes of Island Mountain and operates the Island Mountain mine lying immediately west of the town of Wells. The claims adjoin holdings of Cariboo Gold Quartz Mining Company Limited to the south, east, and north.

Gold-bearing quartz veins were found on Island Mountain in the early 1870's, and in 1878 the Enterprise Company, a group of Barkerville miners, began exploration work on them. This company intended to haul ore to a 10-stamp mill installed in the Kurtz and Lane shaft-house at the Meadows. The Island Mountain Quartz Mining and Milling Co. took over the ground in 1887, moved the mill from the Meadows to Jack of Clubs Lake (near the present mill location), and, assisted by a loan of $20,000 from the British Columbia Government, built a new mill. Several hundred tons of ore, mainly from the Johns adit, was milled in 1890, and 15 to 20 tons of pyrite concentrates was shipped to the Government Reduction Works at Barkerville for treatment.

A satisfactory recovery of gold could not be made, and the property was forfeited to the Government for non-repayment of the loan. No further work was done until 1897, when the same company leased the property from the Government, installed four vanners, and ran the mill for about a month, again unprofitably. In 1903 the late C. J. Seymour Baker tested ore from Island Mountain and cleaned out some old adits, but

* By Stuart S. Holland.

interest in the property again lapsed. In 1925 Baker acquired the five original Crown-granted mineral claims, later known as the Aurum group, from the Government and each year until 1932 employed a small crew clearing out the old workings. In 1932 he optioned the Aurum group of five claims to Reward Mining Company Limited, who located eight adjoining claims to the west. This company bonded the whole property to Cariboo Consolidated Gold Mines Limited, who in turn optioned their holdings to Newmont Mining Corporation of New York. Island Mountain Mines Company Limited was incorporated by that corporation to operate the property.

About 1,000 feet of underground work was done during early exploration. Although several hundred tons of ore was milled, there is no record of the amount of gold produced. Production by Island Mountain Mines Company began in November, 1934, with a 50-ton mill. The mill capacity was increased to 100 tons per day in 1935, and production has been continuous to the present. Up to and including 1950 ore mined is 607,661 tons, from which 276,923 ounces of gold and 38,645 ounces of silver were recovered.

Surface workings for the most part are on the Aurum and Aurum West mineral claims. Attention was first drawn to these outcrops by early prospectors who were able to recover gold by rocker from the broken and weathered quartz outcrops.

Access to the underground workings is by a main level, the 4000 level, about 80 feet above Jack of Clubs Lake. Two older levels, the Mid Lake and Upper Lake, are 280 and 350 feet above the main level. Two very old levels, the Upper Johns and Lower Johns adits, are about 500 and 470 feet above the main level. A vertical two-compartment shaft is sunk below the main level to the 11 or 2550 level. From the main level to the 8 or 3000 level, eight levels have been driven from the shaft at 125-foot intervals, and the three lowest levels are at 150-foot intervals.

The mine lies 5 miles west of the eastern contact of a large area of schistose Precambrian sedimentary rocks which forms a belt about 18 miles wide and at least 40 miles long. These Precambrian Cariboo series schists are overlain to the northeast by sedimentary rock, the Slide Mountain series, of Mississippian age. In the Wells-Barkerville area the Cariboo series has been divided* into the Richfield, Barkerville, and Pleasant Valley formations. The upper part of the Richfield formation has been further subdivided into the Basal, Lowhee, B.C., Rainbow, and Baker members.† Since the publication of Memoir 181, more detailed work at the Island Mountain and Cariboo Gold Quartz mines suggests that Hanson's stratigraphy should be modified, that the Baker member is older than the Rainbow member, and that the Rainbow and Lowhee members and the B.C. and Basal members are the same, being repeated on opposite sides of a tight isoclinal fold. Recent work by the writer in the vicinity of Cariboo Hudson mine indicates that a complete revision of the stratigraphy of the Cariboo series, both in general and in detail, is necessary.

The general strike of the rocks is northwest, and the prevailing dip is at moderate angles to the northeast. The rocks on a small scale are seen to be intricately dragfolded, most dragfolds plunging northwestward at 20 to 25 degrees. On a regional scale it has been considered‡ that the major structure is a simple open anticline whose axis trends northwest through Mounts Pinkerton and Amador to Mount Nelson, and that the rocks near Wells consequently are lying on the northeast limb of this structure. In view of the recent work by the writer between Yanks Peak and Roundtop Mountain it is believed that the regional structure is far from simple, that the rocks are isoclinally folded on both a small and large scale, and it is suspected that there is a far greater repetition of beds than formerly has been considered.

The Island Mountain mine workings are on the Aurum, Aurum N.E., and Aurum West claims. These claims are underlain by rocks that are mapped by Hanson and the

* *Geol. Surv., Canada,* Mem. 149, p. 11 (1926).
† *Geol. Surv., Canada,* Mem. 181, p. 4 (1935).
‡ *Geol. Surv., Canada,* Mem. 149, p. 31 (1926).

mine geologists as belonging to the Rainbow and Baker members of the Richfield formation. The Rainbow-Baker contact strikes northwestward across the claims and dips at about 50 degrees to the northeast. There is about 3,500 feet of strike length of Rainbow-Baker contact on these claims.

The Rainbow member, between the black argillite and quartzite of the B.C. member and the light-coloured rocks of the Baker member, has a width of about 700 feet. The succession away from the B.C. contact consists of light-coloured quartzite, black argillite, limestone 25 to 50 feet thick called the 309 limestone, medium- to light-grey smoky quartzite, limy argillite called the 301 limestone, black argillite, and dark smoky quartzite in contact with the Baker member. The horizontal width between the 309 limestone and the Baker contact is 400 to 500 feet.

Rocks of the Baker member are typically light coloured and calcareous, in contrast to dark ones of the Rainbow. The succession from the Rainbow contact consists of thin limestone beds, sericite schist, " diorite "* (an ankeritized quartzite), " dolomite "* (almost pure ankerite rock), sericite schist, white and light-coloured quartzite, and Johns limestone. No underground working or diamond-drill holes reach beyond the Johns limestone.

Cleavage in varying degrees is present in all the rocks. It is believed to have been developed parallel to the axial planes of the primary folds. In the majority of instances the cleavage is parallel to the bedding and dips northeast. Consequently most of the folds, both small and large, are interpreted as being isoclinal and overturned with their axial planes dipping northeast.

The dominating fold structure in Island Mountain mine is a large dragfold which, in vertical section looking northwest, has the form of an " N " sloping to the right. The upper limb of the fold has many smaller dragfolds on it and dips about 50 degrees to the northeast. The lower limb is also dragfolded and dips about 35 degrees northeast. The distance between the two limbs is about 450 feet, and the effective dip of the connecting member between the two is 15 degrees southwest. The plunge of the axes of the major dragfold and of most of the small ones is 22 degrees northwest. This dragfold has been traced downward through the mine workings on levels below the 3625 level. It migrates to the northwest on its 22-degree plunge and at greater depth will pass out of Island Mountain property.

This fold was recognized and mapped by Benedict. As interpreted by him† on theoretical structural grounds, it indicates that the Baker member lies stratigraphically below the Rainbow member rather than above as was previously considered by Hanson, and that the mine is on the overturned limb of an anticline whose axial plane lies to the northeast. This was the first serious defect to be found in the older structural interpretation.

The rocks throughout the mine area are crossed by a succession of northerly striking, easterly dipping faults having a right-handed displacement. The most important of these is the Aurum fault, which strikes north 20 degrees west, dips about 40 degrees to the northeast, and whose hangingwall side moved about 530 feet in a direction south 59 degrees east. The horizontal component of movement is 475 feet and the vertical 240 feet. About 700 feet to the east of the Aurum fault and parallel to it is the Lake fault. Farther to the east are the Jack of Clubs No. 1 and No. 2 faults. These last two faults strike north 25 degrees east and dip to the northwest. The No. 1 has a horizontal displacement to the left of about 160 feet, and the No. 2 a displacement to the right of about 300 feet. These two faults are believed to intersect and to offset the Aurum fault. In addition, there are also numerous small, normal faults striking about north 55 degrees east and having horizontal displacements of 30 feet or less.

* These are the descriptive terms used at the mine.

† Can. Inst. Min. Met. Trans., Vol. XLVIII, p. 761 (1945).

Mineable gold-bearing ore occurs in pyrite-bearing quartz veins and in pyritic replacement bodies in limestone. Ore is mined in the quartz vein stopes by cut-and-fill and shrinkage-and-fill methods. All waste fill and ore is moved with scrapers.

Vein quartz of commercial grade is mineralized mainly with pyrite and smaller amounts of galena, sphalerite, arsenopyrite, scheelite, and cosalite. Visible gold is commonly associated with cosalite. Ankerite is fairly common, particularly along the walls and in the leaner veins.

Quartz veins occupy fractures which have two general directions. Transverse or horsetail veins strike about north 40 degrees east and dip 50 degrees to the southeast. Diagonal veins strike north 60 to 80 degrees east and dip steeply south. Most of the quartz ore in Island Mountain mine is mined from diagonal veins and comparatively little from transverse veins alone, whereas at Cariboo Gold Quartz mine most of the quartz ore comes from transverse veins.

The two directions of fracturing are well developed throughout the mine, and individual veins frequently show quartz along both sets of fractures. It is generally considered that the transverse veins occupy tensional fractures and the diagonal veins occupy shear fractures, both of which are genetically associated with major northerly striking faults such as the Aurum and other similar ones. The northerly striking faults evidently were active during a long period, so that the fractures were reopened and made accessible to mineralizing solutions.

Individual quartz veins have but little persistence along strike and down dip; the vein fractures usually die out on passing from hard brittle quartzite into softer or more schistose rock. Few, if any, veins cross from the Rainbow quartzite into rocks of the Baker member.

The abundance of quartz-filled fractures in a particular type of dark quartzite in the Rainbow member has restricted exploration by the company to that part of the Rainbow member lying between the 309 limestone and the Rainbow-Baker contact, a horizontal width on the footwall side of the Baker member of 500 feet or less.

Replacement ore has contributed and is continuing to contribute an exceedingly large part of the gold produced in this mine. The importance of replacement ore was early recognized, and it was the discovery of the first replacement orebody in 1933 that justified the installation of the cyanide mill in 1934. This orebody, about 1,250 feet from the portal on the 4000 level, yielded about 33,000 tons of ore which averaged slightly more than 0.8 ounce of gold per ton. The profitable operation of the mine is dependent upon the mining of replacement ore. For this reason, much of the exploratory work is directed toward the finding of such ore. As a consequence, the underground exploration by drifting and by drilling is concentrated largely upon a thorough exploration of the Rainbow-Baker contact.

Replacement orebodies consist almost entirely of pyrite, with a minor amount of arsenopyrite, that has replaced limestone beds in the Baker member at or within a very few feet of the Rainbow contact. The orebodies are cigar-shaped and may have a cross-sectional area of 100 square feet or less. Orebodies of this kind appear to be localized along the axes of dragfolds, both small and large, and plunge northwestward at an angle of 22 degrees, which is also the plunge of the regional dragfolding. These orebodies occupy folds in the southwestward-dipping element of the major dragfold, as well as other folds which lie on the limbs above and below it.

The persistence of some replacement orebodies along their plunge is quite remarkable. On a longitudinal projection parallel to the plunge direction—i.e., north 45 degrees west—it is apparent that a single continuous orebody extends for about 1,000 feet above and 1,000 feet below its plane of intersection with the Aurum fault. The terminations, however, are about 400 to 450 feet in a direct line from the fault with which the axis of the orebody makes an angle of about 25 degrees. Company projections indicate that replacement ore is no more abundant nor richer close to the Aurum fault. It would appear that one must assume, therefore, that the Aurum fault has had little or no effect upon the localization of replacement orebodies. In several instances where a transverse vein crosses limestone, it has been discovered that replacement ore extends from the quartz vein along and into the limestone bed. The localization of replacement orebodies in general does not appear to be related to the spacing or position of transverse veins.

Normally the pyrite grains are about an eighth of an inch across, but at the margins of the replacement orebodies the pyrite is very coarse grained, cubic crystal faces as much as an inch across are commonly observed, and a larger percentage of a grey carbonate is present. The grey carbonate, locally called dolomite, is ankerite of the following composition: Calcium carbonate ($CaCO_3$), 49.7 per cent; magnesium carbonate ($MgCO_3$), 24.6 per cent; manganese carbonate ($MnCO_3$), 3.8 per cent; and ferrous carbonate ($FeCO_3$), 19.4 per cent.

The gold values in part vary with the grain size of the pyrite. Exceedingly fine-grained pyrite may occur as streaks and lenses in material of normal granularity. The finer-grained pyrite assays higher in gold. A selected sample containing about 50 per cent fine-grained pyrite and the balance normal grain-sized material assayed 3.66 ounces of gold per ton. Comparable specimens of fine-grained ore may assay as high as 10 ounces of gold per ton, yet no visible gold is to be seen nor is any cosalite present.

Development work during 1950 comprised 3,767 feet of drifting and crosscutting, 582 feet of raising, and 8,250 feet of diamond drilling. This work was distributed amongst all levels from 4000 down to 2550. In February, work on 2550 level was stopped pending the installation of a larger hoist.

In July an addition to the power-house provided room for a 450-horsepower General Motors diesel engine with a 440-volt attached General Electric alternator. In late October and November, mining operations were suspended while a larger hoist was installed. The hoist, a 54- by 60-inch Nordberg hoist with hydraulic controls on the clutch and brake, was formerly in use at the Berens River mine in Ontario.

The average number of men employed was 122, and the average number employed underground was 84.

Production: Ore milled, 40,580 tons. Content of bullion: Gold, 16,809 oz.; silver, 2,378 oz.

[References: Can. Inst. Min. Met., Trans., Vol. XLVIII, pp. 755–770 (1945). *Geol. Surv., Canada,* Prelim. Paper 37-15 (1937); Mem. 149 (1926); Mem. 181 (1935). *Minister of Mines, B.C.,* Ann. Rept., 1934, pp. C 22, C 23. B.C. Dept. of Mines, Bull. 1, p. 62 (1932); Bull. 3, pp. 13, 14 (1932).]

Marguerite (52° 122° S.W.)

Copper

Copper King

This property, comprising ten claims, located in 1949 and owned by C. E. Johnson and R. R. Moffat, both of Quesnel, is approximately 1½ miles east of Lot 9497 in the Cariboo Land District. It is reached from Marguerite Station on the Pacific Great Eastern Railway by travelling easterly on 10½ miles of wagon-road and trail. The claims cover the former Pollyanna, Manderfield, and Conway claims.

The present workings are a continuation of former work on the Pollyanna claim. They are at an elevation of 4,000 feet on the west side of the summit of a broad, rounded, jack-pine covered range of hills east of Cuisson Lake.

Copper mineralization occurs in irregularly placed quartz lenses which are between shear planes (strike north 30 degrees west and dip 45 degrees east) and on the noses of folds in a wide zone of sheared granodiorite. Work done in 1949 and 1950 has shown this zone to be more than 170 feet wide. The quartz lenses near the surface have been crushed and weathered and are weakly to well mineralized with chalcopyrite, azurite, malachite, and chrysocolla. Surface waters carrying copper carbonates in solution have stained the sheared granodiorite to a depth of at least 28 feet, as shown in the shaft sunk in 1950.

The main original workings on the Pollyanna claim comprised three shafts at 25-foot intervals along a north-south line. When examined in September, 1950, these shafts were filled with water. It was reported that the most northerly shaft was sunk to a depth of 10 feet and that little or no copper mineralization had been found. The middle shaft was sunk to a depth of 30 feet. In 1949 this shaft was drained, and half a ton of ore was mined and shipped to Tacoma, Wash. It was reported that this shipment assayed 10.5 per cent copper. A grab sample of the quartz and sheared granodiorite on the dump of this shaft gave the following assay: Gold, *nil;* silver, 0.1 oz. per ton; copper, 3.3 per cent. The third shaft was not drained by the present owners but was reported to be 27 feet deep. It was noted that the dump material was stained with malachite.

In 1949 considerable trenching was done to crosscut the shear zone approximately 50 feet north of the north shaft. This work was abandoned when it was found that the overburden was much deeper than anticipated. Work was then directed to sinking a shaft 120 feet south of the third shaft. This shaft was sunk to a depth of 28 feet in 1950 and penetrated sheared and weathered granodiorite lightly stained with malachite. One small lens of crushed quartz was exposed on the east wall of the shaft but did not extend across to the west wall. No copper mineralization was visible in the quartz. A grab sample of the sheared diorite on the dump gave the following assay: Gold, trace; silver *nil;* copper, 0.3 per cent.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1925, pp. 155, 156; 1928, p. 197; 1929, p. 192.]

Keithley Creek (52° 121° N.E.)

Gold

Midas — F. H. M. Codville, of Duncan, V.I., and J. Pickering, of Keithley Creek, completed approximately 50 feet of crosscut on the Jim group near Yanks Peak, about 11 miles by road from Keithley Creek P. O. Four men were employed.

Spanish Creek (52° 121° N.E.)

Silver-Lead-Zinc

Rae, Bear, Cariboo — The Rae, Bear, and Cariboo groups, near the head of Black Bear Creek, are held by H. C. Millar, D. A. Millar, and W. Eop, of Likely. A shipment of 8 tons was made to Trail smelter. Gross content: Silver, 746 oz.; lead, 6,907 lb.; zinc, 32 lb.

BLUE CREEK (51° 122° S.E.)*

Gold

Elizabeth, Yalakom (Bralorne Mines Limited) — This property, comprising fifty-three claims owned by Bralorne Mines Limited, is on Blue Creek, a tributary of Yalakom River. It is reached by 48 miles of road from Lillooet by way of Moha. Development work continued on No. 9 vein on Yalakom No. 2 mineral claim. A portable compressor was installed during August and September, and 25 feet of timbered drift was driven by five men. This adit is at an elevation of more than 7,000 feet.

* By J. E. Merrett.

BRIDGE RIVER (50° 122° N.W.)*

Gold

Bralorne Mines Limited

Company office, 555 Burrard Street, Vancouver; mine office, Bralorne P.O. A. C. Taylor, president; M. M. O'Brien, vice-president and managing director; D. N. Matheson, general manager; C. M. Manning, mine superintendent; D. Cameron, assistant mine superintendent; A. Almstrom, mill superintendent. Capital: 1,250,000 shares, no par value. Bralorne mine is on Cadwallader Creek and is 51 miles by road from Shalalth Station on the Pacific Great Eastern Railway.

Development work comprised 7,395 feet of drifting, 1,419 feet of crosscutting and raising, 607 feet of shaft sinking, and 4,065 feet of diamond drilling. With the exception of the 85 drift and crosscut on 2600 level, all drifting and crosscutting were done between 1500 level and 2000 level. This work developed the 51 vein on 1500 and 1800 levels; the 53 vein on 1700, 1800, and 1900 levels; the 75 vein on 1900 and 2000 levels; and the 77 vein on 1700 level.

In the stopes, ore was mined principally by cut-and-fill methods, but some ore was obtained by square-set and vertical slot longwall stoping. In all stopes, scrapers were used to move ore and waste fill. Broken ore reserves were estimated to be 41,800 tons on December 31st.

The Empire shaft-sinking programme, which commenced below 2000 level in February, 1949, was completed in April, 1950. During this period the shaft was extended 970 feet, 93 feet of which was completed in 1950. Sinking of the Crown shaft, which also extends below 2000 level, commenced in July. At the end of December 518 feet was completed.

A new ventilating fan with a capacity of 80,000 cubic feet per minute was installed on 2000 level. Surface air is supplied directly to the fan through a series of raises extending up to the ventilating fan on the surface.

On the surface, construction of thirteen four- and five-room houses was started, and at the end of the year most of these were completed and occupied.

The average number of men employed was 468, of whom 344 were employed underground.

Production: Ore milled, 185,074 tons. Content of bullion and concentrates: Gold, 77,238 oz.; silver, 20,535 oz.

Pioneer Gold Mines of B.C. Limited

Company office, 711 Yorkshire Building, Vancouver; mine office, Pioneer Mine P.O. Victor Spencer, president; H. T. James, managing director; J. A. Graham, mine manager; H. A. Rose, general superintendent; W. B. Montgomery, mine superintendent; T. Bevister, mill superintendent. Capital: 2,500,000 shares, $1 par value. Pioneer mine is on Cadwallader Creek and about 54 miles by road from Shalalth Station on the Pacific Great Eastern Railway.

In 1950, 1,002 feet of drifting and 1,074 feet of crosscutting were completed. The major part of the drifting was done on the 29 vein, which is a footwall branch of the 27 vein. A total of 513 feet of crosscutting was done on various levels in crosscuts to the main ventilation-raise system. A further 728 feet was done in crosscuts to the stations of the proposed internal inclined shaft. This work was completed preparatory to sinking a shaft in the footwall of the 27 vein in order to develop it below 2500 level. In addition to the crosscuts to the shaft, 4,230 cubic feet of waste was obtained from the slashing of shaft stations. Because of adverse economic conditions, work on the shaft-sinking programme was suspended early in November.

The pilot ventilation raises serving the 27 vein from 2500 level to the surface have been completed, except between 800 and 900 levels. Ring drilling and slashing have

* By J. E. Merrett.

commenced from the surface downward to make a raise of 10 by 10 feet finished dimensions. The raise driving accounted for 1,956 feet of the total 2,468 feet done in 1950. Slashing in the raise produced 19,271 cubic feet of waste.

A total of 3,242 feet of diamond drilling was done in 1950.

All stope ore was mined by rill-shrinkage methods, with scrapers being used to move both waste fill and ore.

On the surface one five-room dwelling and twenty garages were built. The former hospital building was renovated to provide two apartments.

The average number of men employed was 248, of whom 146 were employed underground.

Production: Ore milled, 73,551 tons. Content of bullion: Gold, 35,543 oz.; silver, 7,616 oz.

B.R.X. (B.R.X. (1935) Consolidated Mines Limited) Company office, 616 Stock Exchange Building, Vancouver; mine office, Shalalth P.O. A. E. Jukes, president; E. R. Shepherd, managing director. Capital: 7,000,000 shares, 50 cents par value. This property, comprising forty-two claims, lies east of the Hurley River and on the Bridge River road, 3½ miles north of Bralorne. In 1950 the development work was confined to the California workings and comprised 110 feet of crosscutting, 226 feet of drifting, 948 feet of diamond drilling, 204 feet of winze sinking and raising, and the cutting of two shaft stations on the winze.

No. 1 crosscut, commenced in 1949 from the main northwest crosscut at a point 45 feet from 9c shaft station, was continued northeasterly 110 feet to a total length of 180 feet. Three exploratory diamond-drill holes were drilled at the face of this crosscut.

At a point approximately 100 feet from the beginning of the No. 1 crosscut, 9c north drift was started and was driven northerly for a distance of 170 feet. At a point 130 feet from the beginning of this drift a winze station, rope raise, and hoist-room were cut, and a winze inclined 65 degrees to the northeast was sunk a slope distance of 137 feet. A station was cut on the winze at the 10c level, and 55 feet of drifting to the north was done. At the face of the drift, steeply dipping diamond-drill holes were drilled to the west. This development work was successful in extending the known boundaries of the low-grade chalcopyrite-pyrite mineralization.

The number of men employed averaged ten.

Wayside (L.A.P. Mining Company Limited) Company office, 626 Pender Street West, Vancouver. L. A. Prosser, manager; M. Retan, superintendent. Capital: 3,000,000 shares, $1 par value. This private company owns seventeen claims and seven fractions which lie astride the Bridge River road, midway between Gold Bridge and Minto. This property was formerly owned by the Wayside Consolidated Gold Mines Limited.

Except for 72 feet of shaft sinking and the retimbering of some old stopes, all work was done on the surface.

A wooden water tank of 35,000 gallons capacity, for camp and mill use, has been erected above the camp. A new transformer station was erected near the main road. In the mill an ore storage bin, a mill-feed bin, and a conveyor-belt ramp to the latter have been constructed.

The Hadsel mill, used by the former owners, was replaced with a Hardinge mill. Several other smaller pieces of mill equipment have been either overhauled or renewed.

The average number of men employed was sixteen.

Gold-Antimony

Congress Gold Mines Limited Company office, 640 Pender Street West, Vancouver; mine office, Minto P.O. A. E. Jukes, president; Miss J. Whitehouse, secretary-treasurer. Capital: 3,000,000 shares, no par value. In 1950, 388 feet of drifting and 491 feet of crosscutting were done. In

January and February 300 feet of crosscutting and drifting were done in a northwesterly direction from a point on the No. 3 or main level, approximately 800 feet from the portal. A quartz vein, 2 feet wide, that contained stibnite and reportedly gold, was intersected. The internal inclined shaft was drained to below 5 level, and drifts were started on both the north and south drift faces of 4 and 5 levels. A further crosscut was driven from the north heading on 5 level to intersect the same vein that was intersected with the new work on 3 level.

In August, Sheep Creek Gold Mines Limited, which company was financing this operation, suspended work until such time as economic conditions for gold-mining improve.

The average number of men employed was twelve.

Antimony

Gray Rock (Gray Rock Mining Company Limited)

Company office, 207 Hastings Street West, Vancouver; mine office, Minto P.O. G. H. Clark, president; C. E. Little, secretary. Incorporated in 1950 under British Columbia charter. Capital: 3,000,000 shares, $1 par value. This company purchased the holdings of Bellore Mines Limited on June 1st, 1950. This property comprises sixteen claims which are located near the headwaters of Truax Creek, a tributary of the Bridge River. In June the Olympic bridge over the Bridge River on the road to this property was washed away by floods. The Department of Public Works has since constructed a road along the south side of the Bridge River from Gold Bridge to the lower end of the road to the mine.

Between August 1st and October 31st five men under the supervision of L. Belliveau drove 400 feet of crosscut, the portal of which is at an elevation of 6,800 feet. This work was done with the aid of a portable compressor, a Swedish jack-leg air-drill, and Coromant tungsten-carbide-tipped drill steel. The vein that was the objective of the crosscut was not reached, but it is believed that a small advance of the face will reach the vein.

ANDERSON LAKE (50° 122° N.E.)*

Gold

Golden Contact (Golden Contact Mines Limited)

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

Work commenced on the surface on April 4th and underground on June 3rd, and was suspended on November 18th. Between April and June a tractor or jeep road was constructed from Marne Station to the mine. The road follows the British Columbia Electric Railway Company's transmission-line from Marne to the point where the pack-horse trail crosses the transmission-line clearing and then follows the trail to the mine.

Between June 3rd and November 28th eleven men drove 1,170 feet of crosscut and 85 feet of drift on the Pep level. This work comprised 200 feet of crosscut to the north to cross the No. 1 fault zone, and 970 feet of crosscut westerly, paralleling the No. 1 fault zone. The south extension of the East Segment vein zone was intersected 30 feet from the west face of the crosscut. This zone contained small scattered lenses of quartz, some of which carried spectacular showings of free gold. Drifting was directed in a northerly direction in this zone, and 85 feet was done by the end of November.

* By J. E. Merrett.

BARRIERE RIVER (51° 119° S.W.)*

Silver-Lead-Zinc

White Rock This Crown-granted mineral claim (L. 4023), owned by W. W. Elder, of Slocan City, is half a mile east of North Barriere River in the Kamloops Mining Division. It is reached by 17 miles of road and 3 miles of good pack-trail from the Canadian National Railway at Barriere.

Earlier reports made on this property may be found in the Annual Reports of the British Columbia Minister of Mines for 1928 and 1929. In the Annual Report for 1928, page 212, H. G. Nichols states:—

" The mineral occurrences, in the form of quartz veins and stringers carrying silver-lead minerals, are found in a series of fractures, sympathetic to the main fault-zone that is identified with the valley of the Barriere river.

" The formation is composed of a series of bands of limestone and schist, and the main series of fractures, which have a north-east, south-west strike, is developed principally in the limestone, cutting the formation almost at right angles."

A multitude of closely spaced parallel quartz veins of irregular length and width fill tension fractures in the limestone and schist. It was noted that one vein increased in width from a few inches to 3 feet in a length of 20 feet. It was also noted that some wide sections maintained their width for as much as 50 feet. Sufficient surface stripping has not been done, however, to determine if the wide sections of the veins occur in any regular pattern, if the veins are continuous, or if the veins occur in two or more parallel zones striking generally east.

Two main areas have been stripped and small crosscuts have been driven to intersect the formations in these areas.

In the discovery outcrop a rock cut, 25 feet long, 8 feet wide, and 12 feet deep at the face, was driven to intersect a quartz vein nearly 2 feet wide. This vein strikes north 7 degrees west and dips 68 degrees to the east. It contains, particularly on the hanging-wall side, scattered patches of galena and tetrahedrite. Thin layers of azurite and malachite are scattered throughout the quartz. It is believed that these minerals were formed from weathering of the tetrahedrite. A sample taken across 22 inches at the bottom of this cut assayed: Gold, 0.01 oz. per ton; silver, 2.7 oz. per ton; lead, 2.2 per cent; and zinc, 0.8 per cent.

Approximately 250 feet below this outcrop a crosscut 5 by 7 feet was driven 60 feet, at south 80 degrees east, in limestone. The face of the crosscut would have to be advanced about 500 feet to intersect the downward projection of the vein exposed in the open-cut. Several narrow quartz veins and a few masses of quartz can be seen in the crosscut, but no sulphides are visible in the veins or quartz. Four feet from the portal there is a fault that strikes north 40 degrees east and dips 72 degrees easterly. A short distance farther from the portal there is a fault dipping 16 degrees southerly. It extends along the crosscut to within 20 feet of the face and then passes into the back. It displaces all veins intersected an unknown distance.

Considerable work has been done on a second large outcrop that is 600 feet south-west of the discovery outcrop. A rock cut, 23 feet long, 6 feet wide, and 12 feet deep at the face, cuts into the footwall side of a quartz vein at a point where the vein is 4 feet wide. The vein is exposed for about 50 feet on a bluff above the cut. Galena, tetrahedrite, and secondary copper minerals are scattered in patches through the quartz. A grab sample across the face of this cut assayed: Gold, trace; silver, 0.5 oz. per ton; lead, 1.3 per cent.

About 150 feet below this outcrop a crosscut 5 by 7 feet was driven in limestone banded with schist. This crosscut is 237 feet long and was driven south 70 degrees east to cut the projected extension of the vein exposed in the open-cut above. Several small quartz veins and faults were intersected. A succession of narrow faults was

* By J. E. Merrett.

found between 102 and 164 feet from the portal. These faults strike about north and dip steeply east. Between 190 and 196 feet from the portal there is a strong fault zone striking north 17 degrees east and dipping 83 degrees easterly. This zone is filled with calcite and mud seams, and large fragments of quartz. It appears from the survey made that this zone is the extension of the vein in the open-cut. No sulphides were seen. Another fault, striking north 7 degrees west and dipping 73 degrees easterly, was intersected between 206 and 218 feet from the portal. This fault was also filled with calcite and large fragments of quartz. No sulphides were observed. From 218 to 235 feet from the portal several small quartz stringers were found. The only sulphides seen in the crosscut were in a quartz vein, 8 inches wide, a short distance from the portal. A little galena was seen in this vein.

A large number of quartz veins have been exposed by surface stripping. They are irregular in width, undetermined in length, and contain some silver-rich sulphides. Underground development has shown that these veins have been interrupted by post-mineral faults both along the plane of the veins and across them. Local concentrations of galena, tetrahedrite, and secondary copper minerals occur in the quartz. Nothing was seen, however, to indicate that the amount of silver-rich sulphide might increase at any point.

NICOLA (50° 120° S.W.)*

Copper

Guichon Mine Limited

Company office, 125 Pacific Building, Vancouver. J. D. Ferguson, mine manager, Merritt. This company continued exploratory and development work at the Copperado mine, 5 miles by road north-east of Nicola P.O. The shaft was deepened to 270 feet, and 250 feet of drifting and crosscutting were done on the 200-foot level. A geophysical survey was conducted at the property during the summer by Geophysical Exploration Limited, Toronto, using the self-potential method. A crew of from five to eight men was employed at the mine.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 115–120.]

TULAMEEN RIVER (49° 120° N.W.)*

Gold

El Alamein (El Alamein Mines (1950) Limited)

R. C. Cragg, managing director; R. J. Charles, engineer in charge. This company continued development and exploration work at the El Alamein mine on the Tulameen River, 4½ miles upstream from Tulameen P.O. The main face in the upper tunnel was extended 210 feet southwesterly and is now 284 feet from the portal. The hangingwall drift in the upper tunnel was advanced 57 feet. The main face in the lower tunnel was extended 84 feet southwesterly and is now 157 feet from the portal. Test-holes were drilled at regular intervals along the drift, and the cuttings were panned in an effort to locate the continuation of the gold-bearing stringers found near the portal. Five hundred and twenty pounds of ore was treated by amalgamation, and 65 ounces of gold was recovered. Operations were suspended on December 1st. Four men were employed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 124–129.]

Silver-Lead-Zinc

Silver King and Jensen (Silver Hill Mines Ltd.)

E. Borup, president; E. H. Kinder, manager. Five men were employed to improve the road from Tulameen to the camp, preparatory to reopening the old Silver King and Jensen properties at Tulameen Summit, 21 miles by road southwesterly from Tulameen P.O. This work involved reconditioning bridges and blasting rock to make the road passable for trucks. The old camp was rehabilitated to accommodate

* By E. R. Hughes.

fifteen men. A dry-house, bunk-house, dining-room, garage, office, and workshop were built or reconditioned.

Underground work included cleaning out and retimbering the old Jensen tunnel, and preparations were made for reopening the Dornberg No. 2 tunnel.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1929, p. 278; 1930, p. 214; 1931, pp. 129, 130; 1932, p. 139.]

COPPER MOUNTAIN (49° 120° S.W.)*

Copper

Copper Mountain (The Granby Consolidated Mining Smelting and Power Company Limited) A. S. Baillie, president, Copper Mountain; W. I. Nelson, general manager, Allenby; R. S. Douglas, mine superintendent, Copper Mountain; J. A. C. Ross, assistant mine superintendent, Copper Mountain; L. H. McKay, mill superintendent, Allenby. This company operates the Copper Mountain mine at Copper Mountain, 12 miles south of Princeton. 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. 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 an adit level, No. 6, and two vertical shafts. No. 2 adit level is not used as a mine entrance but still serves as a ventilation outlet. The No. 1 shaft is the service shaft and extends from the surface to the No. 6 or main haulage level. No. 2 shaft is used to service No. 7 and No. 8 levels and is an internal shaft, with the hoist on No. 5 level. All ore is passed to No. 6 level and taken from the mine in Granby-type cars, hauled by electric-trolley locomotives. After it is crushed in the coarse-crushing plant on the surface near the portal of No. 6 level, the ore is hauled 8 miles by rail to the concentrator at Allenby.

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

Mining is extensively mechanized. All ore is mined from diamond-drill shrinkage stopes and is then transferred from slusher-drift draw-points to grizzlies by electric slusher-hoists. Most slusher-drifts are now reinforced with a concrete lining, and at the end of the year a crew of about sixty men was regularly employed on underground concrete construction work. Ventilation raises, equipped with auxiliary fans, ensure that each slusher unit is provided with fresh air, so that the dust and smoke from scraping and blasting are carried away quickly. Diamond drilling done during the year comprised 33,847 feet of exploratory and 255,892 feet of blast-hole drilling.

The mining of the 122 East ore-block has caused surface subsidence of an area north of the No. 1 shaft. The subsidence spread to the steel-sharpening shop and made it necessary to remove this building. The possibility of the subsidence engulfing the No. 1 shaft caused the company to drive a new service raise that could be used in place of the shaft if necessary. The driving of the new raise was completed in 1948, and the work of equipping the raise with a manway and skipway, together with electric cables and compressed-air pipes, was completed in 1950. The new raise connects the No. 6 level with the surface at a point 350 feet southwest of the collar of No. 1 shaft.

Fourteen Copco drilling-machines and fourteen Holman Silver Bullet stoping-machines were used in development work. These machines are used in conjunction with tungsten-carbide steel, and this method of mining had, at the end of the year, entirely displaced the standard types of leyner drilling-machines formerly used in development work. The tungsten-carbide bits are sharpened on a silicon carbide wheel in the grinding-

* By E. R. Hughes.

room on No. 6 level. Other additions to equipment include an Eimco model 40 and two model 12 mucking-machines, two Goodman 10-ton electric locomotives, and ten 130-cubic-foot capacity Granby-type ore cars. The bunk-house was enlarged to accommodate sixty-two men.

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. A trained nurse and industrial first-aid attendants are on hand at all times. Aluminium-dust therapy is available for employees. A doctor visits the Copper Mountain camp twice a week and is available in emergencies. An ambulance is maintained for transporting sick or injured persons to the Princeton General Hospital, 12 miles from the mine. Two trained mine-rescue teams competed in the Similkameen Valley Mine Safety Association's annual competition, held in Princeton on June 10th. The Regional Ryan Trophy for the lowest accident frequency in 1949 among the metalliferous mines in British Columbia and Yukon was awarded to this mine.

The mine was worked continuously throughout the year. The crew at Copper Mountain averaged 547, with 418 employed underground. The total payroll for the Copper Mountain, Allenby, and Princeton operations was 866 at the end of the year.

Production: Ore mined, 1,799,852 tons; ore milled, 1,749,964 tons. Net content of concentrates: Gold, 8,475 oz.; silver, 173,424 oz.; copper, 25,486,468 lb.

HEDLEY (49° 120° S.E.)*

Gold

Nickel Plate and French (Kelowna Exploration Company Limited)

Company office, 75 West Street, New York, N.Y.; mine office, Hedley. George L. Mill, manager; E. W. Johnson, mill superintendent; J. Biggs, mechanical superintendent. This is a private company operating the Nickel Plate mine and the French mine at Hedley.

Nickel Plate Mine. — C. T. Williams, mine superintendent. Full descriptions of the operation have appeared in previous Annual Reports. Additional dry-house facilities to accommodate twenty-five men were built at the mine. Five Copco compressed-air drilling-machines were purchased for testing. No other major additions to plant or equipment were made during the year, and only routine development work was done underground. The mine was worked throughout the year. At the end of the year 216 men were employed, 99 of whom were employed underground.

Of the four main parts of the mine, the percentage of production was: Nickel Plate, 78.1 per cent; Morning, 11.4 per cent; Sunnyside, 9.6 per cent; Bull Dog, 0.9 per cent. Production: Ore milled, 123,689 tons. Gross content of precipitates and concentrates: Gold, 44,617 oz.; silver, 3,901 oz.; copper, 104,163 lb.

French Mine Division.—F. Garbutt, mine superintendent. This mine is on the Oregon mineral claim. The company took an option on the claim, owned by F. H. French and associates, and in 1949 did some exploratory diamond drilling. The mine is between Sixteen Mile and Eighteen Mile Creeks, about 8 miles by road from the company's mill at Hedley, and 1½ miles east of the Hedley–Nickel Plate road. A truck-road was built to the mine during the early part of the year, and underground work was started on July 12th. A small crushing and sampling plant was built at the mine, and dry-house accommodation suitable for the small crew was erected. A 500-cubic-foot Holman belt-driven air compressor powered by a 100-horsepower General Electric motor was installed. Electrical power is obtained from the West Kootenay Power and Light Company Limited. As far as is known, the ore occurs in a shallow deposit. The workings consist of an adit

* By E. R. Hughes.

level, at an elevation of 3,910 feet, with two small open stopes, one on each side of the level. The broken ore is scraped from the underground workings along the adit level to a storage bin outside the portal. Output at the rate of 32 tons per day was trucked to the company's mill at Hedley for treatment. Six men were employed. Operations were suspended on November 15th for the winter.

Production: Ore milled, 2,740 tons.

Silver-Lead-Zinc

Iota (Islay B) This group on Stemwinder Mountain, about 3 miles northwest of Hedley, was formerly known as the Islay B. The present owner is J. W. Gallagher, from whom a lease and option have been obtained by K. G. Ewers and William Hegan. From the end of the truck-road at the camp a new road, 1 mile long, has been built to the workings at an elevation of about 4,800 feet. An 8-foot shaft was deepened to 30 feet in a weathered fracture zone. Thirty-five and a quarter tons of ore from the shaft was shipped to the Trail smelter.

Production: Gold, 2 oz.; silver, 576 oz.; lead, 3,648 lb.; zinc, 586 lb.

This is the first property in the Hedley camp to ship silver-lead ore. In addition to Ewers and Hegan, two men were employed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1947, pp. 146, 147.]

FAIRVIEW CAMP (49° 119° S.W.)*

Silica-Gold

Fairview (The Consolidated Mining and Smelting Company of Canada, Limited) G. E. Clayton, mine superintendent. This mine is about 5 miles west of Oliver. The property was formerly operated by the Fairview Amalgamated Gold Mines Limited but was idle for several years until reopened by the present operators in 1946. The No. 6 adit is the haulage level. Shrinkage stoping is being done between this level and the No. 5 level, 135 feet above. A new ventilation raise, 531-L, was advanced 360 feet on the vein and will later connect with an old adit higher up the hill. Electrical power is obtained from the West Kootenay Power and Light Company Limited. The mined quartz is shipped to Trail for use as a flux in the smelter. The quartz contains a small amount of gold. Eleven men were employed underground and six on the surface. Operations were continuous throughout the year. Output averaged 70 tons per working-day.

NORTH OKANAGAN (50° 119° S.W. AND S.E.)*

Gold

White Elephant (Pre-Cambrian) The workings are on the White Elephant mineral claim 5 miles by road westerly from Ewings Landing on the west side of Okanagan Lake and 34 miles from Vernon. Work ceased in July, 1935, and the property lay idle until the summer of 1950, when a start was made to unwater the old workings so that an examination of the mine could be made. An automatic injector was used, and with it the water in the shaft was lowered about 60 feet in two months. It was intended to install a compressed-air operated pump to hasten unwatering, but it was found necessary to postpone the examination of the workings and unwatering was discontinued. A fence was built around the glory-hole adjacent to the shaft. No other work was done. Two men were employed under H. H. Armstrong.

[Reference: *Geol. Surv., Canada,* Sum. Rept., 1931, pp. 86A–90A.]

Mount Vernon.—From this property near Vernon, C. J. Christian and V. Proctor shipped 11 tons of ore to the Trail smelter. Gross content: Gold, 3 oz.; silver, 219 oz.; lead, 2,779 lb.; zinc, 138 lb.

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* By E. R. Hughes.

Silver Star.—R. Wilkie, of Kamloops, shipped 1.5 tons of lead ore. Gross content: Silver, 77 oz.; lead, 802 lb.; zinc, 68 lb.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1926, p. 200; 1949, pp. 137, 138.]

CAMP McKINNEY (49° 119° S.E.)*

Gold

Waterloo

Ignatius B. Healey, Salt Lake City, Utah, owner. This mine is on the Waterloo Consolidated Fraction mineral claim, and is half a mile east of the Cariboo-Amelia mine. The mine has been closed since 1903, except for attempts at unwatering and rehabilitation. In June, 1950, Leo Morris and Raymond Galloway were unwatering and retimbering the mine shaft, using a gasoline pump. On June 29th the water had been lowered to about 50 feet below the shaft collar when Morris descended the shaft to attend to the pump and was overcome by carbon monoxide. Galloway went to his assistance and he was also overcome. Both men died in the shaft from carbon-monoxide poisoning. No other persons were employed, and no other work has been done since.

[Reference: B.C. Dept. of Mines, Bull. 6 (1940).]

WESTBRIDGE (49° 118° S.W.)

Silver-Lead-Zinc

Maybe.—Ore shipped to Trail, 55 tons. Gross content: Silver, 193 oz.; lead, 5,737 lb.; zinc, 4,303 lb.

BEAVERDELL (49° 119° S.E.)*

Silver-Lead-Zinc

Highland Bell Limited

Company office, 844 Hastings Street West, Vancouver; mine office, Beaverdell. K. J. Springer, president; P. L. Clark, mine manager; Fred Tinsley, mine foreman; P. R. Clarke, mill superintendent. The Highland Bell mine, on Wallace Mountain, is served by 4 miles of road from the main camp at Beaverdell. No. 4 level is the main haulage adit. The compressor, power plant, and steel-shop are at the portal of No. 4 level. The 34-degree main winze connects 4 level with 7 and 8 levels and another winze continues to 9 level. In 1950 the winze was extended from 9 level to a new No. 10 level, a vertical distance of 50 feet. The major part of production came from the 7 level workings.

The most outstanding development during the year was the erection of the 50-ton mill adjacent to a spur of the Canadian Pacific Railway at Beaverdell. The mill was officially opened on September 20th. Although Beaverdell has been a centre of silver-mining for about fifty years and has produced some 18,000,000 ounces of silver, this is the first mill to be built there.

Production: Ore mined, 8,383 tons; ore milled, 4,107 tons. Gross content of ore and concentrates: Gold, 237 oz.; silver, 696,561 oz.; lead, 377,113 lb.; zinc, 495,990 lb.; cadmium, 1,325 lb.

Fifty-seven men were employed, including twenty underground and ten at the mill.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1949, pp. 138–148.]

Wellington (Silver Bounty Mines Limited)

G. S. Eldridge, president; John Broatch, manager. This company continued development work on the Wellington mineral claim on Wallace Mountain. The 7 and 8 levels were unwatered and the old shaft was retimbered from 5 to 7 levels. The old shaft was then extended 67 feet below 7 level, and a crosscut was driven 25

* By E. R. Hughes.

feet from the bottom of the shaft in the direction of a vein reported to have been located by diamond drilling earlier in the year. This vein had not been reached at the end of the year. Three men were employed.

The Highland Bell mill.

Highland Silver (Cranberry Creek Gold Mining Co. Limited)

A. E. Horne, manager. This company did some development work on the Highland Silver property on Wallace Mountain. Diamond drilling in the No. 2 adit of the Rambler workings indicated a vein which was further investigated by a shaft. The shaft had been sunk 25 feet when operations were suspended in September. Three men were employed. Production: Ore shipped to Trail smelter, 46 tons. Gross content: Silver, 1,138 oz.; lead, 1,333 lb.; zinc, 2,514 lb.

Gold Drop

This claim is about three-quarters of a mile south of the Rambler mineral claim on Wallace Mountain. The workings on the claim consist of an adit level, approximately 300 feet long, and two partly caved shafts. No active development has been done on the property for many years. In October Mrs. A. E. Horne arranged to purchase the claim from R. F. Sandner, of Christina Lake. A road about 1,000 feet long was built from the Gold Drop adit to connect with an existing road from the Rambler ore-bin. Two workmen, under the direction of A. E. Horne, were employed in sorting ore from old surface dumps. In October 8 tons of the sorted ore was trucked to the Trail smelter. Gross content: Silver, 250 oz.; lead, 449 lb.; zinc, 761 lb.

LIGHTNING PEAK (49° 118° N.E.)*

Silver-Lead-Zinc

Waterloo, Dictator (Paycheck Mining and Development Company Limited)

Company office, 804 Silica Street, Nelson. H. A. McKen, managing director. This company controls a group of eight Crown-granted and forty-two located claims on Lightning Peak. The property is reached by about 20 miles of road from a point on the Monashee Highway 28 miles from Edgewood. The main development in 1950 was the exposure by bulldozer stripping of a mineralized fissure above the Waterloo No. 1 adit. An open-cut was made on this showing and about 15 tons of ore was sorted from it. No shipments were made in 1950. Up to ten men were employed. Work was discontinued in the fall when the Monashee Highway was closed.

GREENWOOD†

Gold-Silver

Providence

(49° 118° S.W.) W. Madden, owner. This mine is 1½ miles north of Greenwood and has been worked intermittently for over fifty years. During 1950 work was done by four lessees. J. S. Kleman and J. Trombley, who obtained a lease to do mining and exploratory work on the 600-foot level, made one shipment of 6 tons of ore on December 15th. Gross content: Gold, 1 oz.; silver, 422 oz.; lead, 183 lb.; zinc, 269 lb.

E. Wanke and O. Johnson obtained a lease to do mining and exploratory work in the area from the 200-foot level upward. Commencing work in June, they made four shipments totalling 20 tons of ore from the remnants near the old 200-foot level workings. Gross content: Gold, 15 oz.; silver, 5,362 oz.; lead, 2,344 lb.; zinc, 2,858 lb.

Apart from these four lessees, no other men worked the mine.

Dynamo.—From this property just south of Greenwood, a syndicate represented by J. McDonell and M. M. Butorac shipped 43 tons of ore to Trail. Gross content: Gold, 1 oz.; silver, 307 oz.; lead, 16,507 lb.; zinc, 8,297 lb.

Lead King.—From the Lead King, south of Greenwood, W. E. McArthur shipped 8 tons of lead ore to Trail. Gross content: Silver, 22 oz.; lead, 1,143 lb.; zinc, 1,250 lb.

PAULSON (49° 118° S.E.)†

Gold-Silver

Albion (Granville Mines Corporation, Limited)

Michael Hretchka, manager; W. Schwartzenhauer, foreman. This company optioned the Albion group from Joe Klomen. The mine is about 6 miles by road southeasterly from Paulson. In July an adit level was advanced 80 feet into the hillside and a connection was made with an old shaft 35 feet below the shaft collar. The old shaft is said to be 60 feet deep. The vein at the face of the adit is 2 feet 10 inches wide. A 25-ton shipment of ore was trucked to Paulson in September, and from there it was shipped to the Trail smelter. At the time of inspection on October 18th no mining was being done and there were two employees at the camp.

Production: Ore shipped, 25 tons. Gross content: Gold, 8 oz.; silver, 48 oz.

ROSSLAND (49° 117° S.W.)*

Gold

Midnight and I.X.L. (Kootenay Central Mines Limited)

Head office, Room 2, 815 Victoria Street, Nelson. J. A. Cooper, manager. Capital: 500 shares, $100 par value. This company owns the Midnight and I.X.L. mines, 1 mile south of Rossland. Work was done intermittently in the Midnight mine, but the I.X.L. mine remained idle. J. Gillis and T. Radich, working on the

* By J. W. Peck.
† By E. R. Hughes.

Midnight under a lease arrangement with the owners, removed ore by underhand stoping the vein north and south of the winze on the sublevel 75 feet below the main adit.

Production: Ore shipped, 132 tons. Gross content: Gold, 66 oz.; silver, 206 oz.

Gold-Silver-Lead-Zinc

Bluebird (Rossland Mines Limited)

Company office, 675 Hastings Street West, Vancouver. Capital: 3,000,000 shares, no par value. This company owns a group of claims in what is known as the South Belt, adjacent to Rossland. In the latter part of 1950 the LBB mining partnership started work on the Bluebird claim 1,000 feet west of the Mayflower workings which were worked by E. H. Lovitt during 1949. A 5- by 8-foot shaft was collared above and a short distance west of the Bluebird workings. Sinking was started on a vein striking easterly and dipping 55 degrees to the north. By December the shaft had reached a depth of 30 feet, exposing a quartz vein about 4 feet wide sparsely mineralized with galena and sphalerite.

Equipment for mining consisted of a 220-cubic-feet-per-minute Gardner-Denver compressor driven by electric power supplied by the West Kootenay Power and Light Company. Ore removed while the shaft was being sunk was hand-sorted; a few tons was trucked to the Whitewater mill at Retallack and the rest was sent to the Trail smelter. Two men were employed.

Production: Ore shipped to Trail, 96 tons. Gross content: Gold, 4½ oz.; silver, 2,613 oz.; lead, 6,053 lb.; zinc, 7,456 lb.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1949, p. 158.]

Douglas

This is a Crown-granted claim located on the Cascade Highway near the Velvet mine. It is owned by the Godfrey brothers, of Northport, who made one shipment in 1949 and one in 1950. Production: Ore shipped in 1950, 8 tons. Gross content: Silver, 16 oz.; lead, 1,051 lb.; zinc, 905 lb.

NELSON*

EAGLE CREEK (49° 117° S.E.)

Gold

Granite-Poorman (Kenville Gold Mines Limited)

British Columbia office, Royal Bank Building, 675 Hastings Street West, Vancouver; mine office, Box 390, Nelson. G. H. Rainville, president. Capital: 3,500,000 shares, $1 par value. This property, 7 miles by road from Nelson, is controlled by the Quebec Gold Mining Corporation. Leasing and custom milling operations continued under the jurisdiction of the company until May 31st, 1950, after which date F. C. Buckland, of Vancouver, obtained a lease on the mine and plant. In 1949 the mine was divided among six groups of lessees, but by May 31st, 1950, only the following were operating:—

(1) C. Johnson, A. Johnson, and W. Johnson: 219 and 220 Yule vein, 2750 level.

(2) H. Cooper and A. Jmaeff: Midway vein above 2750 level.

Local ores were milled on a custom basis. Van Roi ore was milled until February 22nd, Arlington ore until May 31st, and Venango ore until the end of February. In addition to the Kenville lessees' ore, an attempt was also made to mill some of the old backfill, but this project was soon abandoned. Silver Hill and Silver King ores brought to the mill in 1949 were not milled and were still on the site at the end of 1950.

F. C. Buckland continued operating the mill on a custom basis. He also opened up the old Eureka mine and started a raise about 1,200 feet in from the portal on the lower level to connect with a winze sunk from the upper level. Information on the location of

* By J. W. Peck.

this winze was, however, unreliable, and the raise was abandoned after being driven 100 feet. Ore from the Eureka dump was trucked 3 miles to the Kenville mill. The mill also treated some of the old Ymir Yankee Girl tailings from Ymir. The mine and mill reverted to the company on October 1st. On October 22nd the Johnson brothers ceased operating their lease, leaving only one group of lessees active at the end of the year.

Production:—

From the Granite-Poorman:—

Milled for the lessees by the company, 1,718 tons.

Milled for the lessees by F. C. Buckland, 550 tons.

Shipped to Trail, 879 tons of ore.

Gross content: Gold, 476 oz.; silver, 704 oz.; lead, 7,902 lb.; zinc, 6,451 lb.

From the Arlington, 2,100 tons milled.

From the Venango, 176 tons milled.

From the Van Roi, 1,466 tons milled.

From the Eureka, 200 tons milled.

From the Ymir Yankee Girl, 1,368 tons milled.

Kokanee Creek (49° 117° N.E.)

Silver-Lead-Zinc

Molly Gibson

This mine is at the head of Kokanee Creek and is owned by The Consolidated Mining and Smelting Company of Canada, Limited. R. J. Johnston, of Trail, working under a lease arrangement with the company, shipped two truckloads of ore to the Trail smelter.

Production: Ore shipped, 29 tons. Gross content: Silver, 1,301 oz.; lead, 6,829 lb.; zinc, 5,701 lb.

YMIR (49° 117° S.E.)*

Gold-Silver-Lead-Zinc

Goodenough (Protection)

This mine, on the north slope of Ymir Creek, 5½ miles by road from Ymir, was operated under a purchase agreement by J. Turk, A. Fata, and F. Patula. Ore was obtained from above the No. 2 level and also from the sublevel between No. 2 and No. 3 levels. For a while the ore was removed via No. 3 level, a distance of 1,700 feet, by wheelbarrow; track was installed later. On the surface the vein exposed in 1949 to the south of the No. 3 portal was stripped farther. Ore was mined from the stripped part of the vein by hand-steel methods and trucked to the smelter at Trail.

Production: Ore shipped, 183 tons. Gross content: Gold, 164 oz.; silver, 1,355 oz.; lead, 21,464 lb.; zinc, 28,403 lb.

Dundee

A. Burgess and three associates continued to work the Dundee mine throughout 1950. The 1235 level, which also serves the Ymir Yankee Girl mine, was used as the main haulage level, and a portable compressor was set up at the portal. Most of the ore mined in 1950 came from pillar remnants of the main vein on the 1000 level, but about 200 tons came from the 900 level.

Production: Ore shipped, 1,032 tons. Gross content: Gold, 320 oz.; silver, 5,459 oz.; lead, 161,024 lb.; zinc, 178,425 lb.

Ymir Yankee Girl

O. W. Gowing obtained a lease on the Ymir Yankee Girl mill tailings at Ymir. These were dug up and at first trucked to the Kenville mill but were later trucked directly to the smelter at Trail.

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

A sublease was given to A. Kraft and A. MacDonald, of Ymir, who used a tumble screen to wash the sludge off the wooden chips that had passed through the old mill. Gross content of 13 tons shipped by them to Trail smelter: Gold, 14 oz.; silver, 48 oz.; lead, 484 lb.; zinc, 580 lb.

O. W. Gowing and D. S. MacDonald also operated a lease for the first four months of 1950 in the Ymir Yankee Girl mine. The 1235 level, which also serves the Dundee mine, was used. At approximately 1,500 feet from the branch into Dundee ground (or 2,700 feet from the portal) a raise near the Yukon oreshoot extends to the 1100 level above. About 30 feet east of this raise on 1100 level the partners, assisted by two other men, did underhand mining to a depth of 12 feet over a distance of 15 feet. The vein here dips about 40 degrees, is about 12 inches wide, and has been stoped out above the level. The ore was lowered to the 1235 level and was taken from the mine by a horse-drawn rubber-tired cart. Drilling was done by hand-steel.

Production: Ore shipped to Trail from mine, 964 tons. Gross content: Gold, 179 oz.; silver, 3,974 oz.; lead, 133,459 lb.; zinc, 298,202 lb. Mill tailings shipped to Kenville mill, 1,368 tons; to Trail, 143 tons. Gross content of the latter: Gold, 61 oz.; silver, 1,039 oz.; lead, 29,770 lb.; zinc, 90,840 lb.

Centre Star (Wesko)

A. Kraft and A. MacDonald, of Ymir, operated a lease at the old mill-site of this mine. The wooden scraps that had passed through the mill were put through a tumble screen, and 1.7 tons of sludge was collected and shipped to Trail. Gross content: Gold, 1 oz.; silver, 4 oz.; lead, 66 lb.; zinc, 17 lb.

X-Ray (Ymir Good Hope Mining Company)

Company office, 503 Westlake Avenue, North Seattle, Wash.; British Columbia office, 101 Medical Arts Building, Nelson. John Meduna, president. Capital: 250,000 Class A shares, $1 par value; 1,500,000 Class B shares, 10 cents par value. This property, 5½ miles by road from Ymir, is on the east side of Huckleberry Creek, a southerly flowing tributary of Ymir Creek. In the latter part of 1950 a small development programme was started on this property, which had been idle for about three years. A contract was let to extend the Noble adit, which was 126 feet long, a further 300 feet. When the property was visited on October 18th, the face was 256 feet from the portal, and the adit was following a quartz vein averaging about 1 foot in width. Small amounts of sphalerite were visible. A portable compressor and a mucking-machine were in use. D. S. MacDonald was in charge, with a total of three men employed. All work ceased December 6th, when the face was reported to be 325 feet from the portal.

Last Chance*

This group of sixteen claims, located recently by E. P. Haukedahl, Ed. Emilson, and associates, of Ymir, is under option to New Jersey Zinc Explorations Limited. It is about 3½ miles east of Ymir on the north side of Oscar (Bear) Creek and is reached by a trail 1¼ miles long from the end of the Oscar Creek logging-road.

The property is in a nearly level pass which trends north 30 degrees east and lines up with the pass to Porcupine Creek, in which the Oxide group is located. It is presumed that the two passes are localized on the same structural break, but positive evidence is lacking.

The ground is heavily mantled with drift, and the geology is not known, except that dips are predominantly to the east in argillites, quartzites, and schists. At the southern of three ponds six short adits have been driven eastward in the valley bottom to investigate what appears to be a strong zone of faulting which dips eastward and trends with the valley at north 30 degrees east. The adits, from a few feet to 160 feet long, were driven to test the possible existence of a fault zone, and the information gained so far is that a

* By M. S. Hedley.

fault exists and that some mineralized dolomite occurs in black argillites. One adit crossed about 15 feet of dolomite in the floor, beneath glacial drift. The dolomite contains a small amount of zinc mineralization. Another adit crossed for 20 feet dolomite dipping at a low angle to the east, beneath argillites. This dolomite contained heavily oxidized zinc mineralization and a small amount of lead.

Plans were under way in September, 1950, to advance a newly started adit to investigate the possibility of finding more dolomite to the east of the fault zone.

Jack Pot*

This property, located in 1948 by E. P. Haukedahl, E. H. Barclay, and S. W. Barclay, of Ymir, is under option to New Jersey Zinc Explorations Limited. It is on the ridge between Porcupine and Hidden Creeks and is reached from the Porcupine Creek road by a switchback road built in 1949. The showings are on the summit and the northern slopes, half a mile to a mile east of the Hunter V glory-hole.

The property is an old one, located and partly explored in forgotten times when the predominantly zinc showings were not attractive. Recent exploration has consisted of a minor amount of hand-stripping and a large amount of bulldozer stripping and diamond drilling. This work was started in 1949 and continued until the winter of 1950 under the supervision of R. C. Macdonald.

The geology is complex and, in spite of much careful and detailed mapping, is not well understood. The rocks in the valley of Porcupine Creek strike northward and dip steeply to the east, although flattening at lower elevations. There is a hint of recumbent folding on the south slope. The valley of Hidden Creek is occupied by granite which extends to the south edge of the property. The crest of the ridge and the upper northern slope are underlain by rocks which dip, on the average, flatly to the south, but are acutely crumpled locally. The relationship of these to the east-dipping rocks farther down the north slope has not been determined. A sharp flexure of major size is indicated, whether or not there has been much faulting. The possibility of overturning should not be overlooked, although its existence is difficult to prove.

The section on the ridge summit includes two bands of crystalline limestone separated by quartzites. Detailed relationships are obscured by local granitization of the quartzites and by granitic zones that possibly were localized along faults. The limestones contain dolomite zones which locally are smeared with yellowish-green to very dark-green serpentine. Sulphides consist principally of sphalerite in discrete dark-brown grains. Galena is in disseminated grains and is not abundant. Pyrite in many instances is in the form of pyritohedra. Pyrrhotite occurs in a few places, particularly the Lerwick zone, and may contribute to rapid disintegration by the formation of iron sulphate.

Four zones of mineralization are recognized, the Main, West, East, and Lerwick. The total area over which mineral occurs is impressive, but details of its localization are not well understood. The ore is apparently bedded for the most part and occupies more than one horizon. The West showing, 4 to 8 feet thick and about 500 feet long at the surface, is not all in one band. The maximum intersection obtained in the Main showing was 42 feet. The Lerwick zone, on which bulldozer stripping has been done, contains lenticular masses of ore.

Following close drilling of the Main zone, more widely spaced holes, one of which was 800 feet long, were put down to test the southerly continuation, without marked success. Drilling of the East zone was in progress late in 1950, with a view to determining the possible extent of mineralization.

Zinc-bearing mineralization is known to occur in limestone at scattered points from the Jack Pot down into the basin of Porcupine Creek. The Oxide group lies to the north, across the creek. There is abundant indication of zinc mineralization and abundant limestone in this area, but structural complexity and heavy overburden have made explor-

* By M. S. Hedley.

ation difficult. The diamond-drilling campaign started with close delineation of the Main zone, but in 1950 it was aimed at determining over-all extent of the ore zones rather than blocking out tonnage.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1948, pp. 132, 133; 1949, pp. 165, 166.]

Oxide*

This group is owned by E. P. Haukedahl and associates, of Ymir, and is under option to New Jersey Zinc Explorations Limited. It is on the ridge between Oscar (Bear) and Porcupine Creeks, about 3½ miles east of Ymir. The property extends south into the valley of Porcupine Creek. A road from Porcupine Creek leads to a camp-site on the south slope and continues steeply to a pass leading to Oscar Creek valley.

Heavily oxidized mineralization over impressive widths has been found at the surface in a roughly north-south zone which may represent a major fault zone. All attempts in past years to reach and explore the unoxidized parts of the zone by diamond drilling, stripping, and tunneling have failed, particularly because a heavy cover of drift makes exploration on the south slope difficult. In September, 1950, a diamond-drill hole was being drilled at 78 degrees downward from a point apparently in the hangingwall of the zone a short distance below the camp-site in order to strike the zone at considerable depth below the surface showings. Projection of the zone is uncertain, because it is semi-bedded and may flatten with depth in response to the general decrease in dip of the easterly dipping rocks. Later in the year an adit was being driven northerly at a point, elevation 4,085 feet, about 1,000 feet south of the International adit.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1948, p. 131.]

SALMO (49° 117° S.E.)†

Erie Creek

Gold-Silver-Lead-Zinc

Arlington

This mine, 7 miles by road from Salmo, was operated by Kenville Gold Mines Limited until May 31st, 1950, under an agreement with F. C. Buckland, who optioned the property in 1948. The company, however, did not continue the intensive exploratory programme of 1949. Instead, a contract was given to R. Golac to remove the backfill from the flat-lying stopes and truck it to the Kenville mill at Nelson. This operation ceased in April. After May 31st, F. C. Buckland installed a small sorting plant and started sorting ore out of the large dumps at this mine. Only a few shipments were made to Trail before operations ceased in July. It is reported the property has now reverted to its original owners.

Production: Ore shipped to Trail, 15½ tons. Gross content: Gold, 17½ oz.; silver, 48 oz.; lead, 889 lb.; zinc, 866 lb.

Ore shipped to Kenville mill, 2,100 tons. Gross content of concentrates: Gold, 309 oz.; silver, 976 oz.; lead, 10,580 lb.; zinc, 18,538 lb.

Sheep Creek

Gold

Sheep Creek Gold Mines Limited

Company office, c/o Robertson, Douglas & Symes, Bank of Montreal Building, 640 Pender Street West, Vancouver; mine office, Sheep Creek. A. E. Jukes, president; H. E. Doelle, managing director; F. R. Thompson, mine superintendent. Capital: 2,000,000 shares, 50 cents par value. The mill, reopened October 5th, 1949, was operated until May 12th, 1950, at which time all broken ore had been milled. The bulk of the ore

* By M. S. Hedley.
† By J. W. Peck, except as noted.

came from stopes on the 700 and 900 levels. Most of the development work was done on the 900 and 1000 levels. On the 900 level, drifting was done on the 64 and 68 veins, while a winze was sunk on the 81 vein. In this winze a sublevel was established at 50 feet, and about 120 feet of drifting was done before the project was abandoned. On the 1000 level a crosscut was driven to the 92 vein, and some drifting was done on this vein. Most of the development proved disappointing, and toward the end of the year equipment was being removed from all levels below No. 7 level. After the mill was closed, any ore obtained from development, stopes, general clean-up, surface assay dump, etc., was trucked directly to the smelter at Trail. From a high of ninety-five men in January, the number of employees dropped to only seven at the end of 1950. Development footages are as follows: Drifting and crosscutting, 1,935 feet; raising, 35 feet; sinking, 64 feet.

Production: Ore milled, 15,021 tons. Ore shipped crude, 802 tons. Gross content of bullion and of ore shipped crude: Gold, 5,004 oz.; silver, 2,095 oz.; lead, 8,481 lb.; zinc, 4,728 lb.

Bell (Sheep Creek Gold Mines Limited).—Operating from the Sheep Creek camp, Sheep Creek Gold Mines Limited conducted an exploratory and diamond-drilling programme on the Bell claims which are north of the H.B. and south of the Salmo Malartic mines on Aspen Creek.

Reno and Gold Belt

A. Kraft and A. MacDonald, of Ymir, leased the old mill-sites of the Reno and Gold Belt mines at Sheep Creek. The piles of wooden scraps that had passed through the mills were put through a tumble screen. The washed sludge was collected and shipped to Trail.

Production: Ore shipped, 8.49 tons. Gross content: Gold, 6.3 oz.; silver, 9 oz.; lead, 91 lb.; zinc, 62 lb.

Gold Belt.—Leasing operations yielded 82 tons of dry ore that was shipped to the Trail smelter. Gross content: Gold, 24 oz.; silver, 42 oz.

Kootenay Belle

A partnership of J. R. Thompson, R. Lefevre, A. Rollick, and F. Latoria operated this mine on a lease during the first part of the year. Ore was obtained from pillar extraction on an intermediate level between No. 2 and No. 3 levels. The aerial tram was used from No. 3 level to bring the ore down for trucking to the smelter at Trail. Air was supplied by a 300-cubic-feet-per-minute compressor.

Production: Ore shipped, 468 tons. Gross content: Gold, 261 oz.; silver, 204 oz.

Nugget

A. Endersby, Fruitvale, owner and operator, and his son did intermittent work at this property. Fifteen tons of ore was mined from the upper Nugget level and the remainder came from the 4900 level.

Production: Ore shipped, 102 tons. Gross content: Gold, 91 oz.; silver, 158 oz.

Aspen Creek

Silver-Lead-Zinc

H.B. (The Consolidated Mining and Smelting Company of Canada, Limited)*

The H.B. mine is on the west side of Aspen Creek, a southerly flowing tributary of Sheep Creek, 8½ miles from Salmo. Current development culminates an intensive re-examination of the property during the past few years. The H.B. property was located some forty years ago by P. F. Horton and H. M. Billings (hence the name) and was under lease and bond to The Consolidated Mining and Smelting Company in 1911, when work was done on heavily oxidized showings of zinc and lead ore. Shipments were started in 1912, when 742 tons of lead carbonate ore was shipped to Trail. The bond was relinquished, and the property was leased by W. R. Salisbury in 1913, who continued to make shipments of lead ore.

* By M. S. Hedley.

The Salisbury lease expired in 1915, and a lease and bond was taken by Spokane interests on the H.B. and Zincton groups. Work continued under the direction of R. K. Neill, and shipments of predominantly zinc-bearing ore were made to smelters in the United States. The zinc carbonate and silicate ore could not be treated at Trail and was shipped to plants which made zinc oxide, chiefly for use in the manufacture of paint. Shipments made in 1917 were in the name of W. G. Harris, of Silverton.

The property was under option to the Victoria Syndicate in 1925, when that company drove No. 4 level crosscut and continued exploration work in 1926. The property was operated by P. F. Horton, still one of the owners, in 1927, when ore containing chiefly lead was shipped. The property was bought in 1927 by The Consolidated Mining and Smelting Company and lay idle for many years. Production from 1912 to 1927 amounted to 17,200 tons, containing 6 ounces of gold, 14,696 ounces of silver, 2,587,298 pounds of lead, and 6,956,184 pounds of zinc.

All the upper workings were in heavily oxidized ore, and only a small amount of unoxidized material was encountered on No. 4 level, 300 feet vertically below No. 2 level, which was the main working from which most ore had been mined. No ore had been found on the lowest or No. 7 level.

Starting about 1946 the company began geological investigations that led in 1948–49 to a considerable amount of surface diamond drilling. Underground work was started in June, 1949, with the rehabilitation of No. 4 level, and a drive was started due south from the existing face. A raise was put up to No. 3 level to be used as an ore-pass to handle oxidized ore from that level and above.

The exploratory drive was carried south for nearly 1,500 feet and was slashed at 100-foot intervals for diamond-drill stations. A parallel drive was subsequently made about 230 feet to the west, 300 to 750 feet south of the old face of No. 4, and connected to the main drive by three crosscuts at 200-foot intervals. A large amount of drilling was then done to delimit partially an impressive low-grade ore zone, which is unoxidized. Two orebodies are indicated, of which the eastern is the larger.

More detailed drilling was continued in 1950 from two 45-degree raises put up to the north in the central part of the east body. The raises were started 150 feet apart, and from them ring drilling was carried out at 50-foot intervals in an effort to delimit and sample a section of the orebody 350 feet long.

Oxidized ore was shipped from the dumps and from underground in 1949 and 1950. This has the appearance of ochre and contains about 10 per cent zinc. The quantity shipped by truck to Trail depends upon the rate at which it can be handled by the smelter. As much as 70 tons per day was shipped in 1949, and the rate in 1950 was about 40 tons per day. The ore from underground was mined by square-set stoping across widths as great as 18 feet.

The ore is a replacement in limestone, part of a band normally about 100 to 200 feet thick, but with a thickness increased by folding to about 500 to 600 feet. The form of the folding is one of sharp rolls and steep limbs that gives to the limestone a low cumulative dip to the east. The plunge of the fold axes is about 20 to 25 degrees to the south in the mine area, roughly parallel to the ground surface. The oxidized ore zone strikes northwestward, and the newly discovered unoxidized zone strikes north. The meaning of the change in strike is not known, nor the relationship between the two ore zones.

The limestone was originally a banded rock, but it has undergone much deformation, involving both comminution and flowage. Some, apparently the product of extreme deformation, has a speckled or " tweedy " appearance, a term coined by A. E. Buller at Reeves MacDonald and applicable in many parts of the Salmo area. The limestone has been dolomitized, presumably a secondary alteration in the ore zone, but the process has not been closely studied.

The east orebody is skirted on the east side by the main south drift. It is about 350 feet high and plunges beneath No. 4 level to the south. As explored by diamond drilling it is roughly vertical, in spite of the fact that the dip of the limestone, or at least the dip of the rude banding in the limestone, is steeply east. The bottom or lower part of the orebody is not fully outlined. There is nothing to indicate what the controlling factors may be, except abundant evidence of fine brecciation, but the ore margins at present recognized do not appear to be related to any particular degree of brecciation.

The west orebody is smaller and has not been as thoroughly drilled yet. The west drift lies in the orebody.

The width of the east orebody is being determined for mining by close drilling within the 350-foot-long block. It is too early to estimate this width, but a figure in the neighbourhood of 50 feet is not unlikely.

A large tonnage is undoubtedly indicated, in one or both orebodies as at present outlined. The ratio of zinc to lead is about 5 to 1, and the grade will depend on the mining limits chosen. Selective mining of higher-grade parts is probably feasible, but mining of entire low-grade blocks is more attractive because much lower costs are to be expected.

Much work remains to be done before the ore zone can be fully assessed and the ore limits outlined. At present a very satisfactory, large tonnage of low-grade ore has been brought to light by rapid and efficient development.

An average of thirty-six men was employed under the direction of J. E. McMynn, superintendent.

Production, oxidized ore: Ore shipped, 2,877 tons. Gross content: Silver, 13,019 oz.; lead, 771,654 lb.; zinc, 1,492,105 lb.

Iron Mountain

Lead-Zinc-Tungsten

Emerald, Jersey (Canadian Exploration Limited)*

Head office, Royal Bank Building, Vancouver; mine office, Salmo. Harold Lakes, manager; J. B. Magee, mine superintendent; G. H. Grimwood, mill superintendent. The mine camp is on the summit between Sheep Creek and Lost Creek, 8 miles by road from Salmo, and the mill, served by tram-line and by a recently constructed road, is on the Nelson–Nelway Highway, 5 miles south of Salmo.

The mine has had a varied history and is now in a new and important phase of development. The ground was prospected many years ago for gold as well as for lead ore. The Emerald was a small but steady producer of lead ore from 1907 to 1925. A small mill was constructed in 1919 but has since burned down. Production was from the Emerald zone, but early exploration was done also on the Jersey and Dodger zones.

After many years of inactivity, the owners, The Iron Mountain Limited, increased their holdings from seventeen to forty-one Crown-granted claims and carried out exploration and a small amount of development work for three years, under the direction of Harold Lakes, of Nelson. On May 20th, 1942, following recognition of scheelite in skarn on the property, Harold Lakes discovered scheelite in quartz and in iron-bearing skarn in a series of long-forgotten workings driven in search of gold. This was west of the principal lead-zinc showings, along a granite contact. Later in the same year, scheelite ore of similar type was found near the Dodger lead-zinc zone.

Exploration of the tungsten-bearing zone was immediately successful, and on August 17th, 1942, the property was purchased by the Dominion Government. Work thenceforth was accelerated by Wartime Metals Corporation, of Montreal, with E. E. Mason as manager of the Emerald Tungsten Project. The Emerald ore zone was developed, a tramline constructed, and a 300-ton concentrating plant was built. The mill, completed in

* By M. S. Hedley.

June, 1943, was put into production on August 1st, at a rate of about 200 tons per day, but on September 10th an order was received to close down.

Early in 1947 the property was bought by Canadian Exploration Limited. Rehabilitation proceeded rapidly, and milling commenced on June 12th; the tonnage treated was increased to approximately 260 tons a day by the end of that year. Exploration for additional tungsten ore was carried out at the same time, under the direction of Harold Lakes, consulting geologist. This work was extended to a study of the Jersey showings, which were dominantly zinc-bearing, and by the end of 1948 an impressive tonnage of lead-zinc ore had been proved by diamond drilling.

The mining of tungsten ore was stopped at the end of 1948, and the last tungsten ore was milled on January 12th, 1949. The decision had been made to mine the zinc-lead ore rather than tungsten ore, and immediate steps were made to convert the mill. By March, 1949, the mill was handling over 300 tons per day. In the interval the road to the Jersey showings was improved, the power-line was extended, and compressors were moved from the Emerald workings. The surface was stripped and an open pit started. The ore was hauled by truck to the head of the tram.

Since that time two adit levels have been driven into the ore zone, and shop and other facilities have been provided. A new road was built in 1950 to haul ore from No. 5 level directly to the mill, in order to obviate difficulties with the tram-line. The milling rate has been raised to 500 tons per day, and exploration and development have been pushed.

No. 5 portal is 1.4 miles by road south of the camp and about a mile south of the Emerald surface plant. The engineering and geological offices have recently been moved from the camp to the mine, and the surface plant is now to a large extent independent of that at the Emerald workings. Water is obtained in small quantity from a spring and from diamond-drill holes.

The ore, with a zinc-lead ratio between 2½ and 3 to 1, is a replacement in limestone which is estimated to be several hundred feet thick, folded, and partly altered to skarn. The limestone overlies a quartzitic series and is overlain by black argillite along a faulted contact. It is irregularly folded into a series of crumples and locally pinched folds with a low plunge to the south.

Two and perhaps three or four main ore runs are at present recognized in the closely drilled area about 900 feet wide by 1,500 feet long at the Jersey. The general ore zone has been proved by exploratory drilling to extend from the Jersey to the Dodger zone, a strike distance of about 7,000 feet, although the details of occurrence in the central and northern parts are not yet known.

The ore occurs in bodies of lenticular cross-section, as much as 40 feet thick, that as often as not occupy a synclinal position in the structure. The ore consists of brown sphalerite, galena, and a variable though rarely large amount of pyrite. Each body of ore tends to be surrounded by an envelope of dolomite. An excellent series of vertical sections, mounted on glass, has been prepared at the mine office to illustrate the geology and is invaluable in planning development, but the determination of exact stoping limits will depend on additional drilling and may require a flexible system of mining.

The lowest adit, No. 5, is the main haulage level, at an elevation of 4,010 feet, and the other adit, No. 6, is 80 feet higher. No. 5 is driven northerly, starting at the base of the ore zone at the surface, and will remain below the ore because of the low southerly plunge. A little of the initial stoping was done under too light a cover and had to be abandoned. Scraper stopes with convenient draw-points are laid out along the two or possibly three main ore runs. All ore is passed to No. 5 level, crushed, and elevated to a haulage bin for transport to the mill.

Tungsten-bearing residues, accumulated before February, 1949, were shipped to London, England.

Production: Ore milled, 128,485 tons. Gross content of concentrates: Silver, 4,865 oz.; lead, 5,148,781 lb.; zinc, 16,367,166 lb.; cadmium, 132,848 lb. Content of tungsten residues: Tungstic oxide (WO_3), 281,160 lb.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1947, pp. 163, 164; 1948, p. 135; 1949, pp. 168, 169. *B.C. Dept. of Mines,* Bull. 10 (Revised), 1943, pp. 135–146. *Geol. Surv., Canada,* Mem. 172 (1934). Mason, E. E., "Emerald Tungsten Project," *The Miner,* pp. 38–42, June, 1944.]

LOST CREEK (49° 117° S.E.)*

Lead-Zinc

Tungsten King, Truman, Black Rock

The Tungsten King group of eighteen claims, including twelve Crown-granted claims, lies astride Lost Creek and adjoins the Canadian Exploration ground to the south. The main workings are about 2 miles by road from the Nelson–Nelway Highway. These consist of several open-cuts put in by The Consolidated Mining and Smelting Company when the claims were explored for tungsten in 1942 and 1943. The group is owned by E. and R. Oscarson, of Spokane, and L. R. Clubine, of Salmo, but was optioned in 1950 by D. I. Hayes for American Zinc Company. Bulldozer stripping exposed a sphalerite-limestone replacement on the northwest corner of the Mastadon claim. Ten diamond-drill holes, the longest being about 500 feet, were drilled.

The Truman group of twenty claims, which adjoins the Tungsten King group to the west and south, was also optioned by D. I. Hayes from the owner, L. R. Clubine. Late in 1950 two diamond drills were used on exploratory work, one on the south side of Lost Creek and one on Lime Creek.

D. I. Hayes also has an option from L. R. Clubine on the Black Rock group of twenty-one claims which lies astride Sheep Creek, adjoining the Canadian Exploration ground on the north and the H.B. ground on the west.

NELWAY (49° 117° S.E.)†

Iron

Lomond (International)

This property is reached by a quarter of a mile of road from a point 2 miles west of Nelway on the Nelway–Waneta road. It is owned by G. Shallenberger, of Nelson. Shallow deposits of earthy iron oxide are exposed on the banks of Lomond Creek. In 1950 limonite ore was mined under contract by D. G. White and G. Gimple, who trucked the material to the Lehigh Cement Works at Metaline Falls, Wash. Also, a shipment of 100 tons was sent to C. K. Williams & Co. of California for experimental use as a paint pigment. Total production was between 3,000 and 4,000 tons. The ore was mined from a surface pit and loaded into trucks by means of a bulldozer and ramp.

Silver-Lead-Zinc

Diem Mines Limited

Company office, 609 Baker Street, Nelson. Capital: 100,000 shares, $1 par value. This company is a subsidiary of Day Mines Incorporated, of Wallace, Idaho, and was formed to develop several groups of claims in the Nelway and Sheep Creek areas. Along the International Boundary a group of thirty-five claims was located, two to three claims wide, west of the Pend d'Oreille River. Fourteen claims or fractions were located astride the Salmo River, north of its confluence with Rosebud Creek. Three claims or fractions were also located on Bennett Creek, south of its confluence with Sheep Creek, covering the open ground remaining on that creek. No work was done on the company's holdings other than general prospecting and geological work.

* By J. W. Peck.

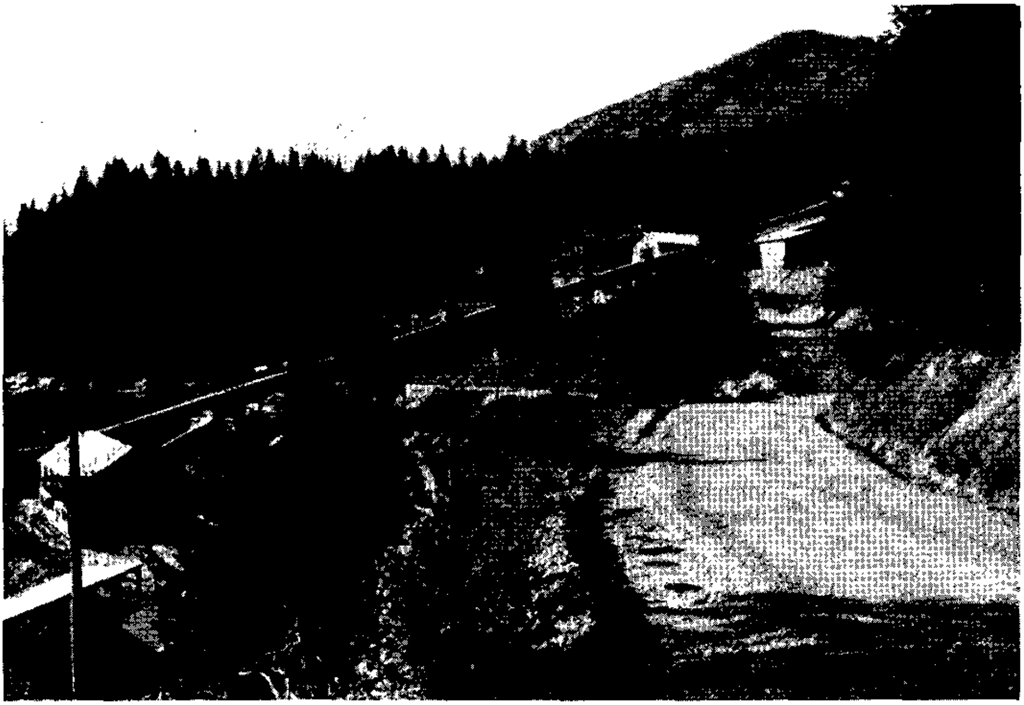
† By J. W. Peck, except as noted.

Reeves MacDonald Mines Limited*

Company office, 413 Granville Street, Vancouver; mine office, Remac. L. P. Larsen, Spokane, Wash., president; W. L. Zeigler, Metaline Falls, Wash., general manager; F. R. Jones, superintendent. The company is capitalized for 3,000,000 shares at $1 par value, of which 2,338,000 are outstanding. Pend Oreille Mines and Metals Company owns 1,389,000 shares.

The Reeves MacDonald mine is on the Pend d'Oreille River about 4 miles west of Nelway. The property is extensive, including sixty-four Crown-granted mineral claims between the Pend d'Oreille and Salmo Rivers.

The mill, producing at a capacity of 500 tons per day in 1949, was increased to 1,000 tons capacity in 1950 by the addition of a second ball mill. In September about 800 tons of ore was treated daily. Concentrates were trucked to the Trail smelter via Salmo. All work was restricted to the Reeves orebody, which was mined from internal levels and from the glory-hole.



Offices, conveyor-shed, and mill partly hidden by trees, at the Reeves MacDonald.

The orebody is a replacement in limestone and dips at 55 degrees to the south. It was developed by twin raises driven in the footwall from the 1900 adit level to the 2650 adit level, and it was originally intended to mine slots at 50-foot level intervals and blast the remaining horizontal pillars. At present, although several of the upper levels have been completely slashed out in horizontal slots, the mining method of the lower part of the block is being modified. The 1950 level, above the 1900 main haulage, is a slusher drift, and the 2000 level is coned out to box holes. On levels above the 2000, ore will be slashed by down holes as well as by horizontal holes. One of the twin raises was being timbered, and a hoist was being installed to service the main body of the mine. The apex of the orebody, at about the 2800 level, was being glory-holed, all ore from the upper part of the mine passing down the single transfer raise.

* By M. S. Hedley.

The orebody is now sufficiently developed to show that it is remarkably uniform through the known vertical range of nearly 1,000 feet. In fact, there is very little detectable difference in outline or character of the ore between several of the uppermost 50-foot levels. The main orebody averages about 350 feet in length by 40 feet in thickness, although widths as great as 70 feet are attained. The body terminates in a wedge to the east, in dolomite, and in two tails on the west. These tails, as much as 20 feet thick, are separated by limestone and are somewhat lower in grade than the main body. The full extent of the tails is not known, but the stronger, hangingwall tail has been traced for a length of 250 feet.

Drilling with jack-legs in the glory-hole at the Reeves MacDonald.

The orebody is probably localized by dragfolding, but there is no positive evidence that this is so. Minor crumples within or adjacent to the ore show no systematic pattern, and some of what was once thin-bedded limestone has been finely comminuted and has flowed. The fact that the pitch of the orebody is parallel to the plunge of known dragfolds in the mine area suggests that it is a replaced dragfold. Minor gash veinlets, some of which are well mineralized, occur at right angles to the pitch, indicating that stretching took place along the line of pitch, possibly due to a process of dragging along the course of the limestone band.

A programme of test prospecting was carried out in the area of the known orebodies, involving analysis of soil samples by the dithizone method. This work was not completed at the time the mine was visited in September.

Improvements were made to the camp, and seven houses were built, with ten under construction. An average of 153 men was employed.

Production: Ore milled, 213,376 tons. Gross content of concentrates: Silver, 16,616 oz.; lead, 3,820,884 lb.; zinc, 17,303,286 lb.; cadmium, 106,188 lb.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1949, pp. 169–174.]

SOUTH KOOTENAY LAKE (49° 116° S.W.)*

Summit Creek

Gold-Silver-Lead-Zinc

Bayonne Messrs. MacDonald and Moore, of Ymir, hold a lease on this mine on Bayonne Creek, 24 miles by road from Tye. During 1950 an average of four men worked on a percentage basis removing remnants of ore from the 5-3 and 8-3 stopes.

Production: Ore shipped, 248 tons. Gross content: Gold, 177 oz.; silver, 996 oz.; lead, 12,143 lb.; zinc, 8,913 lb.

Spokane This mine is on Wall Mountain, 18 miles by rough road from Tye. A steeply dipping quartz vein in granodiorite has been developed by adits, the main one being known as No. 4. Kootenay Central Mines Limited, which operated the mine in 1949 until the heavy snowfall forced a shutdown, did not resume operations in 1950. The bunk-house and cook-house building was found collapsed in the spring, when the company returned to remove the machinery. The property reverted to the former owners, and during the summer A. Johnson, H. Hawkins, and K. Laib worked with hand-steel. They shipped two carloads of ore, chiefly from the old workings between No. 4 and No. 3 levels. The new No. 5 level was not worked, and thus the face remains about 120 feet from the portal with no vein yet intersected.

Production: Ore shipped, 80 tons. Gross content: Gold, 34 oz.; silver, 616 oz.; lead, 21,358 lb.; zinc, 1,929 lb.

Sanca

Silver-Lead-Zinc

Lakeview This mine, near Sanca and midway on the highway between Kootenay Bay and Creston, was inactive during the first half of 1950. The property was purchased in 1948 by J. Powelson and W. R. Bullock, the latter now deceased. In August a lease was given to C. Carpenter who, with two men, worked in the north drift on the lower or adit level. This drift was cleaned up, and at the face, or 180 feet from the junction of the drift with the crosscut adit, a raise was started. The drift and raise follow a shear in calcareous sediments. Lenses of galena and sphalerite found in the shear are quite high grade. The raise was up over 30 feet by the end of September, but little ore had been located.

Production: Ore shipped, 56 tons. Gross content: Gold, 1 oz.; silver, 330 oz.; lead, 13,725 lb.; zinc, 22,395 lb.

Pilot Bay

Pilot Bay Concentrator and Smelter The old plant site on Pilot Point, 3 miles by road from Kootenay Bay, is owned by Mr. and Mrs. H. T. Stearns, of Hope, Idaho. The old smelter has not operated since 1896, but in 1948 and 1949 shipments of clean-ups around the plant were made to the Trail smelter. In 1950 a lease was given to J. Asher and G. L. Green who, during 1948 and 1949, operated a small mill at the Highland property at Ainsworth on old mill tailings retrieved from below the surface of Kootenay Lake. During the latter half of 1950 the mill was dismantled, moved and set up on the shore of the lake near the old smelter. Operations were expected to be under way early in 1951.

In September two shipments of further clean-ups from around the plant were made.

Production: Tailings shipped, 123 tons. Gross content: Gold, 1 oz.; silver, 557 oz.; lead, 18,536 lb.; zinc, 11,869 lb.

* By J. W. Peck.

CRAWFORD CREEK

Silver Hill

J. J. Gray, of Toronto, holds a lease on this property from R. F. Miller, of Toronto, a trustee for B.C. Lead & Zinc Mines Ltd., a former operator. In 1949 a road was built to the lower adit, making the mine 14 miles by road from Kootenay Bay. Numerous adits and open-cuts develop flat-lying veins that can be traced along the hillside for over 2,000 feet. The vein filling is quartz containing galena, sphalerite, pyrite, and tetrahedrite. The mineralization is 1 to 2 feet wide and lies conformable to the argillite bedding. The largest dump is at the lowest adit, and it was here an ore-chute was built and a hoist and scraper were installed. Quartz ore among argillite waste made sorting quite simple. Most of the ore was trucked directly to the Trail smelter. The remainder was trucked to Sirdar and loaded on railway cars for delivery to Trail. Because of snow, work did not get under way until July and ceased in October. Three men were employed under the direction of W. S. Hamilton, of Nelson.

Production: Ore shipped, 750 tons. Gross content: Gold, 1 oz.; silver, 9,951 oz.; lead, 45,349 lb.; zinc, 34,801 lb.

Colorado (Colorado Mining and Milling Co. Ltd.).—In 1949 the Colorado Mining and Milling Co. Ltd. was formed to develop the Colorado group in Rose Pass at the headwaters of Crawford Creek. No work was done on the claims in 1950, and the company relinquished its option to the owner, J. W. Mulholland, of Nelson.

NORTH KOOTENAY LAKE (49° 116° N.W.)*

RIONDEL

Silver-Lead-Zinc

Bluebell (The Consolidated Mining and Smelting Company of Canada, Limited)†

This property is at Riondel, on the east shore of Kootenay Lake, about 6 miles north of Kootenay Bay. It is reached by a road that leaves the highway a short distance from the ferry landing. Almost all the work was confined to developing the Kootenay Chief ore zone, about 1,600 feet south of the Bluebell ore zone. This zone was reached late in 1949 on the 225 level, about 200 feet below lake-level, driven from the Bluebell shaft. A raise was driven at 45 degrees to connect with the bottom of the Kootenay Chief winze sunk from 75 level. Some drifting was done on the 75 level, and a large amount of diamond drilling was done on the 75 and 225 levels. The work done indicates an ore zone roughly equivalent in size and grade to the Bluebell zone.

Work was temporarily halted on the Comfort ore zone to the north. Poor ground north of the Bluebell ore zone made driving slow and difficult. In August bad air prevented access to this section.

Plans were well under way in 1950 toward putting the Kootenay Chief and ultimately other parts of the property into production. A new camp was partly erected east of the old camp, and a new mill-site was prepared not far north of Galena Bay, where new docking facilities were planned. A 7- by 20-foot 3-compartment shaft was raised at 35 degrees from 225 level, elevation 1,558 feet, to a short service adit at the new mill-site, elevation 1,809 feet, and to the surface, a short distance above.

The lowest or 375 level was to be driven from the Bluebell zone south under the Kootenay Chief ore zone and ultimately connected with the new shaft. When development is completed, the old Bluebell shaft will be used chiefly for pumping, and hoisting and servicing will be through the Kootenay Chief shaft at the mill-site.

* By J. W. Peck, except as noted.
† By M. S. Hedley.

The original development on the 375 level, on the Bluebell ore zone was not extensive, and only about half the ore developed on it was mined out by former operators, chiefly because of difficulty with water. Oxidation exists on this level, approximately 350 feet below the surface of the lake and near the lake bottom, which is about 400 feet deep.

It is not known whether oxidation of ore to this known depth may give trouble in mining in some parts of the property, although the Kootenay Chief ore zone is not oxidized, except superficially. Kootenay Lake is a drowned river valley with a low, uniform gradient and flat bottom, and the limestone horizon in which the ore zones are localized dips with the valley wall. It is not to be expected that oxidation will persist to much greater depth that that known, unless the ancient valley fill is deep.

The date of production at the mine will be dependent on power to be brought from the West Kootenay power plants.

An average of about fifty-five men was employed under the direction of D. S. Campbell, superintendent, and W. R. Selby, assistant superintendent.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1949, pp. 176–178.]

HOWSER

Surprise The Surprise property on Glacier Creek east of Howser was worked by J. Gallo and L. Disereau, of Lardeau. They did 150 feet of raising and shipped ore to the Trail smelter. Production: Ore shipped, 200 tons. Gross content: Gold, 1 oz.; silver, 2,933 oz.; lead, 2,296 lb.; zinc, 3,097 lb.

AINSWORTH

Silver-Lead-Zinc

Kootenay Florence (Ainsmore Consolidated Mines Limited) Company office, 112 Yonge Street, Toronto; mine office, Ainsworth. A. E. Silverwood, president; W. J. Bull, manager. Capital: 100,000 shares, no par value. The Kootenay Florence mine and mill are 2 miles north of Ainsworth on the Nelson–Kaslo Highway. The mine is developed by two main adits; the lower, No. 9, is the main haulage level and is connected to the upper, No. 5, by a 400-foot raise system. As in 1949 all production came from No. 9 level and its No. 8 sublevel above. The vein section from 806 to 912 was worked, with as many as five stopes being mined. This section is about 2,500 feet from the portal. The vein is of the fissure type and is mined in open stopes averaging 8 feet in width.

Production continued at a steady rate throughout 1950. The only custom milling was 92 tons received from the Daisy Bell property at Ainsworth and 157.5 tons from the Nameless Fraction at Woodbury Creek. The number of men employed averaged twenty-five.

Production: Ore milled, 13,339 tons. Gross content of concentrates: Gold, 1 oz.; silver, 22,295 oz.; lead, 1,290,099 lb.; zinc, 725,184 lb.; cadmium, 3,331 lb.

Highlander, etc. (Yale Lead & Zinc Mines Limited) Company office, 525 Seymour Street, Vancouver; mine office, Ainsworth. H. W. Knight, president; H. D. Forman, manager. Capital: 3,500,000 shares, $1 par value. This company, which was formed in 1949, controls most of the claims lying between Coffee and Cedar Creeks in the Ainsworth Camp. The programme of geological examination, diamond drilling, surveying, and mapping begun in the autumn of 1949 continued through most of 1950. The Mile Point adit (elevation, 1,846 feet) was opened up and a few feet taken out with hand-steel. The Little Phil was opened up as an entrance to the Maestro. Approximately 100 feet of drifting was done by hand-steel work in the Black Diamond. Diamond-drill holes were put down from the surface south of the Banker to test the Albion and Banker lode. The Albion was also drilled from underground. Diamond drilling was also done on the United and on the Jackpot, which is a claim located to the north of the Banker. The main underground development was in the Highlander adit (elevation, 2,145 feet), where the north drift was extended 400 feet and a raise was started from this drift toward the Albion adit (elevation, 2,578 feet). This raise follows the dip of the Highlander vein, which is approximately 45 degrees, and was up about 250 feet by the end of 1950. A 100-foot crosscut was also driven off the north drift into the hangingwall for use as a diamond-drill station.

In November construction of a sink-float plant and flotation mill of 250 tons daily capacity was begun. The site chosen was just below the Nelson–Kaslo Highway, about a mile south of Ainsworth and 600 feet on the slope below the Highlander adit. Construction of the buildings was well advanced by the end of December. Forty-five men were employed at the year's end.

Production: 20 tons sent to Whitewater mill for sink-float test. Gross content: Silver, 113 oz.; lead, 1,145 lb.; zinc, 1,717 lb.

Black Diamond

T. and S. Hawes continued to operate their lease on this mine from the Yale Lead & Zinc Mines Limited. Of the shipments to the Trail smelter, three truckloads were obtained from the removal of pillars in the top level and the remainder was obtained by ground sluicing the dump.

Production: Ore shipped, 59 tons. Gross content: Silver, 1,277 oz.; lead, 21,011 lb.; zinc, 6,789 lb.

Spokane Trinket

These claims are part of the Yale Lead & Zinc holdings in the Ainsworth camp. Shipments of crude lead ore were made to the Trail smelter by W. R. Glasspoole and T. Lane, lessees. The returns credit 61 tons to the Spokane and 20 tons to the Spokane Trinket. Total ore shipped, 81 tons. Gross content: Silver, 891 oz.; lead, 62,923 lb.; zinc, 7,414 lb.

Silver Hoard.—W. E. Lane continued to operate this property under lease from the Giegerich estate and Wood Vallance Co. Ltd. Production: Ore shipped, 3 tons. Gross content: Silver, 67 oz.; lead, 1,098 lb.; zinc, 584 lb.

Neosho

This Crown-granted claim is owned by S. Hallgren. It is located 1½ miles by road from the old No. 1 mine road, or approximately 5½ miles from Ainsworth. Toward the end of 1949 a lease was given to Bruno Sterno and E. Meyer, who worked for several months opening up the old workings, which have been caved and inaccessible since 1928. This work was done under considerable difficulty and required much timber. When the writer visited the property on April 26th, what seemed to be the main adit had been reopened for a distance of 162 feet. Shallow shafts or stopes appeared to have connected with the surface 10 to 20 feet above. The lessees worked the first part of the adit through to surface. Work was all done by hand, and several truckloads of ore, obtained in the reopening process, were trucked to Trail. Native silver was observed in addition to sphalerite and galena. No work was done in the latter half of 1950.

Production: Ore shipped, 83 tons. Gross content: Silver, 1,217 oz.; lead, 3,633 lb.; zinc, 8,318 lb.

Star, Sunlight

These two Crown-granted claims are reached by a road 2 miles long that leaves the No. 1 mine road near the United mine at a point 4 miles from Ainsworth. The portals of the workings are on the Sunlight claim, but the underground workings extend into the Star claim. The claims are owned by D. H. Norcross, of Nelson, who, during 1950, operated a lease-partnership arrangement with Bert Wilson and George Beatty. The mine is developed by two adits 185 feet apart vertically. There is also a 50-foot sublevel connected by a 50-foot raise to the upper adit and also to surface by an old shaft. The upper adit is 250 feet long, and the lower, though inaccessible in 1950, was reported to be in about 800 feet.

In 1950 the partners mined about 50 tons of oxidized ore from a stope on the sub-level. Forty tons of lower-grade ore was obtained from a 30-foot raise driven at the end of the upper adit. In addition, a few tons of ore was obtained from surface stripping on a vein exposed in 1949. Air for mining was supplied by a small portable 110-cubic-feet-per-minute compressor.

Production: Ore shipped, 135 tons. Gross content: Gold, 3 oz.; silver, 1,422 oz.; lead, 37,530 lb.; zinc, 36,965 lb.

Nicolet and Snelling

W. R. Glasspoole and Thomas Lane shipped a small tonnage of ore from these adjoining claims, 1½ miles north of Ainsworth, which they are working under lease from Ainsmore Consolidated Mines Limited. Ore was removed from underground on the Nicolet and from the surface cuts on the Snelling.

Production: Ore shipped, 5 tons. Gross content: Silver, 24 oz.; lead, 2,999 lb.; zinc, 1,240 lb.

Lakeshore

W. Robinson obtained a lease on this claim from Ainsmore Consolidated Mines Limited. Ore removed from open-cuts was trucked to the Trail smelter. Production: Ore shipped, 13 tons. Gross content: Silver, 73 oz.; lead, 7,954 lb.; zinc, 2,047 lb.

Laura M

This claim is part of the Ainsmore Consolidated holdings in the Ainsworth Camp. It was leased by Hans Hansen, who made five shipments of dump ore by truck to the Trail smelter. Production: Ore shipped, 29 tons. Gross content: Silver, 290 oz.; lead, 21,191 lb.; zinc, 4,139 lb.

Carey Fraction

This claim is part of the Ainsmore Consolidated holdings. It was operated under lease by J. G. Isaacs. Two truckloads of broken ore salvaged from the old workings were sent to the Trail smelter. Production: Ore shipped, 13 tons. Gross content: Silver, 44 oz.; lead, 4,555 lb.; zinc, 2,345 lb.

Early Bird

The Early Bird claim lies astride the Nelson–Kaslo Highway, about 1½ miles north of Ainsworth. It is being purchased from Mr. Pringle, of London, England, by F. W. Robinson, of Ainsworth. Little work was done in 1950 other than shipping one truckload of ore in October.

Production: Ore shipped, 6 tons. Gross content: Silver, 22 oz.; lead, 3,313 lb.; zinc, 1,237 lb.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, p. 181.]

Twin

H. Hansen continued to operate his lease from Ainsmore Consolidated Mines Limited. Ore shipped to the smelter came in about equal amounts from underground and from a surface dump. Production: Ore shipped, 7 tons. Gross content: Silver, 53 oz.; lead, 4,472 lb.; zinc, 875 lb.

Libby and Highland

These Crown-granted claims are on Cedar Creek, northwest of Ainsworth. They are owned by The Consolidated Mining and Smelting Company of Canada, Limited, but were operated under lease in 1950 by Bruno Sterno and Edward Meyer, who made a shipment to the Trail smelter in August.

Production: Ore shipped, 42 tons. Gross content: Silver, 272 oz.; lead, 20,170 lb.; zinc, 10,928 lb.

Ayesha (Northern Exploration Limited)

Company office, Room 1519, Marine Building, Vancouver; local office, 425 Baker Street, Nelson. J. V. M. Miller, president. Capital: 20,000 shares, no par value. The property is on Cedar Creek, about 2 miles by road from Ainsworth. The company has a working agreement with W. S. Hamilton, of Nelson, to develop the Ayesha claim, which was operated in 1949 by Silver Hill Mines Ltd. An option was obtained on the property by W. S. Hamilton when the latter company abandoned its option. In the latter part of 1950 the old camp was rehabilitated, and work was started on a surface showing above the Ayesha adit. A 12-foot wide zinc-lead replacement zone in limestone was exposed and was traced for 30 feet. The central section of the zone, 3 feet wide and more heavily mineralized than the sides, was mined, and two truckloads were sent to the Trail smelter. Three men were employed.

Production: Ore shipped, 13 tons. Gross content: Silver, 95 oz.; lead, 3,465 lb.; zinc, 4,460 lb.

Belle Aire This is a mineral claim located astride Coffee Creek, adjacent to the Coffee Creek bridge on the Nelson–Kaslo Highway. It is owned by S. Hallgren, who lives near by. In 1950 Mr. Hallgren extended an old adit that is collared on the north side of Coffee Creek at about high-water mark. This adit follows a narrow fissure vein mineralized with small lenses of galena and sphalerite. A small bridge was built across Coffee Creek, and ore was removed from near the face, about 80 feet from the portal. One shipment was trucked to the Trail smelter.

Production: Ore shipped, 4 tons. Gross content: Silver, 8 oz.; lead, 722 lb.; zinc, 61 lb.

WOODBURY CREEK

Woodbury Dr. L. D. Besecker, of Ainsworth, owns the Woodbury group of claims at the mouth of Woodbury Creek. The Nelson–Kaslo Highway crosses the property; the Vigilant and Dixie Fraction claims lie north of it and the Nameless and August Fractions lie south. Privateer Mine Limited held an option on the group in 1949 but relinquished it in April, 1950. Dr. Besecker and lessees carried on after that date.

J. A. Cooper, of Walla Walla, Wash., obtained a lease-purchase arrangement on the Vigilant and the adjoining Zoa claims. In the Vigilant adit, which was driven by Privateer on a fissure vein on the east bank of Woodbury Creek, stoping was done almost to surface over an adit length of 150 feet. Previous to this Dr. Besecker had traced the nearly vertical vein on the surface and had collared another adit approximately 100 feet above. Mr. Cooper extended this adit to a total distance of about 100 feet. The vein then narrowed, but the ore near the portal was satisfactory for stoping through to surface. During the latter part of the year, work was concentrated in the lower adit, and by the end of December the drive on the vein had been extended to a point 180 feet from the portal. Ore removed via the lower adit was hoisted over a surface incline to an ore-bin 100 feet higher on the hillside. From there a truck-road was built in 1950 to the main highway to allow direct haulage to the Trail smelter. Air was supplied by a portable Jaeger 250-cubic-feet-per-minute compressor. The number of men employed averaged six.

On the Nameless Fraction, which lies adjacent to the shore of Kootenay Lake, a lease was obtained by C. A. McLeish and W. McCulloch, both of Kaslo. Portals were collared above high-water mark on two fissure veins known as "B" and "C" and situated about 45 feet apart. These adits were driven 65 feet and 35 feet respectively. Some ore was obtained from near the portal of "C" adit, but the best showing was in "B" adit, 30 feet from the portal. Here stoping was done on an oreshoot 20 feet long and averaging 18 inches in width. The vein contained galena, sphalerite, chalcopyrite, and pyrite, and these minerals had replaced the wallrock at intervals. Ore removed had to be taken by boat around a rock bluff for a few hundred feet south and then transhipped by truck to the Trail smelter or to the Kootenay Florence mill.

On the August Fraction, Dr. Besecker and two men worked on a fissure vein known as the "A" vein, which is a few hundred feet south of the "B" and "C" veins of the Nameless Fraction. An adit is collared on this vein just above the high-water mark of Kootenay Lake. Dr. Besecker and Privateer made shipments from here in 1948 and

1949 respectively. In 1950, 30 feet of drifting was done to make the face 90 feet from the portal. The best section of the vein appeared to be in the floor, and thus underhand mining was done in the last 30 feet to a depth of 10 feet. Air for mining at the August and Nameless Fractions was supplied by a 160-cubic-feet-per-minute compressor driven by a gasoline engine. A small change-house was also built.

On the Dixie Fraction, H. Currie traced a vein which is exposed on the adjoining Budweiser No. 2 claim. An open-cut was made just above the Vigilant road, and 2 tons of sorted galena ore was sent to the Trail smelter.

Production: To Kootenay Florence mill from Nameless Fraction, 157.5 tons. Gross content: Silver, 141 oz.; lead, 14,340 lb.; zinc, 13,110 lb. To Trail smelter from Nameless Fraction, 13.7 tons. Gross content: Silver, 22 oz.; lead, 1,888 lb.; zinc, 1,492 lb. To Trail smelter from Vigilant, 526 tons. Gross content: Silver, 3,226 oz.; lead, 196,405 lb.; zinc, 71,907 lb. To Trail smelter from August Fraction, 62 tons. Gross content: Silver, 1,098 oz.; lead, 74,565 lb.; zinc, 5,993 lb. The 62 tons includes 2 tons of sorted lead ore from the Dixie Fraction.

Daisy Bell (Woodbury Mines Limited) Company office, Room 919, 850 Hastings Street West, Vancouver. R. Wilkinson, president; H. Hill, consultant. Capital: 3,000,000 shares, 50 cents par value. This company operated the Daisy Bell group of claims, on which the company holds an option. The property consists of six claims lying to the south of the south fork of Woodbury Creek. The main workings are on the Florence M claim, about 2 miles by road from the Kootenay Florence camp.

During the greater part of 1950 the property was worked by W. J. Turner, the former owner. The adit on the fissure vein was extended to make the face 120 feet from the portal. Stoping of available ore had been done above this adit in 1949. In 1950 a bench was taken on the floor of the adit to a depth of 10 feet. The new company continued the work, and by the end of 1950 the bench had been extended nearly the full length of the adit.

Most of the ore was trucked to the Kootenay Florence mill, but one truckload was sent to the Trail smelter. Two men were employed in December.

Production: Ore shipped to Kootenay Florence mill, 92 tons. Gross content: Silver, 152 oz.; lead, 8,760 lb.; zinc, 5,424 lb. Ore shipped to the Trail smelter, 7.6 tons. Gross content: Silver, 73 oz.; lead, 3,236 lb.; zinc, 1,145 lb.

Gold-Silver-Lead-Zinc

Scranton (Scranton Consolidated Mining Company) Company office, 444 Pacific Building, Portland 4, Ore.; British Columbia office, Ainsworth. R. B. Mahan, manager. Capital: 650,000 shares, $1 par value. This company owns the Scranton mine, which is inside Kokanee Glacier Park on Pontiac Creek, a northerly flowing tributary of Woodbury Creek. It is connected by a private road, 11 miles long, to the Nelson–Kaslo Highway. Operations were closed down from November, 1949, until April, 1950, and because of time lost removing snow, mining was not started until June.

In 1949 development began on a quartz vein that was exposed in the Scranton camp-site approximately 150 feet south of the main No. 1 portal. Two adits were started, one 30 feet below the No. 1 adit, and one across Pontiac Creek a few hundred feet to the west on the Grandview Fractional claim. In 1950 the first above-mentioned new adit was advanced 50 feet to a point about 180 feet from the portal. Efforts were then concentrated in the other adit, which was advanced as a drift on the vein to make the face 325 feet from the portal by the end of September. This drift, called "Sunset," followed a 3-foot wide quartz vein in granite for 50 feet before the vein pinched out.

This section, well-mineralized with galena and sphalerite, was stoped through to surface. The ore was trucked to the Trail smelter.

The Sunset adit, being about at creek level, had practically no dump room. This necessitated building ore- and waste-bins above track level, arranged so that cars can be pulled up a ramp to the top of the bins. Other buildings include a compressor-house and a long building containing office, bunk-house, and cook-house. The number of men employed averaged five.

Production: Ore shipped, 349 tons. Gross content: Gold, 80 oz.; silver, 2,774 oz.; lead, 65,950 lb.; zinc, 50,728 lb.

KEEN CREEK (49° 117° N.E.)*

Silver-Lead-Zinc

B.N.A. (B.N.A. Mines Limited Liability)

Company office, 614–15 Central Building, 620 View Street, Victoria. Capital: 1,000,000 shares, $1 par value. This company owns the B.N.A. group of five Crown-granted mineral claims located on Keen Creek about 4 miles from the Cork Province mine. Two men were employed from July 17th to October 20th under the direction of W. E. Newton. Stripping was done above the No. 6 adit, and 7 tons of ore was removed and trucked to Trail. No equipment was installed, all work being done by hand.

Production: Ore shipped, 7 tons. Gross content: Silver, 883 oz.; lead, 1,432 lb.; zinc, 2,520 lb.

Montezuma

The Montezuma mine lies in the basin of Montezuma Creek, a southerly flowing tributary of Keen Creek. It is reached by trail from the Keen Creek road. It is owned by H. C. Giegerich but was leased by B. W. Price and J. H. Lassen, c/o B. W. Price, Box 512, Rossland, who made a shipment of jig tailings to the Whitewater mill.

Gold Cure (Red Hawk Gold Mines Limited)

Company office, 800 Hall Building, 789 Pender Street West, Vancouver. Capital: 2,000,000 shares, 50 cents par value. This company holds an option on the Gold Cure group of four Crown-granted claims on Briggs Creek. The property is reached by a trail, 2 miles long, which leaves the Keen Creek road at a point half a mile beyond the Cork Province mine. Two men were employed under the direction of W. Silta to open up the old adits. A contract was given late in the year to Foundation Test Boring Ltd. to do 2,000 feet of diamond drilling.

Cork Province (Base Metals Mining Corporation Limited)†

Head office, 62 Richmond Street West, Toronto. A. P. Earle, Montreal, president; Chamberlain Management Corporation, manager; C. Rutherford, consulting engineer; Donald McLean, superintendent. The property is on Keen Creek about 10 miles by road from Kaslo. The Cork and Province mines were developed separately from 1900 and, up to 1913, 15,875 tons of silver-lead ore was mined, most of which was treated at the Cork mill. The two properties were amalgamated in 1914, and operations were continued by Cork Province Mines Limited. A flotation plant was added to the mill in 1918, but operations ceased in 1920. Activity was renewed in 1923 and continued until 1926 and was renewed again in 1929; thereafter the property remained idle for nearly twenty years.

Total production from 1900 to 1940, when a clean-up around the mill was made, amounted to 65,018 tons mined. Content of ore and concentrates: Gold, 10 oz.; silver, 230,292 oz.; lead, 6,134,056 lb.; zinc, 1,605,287 lb. Since installation of flotation cells, 34,317 tons was mined, with an average recovered grade at the mill of about 4 ounces of silver per ton, 4.6 per cent lead, and 2.3 per cent zinc.

* By J. W. Peck, except as noted.
† By M. S. Hedley.

In 1948 Charles Lind, of Kaslo, acquired a lease and bond on the property, shipped 385 tons of dump ore, and commenced rehabilitating No. 3, the main adit level. The property was bought by Base Metals Mining Corporation Limited early in 1949, and Lind remained as superintendent. Mining of stope remnants began as soon as the workings were made accessible, and a programme of diamond drilling was carried out. Ore was milled at the Whitewater mill at Retallack, and the concentrates were shipped to Trail. Mining and development continued through 1950, and construction of a 75-ton mill was begun late in the year.

The orebodies occur in schistose sediments, dominantly argillaceous but including bands of limestone and limy strata. The strata dip steeply to the southeast and south. There is some dragfolding, but the local structure is not well known. One main and several subsidiary fissures or shears strike northeastward, and dip steeply southeastward as a rule. The fissures swing in and out of the bedding, and may form a sort of braided system, the details of which are not apparent. The ore is a sideritic replacement associated with the fissuring. It occurs in limestone and limy strata, and locally in schist.

The orebodies are lenticular and are as much as 20 feet wide. The finding of a new orebody on No. 5 level, of which there was no indication on No. 3 level crosscut, was the deciding factor in building a mill. A detailed geological examination followed by more diamond drilling would probably lead to a better understanding of the distribution of ore.

The winze below No. 3 level was deepened from No. 5 to No. 6, and drifting was done on the latter level.

Ore from dumps amounting to 8,890 tons was milled at the Whitewater mill on a customs basis and yielded 86 tons of lead concentrates and 211 tons of zinc concentrates. Newly mined ore amounting to 3,776 tons was also milled at the Whitewater mill and yielded 160 tons of lead concentrates and 442 tons of zinc concentrates.

The concentrates reported include 49 tons of lead concentrates and 137 tons of zinc concentrates for which smelter settlements had not been made at the end of the year. The gross metal content reported under " Production " similarly exceeds the quantities of metal accounted for in smelter settlements to the end of the year.

Production: Ore milled, 12,666 tons. Gross content of concentrates: Silver, 10,382 oz.; lead, 298,487 lb.; zinc, 722,221 lb.

PADDY PEAK (49° 117° N.E.)*

Silver-Lead-Zinc

Utica (Utica Mines (1937) Limited). Company office, 640 Pender Street West, Vancouver; mine office, Kaslo. D. N. Armstead, president; D. Williams, mine manager. Capital: 3,000,000 shares, 50 cents par value. The Utica mine is at the head of Twelve Mile Creek, about 15 miles by road from Kaslo. The main level is the No. 7 adit, which is connected by a raise to the No. 4 adit. A sublevel, No. 5, has been developed off this raise. There are two main veins, known as " East " and " West," which are parallel and about 80 feet apart where the present work is being done.

The mine operated continuously until October, when operations ceased and most of the heavy equipment was removed and stored at Kaslo. On the East vein on No. 5 level a stoping section, from 115 to 225 feet from the main raise, was carried up 70 feet. The vein over this section contained from 1 to 6 inches of galena with some barren sections. A raise to be used as an ore-pass was driven up from No. 7 level on this vein. No. 5 level drift on this vein was further extended to make the face 405 feet from the main raise. On the West vein on No. 5 level, drifting was done to make the south and north faces 155 feet and 215 feet respectively from the crosscut connection with the East vein. A raise was completed on this vein through to No. 4 level, and at 50 feet above

* By J. W. Peck.

No. 5 level a sublevel was started. This sublevel was driven to the north 50 feet and exposed a well-mineralized vein, 2½ feet wide, with sphalerite the dominant mineral.

All ore obtained from the mine workings was shipped by truck and rail to the Trail smelter. The removal and shipping to the Whitewater mill of a part of No. 7 dump was started. About 230 tons was stockpiled at the mill, but none of this had been treated by the end of the year. On No. 7 level, horses were used to haul broken rock. The number of men employed averaged fifteen.

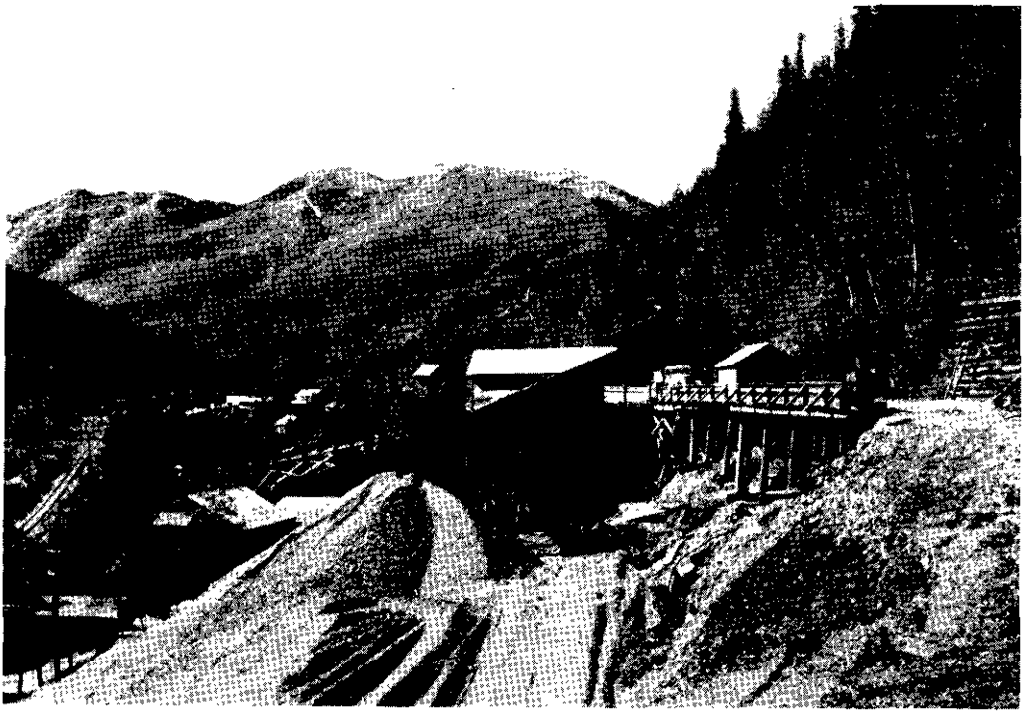
Production: Ore shipped to Trail, 220 tons. Gross content: Gold, 3 oz.; silver, 24,552 oz.; lead, 48,940 lb.; zinc, 63,748 lb.

RETALLACK-THREE FORKS (50° 117° S.E.)*

Silver-Lead-Zinc

Whitewater (Kootenay Belle Gold Mines Limited) Company office, 475 Howe Street, Vancouver; mine office, Retallack. J. L. Trumbull, president; V. McDowall, mine manager. Capital: 750,000 shares, 50 cents par value. Kootenay Belle Gold Mines Limited owns 60 per cent of the stock of Retallack Mines Limited, which owns the Whitewater mine and mill at Retallack. As in 1949, dumps and custom ore produced the bulk of the milling ore. Underground, the 14 level adit, the 9 level adit, and the connecting raise were retimbered where necessary. This permitted mining on a small scale in the 1472 area, last mined in 1945 when a fire destroyed the power plant and forced a shut-down. Rehabilitation of No. 10 level was also begun.

* By J. W. Peck.



Whitewater mill at Retallack.

The mill was closed from December, 1949, until February 15th, 1950. Thereafter stockpiles and the 14 level dump kept the mill supplied until May, when a sink-float plant was installed in conjunction with the mill. This sink-float plant uses ferro-silicon as a medium to float the waste and has a capacity of 30 to 50 tons per hour. The installation of this plant permitted the treating of larger tonnages of low-grade dump material; the maximum tonnage treated in one day was 800 tons. Leases were obtained on mine dumps in the area, and over 34,000 tons was obtained in this way. A second sink-float plant was purchased, with the intention of establishing it at Sandon to handle dumps in that vicinity. This second plant would eliminate hauling the waste from Sandon to the mill at Retallack, a distance of 13 miles.

The total ore milled, including ore from the Whitewater mine and dumps, ore purchased, and custom ore is broken down as follows:—

Sources of Ore Milled		Tons
Retallack Mines Limited—Whitewater mine and dumps		61,276
Kootenay Belle leases—		
Cork Province dump	8,890	
Monitor dump	5,488	
Richmond Eureka dump	8,391	
Seaton Creek (Rambler tailings)	11,400	
		34,169
Custom ore—		
Cork Province	3,258	
Silversmith (Carnegie Mines Ltd.)	2,380	
Van Roi (Transcontinental Resources Limited)	807	
Yale Lead & Zinc Mines Limited	49	
Jackson (Selkirk Mining Company Limited)	1,517	
		8,011
Ore purchased—		
Bosun (Santiago Mines Limited)	7	
Bluebird (Rossland Mines Limited)	17	
Ruth Hope lessees	231	
Montezuma lessees	81	
		336
Total		103,792
On stockpile, December 31st, 1950—		
Whitewater mine and dumps		4,136
Kootenay Belle leases, etc.		6,971
		11,107

The crew was increased steadily, with fifty men employed by December.

Whitewater production: Ore milled, 60,110 tons, includes 1,680 tons of old tailings. Gross content of concentrates: Gold, 28 oz.; silver, 23,508 oz.; lead, 269,969 lb.; zinc, 2,113,679 lb.; cadmium, 12,509 lb.

Keystone Charleston (Slocan Charleston Mining Company Limited) Company office, 609 Baker Street, Nelson. Capital: 1,000,000 shares, $1 par value. This company owns the Keystone and Charleston group of Crown-granted claims which adjoin the Whitewater property on the north. The mine has been inactive since 1947. In 1950 a small crew was employed from July 7th to November 15th under the supervision of Charles Lind. Work was concentrated in the upper levels, where a raise connection was made between No. 2 and

No. 1 levels, 130 feet apart vertically. In driving the raise, ore was exposed 50 feet below No. 1 level and a stoping area was developed here. A stope was also silled out on No. 1 level. Ore from this operation, totalling 650 tons, was trucked to the Whitewater mill but was not milled in 1950.

Jackson (Selkirk Mining Company Limited)

Company office, 800 Hall Building, 789 Pender Street West, Vancouver. E. Brown, president. Capital: 100,000 shares, no par value. This company owns the Jackson mine on Stenson (Jackson) Creek, 5.7 miles by road from Retallack. The workings consist of five adit levels and an inclined shaft. The Jackson lode dips from 30 to 45 degrees, and the heavy ground has in places made the workings inaccessible. In 1950 the No. 3 adit was rehabilitated, and a stope was developed on a parallel fissure 8 feet below a mined-out stope.

Air for mining was supplied by a portable compressor. Buildings consist of an old bunk-house and a newly erected change-house. An ore-bin was also built. Ore was trucked to the Whitewater mill at Retallack. Arrangements were made later for milling to be done at the Kenville mill at Nelson, starting January 2nd, 1951. Six men were employed.

Production: Ore milled, 1,517 tons. Gross content of concentrates and of 20 tons of crude lead ore: Silver, 1,661 oz.; lead, 21,656 lb.; zinc, 431,052 lb.

[Reference: *Geol. Surv., Canada,* Mem. 184, 1935, p. 224.]

Wellington (Waddington Mining Corporation, Limited)

Company office, Room 414, 850 Hastings Street West, Vancouver. R. Crowe-Swords, president. Capital: 5,000,000 shares, no par value. In March this company obtained an option on the Wellington group owned by Wellington Mines Ltd. (company office, Nelson). This group consists of the following Crown-granted claims: Wellington, Ottawa, Ivanhoe, Tiger No. 2, A.Y., I.C., Hazel, Metis, Horse Shoe, Blutcher, Blue, Red Fraction. The claims adjoin and lie west of the Whitewater and Slocan Charleston properties. The main workings are reached by road from Retallack.

A little work was done in 1950 following the recommendations of C. C. Starr, consulting engineer. Three men, under the supervision of S. Ross, were employed to open up the old workings. Most of this work was in the Wellington adit, where considerable retimbering was necessary.

The option was dropped in the autumn. After that S. Ross obtained a lease on the dumps, with the intention of shipping to the Whitewater mill. It is reported that the Wellington adit is again closed due to sloughs caused by road work in the vicinity.

Lucky Boy

H. Hill, of New Westminster, obtained from C. Lind, of Kaslo, a lease and bond on this property, which consists of three claims on Kaslo Creek, 4 miles below Retallack. Three holes, totalling 300 feet, were drilled. Results of the drilling were inconclusive, and the project was abandoned.

Lucky Jim (Zincton Unit, Sheep Creek Gold Mines Limited)

Company office, Room 209, 413 Granville Street, Vancouver; mine office, Zincton. J. S. McIntosh, general superintendent; G. Avison, mill superintendent. Zincton Mines Limited was dissolved in October, 1950, and Sheep Creek Gold Mines Limited assumed direct operation of the Lucky Jim mine at Zincton. The mine is serviced through two main adits; No. 9 is the lower and main haulage level to the mill, and No. 3 is the upper. No. 3 is reached by an outside road and tram-line and is also connected underground by a series of raises to No. 9 level. Continuous production at full mill capacity was maintained throughout 1950, with the bulk of the ore coming, as in 1949, from the 1000 and 1001 stopes (below No. 9 level). Ore was also obtained from stopes on No. 2, No. 7, and No. 8 levels.

The main development was the sinking of a new incline from No. 9 to No. 11 level. Drifting was in progress on the new No. 11 level at the end of the year. A raise was driven from No. 1 level to check information obtained by diamond drilling from the surface. On the surface a scraper loading ramp was established at an old sorting dump that accumulated when ore was sent by rail to the Rosebery mill. It is estimated 5,000 tons is available here. The number of men employed averaged ninety.

Development: Drifting, 289 feet; sinking, 240 feet; raising, 441 feet; diamond drilling, 7,934 feet.

Production: Ore milled, 96,640 tons. Gross content of concentrates: Silver, 56,471 oz.; lead, 935,299 lb.; zinc, 8,405,795 lb.; cadmium, 50,050 lb.

Silver Glance, Panama, and London (London Hill Mines Ltd.) Company office, 850 Hastings Street West, Vancouver. C. F. MacKenzie, managing director. Capital: 350,000 shares, $1 par value. This company was formed to consolidate three groups of Crown-granted claims on London Ridge, 3 miles by trail from Zincton. The Silver Glance group consists of the Silver Glance, Summit Queen, and Silver Glance Fraction; the Panama group consists of the Panama, Booster, and Bourbon Fraction; and the London group consists of the London, King, Queen, and Baldwin. The properties have been idle since 1926. No work was done in 1950.

Rambler The Rambler mill tailings lie in the bed of Seaton Creek, about half-way between Zincton and Three Forks. They are owned by *Sheep Creek Gold Mines Limited.* A lease was obtained by Kootenay Belle Gold Mines Limited, and the tailings were dug up and trucked to the Whitewater mill at Retallack.

Production: Ore shipped, 11,400 tons. Gross content of concentrates: Silver, 10,810 oz.; lead, 31,526 lb.; zinc, 269,710 lb.; cadmium, 2,372 lb.

McAllister (Noonday Mines Limited) The McAllister mine was optioned in 1949 by Noonday Mines Limited, a subsidiary of Alpine Gold Limited. The property is on London Ridge, 5½ miles by road up Kane Creek from Three Forks. Because of snow the mine remained closed from December, 1949, to March, 1950. Work was then concentrated in the lowest or No. 6 adit, where a small vein had been intersected by the adit crosscut at about 1,250 feet from the portal. This vein strikes north 35 degrees west. When drifting was done to the northwest, the vein widened, and after 50 feet of drifting it was 3½ feet wide. The vein is chiefly of quartz containing grey copper. A raise was put up from the end of the drift, and stoping was done in this area until the vein narrowed to a knife-edge. Diamond drilling was then done from the main crosscut but, though the vein was located, the results of the drilling were not encouraging.

Air for mining was supplied by a portable compressor. Ore obtained was trucked to the railway at Three Forks for transhipping to Trail. Later, however, it was trucked directly to the smelter. Seven men were employed under the supervision of F. H. Crosby. All work ceased in the fall.

Production: Ore shipped, 34 tons. Gross content: Silver, 7,431 oz.; lead, 2,196 lb.; zinc, 1,921 lb.

Monitor This old property is at Three Forks, on the south side of Carpenter Creek. The mine is developed by five adits, No. 4 being above and No. 5 below the New Denver–Sandon Highway. A lease was obtained on the dumps at this mine by Kootenay Belle Gold Mines Limited. During the early summer a crew was employed removing and trucking material, chiefly from the No. 4 and No. 5 dumps, to the Whitewater mill at Retallack.

Production: Ore milled, 5,488 tons. Gross content of concentrates: Gold, 15 oz.; silver, 2,022 oz.; lead, 26,984 lb.; zinc, 60,041 lb.; cadmium, 497 lb.

In the fall of 1950, for a short period, Arthur Lakes had a crew driving an adit on the Min and Cork claims, which are part of the Monitor group and lie south of the Monitor claim.

SANDON (49° 117° N.E.)*

Silver-Lead-Zinc

Ruth Hope

C. Higgins and H. Richmond continued to operate the former's lease on this mine. Ore trucked to the Whitewater mill at Retallack, 231 tons. Production: Ore shipped to Trail, 43 tons. Gross content of the latter: Silver, 4,740 oz.; lead, 58,191 lb.; zinc, 3,997 lb.

Silversmith (Carnegie Mines Ltd.)

In 1949 Carnegie Mines Ltd., of Montreal, optioned this old producer at Sandon. In 1950 the road up Sandon Creek was repaired and over 2,200 tons was shipped from No. 3 dump to the Whitewater mill at Retallack. Underground, the No. 10 level was rehabilitated and mining commenced on a small scale in the Rabbit Paw section, about 3,300 feet in from the portal. About 250 tons was produced from this section and trucked to the Western Exploration mill at Silverton, but this ore was not milled in 1950.

In the old mill about 160 tons was cleaned up from the old thickeners. Six and a half tons was also cleaned up from the jigs. This clean-up was trucked to the Whitewater mill.

Operations were under the supervision of R. Crowe-Swords. Seven men were employed.

Production: Gross content of 65 tons of crude ore, 37 tons of lead concentrates, and 186 tons of zinc concentrates: Gold, 5 oz.; silver, 11,013 oz.; lead, 71,752 lb.; zinc, 214,615 lb.; cadmium, 1,348 lb.

Richmond Eureka

Kootenay Belle Gold Mines Limited obtained a lease from Carnegie Mines Ltd. on the dumps at this old property. Dump material was trucked to the Whitewater mill at Retallack. Production: Ore shipped, 8,391 tons. Gross content of concentrates: Gold, 11 oz.; silver, 20,080 oz.; lead, 112,191 lb.; zinc, 325,580 lb.; cadmium, 2,203 lb.

Noble Five and Deadman

In 1949 and 1950 C. F. Johnston of 721 Eastern Avenue, Toronto, obtained control of the Noble Five and Deadman groups above Cody. In 1950 a road was built to the Noble Five camp, 2½ miles from Sandon, use being made of the old Slocan Sovereign road. This camp is at the 18 or lowest level adit of the Noble Five mine. A 4-compartment vertical raise extends from the 18 level to the 8 level, 1,000 feet above, with stations or sublevels cut at 200-foot intervals. In addition to 8 level, there are several other adits above 18 level. Below 18 level there are a winze and one sublevel. Starting in June a crew was employed to open up the portals, which were all caved. The levels, manways, etc., were retimbered where necessary. Diamond drilling totalling 2,200 feet was done, 1,400 feet on 18 level and 800 feet on 8 level.

On the surface the buildings were rehabilitated and a portable compressor was installed. At the Deadman, which lies north of the Noble Five, the No. 4 adit was opened up. All work ceased December 2nd because of winter. W. Hall was in charge, with up to ten men employed.

[Reference: *Geol. Surv., Canada,* Mem. 184, 1935, p. 91.]

Bluebird (Bluebird Mines Limited)

Company office, 507 Stock Exchange Building, 475 Howe Street, Vancouver. C. Rutherford, consulting engineer. Capital: 2,000,000 shares, 25 cents par value. The Bluebird property is northeast of Cody on the divide between Carpenter and Stenson (Jackson) Creeks, at an elevation of over 7,000 feet. Between July and October three men were employed under the supervision of H. Hewat opening up the workings.

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

Altoona

This property is owned by E. Doney but was optioned in 1950 to the Kootenay Belle Gold Mines Limited. It lies astride the old K. and S. right-of-way, 1½ miles northwest of Sandon. The old railway road-bed was made into a truck-road, and a compressor-house and an ore-bin were erected near the portal of No. 2 adit. A stope was started about 150 feet in from the portal on No. 2 level and mining commenced in November at the rate of about 25 tons per day. About 400 tons of ore was mined and trucked to the Whitewater mill at Retallack, but was not milled in 1950.

Shady Fraction

This claim was located in 1950 on Carpenter Creek east of Cody and adjoins the Wellington and Chambers Crown-granted claims on the south. It is owned by W. Suran, who made a small shipment of float in October.

Production: Ore shipped, 1½ tons. Gross content: Silver, 114 oz.; lead, 1,943 lb.; zinc, 91 lb.

Carnation (Kelowna Exploration Company Limited)*

Company office, 75 West Street, New York; mine office, Hedley; operational office, Sandon. R. McLean Stewart, president; Paul Billingsley, consulting engineer; G. L. Mill, manager; J. C. Black, superintendent. The former Carnation group is part of the company's extensive holdings south of Sandon. The 5480 level on the Carnation lode, started in 1949, was continued through 1950.

Driven 230 feet southwestward into the hill, the adit was then turned and driven 1,380 feet in a crosscutting direction of south 7 degrees west. A mineralized lode zone, probably related to the Minniehaha lode, was encountered 680 feet from the turn and a second, larger zone at 1,080 feet. On the latter a drift was driven to the west about 1,350 feet, where a crosscut was driven to the south, into the hangingwall of the lode. The drift was driven in the footwall, and six short crosscuts were driven from the drift into or across the lode. Small amounts of zinc mineralization were observed locally. The innermost crosscut was 200 feet long in mid-September and had not been completed.

An attempt was made by bulldozer stripping to locate the first or Minniehaha lode at the point of its emergence at the surface, at the level of the adit. Several surface holes were drilled to obtain intersections on it. Where struck in the adit, this lode zone was mineralized with sphalerite and galena across a width as great as 15 inches.

Late in the summer, stripping was done in search of the Carnation lode just above the old road, at about the 6,000-foot level. A quantity of breccia of ore type was disclosed; it did not contain sulphides; plans were made to explore it further. Diamond drilling was planned to explore the Carnation vein below the 5480 level, from the crosscut in the hangingwall.

The Minniehaha lode was followed for 80 feet to the east in the 5480 adit, and a new adit was started 200 feet from the 5480 portal. The road was extended to the 6300 adit, in which a crosscut was driven to the south.

An average of eighteen men was employed.

Wonderful, Corinth (Silver Ridge Mining Company Limited)

Company office, c/o R. A. Grimes, Sandon. John R. Kenney, managing director. Capital: 2,000,000 shares, 50 cents par value. This company owns a group of claims at Sandon. Work ceased in November, 1949, and the property lay idle until the summer of 1950, when the company continued its exploratory programme, although on a reduced scale. The adit on the Corinth claim was extended to 600 feet in an unsuccessful effort to locate the downward extension of a vein exposed by lessees in 1948. The crew was then returned to work in the main Pearson adit, where drifting was commenced on a shear exposed in the Wonderful crosscut 1,500 feet from its junction with the main adit. Work ceased at the end of November but

* By M. S. Hedley.

commenced again at the end of December. A small shipment of ore was made to Trail. Six men were employed.

Production: Ore shipped, 3 tons. Gross content: Silver, 113 oz.; lead 3,295 lb.; zinc, 410 lb.

Sylverite (Slocan Base Metals Limited)

Company office, 904 Hall Building, 789 Pender Street West, Vancouver. James S. Don, managing director. Capital: 3,000,000 shares, no par value. This company was formed as a reorganization of the Sylverite Mines Ltd. and the Excelda Mines Limited. The ground held is the Sylverite property of six claims located 2½ miles northwest of Sandon. No work was done in 1950.

Palmita.—This claim is adjacent and north of the Victor claim of the Violamac property. In the fall of 1950 C. Higgins obtained a lease and worked in the vicinity of a narrow vein exposed by bulldozer stripping in 1949.

Elkhorn

This Crown-granted claim lies northwest of Sandon, about halfway along the Sandon–Victor road. It is owned by N. Tattrie but was optioned by Kootenay Belle Gold Mines Limited. Late in the year a bin was built above the road and preparations were made to handle the dumps.

Victor (Violamac Mines (B.C.) Limited)*

Head office, 67 Yonge Street, Toronto; mine office, New Denver. Mrs. Viola R. MacMillan, president; George A. MacMillan, vice-president; J. W. Ambrose, consulting engineer. This property is southwest of Carpenter Creek, 2½ miles northwest of Sandon, and is reached by a road from the Silversmith mill-site, half a mile below Sandon. The first showing on the Victor ground was found by the late George Petty, by ground-sluicing, in 1921. Production started in 1923 and has since been continuous, with the exception of 1930 and 1931. The mine was leased by E. Doney, of New Denver, from 1931 until its purchase by the present owners in 1948, who at the same time purchased Mr. Doney's lease. A short time thereafter it was demonstrated that No. 4 level had not been driven on the ore-bearing fissure and that a short crosscut had stopped only 3 feet short of an important orebody.

Development on Nos. 4 and 5 levels was highly satisfactory, and ore was sorted underground and shipped to Trail by truck. A small mill was built and was brought into production in 1950. High-grade lead ore will continue to be sorted, but zinc-bearing and low-grade material, much of which was formerly wasted, will be milled.

The vein is small and is in somewhat broken ground. The orebody averages a little more than 1 foot wide, but almost massive galena has been encountered in widths as great as 5 feet. The distribution and control of oreshoots are not yet fully understood.

The vein strikes northeastward and is steep. It is developed by six adits. No. 7 level, at present being driven, is about 200 feet below No. 5. No. 7 level for the first few hundred feet showed no change in structural conditions. It is not on the vein, but minor mineral-bearing fractures were encountered by it.

The new mill was designed and built by Henry Sexton of the Tri State mining district. It is on the steep hillside immediately below No. 7 level. From the ore-bin a belt feeder conveys the ore to a ½-inch trommel screen in closed circuit with a jaw crusher; the crushed ore goes to lead and zinc jigs which produce concentrates; the overflow from the jigs goes through a drag classifier and 5-ton ball mill to lead and zinc flotation cells, where a further recovery is made. The mill was running by December 5th. The number of men employed averaged thirty-five.

Production: Ore shipped, 2,418 tons. Gross content: Gold, 88 oz.; silver, 175,553 oz.; lead, 2,194,685 lb.; zinc, 887,578 lb.

* By M. S. Hedley.

Queen Bess (Bess Mines Limited)*

Head office, 555 Burrard Street, Vancouver. A. C. Taylor, president. Bess Mines Limited was formed by Bralorne Mines Limited and Kelowna Exploration Company Limited to explore the ground of the former Queen Bess, Idaho, and Alamo groups, which are held under option. The work is carried out by Kelowna Exploration. The property comprises thirty-four Crown-granted claims on Howson Creek.

A road for truck and bulldozer was slashed over the ridge from the Corinth road to the Queen Bess workings, and a considerable amount of stripping was done, partly in the old dumps. No. 7 adit, "B" vein adit, and a lower adit on the road below were re-opened, and some driving was done in "B" vein adit with hand-steel. Some diamond drilling was done, chiefly from the surface. An intensive geological examination of the surface, started in 1949, was continued.

Chief result of the work was that "B" vein was proved to be a faulted section of the main Queen Bess lode. The structural environment is complex, with overturned and crumpled argillites and quartzites disrupted by strike faults. The lode normally crosscuts the formation, but locally swings and follows the strike faults. This condition is found in other properties and is sometimes associated with ore occurrence. Predominantly zinc-bearing mineralization was being followed by a drift to the southeast in "B" vein adit in midsummer of 1950.

Work was done under the direction of J. C. Black, superintendent, and W. M. Sharp, geologist.

SLOCAN LAKE (49° 117° N.E.)†

Silver-Lead-Zinc

Bosun (Santiago Mines Limited)

Company office, 423 Hamilton Street, Vancouver; mine office, New Denver. R. Crowe-Swords, president; T. R. Buckham, mine manager. Capital: 6,000,000 shares, 50 cents par value. The Bosun mine is on the east shore of Slocan Lake, 1½ miles south of New Denver on the Nelson–Nakusp Highway. The main haulage level, No. 6 adit, is driven beneath the highway from a site 40 feet above Slocan Lake.

Operations were on a small scale in 1950. During the first half of the year, production came from the eastern section of the mine, where a winze, 2,730 feet from the portal, had been sunk on the vein to No. 7 level. In 1949 drifting was done in an easterly direction from the bottom of the winze 30 feet below No. 7 level, and another winze sunk on this sublevel 35 feet from the main winze. The area near the winze was stoped out, but in 1950 it was sunk further and a new sublevel called "No. 8" established. On this new No. 8 level about 100 feet of drifting was done. Some of the back was taken down, and it was the intention to raise from this No. 8 level to connect with the bottom of the main winze. The vein, however, was not as high grade as it was where mined out in the small winze, and therefore the project was abandoned. No. 8 level was flooded at the end of the year.

In the latter half of 1950 ore was produced from No. 5 level and from the western block on No. 6 level. No. 5 level was opened up by the rehabilitation of a raise on No. 6 level about 3,100 feet in from the portal. Sphalerite was more noticeable in this area than in other sections of the mine. In the western block on No. 6 level a stope about 1,000 feet in from the portal was worked on a small scale.

The small jig mill was not operated, but ore was crushed to 1½-inch size before shipment. About 230 tons of ore was trucked to the Western Exploration mill at Silverton, and crude lead ore amounting to 152 tons was trucked to the Trail smelter. In December eight men were employed.

* By M. S. Hedley.
† By J. W. Peck, except as noted.

Two lessees, J. Zambon and W. D. Pengelly, worked in the western part of the mine during the first half of 1950. They shipped 51 tons of crude lead ore to the Trail smelter and 7 tons to the Whitewater mill.

Production: Total crude ore shipped to Trail, 198 tons. Gross content of crude ore shipped to Trail, and of concentrates from 237 tons of ore milled: Gold, 4 oz.; silver, 19,170 oz.; lead, 138,371 lb.; zinc, 104,161 lb.

Western Exploration Company Limited

*Mammoth.**—The Mammoth mine is owned by Western Exploration Company Limited and is worked jointly with the Standard. It is reached from the Standard camp by a steep one-way road. Ore is delivered to the mill at Silverton by a 16,000-foot aerial tram. The first serious development on the Mammoth was in 1923. A total of 1,425 tons of crude ore was shipped between 1925 and 1935. The mine was fully equipped in 1929, but it was 1935 before major production commenced. Following one long period of inactivity and several minor shut-downs, the known ore above No. 7 level was exhausted in 1944. The mine is producing again, from a recently developed block of ground below No. 7 level.

No. 9 level, a crosscut to the vein, 1,050 feet long, was started in 1948, from an exposed position which is inaccessible in winter months. The crosscut was finished the following year, and a raise was put up in the footwall of the lode to No. 7 level, a vertical distance of 340 feet. In 1950 a hoist was installed and No. 8 level was driven from the raise into the orebody. The tram-line was repaired, a task which involved a large amount of reconstruction of towers. Production started in November.

All hoisting and servicing will be done from No. 7 level, at the head of the tram, and No. 9 will be used for drainage and waste disposal and will provide ventilation. Mining is by square-set stoping.

The ore is a downward continuation of the ore mined through a vertical distance of about 700 feet above No. 7 level. It is a vein-like body above No. 4 level and pipe-like below. The known vertical range of this ore is about 1,000 feet.

Production: Ore milled, 12,222 tons. Gross content of concentrates: Gold, 27 oz.; silver, 122,568 oz.; lead, 767,469 lb.; zinc, 1,775,246 lb.; cadmium, 7,955 lb.

Standard.—The Standard mine operated on a reduced scale, with most of the tonnage coming from the 640 stope. A crew was also employed extending the old No. 7 level. The camp was not operated, the men being transported from Silverton.

Enterprise.—A small production of about 10 tons per day was maintained at the Enterprise. No. 8 and No. 6 levels produced most of the ore.

Standard Mill.—The mill at Silverton was operated intermittently treating ore from the Standard and Enterprise mines as it was mined. Ore from the Bosun and the Galena Farm was also milled on a custom basis.

Van Roi, Hewitt (Van Roi Consolidated Mines Ltd.)

Company office, 1519 Marine Building, 355 Burrard Street, Vancouver; mine office, Silverton. W. B. Milner, president; D. R. Wilson, manager. Capital: 3,000,000 shares, no par value. This company, controlled by Transcontinental Resources Limited was formed to consolidate under one owner the Van Roi and Hewitt mines at Silverton. Options were also obtained on the adjoining Galena Farm and Metallic properties. The Van Roi camp is 6½ miles by road from Silverton.

Van Roi Mines (1947) Ltd. continued operations in the Van Roi mine until February. A stope, developed on No. 3 level in the southeast section of the mine in 1949, was mined out to its upper limits. The ore was trucked to the Kenville mill at Nelson and to the Western Exploration mill at Silverton. The property then remained idle until October, when Transcontinental Resources Limited obtained control. This company rehabilitated the levels of the adjoining Hewitt mine and by the end of 1950 had com-

* By M. S. Hedley.

menced mining in a stope on the lowest or No. 10 level, approximately 2,400 feet in from the portal. From the No. 3 dump, west side, 807 tons was removed and trucked to the Whitewater mill at Retallack for a sink-float test.

Machinery for mining consisted of a Schramm UD-18 International diesel 315-cubic-feet-per-minute compressor set up at No. 10 portal of the Hewitt, and an Ingersoll-Rand G.M. diesel 365-cubic-feet-per-minute compressor set up at No. 3 portal of the Van Roi. Twelve men were employed in December.

Production: Ore milled, 1,466 tons; ore shipped, 5.7 tons. Gross content of ore and concentrates: Gold, 23 oz.; silver, 9,490 oz.; lead, 75,699 lb.; zinc, 103,464 lb.

Galena Farm

Frank S. Mills, of Silverton, continued to operate his lease on this old property 1½ miles by road south of Silverton. Up to June one man was employed, but after that date a partnership of three men was formed. The bulk of the ore mined came from the lower adit level in the extreme west end of the Main lode. Some ore was also mined from the surface where the vein outcrops near the old compressor building. Ore obtained was crushed in a small jaw-crusher and then trucked to the Western Exploration Company's mill at Silverton. In November, Transcontinental Resources Limited obtained an option on the property, but Mr. Mills and his partners continued to work under lease. One shipment of 8 tons was trucked to Trail. Gross content: Silver, 516 oz.; lead, 7,472 lb.; zinc, 1,767 lb.

Production: Ore milled, for Mills, 180 tons; for Mills, Pengelly, and Cooper, 825 tons; total, 1,005 tons. Content: Silver, 2,960 oz.; lead, 15,332 lb.; zinc, 190,398 lb.

Noonday

This Crown-granted claim, about 2 miles by road from Silverton, adjoins the Galena Farm mine to the east. It was subleased from A. Erickson by G. W. Lyon, A. Lyon, and H. Cleaver, who worked from August until November. A short road was built to the portal of the upper level, and about 50 tons of backfill was drawn from an old stope near the portal. A section of the adit, extending 30 feet from the portal, caved through to surface, and further operations were suspended for the winter. The 50 tons was stored in a bin and was not shipped in 1950.

Metallic

This property is alongside the Silverton–Hewitt road, about 2 miles from Silverton. It was inactive most of the year but was under lease in the early part to J. Tarnowski, G. Tarnowski, and J. Heichert. These partners started two raises on the lower level approximately 45 feet each way from the main raise that connects with the upper level. From the raise nearest the portal, 70½ tons of ore was obtained, 65 tons being trucked to the Western Exploration mill at Silverton and 14 tons to the Trail smelter. The other raise was carried up 67 feet, but no ore was found.

Late in 1950 Van Roi Consolidated Mines Ltd. obtained an option on the property, but no further work was done.

Production: Lead ore shipped to Trail, 14 tons. Gross content: Silver, 719 oz.; lead, 2,993 lb.; zinc, 3,792 lb.

A.U. (Lucky Thought)

The A.U. mine of five claims and fractions, owned by John O. Nesbitt and James J. McNow, of Silverton, covers ground formerly owned by The Consolidated Mining and Smelting Company and known at that time as the Lucky Thought group. The mine is on Silverton Creek, 4 miles by road from Silverton. It has not been worked since 1937. Shipments of surface material were made in November and December to the Trail smelter.

Production: Ore shipped, 26 tons. Gross content: Silver, 794 oz.; lead, 4,347 lb.; zinc, 13,458 lb.

White Hope

The White Hope, White Hope No. 1, Homestake, and Senator are four Crown-granted claims lying astride the Nelson–Nakusp Highway, about 5 miles north of Slocan City. They are owned by Spokane Slocan Company. J. J. McDonell, of Slocan City, obtained a lease in 1950 and made a few shipments from the surface of the White Hope claim.

Production: Ore shipped, 27 tons. Gross content: Gold, 1 oz.; silver, 207 oz.; lead, 9,923 lb.; zinc, 9,234 lb.

SPRINGER CREEK (49° 117° N.E.)*

Silver

Ottawa

This mine, 6 miles by road from Slocan City, was operated by three lessees, A. Olson, E. Grove, and P. Grove. The property is owned by the Ottawa Silver Mining & Milling Company. On December 22nd an option was given to the Violamac Mines (B.C.) Limited, who employed the lessees to continue the work. The lessees worked on the lower or No. 6 level using hand-steel.

Production: Ore shipped, 136 tons. Gross content: Silver, 20,036 oz.

Howard Fraction

This group, owned by H. L. Harbour, of Slocan City, consists of the Howard Fractional Crown-granted claim and two recorded claims, Gloria and Teddy, which replace the cancelled Crown grants, Tiger No. 7 and Bland No. 2. The property is on the southern slope of the divide between Lemon and Springer Creeks, at elevation 6,500 feet. It is reached by a 6½-mile road up Springer Creek, thence by a 3-mile newly constructed road up Tobin Creek.

Toward the end of the summer a few loads of dump ore were trucked to Slocan City for transhipping to the Trail smelter. The workings were inaccessible but, from the appearance of the dump, development in the past was on a quartz vein in granite. The dip of the vein at the outcrop is about 15 degrees into the hill.

Production: Ore shipped, 35 tons. Gross content: Gold, 2 oz.; silver, 225 oz.

NORTH LARDEAU (50° 117° N.E.)*

Silver-Lead-Zinc

Spider (Sunshine Lardeau Mines Limited)

Company office, 942 Pender Street West, Vancouver; mine office, Beaton. H. E. Holcombe, president; David Burns, superintendent. Capital: 3,000,000 shares, no par value. This company has an option on the Spider group on Poole Creek, 7 miles by road from Beaton. A base camp was established at Camborne, site of the Meridian mill, the building of which is still in good condition. The 4-foot-wide trail to the mine was repaired and improved so that supplies could be transported to the mine camp, 2 miles distant. The mine camp is near the portal of No. 4 adit and 1,600 feet higher than Camborne.

The mine is developed by five adits, Nos. 1 to 5 at elevations 3,709 feet, 3,658 feet, 3,667 feet, 3,585 feet, and 3,458 feet respectively. An exploratory diamond-drill programme was carried out chiefly on No. 4 and No. 5 levels. On No. 4 level the ore fissures appear to strike across a carbonate zone, and thus drilling was done in a southerly direction to crosscut this zone and to locate parallel fissures. On No. 5 level, which is driven southwest for 110 feet and then southeast for 360 feet, five holes were drilled from a location where the adit swings from southwest to southeast. These holes located a new vein called No. 4 about 45 feet west of the adit turn. Crosscutting to investigate this vein was in progress at the end of the year. Additional diamond drilling was done near the

* By J. W. Peck.

face of No. 5 adit. A total of 2,000 feet of drilling was done underground and 1,000 feet was done from the surface.

On the surface the buildings at Camborne and at the mine were rehabilitated. A warehouse and tractor shed were erected. New machinery consisted of a 90-horsepower Vivian diesel engine. Operations commenced May 15th and continued until the end of the year. The number of men employed averaged nine.

[Reference: *Geol. Surv., Canada,* Mem. 161, 1930, p. 85.]

Nettie L., G.Y.P. Fraction, and Ajax (Trout Lake Mining Company Limited) Company office, 120A McKenzie Avenue, Revelstoke. R. M. Patriquin, president; A. E. Peterson, mine superintendent. Capital: 200,000 shares, $1 par value. This company was formed to develop several claims on Nettie L. Mountain overlooking the town of Ferguson. A new road 1.7 miles long was built from 5-Mile on the Lardeau Creek road to the Nettie L. camp 1,100 feet above. It was also extended half a mile to the G.Y.P. adit, and a further few hundred yards to the lower Nettie L. dump. The old portals of the Nettie L., G.Y.P. Fraction, and Ajax were retimbered and some clean-up was made of the workings. A bunk-house, garage, and compressor-house were erected. Four men were employed.

SOUTH LARDEAU (50° 116° S.W.)*

Silver-Lead-Zinc

St. Patrick (Hamil Silver-Lead Mines, Limited) Company office, 902 Rogers Building, 470 Granville Street, Vancouver. Capital: 3,000,000 shares, 50 cents par value. This company controls a group of claims including the old St. Patrick on the north side of Hamill Creek. The property has been idle for many years, being last worked by lessees in 1937 and 1938. In 1950 a road 3 miles long was built to the mine from a point 6 miles from Argenta on the Argenta–Howser road. When this work was completed late in 1950, rehabilitation was started on the mine buildings, which consisted of two dilapidated log buildings at the main adit portal and two log buildings in good shape at a camp-site 500 feet lower.

[Reference: *Geol. Surv., Canada,* Mem. 161, 1930, p. 50.]

Surprise This property is on Glacier Creek, 5 miles by road from Howser. It is owned by W. Clark, of Howser, but J. Gallo and his partner, F. Pellizari, hold an option on it. The mine is developed by two main adits 110 feet apart vertically. In the past all ore has come from the upper or No. 1 adit which follows a quartz-tetrahedrite vein.

In 1950 a raise 30 feet long was put up at the face of No. 1 adit and stoping commenced in this section. At the top of the raise the vein was 16 inches wide. On the surface, open-cut work was also done on a parallel vein 200 feet north and 50 feet higher than the portal of No. 1 adit.

Air for mining was supplied by a portable compressor. Water, however, is a problem and at times has to be transported to the mine from Glacier Creek, 1,300 feet below. Some repairs had to be made to the road before ore could be trucked the 17 miles to Lardeau for transhipping to the Trail smelter. Three men were employed.

Production: Ore shipped, 195 tons. Gross content: Gold, 1 oz.; silver, 2,933 oz.; lead, 2,296 lb.; zinc, 3,095 lb.

UPPER ARROW LAKE (50° 118° N.E.)*

Zinc

Big Ledge The Consolidated Mining and Smelting Company of Canada, Limited, continued its diamond-drilling programme on this property on Pingston Creek. Work was restricted to the summer months. About ten men were employed. A total of 7,239 feet was drilled.

* By J. W. Peck.

CRESTON (49° 116° S.W.)*

Silver-Lead

Alice

The Alice mine, owned by K. C. Constable and R. B. Staples, is on the west slope of Arrow Mountain, 2 miles north of Creston. A new road of improved grade was built to the lower adit site in 1949. In 1950 the mine remained inactive until August, when a lease was given to R. Welloff and J. S. Maines. Three loads of ore obtained by sorting the dumps were trucked to the Trail smelter. The mine remained caved and inaccessible.

Production: Ore shipped, 19 tons. Gross content: Silver, 260 oz.; lead, 14,826 lb.; zinc, 195 lb.

Delaware

This property is at 4,500 feet elevation on Rolf Mountain, to the north of Creston. It is reached by about 7 miles of road from a point 5 miles from Creston on the Creston–Cranbrook Highway. It is owned by J. W. Hill, of Delaware, U.S.A., but has been under a five-year lease to R. W. and F. E. Crawford, of Creston. The mine has been developed by two main adits, 50 feet apart vertically, driven on a quartz vein which dips about 53 degrees and varies in width from a few inches to several feet. A third adit, lower down the hill, is not on the vein.

Operations in 1950 were restricted to the first half of the year, when three men worked on a sharing arrangement. In 1949 the vein was found past a fault in No. 2 adit, but it was not drifted upon here until 1950. Lenses of galena were dispersed in this vein, and ore was obtained by taking down the back and hand-sorting the vein. The face was reported to have been advanced to over 300 feet from the portal when operations ceased.

Production: Ore shipped, 65 tons. Gross content: Silver, 265 oz.; lead, 14,149 lb.; zinc, 260 lb.

KIMBERLEY (49° 115° N.W.)*

Silver-Lead-Zinc

Sullivan (The Consolidated Mining and Smelting Company of Canada, Limited)

Company office, 215 St. James Street West, Montreal; mine and smelter office, Trail. R. E. Stavert, Montreal, president; R. W. Diamond, Trail, vice-president and general manager. Sullivan mine office, Kimberley. J. R. Giegerich, mine superintendent; H. R. Banks, mill superintendent. Capital: 4,000,000 shares, $5 par value. The company owns and operates the Sullivan mine on Mark Creek, near Kimberley, and the Sullivan concentrator at Chapman Camp. The following report is based on an outline of the 1950 operations supplied by the management.

Safety.—Accident-prevention work, both underground and on surface operations, has been earnestly and sincerely carried out by all employees, safety committees, and supervisors during the year. The interest shown by everyone is reflected in the results obtained. The surface employees worked 227 days before having a lost-time accident. The 227 accident-free days represent a total of 61,460 man-shifts of exposure.

The underground school of instruction played an important part in the accident-prevention work. A total of 215 employees attended the school during 1950, and sixteen supervisors attended the school as assistant instructors.

Regular first-aid classes were held for all employees during the year, and 160 employees were examined for first-aid certificates. The East Kootenay Mine-rescue and First-aid Competitions were held in Kimberley during 1950, and the Kimberley first-aid teams won the Department of Mines Cup and the Rotary Shield. The mine first-aid team also won the Blaylock Bowl in the Cominco Competition which was held in Kimberley during the year.

* By J. W. Peck.

Mine-rescue training was actively carried out during the year. Six mine employees successfully completed the Department of Mines mine-rescue course during the year. The Sullivan mine entered three teams in the East Kootenay Mine-rescue Competitions, in which one of the teams came third. Shortly after the mine-rescue meet, all mine-rescue personnel were called to duty to assist in combating the sulphur-dioxide fumes, which came from the oxidation of the iron sulphide in the material which is being used as stope fill in parts of the mine.

All mine-rescue men responded for this work, and they all deserve great credit for the efficient manner in which they carried out the work according to the methods prescribed in mine-rescue practice. The work consisted of erecting gunite and concrete seals, installing ventilation pipe and fans, and removing equipment from contaminated zones. Much of this work was done in high concentrations of sulphur dioxide and also high temperatures. The protective apparatus found most useful for this type of work is the All-service gas masks, where sufficient oxygen is present. The Chemox apparatus is used in low-oxygen areas or where the concentrations of sulphur dioxide are high. Patrol work by mine-rescue men is carried out every day on three shifts in the areas affected by the sulphur-dioxide fumes. Credit is due to the British Columbia Department of Mines instructors and to the instructors at the mine who trained the men in mine-rescue work.

Many new problems had to be overcome in working in sulphur-dioxide contaminated areas which are not as yet described in text-books, and various methods were developed to handle sulphur-dioxide gas emitted by float-sulphide fill from three locations. This work has continued daily for the past five months without accident. The mine-rescue men are provided with special woollen suits, as the fumes destroy any other fabric. The McCaa apparatus, although available, was not used in this work because of the effect of the acid fumes on metal parts of that apparatus.

Regular tests were made underground and at surface outcasts for carbon monoxide and sulphur dioxide, and analyses of mine-air samples were made by Orsat apparatus. Also, temperatures were recorded when required.

Two fires occurred on main exhaust fans. Little damage was done, and no smoke hindrance was encountered underground.

Ventilation.—The main ventilation system continued as a south to north flow, with various splits to all levels. Return air in the primary mechanical exhaust system measured 409,000 cubic feet per minute, and in a separate contaminated circuit measured 104,000 cubic feet per minute, a total mechanical exhaust of 513,000 cubic feet per minute from underground. The main intake shaft operated on forced draught for eight months of the year at 125,000 cubic feet per minute, below 3900 level. Preliminary proposals are being drawn up to extend the main ventilation of the mine.

Dust Control.—Routine dust testing was carried out monthly, giving the following results by the Konimeter method of sampling:—

	Average Particles per Cubic Centimetre of Air
Stopes	372
Ventilation (airways)	288
Development	516
Slushers	521
Miscellaneous	381
General mine-air average (December 1st, 1950)	403

Preliminary plans were made for the disposal of dust from the conveyor raise, 39128 dumps, and 2850 crushing plant.

Preliminary tests on dust produced from drilling at subheadings with air-leg equipment and tungsten-carbide bits ranged from 380 to 404 particles per cubic centimetre of air.

Aluminium-powder treatments in the main dry building were carried on daily except during hot weather, when the treatments were discontinued in the interest of employee comfort.

Sink-float Project (Crushing and Transportation).—The new underground crushing chamber on the 3800 level was completed, and transportation of ore to the mill along the 3700 haulageway commenced November 23rd, 1949. The new system was in full operation by December 7th, 1949, and haulage by the Canadian Pacific Railway was terminated after twenty-six years of service.

The ore drawn from the stopes above the 3900 level is trammed to a 6,000-ton ore-pocket, where it is delivered without previous crushing. A chute below the ore-pocket is equipped with a Ross chain feeder which feeds a Ross roll grizzly. Grizzly oversize goes to a 36- by 48-inch Dominion jaw crusher, where it is crushed to 6-inch size. The undersize drops on to a conveyor, where it joins the discharge from the crusher and is delivered to a distributing chute.

Ore from below the 3,900-foot level has already passed through a primary crusher and is delivered to the 3800 crushing station by the mine conveyor-belt system. It joins the upper-level ore at the distributing chute.

The 6-inch ore from both upper and lower levels then passes over a 6- by 12-foot Tyrock screen and a 6- by 12-foot Dillon screen in parallel. The oversize goes to two Symons 7-foot standard cone crushers, where it is crushed to −1½ inches. The undersize and crushed product are then conveyed to a 15,000-ton ore-pocket, from which it is later drawn into cars for transportation to the concentrator along the 3700 level.

The first 2 miles of the 36-inch gauge electric haulageway from the underground bin is a rock tunnel 10 feet high by 12 feet wide. The second 2 miles passes through a 1,200-foot open-cut 80 feet deep, then over a 650,000-cubic-yard fill 1,100 feet long with a maximum height of 115 feet, and finally along a side-hill cut and fill to a 6,000-ton ore-bin at the concentrator. In addition to 21,000 feet of main line, there are 8,000 feet of passing and float-disposal tracks.

Transportation equipment consists of two 48-car trains, each hauled by a General Electric 40-ton double-truck mine locomotive, powered by four 120-horsepower motors, with draw-bar pull rated at 20,000 pounds at 10 miles per hour.

The ore-cars were made by the Differential Steel Car Company and are of the axle-less type with eight wheels, 10 inches in diameter with tapered roller bearings. They hold 250 cubic feet, equivalent to 15 tons of ore or 10 tons of float (waste).

Ore haulage is accomplished in two shifts, five days per week. An average of 50,000 tons per week has been maintained throughout the year.

The trains are dumped, five cars at a time, by a rotary dumper over the 6,000-ton ore-bin. After dumping, part of the train is loaded with float from the sink-float plant, mixed with a small percentage of iron sulphides, and returned to the mine for backfill. The fill is dumped by another rotary dumper into a storage bin, from which it is drawn off and distributed to various stopes as required.

Up to the end of November, 1950, in just over a year of operation, 2,694,000 tons of ore was hauled to the concentrator over this new transportation system and 300,000 tons of backfill was returned to the mine.

Open-pit Operation.—On the Sullivan hill, close to the site of the original discovery of the Sullivan mine, the company is preparing to mine 2,000,000 tons of ore by open-pit operation. The ore is from 20 to 100 feet thick and is overlain by rock up to 150 feet thick and surface gravel up to 30 feet thick.

It is estimated that removal of gravel and waste will take about a year. A raise 500 feet long is to be driven from the 3900 level to one corner of the open pit. It is expected that production of ore from the pit may reach 3,000 tons per operating-day. The broken ore is to be transferred to the 3900 level in the raise, and to be transported and crushed in the regular mine equipment.

Work toward stripping the gravel and waste rock overlying the ore was started by Northern Construction on October 16th.

Main Underground Developments.—Drifting between No. 1 shaft and 33503 winze on the 3050 level was completed. During the year the 2850 level was extended south of No. 1 shaft, and the 2850, 3050, and 3200 level drifts were extended to the north.

The 3902 conveyor extension from the 3350 level to the 2850 level was completed, and installation of equipment was commenced.

Excavation for the 2850 level crushing unit was completed, and installation of equipment has started. This unit should be ready for operation early in 1951.

The excavation of the 2850 level pumping station was completed, and installation of equipment is under way.

The driving of No. 2 service shaft, which will replace 3901 shaft, was near completion at the end of the year. The shaft timbering and hoist installation should be completed by the middle of 1951.

Three stopes below the 3900 level were partly filled with float-sulphide fill, which was transported from the concentrator via the 3700 haulageway.

Considerable development was done in the south part of the mine, above the 3650 level, in order to prepare stoping blocks there for mining.

Production from pillars was approximately 36 per cent of the total mine production for the year.

Personnel.—The total number of men employed at mine and mill averaged 2,100.

Development: Drifting and crosscutting, 8,764 feet; sublevels, 19,278 feet; raising, 27,138 feet; diamond drilling, 3,766 feet.

Production: Ore milled, 2,680,962 tons.

ST. MARY RIVER (49° 116° N.E.)*

Silver-Lead-Zinc

Boy Scout (Thomas Consolidated Mines, Incorporated)

David E. Watson, secretary-treasurer. Late in 1950 this company obtained an option on a group of claims on Hell Roaring Creek. This group was formerly called the Boy Scout group and contains the Crown-granted claims Warhorse, Hope, Granite, and Faith. The property was diamond drilled by the Lake Expanse Gold Mines Ltd. late in 1949. Work by the present company was restricted to road building and by December 5 miles of road had been constructed from St. Mary Lake. Approximately 800 feet remain to reach a point 250 feet vertically below the lower adit. The company intends to start a stripping programme in this area. Work was under the direction of W. N. Campbell.

Leader

The Leader group of fourteen mineral claims is located on the east side of Angus Creek, 7 miles by trail from St. Mary Lake. It is owned by Gordon Blaney and associates but was optioned in 1950 to Estella Mines Ltd. The claims were at one time known as the Mascot group, then the Wellington, and in recent years were held by Harold Bennett, of Cranbrook, under the name of Old Glory. In 1950 construction of a road was commenced. This work ceased in October, as the company required the machinery for the Estella road.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1932, p. 162. *Geol. Surv., Canada,* Sum. Rept., 1932, p. 92.]

WASA (49° 115° N.W.)*

Silver-Lead-Zinc

Estella (Estella Mines Ltd.)

Company office, 208 Yorkshire Building, 525 Seymour Street, Vancouver; mine office, Kimberley. A. R. Allen, manager; R. Sostad, mine superintendent. Capital: 3,500,000 shares, $1 par value. This company, formed in May, 1950, acquired the

* By J. W. Peck.

Estella property, situated at the head of Tracy Creek, 18 miles by road east of Wasa. Most of the development was done in the early part of the century. Since then the property has lain idle, except for surface diamond drilling done from 1927 to 1929 by The Consolidated Mining and Smelting Company.

The mine is developed by a small shaft and two adits, Rover and Estella. The Rover adit, at elevation 6,240 feet, has been drifted southeasterly for 886 feet, and from there a crosscut has been driven to the northeast and southwest 70 feet and 20 feet respectively. At 170 feet from the portal a winze has been sunk and is reported to be 50 feet deep. At 225 feet there is a 65-foot raise. Short crosscuts into the footwall and hangingwall of the adit drift indicate a mineralized zone for at least 600 feet. Zinc is more abundant than lead. The Estella adit, at elevation 6,100 feet, has been driven as a crosscut in a southerly direction for 975 feet. At 945 feet from the portal a fault has been intersected, and 85 feet of drifting has been done on it. This drift is nearly vertically below the Rover adit, 700 feet in from its portal. In 1950 a diamond drill was set up at the face of the Estella adit and eight holes were drilled. The management reports there is a vein 5 feet wide indicated 54 feet ahead of the face. By the end of 1950 this adit had been slashed its entire length to allow a mechanized drive to commence at the face for investigation of the drill results.

At the portal of the Estella adit, a mine plant was established. Machinery and engine shops were erected and also a 200-ton ore-bin. Machinery consisted of two Holman 500-cubic-feet-per-minute compressors, two General Motors diesel engines, one 15-kw. diesel lighting plant, one portable Schramm 420-cubic-feet-per-minute compressor, one Buda diesel engine, two Mancha 1½-ton trammers, one Cleveland Jumbo, two Eimco mucking-machines, eighteen mine cars, and other miscellaneous equipment. The old mine camp 100 feet below the Estella adit was rehabilitated. New buildings erected were cook-house, bunk-house, and change-house.

The steep 3½-mile road from Tracytown to the mine was relocated, and by December a good road had been built with a maximum grade of 8 per cent. This is to allow easy truck haulage of ore to a mill-site 16 miles away near Wasa. Here at the mill-site six residences were under construction at the end of 1950. Drilling for water was also under way. An office was established at Wasa. The number of men employed averaged twenty-four but had increased to fifty-five in December.

WINDERMERE (50° 116° S.E.)

Silver-Lead-Zinc

Paradise (Sheep Creek Gold Mines Limited)*

This property was bought by Sheep Creek Gold Mines Limited in 1942 and brought into production in 1949. The mill-site is at Jackpine Flat on Toby Creek, 12 miles from Lake Windermere Station. The mine camp, reached by 7½ miles of mountain road from the mill, is in the basin at the head of Spring Creek, at an elevation of about 7,800 feet. The mine is on the north side of the basin, on the slope of a high ridge extending eastward from Mount Nelson. The ore is hauled to the mill by truck.

The newly constructed 50-ton mill was brought into production late in 1949, but at the end of the year operations ceased because of the severity of the winter. Extraction had been unsatisfactory because of the partly oxidized nature of the ore, so about three months were devoted to test work in the mill. Milling was resumed in April, and although the extraction was greatly improved in midsummer, about 25 per cent of the lead was still unrecoverable.

Mining by square-set stoping was carried out on the main orebody on the 7800 or main adit level, and also on the 7900 level. The ground is much shattered and there are many clay slips in the ore zone, so that work must proceed carefully. The ore is

* By M. S. Hedley.

a relatively massive replacement in limestone near overlying slates, and the slate hanging-wall may give trouble, particularly if broken into. The boundaries of the ore are irregular, and the stope outlines vary from floor to floor. Pyrite is abundant and is nearly massive locally.

The 7700 adit level, 335 feet east and 40 feet south of the 7800 portal, was advanced from 52 to 330 feet from the portal in July, and some diamond drilling was later done from it. This adit is driven in limestone near contacts with slate and quartzite and encounters dragfolds of slate in the limestone. The relationship between limestone, slate, and quartzite is very important to the future of the mine and has not yet been determined.

The average number employed was thirty-five; J. J. A. Crowhurst, superintendent.

Production: Ore milled, 12,002 tons. Gross content of concentrates: Gold, 12 oz.; silver, 35,099 oz.; lead, 819,129 lb.; zinc, 1,764,703 lb.; cadmium, 5,415 lb.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1949, pp. 196–199.]

Mineral King* This property, on the Toby slope of the ridge between Toby and Jumbo Creeks, is reached by 3 miles of trail from the Toby Creek road. Sheep Creek Gold Mines Limited obtained a working agreement and during October drilled four short diamond-drill holes totalling 270 feet. This drilling was done from the surface, along and down the main showing.

[Reference: *Geol. Surv., Canada,* Mem. 148, 1926, p. 49.]

SPILLIMACHEEN (50° 116° N.E.)*

Lead-Zinc

Silver Giant (Silver Giant Mines Limited) Company office, 706 Holden Building, 16 Hastings Street East, Vancouver; mine office, Spillimacheen. W. R. Wheeler, president; T. G. McLelan, secretary. Capital: 3,000,000 shares, 50 cents par value. This company owns the Silver Giant mine, located in the Spillimacheen River valley, 8 miles by road from Spillimacheen. The property was idle from March, 1949, until the summer of 1950, when Hedley Mascot Gold Mines Limited assumed operating control. Efforts were then concentrated on building a mill and surface buildings, and by the end of 1950 this programme was well advanced. At the mill-site the jaw and gyratory crushers, the ball mill, the classifier, and the flotation cells had been installed in two buildings. Capacity is rated at about 200 tons per day. Milling is expected to commence by February, 1951. Other new surface buildings erected were compressor-shop, machine-shop, bunk-house, and cook-house.

Underground, the No. 5 and No. 6 levels were cleaned out and retimbered where necessary. In December a raise connection was made between No. 6 and No. 5 levels. P. W. MacMillan was in charge in December, with sixty-two men employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1949, p. 200.]

A and B (Lead Hill Mining Company Limited).—Company office, 507 Stock Exchange Building, 475 Howe Street, Vancouver. Capital: 3,500,000 shares, 50 cents par value. This company controls the A and B groups of claims in the valley of the Spillimacheen River. In 1950 a tractor-road was built from the Silver Giant mine to the property, a distance of 6 miles. A diamond-drill programme was commenced, but this work ceased in August.

FIELD (51° 116° S.E.)*

Silver-Lead-Zinc

Monarch and Kicking Horse (Base Metals Mining Corporation Limited) Head office, Room 413, 62 Richmond Street West, Toronto. E. J. Gleason, manager; C. Ney, geologist and mine superintendent; V. C. Segur, mill superintendent. Capital: 3,000,000 shares, no par value. This company operates the Monarch mine on Mount Stephen and the Kicking Horse mine on Mount Field, both 2½ miles east of Field. The diesel power plant, the mill, and the camp are on the Monarch or railway side of the valley, the Kicking Horse

* By J. W. Peck.

being directly across. Milling was continued throughout 1950, except for a brief shutdown due to the railway strike in August. As in recent years, the Kicking Horse produced about two-thirds of the tonnage, this being chiefly zinc ore. In the upper zone, ore was obtained from remnants in the No. 3 and No. 4 stopes, while new stopes, called " No. 5 " and " No. 6," were started along the strike of the zone. Development of the flat-lying ore zone has now extended approximately 2,000 feet into the mountain. Ore was also obtained from the No. 1 or lower ore zone, where the workings have been extended to 1,200 feet into the mountain. A new exit was made on No. 1 level to allow for drainage and handling of waste. In the Monarch the 200c stope continued to produce the bulk of the lead ore, but the ore pinched down twice during 1950, making steady production difficult to maintain. A new exit to surface was made, the drive breaking through 1,000 feet southeast of the tram portal. This improved the ventilation and allowed the 500A and 500B stopes to be worked. A crosscut was then driven ahead of the 200c stope to allow further prospecting in that area. Two compressed-air motors were obtained, which eliminated hand tramming on the main haulage level.

Development: Drifting, 1,102 feet; crosscutting, 385 feet; raising, 309 feet; diamond drilling, 10,489 feet. The number of men employed averaged eighty-eight.

Production: Ore milled, 45,330 tons. Gross content of concentrates: Silver, 21,092 oz.; lead, 3,867,308 lb.; zinc, 5,158,641 lb.; cadmium, 12,332 lb.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, p. 205.]

KINBASKET LAKE (51° 118° N.E.)*

Silver-Lead-Zinc

Mogul and Timbasket (Kootenay Exploration Limited)

Company office, 560 Baker Street, Nelson. W. S. Hamilton, president. Capital: 200,000 shares, 50 cents par value. This company owns a group of claims on the southwest end of Kinbasket Lake, including the Crown-granted Mogul and Timbasket claims. Surface trenching in 1949 exposed mineralized replacement of the country limestone. In September, 1950, the property was optioned to The Consolidated Mining and Smelting Company. This company carried out a brief exploratory programme and built trails to probable drilling-sites for 1951.

REVELSTOKE

Silver-Lead-Zinc

Regal Silver, Snowflake (Stannite Mines Limited)*

(51° 117° S.W.) Company office, 208 Pacific Building, 744 Hastings Street West, Vancouver; mine office, Albert Canyon. A. S. MacCulloch, vice-president and manager. Capital: 3,000,000 shares, no par value. This company owns the Regal Silver and Snowflake properties, which are on Clabon Creek, 7½ miles by road from Silver Creek Siding, a freight stop on the Canadian Pacific Railway 19 miles east of Revelstoke. The Snowflake mine is above the Regal Silver on the same vein system. Work in 1949 and 1950 has been restricted to the Regal Silver.

In January one of the two bunk-houses burned down, necessitating a reduction in the crew. The main development was the driving of a raise from No. 8 to No. 5 level. This raise, however, broke through to surface at 460 feet in a location about 150 feet north of No. 5 portal. A sublevel, called No. 7 level, was established off this raise and consists of a 45-foot crosscut to reach the vein and 100 feet of drifting on the vein. A new adit was collared 80 feet vertically below No. 5 level, and drifting commenced on the vein with the intention of crosscutting to break into the raise from No. 8 level. On No. 5 level a stope was started on the vein 290 feet in from the portal. The back was taken down to a height of 25 feet over a length of 60 feet. This ore had to be sacked and then

* By J. W. Peck.

lowered down a surface slide to the road 500 feet below. About ten men were employed. A shipment of 38 tons of ore made to the smelter in December, 1949, is included in the following data on production.

Production: Ore shipped, 366 tons. Gross content: Silver, 5,724 oz.; lead, 115,631 lb.; zinc, 43,200 lb.

Mastodon* This property, about 25 miles north of Revelstoke, owned by D. F. Kidd, of Vancouver, and associates, contains forty-six claims and fractions, some of which have been surveyed. The property is reached by a good pack-trail which begins at Mile 17 on the Big Bend Highway at elevation 2,000 feet, and extends 4½ miles eastward up the south side of the valley of La Forme Creek to a crossing at elevation 3,250 feet. Thence the trail ascends the steep north side of the valley by a series of switchbacks, rising some 1,200 feet in altitude in a distance of little more than 1 mile. The trail continues northward about 2 miles to the camp, elevation about 5,000 feet. The camp and the near-by main workings are in a broad northerly trending upland valley which forms a saddle between the deep valley of La Forme Creek and the equally deep and more precipitous valley of Carnes Creek approximately 5 miles to the north. During 1950 work was done on the conversion of the lower section of the pack-trail to a road, the terminus of which will be the crossing on La Forme Creek, a proposed mill-site. By the end of the year 3 miles of this road had been completed.

The area is heavily timbered. Hemlock, spruce, and balsam are plentiful on the property, and red cedar grows at lower elevations. The saddle valley has an almost continuous mantle of glacial drift which, near the workings, ranges in thickness from 6 to 40 feet. Outcrops are plentiful only on the precipitous south side of the Carnes Creek valley.

The camp, with accommodation for twelve persons, has a comfortable log bunk-house and cook-house, and a frame dry. The mining plant, located near No. 2 adit level, includes an Ingersoll-Rand semi-diesel engine of 145 horsepower, a 500-cubic-feet-per-minute Ingersoll-Rand compressor, and an Eimco loader. During the summer the crew averaged ten men.

The Mastodon showings were discovered in 1898, and the first development work was done in 1916 and 1917 by The Mastodon Mining Company Limited. A shaft was sunk 110 feet, inclined at 34 degrees, and near the bottom a level (now known as No. 1 level) was established. One ton presumably of sorted ore from this working, which was shipped to the Trail smelter, assayed: Silver, 23.3 oz. per ton; lead, 46.7 per cent; zinc, 15.7 per cent. Two hundred feet south of this shaft a crosscut about 200 feet long was driven to test what appeared to be the continuation of the ore zone. A subparallel mineralized zone was tested by an inclined shaft 60 feet deep, started about 450 feet southeasterly from No. 1 shaft at an elevation of about 5,740 feet. Altogether this company drove about 450 feet of underground workings.†

The property was relocated in 1932 by E. Larsen and E. Earlandson, two of the present owners, and was optioned to Fawn Mining Company Limited. After making a few open-cuts, this company relinquished its option. In 1942 several drill holes, totalling 2,000 feet, were drilled by D. F. Kidd, but little core or sludge was recovered because of the cavernous character of the rocks. In 1946 New Jersey Zinc Explorations Limited made a large open-cut a short distance northwesterly from the shaft. The overburden was 25 feet deep and the cut is caved now, but the report is that a considerable width of zinc mineralization was discovered. However, that company did no further work and the property reverted to the owners, who continued surface and underground development work in 1949 and 1950. The underground work done in 1950 amounted to 1,535 feet of drifting and crosscutting, 350 feet of winzing and raising, and 726 feet of diamond drilling.

* By W. H. White.
† *Minister of Mines, B.C.*, Ann. Rept., 1916, p. 192; 1917, p. 150.

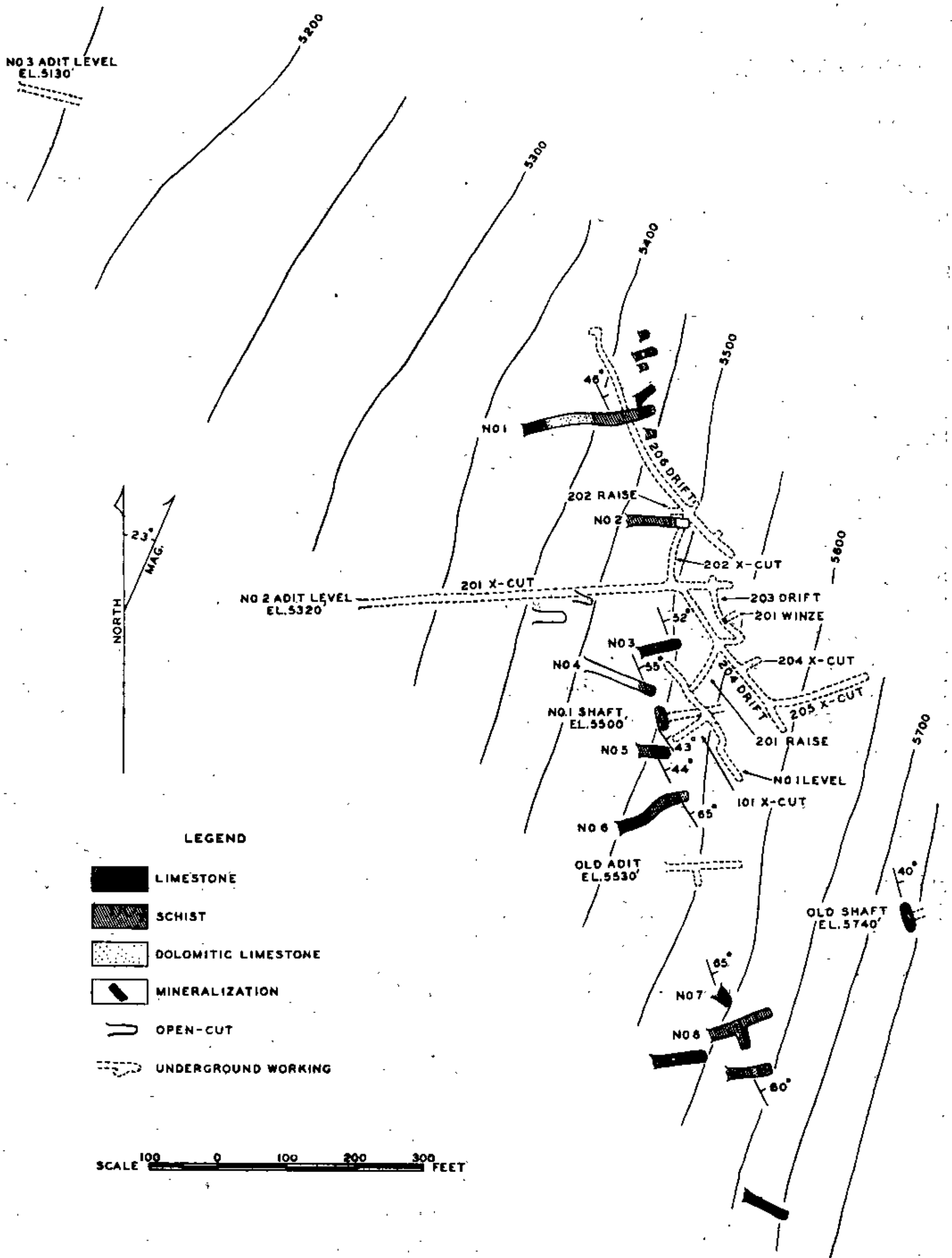


Fig. 3. Mastodon group—surface and underground workings.

The writer examined the workings and made a study of the metal content of twigs from trees near the workings between July 10th and July 31st, 1950. The principal surface and underground workings which existed at that time are shown on Figures 3 and 4. Workings consisting of fifteen open-cuts and strippings on the "north showings," some 3,500 feet northerly from the "main showings," are not shown on the figures. No. 2 adit, elevation 5,320 feet, includes 1,640 feet of crosscuts and drifts; 201 winze, water-filled but reported to be 100 feet deep; 201 raise extending to No. 1 level; and 202 raise extending 46 feet above the level. No. 3 adit level, elevation 5,130 feet, had been driven as a crosscut 100 feet southeasterly from its portal by the end of July, 1950. By the end of the year this crosscut was 820 feet long, and from the face a drift extended 180 feet southerly. Several short diamond-drill holes, totalling 726 feet, were drilled in No. 3 adit level.

The Mastodon showings are near the southwestern edge of a broad, northwesterly trending belt of metamorphosed sedimentary rocks, correlated by Gunning with the upper part of the Windermere group of the Lardeau area to the southeast.* Granite gneiss, well exposed on the trail up La Forme Creek, lies to the southwest of the belt of metamorphosed sedimentary rocks. The rock in the Mastodon open-cuts and underground workings includes in beds of varying thickness: massive grey crystalline limestone, which in places becomes dark coloured and apparently somewhat siliceous and argillaceous; thin-bedded crystalline limestone; limy sericite schist; and thinly foliated silvery quartz-sericite schist. Massive buff-coloured dolomite occurs near the face of 205 crosscut, and near the ore zones grains and thin, crooked lamellæ of dolomite occur along the bedding of the limestone.

The strike of the strata varies little from north 25 degrees west and the dip ranges from 10 degrees to 65 degrees northeastward, averaging about 50 degrees. However, the structure is far more complex than would be suggested by the regularity of attitude. The difficulty experienced in correlating strata even in fairly closely spaced exposures, together with the presence of small, tightly compressed folds with axes plunging gently to the northwest, suggests isoclinal folding in which individual beds, particularly the limestone beds, are markedly lenticular and probably discontinuous. Slickensides observed in a few places underground suggest bedding faults on which the amount of movement is unknown.

In 201 crosscut a sequence of strata begins with quartz-sericite schist and grades eastward successively to limy sericite schist, next to schistose thin-bedded limestone and finally to massive grey crystalline limestone. This sequence is repeated four times in the same order in the 500-foot length of the crosscut. The strata strike northwesterly and dip northeastward and are thought to be right side up, that is, they face northeastward. The recurrence of the sequence may be due to rhythmic sedimentation.

The orebodies are lenticular, bedded zinc-lead replacements in limestone and are localized along or near contacts with limy sericite schist or quartz-sericite schist. The predominant ore mineral is honey-yellow sphalerite. On the whole, galena is only sparingly present and is in isolated grains, but locally it may occur in greater amounts. Grey copper is of sporadic occurrence. Pyrite is notably absent. The gangue is mainly crystalline limestone and dolomite. Fluorite and barite occur in the "north showings" but were not observed in the main deposits. Some details concerning the ore occurrences are given in the following paragraphs. References will be made to Figures 3 and 4, on which numbers have been assigned to the main open-cuts and underground workings.

A zone about 7 feet wide, exposed in the east end of No. 1 open-cut, is slightly copper-stained and sparsely mineralized with sphalerite and a little galena. This zone is

* Gunning, H. C. (1928): Geology and mineral deposits of the Big Bend Area, British Columbia—*Geol. Surv., Canada*, Sum. Rept., 1928, Pt. A, pp. 140–153; and Okulitch, V. J. (1949): Geology of part of the Selkirk Mountains in the vicinity of the main line of the Canadian Pacific Railway, British Columbia—*Geol. Surv., Canada*, Bull. No. 14, pp. 5–10.

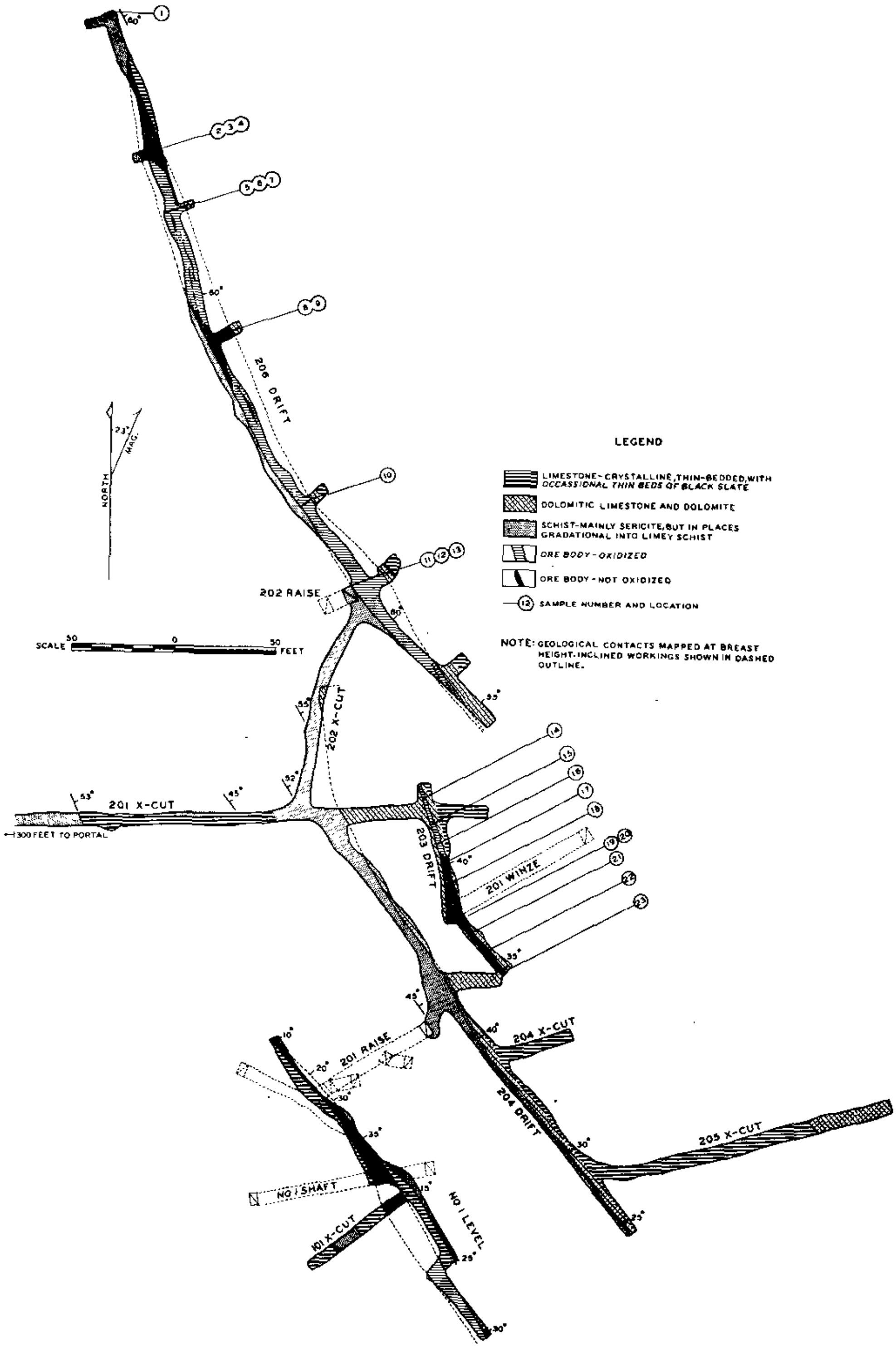


Fig. 4. Mastodon workings—geology and sample locations.

on a contact, with thin-bedded crystalline limestone to the east and massive dolomitic limestone to the west. Stringers of unusually dark-coloured sphalerite occur along the folia of a bed of limy sericite schist exposed about 65 feet farther west in this cut. Several open-cuts north of No. 1 cut and also No. 2 open-cut, about 150 feet to the south, contain only unmineralized dolomitic limestone and schist. No. 3 open-cut contains an oxidized zone about 2 feet wide in which some galena is visible. No. 4 is the deep open-cut, now caved, reported to contain a considerable width of zinc mineralization of commercial grade. A zone 26 feet wide in No. 5 open-cut is moderately well mineralized with small irregular stringers and masses of sphalerite and galena, together with a little grey copper. The apparent continuation of this zone to the southeast appears in No. 6 open-cut, where it is only 3 feet wide. The hangingwall (east) side is limy sericite schist and the footwall is thin-bedded, somewhat dolomitic, crystalline limestone. Sphalerite is very sparsely disseminated in the footwall rock across a width of 50 feet. In No. 7 open-cut an oxide zone about 8 feet wide occurs in a bed of limy sericite schist, but similar gossan in near-by No. 8 open-cut is only 2 feet wide. Other cuts to the south are unmineralized.

CHANNEL SAMPLES

Sample No.	Location	Width		Gold	Silver	Lead	Zinc
		Ft.	In.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
1		4	2	Nil	Nil	Nil	0.3
2	West side	6	4	0.01	2.2	3.3	27.0
3	Centre	4	—	Nil	Nil	Trace	25.4
4	East side	4	—	Nil	Nil	Trace	46.9
5	West side	5	—	Nil	5.9	14.2	27.4
6	Centre	4	6	Trace	0.2	0.7	42.4
7	East side	2	6	Nil	Trace	Trace	45.6
8	West side	6	—	Nil	0.1	1.0	25.7
9	East side	6	—	Nil	0.1	Trace	34.9
10		3	9	Trace	6.3	12.4	17.9
11	West side	6	—	Trace	0.6	1.4	34.6
12	Centre	6	—	Nil	0.2	0.5	34.6
13	East side	6	—	Nil	0.7	0.7	23.6
14		2	—	Nil	Nil	Trace	9.2
15		5	3	Trace	0.9	0.5	28.2
16		5	9	Nil	0.2	0.3	29.8
17		4	—	Nil	Nil	Trace	31.0
18		5	—	Nil	Nil	Trace	24.3
19	West side	5	4	Trace	0.1	Trace	22.5
20	East side	4	10	Trace	Nil	Trace	9.6
21		4	—	Nil	Nil	Trace	8.0
22		3	4	Nil	Trace	Nil	13.2
23		2	6	Nil	Nil	Nil	15.1

The old water-filled shaft southeasterly from No. 1 shaft was sunk on a bedding fault in schistose, thin-bedded crystalline limestone, striking north 15 degrees west and dipping 40 degrees eastward. Small amounts of sphalerite, galena, and grey copper are visible along the footwall side of the fault.

The old adit 200 feet south of No. 1 shaft is a crosscut accessible to a point 142 feet easterly from the portal, where it is caved. The first 53 feet of the working cuts thin-bedded crystalline limestone and some schist, and at this point a drift extends 32 feet southerly, along a thoroughly oxidized zone about 2 feet wide, in very thinly foliated schist. Beyond this drift the crosscut penetrates, successively, 12 feet of thin-bedded crystalline limestone and 67 feet of limestone breccia. The latter consists of angular blocks, up to 10 inches across, of the thin-bedded limestone in a calcareous matrix. Occasional grains of sphalerite are visible in the matrix. This is the only place on the property that this peculiar rock was observed.

No. 1 shaft, inclined 37 degrees eastward, was sunk on a mineralized zone approximately parallel to the bedding. The zone is about 6 feet wide at the surface and tapers irregularly downward, terminating about 50 feet down from the collar of the shaft. The footwall rock is a thin bed of limy sericite schist and the hangingwall is black siliceous limestone. The hangingwall of the mineralized zone is an undulating slickensided fault surface in the black siliceous limestone and dips a little more steeply than the bedding. The ore consists of irregular small masses and discontinuous stringers of sphalerite and galena, with a little grey copper in a gangue of calcite, dolomite, and a little quartz. At No. 1 level, 75 feet down from the shaft collar, another ore zone appears in thin-bedded crystalline limestone which lies beneath the bed of limy schist forming the footwall of the shaft. Large masses and bedded veins of solid honey-yellow sphalerite with no galena and no grey copper characterize this orebody. At the shaft it is 6 feet wide, dipping 35 degrees northeastward. The width decreases gradually and the dip flattens as the orebody is followed northwestward along the level, and at the face ore about 2 feet thick lies almost horizontally. Southeastward from the shaft this orebody diverges gradually from the hangingwall schist and is entirely in the thin-bedded limestone. Five feet of ore is exposed in 101 crosscut, where the bedding dips only 15 degrees to the northeast. The orebody continues to the southeast, increasing in width to 7 feet, then decreasing to about 4 feet at the face. The dip at the face is about 30 degrees northeastward. The orebody on No. 1 level is at least 180 feet long and ranges in width from 2 to 7 feet.

Three orebodies occur in the workings on No. 2 adit level. The largest orebody is explored by 206 drift, several short crosscuts, and by 202 raise. In plan this orebody has the shape of a gently curved lens 355 feet long, which reaches a maximum width of 18 feet at 202 raise, and tapers irregularly to zero at its extremities. The strike changes gradually from northwest to north 25 degrees west, and the dip is fairly uniform at about 60 degrees to the northeast. This orebody is a bedded replacement along a contact. Limy sericite schist forms its footwall, and the hangingwall is banded black and buff dolomitic limestone grading outwards into light-grey crystalline limestone. Honey-yellow sphalerite occurs as solid vein-like masses as much as 2 feet wide, as thinner discontinuous stringers along the bedding, and as disseminated grains. Small lenticular masses and stringers of galena occur locally. A small amount of sphalerite is disseminated in the hangingwall rocks. Southeastward the orebody frays into many separate stringers of sphalerite which taper and almost disappear at the face. Near this face the strata are cut by numerous westerly striking quartz veinlets which contain a few grains of sphalerite and galena. Northwestward the orebody pinches more abruptly to a few crooked stringers of sphalerite at a point about 15 feet from the face. The drift continues to this face, following a slightly oxidized bedding fracture in limy sericite schist.

In 202 raise, which is driven up the footwall of the orebody, the mineralized width decreases from 18 feet at the level to about 2 feet at a point 36 feet above the level, and finally, at the face, 46 feet above the level, only a 2-inch stringer of sphalerite remains. About 20 feet above the level the attitude of the strata begins to change, and at the face of the raise the dip is 20 degrees flatter and the strike about 20 degrees more westerly than on the level below. Moreover, near the face of the raise the hangingwall is very hard dense black siliceous material, in marked contrast to the hangingwall rocks on the level.

The second orebody is exposed in 203 drift, and 201 winze, now flooded, inclined at 40 degrees, was sunk on the ore. This orebody is in thin-bedded crystalline limestone and black dolomitic limestone some 30 feet east of the schist contact in 204 drift. The length of ore exposed is 100 feet, and the width varies from about 2⅛ feet at either end to a maximum of 10 feet at the collar of 201 winze. At this place some mineralization appears to diverge into the footwall. The ore resembles that in 206 drift, except that galena is absent.

The third orebody in No. 2 adit level follows a limestone-schist contact in 204 drift, extending 140 feet southeasterly from 203 crosscut. The mineralized width ranges from 1 to 3 feet. Near the face of 204 drift this oreshoot appears to fray into separate stringers.

The 201 raise, driven in the footwall schist from 204 drift to connect with No. 1 level, has three short branches, Sphalerite in veinlets and as disseminated grains occurs across widths as great as 12 inches in the upper two prospect raises, but neither occurrence correlates satisfactorily with the orebodies on either level. The lower prospect raise, extending 50 feet into the hangingwall of the main raise at an inclination of 45 degrees, might be expected to intersect the continuation either of the orebody in 204 drift or the orebody on No. 1 level. However, no mineralization is present, and the rock is thin-bedded black argillite, unlike any other rock in the workings. These raise workings indicate discontinuity of the ore zones between levels.

A feature of all the orebodies is that they have been partly or completely oxidized to reddish-brown earthy material by the action of ground-water circulating freely and to considerable depth through numerous solution channels and caverns in the calcareous strata. The oxidized ore contains residual lumps of sphalerite and in places galena, and much of it is rich in finely divided secondary zinc and lead carbonates. The distribution of fresh and oxidized material is indicated on Figure 4.

The locations of twenty-three channel samples taken in 206 drift and 203 drift are shown on Figure 4 and the assay results and other data for the samples are given in a table facing the figure. Both fresh and oxidized material was sampled at places where the full widths of the oreshoots were accessible.

Two groups of open-cuts and strippings have been made recently by the owners on the " north showings." The first group of five open-cuts is on a small knoll, elevation 5,250 feet, about 150 feet southwesterly from the northeast corner of BK No. 1 claim. These cuts are 3,000 feet northerly from the main workings, and the intervening area is continuously drift-covered. The rock in the cuts is limy sericite schist and thin beds of grey, somewhat dolomitic, crystalline limestone. Locally the bedding is severely contorted, but the general strike is northwesterly, and the dip varies from 30 to 60 degrees northeastward. Very sparse mineralization occurs in three adjoining open-cuts, representing a possible strike length of 130 feet. The mineralized width ranges from 3 to 7 feet. Dark-brown sphalerite, a little galena, and few grains of grey copper are disseminated in the limestone and occur also in irregular veinlets accompanied by white and mauve crystals of fluorite, white crystalline barite and quartz.

The second group of workings includes ten shallow strippings on the precipitous southern side of the Carnes Creek valley. The uppermost exposure is 350 feet northerly from the northeast corner of BK No. 1 claim, at elevation 5,000 feet, and the lowest exposure is 600 feet farther north and about 600 feet lower in elevation. This series of strippings exposes at intervals a zone of interbedded limy sericite schist and thin-bedded crystalline limestone, of which the attitude differs from those observed elsewhere on the property. The strike ranges from north 10 degrees west to north 25 degrees east, and the dip varies irregularly between 62 and 78 degrees eastward. Very sparse mineralization, similar in character to that described in the last paragraph, is visible in every stripping across widths which at several places are as great as 60 feet. Although correlation of the individual exposures is difficult on this steep slope, it appears likely that several subparallel mineralized zones are present, rather than one continuous zone.

Zinc Contained in Tree Samples.—In conjunction with the examination of the mineral deposits on the Mastodon property, a survey was made of the zinc content of trees, using the dithizone method of analysis. Twig samples were taken along lines bearing north 70 degrees west at intervals ranging from 50 to 100 feet. The lines were spaced 100 feet apart near the main workings and 200 feet apart elsewhere. The total number of samples taken and analysed was 330. The samples were not air-dried prior to analysis.

As it was impossible to maintain the desired spacing of samples using only one species, which is the ideal condition, any one of three species was sampled. These were mountain hemlock (*Tsuga mertensiana*), Engelmann spruce (*Picea Engelmannii*), and alpine fir, locally called balsam (*Abies lasiocarpa*). Hemlock and spruce were most suitable. Their zinc contents are comparable, and results can be checked with a small margin of error. However, the zinc content of balsam was found to be erratic, possibly due to the high content of water and pitch in the twigs. As the work proceeded, balsam was used as seldom as possible. Some of the variation might be eliminated by air-drying balsam samples to constant weight prior to analysis.

The results of the survey are illustrated by Figure 5. Areas enclosed by heavy dotted lines in which all samples of spruce and hemlock and most samples of balsam contained over 100 parts per million zinc are considered to be anomalous. The average zinc content of spruce and hemlock in four general areas is given in the following table. Area A is the large anomaly over the main workings. Area B is the remainder of the area sampled in the vicinity of the main workings, excluding the small anomalies. The northern limit of Area B is taken arbitrarily at the line of samples 800 feet north of the shaft. Area C extends northerly from Area B and straddles the first group of open-cuts on the "north showings," where sparse zinc mineralization is exposed. Area D is near the camp, exclusive of possible anomalous areas.

	Area A			Area B			Area C			Area D		
	Number	Av. Zinc	Range P.P.M.	Number	Av. Zinc	Range P.P.M.	Number	Av. Zinc	Range P.P.M.	Number	Av. Zinc	Range P.P.M.
Spruce	12	135	105–200	36	78	54–96	7	67	57–91	20	70	54–92
Hemlock	21	135	106–188	53	64	27–98	101	54	29–76	8	58	41–90

There is a distinct and abrupt increase in zinc content of nearly 100 per cent at the boundary of the main anomalous Area A. The average normal values for both species in Area B are about 11 per cent higher than in Area D and about 18 per cent higher than in Area C. Hence there appears to be a slight increase in zinc content as the main anomalous area is approached, but this can be detected only by taking a large number of samples. In Areas B, C, and D the average zinc content of spruce is higher than that of hemlock and the range of zinc content in the spruce is somewhat less.

The main anomaly appears to be related in position to underlying zinc mineralization. Its peculiar shape is ascribed to overlapping due to lateral diffusion of zinc from closely spaced, subparallel mineralized zones. The open-cuts to the south and north of the limits of the anomaly are either unmineralized or only sparsely mineralized. Three smaller anomalies near the main anomaly may have some significance, but they should be checked by more closely spaced samples.

The area between the main workings and the "north showings" contains no zinc anomalies. The two isolated high values are of little significance.

The anomalous values found near the camp may have some significance. The time available was not sufficient to delimit anomalous areas. However, as there appear to be no lithological nor structural reasons for the restriction of mineral deposits to any particular part of this general area, the anomalous values found near the camp might well bear further investigation.

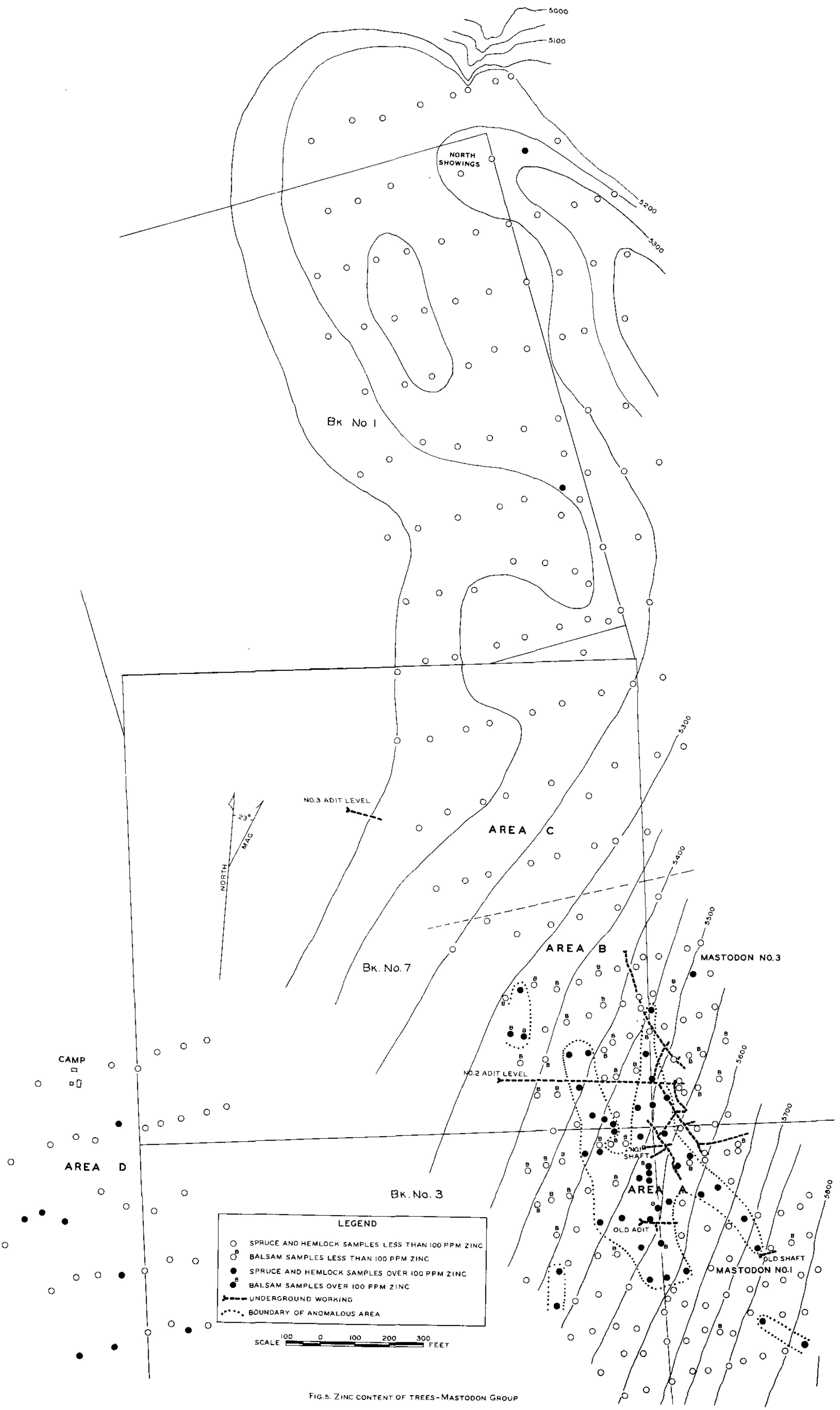


FIG. 5. ZINC CONTENT OF TREES—MASTODON GROUP

SKAGIT RIVER (49° 121° S.E.)*

Copper

A.M. (Canam Mining Corporation Limited)

Company office, 571 Howe Street, Vancouver. J. W. Heffernan, president. This group, consisting of eight Crown-granted mineral claims, is about 7 miles by truck-road southerly from Mile 30 on the Hope–Princeton Highway. From No. 6 level, the lowest level, at about 5,500 feet elevation, a diamond-drill hole about 250 feet long was drilled to trace the downward extension of the main showing below the level.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 210–213.]

Gold Coin

This group of claims is on the north side of Shawatum Creek and about 3 miles from Mile 23 on the Decca–Walton logging-road. Don McPherson, of Yerington, Nev., optioned this group from Charles J. Howlett. The old pack-trail was rehabilitated and several hundred feet of diamond drilling was done to explore the downward extension of a series of narrow veins that outcrop in bluffs just north and above an old cabin on Shawatum Creek.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1929, pp. 241, 242; 1938, pp. F 19, F 20.]

CHEAM RANGE (49° 121° S.W.)*

Copper

Lucky Four (Rico Copper Mines Limited)

Head office, 511 Credit Foncier Building, Vancouver; mine office, Laidlaw. W. J. Asselstine, president. This company has agreements under which it may acquire title to the Lucky Four group of six Crown-granted mineral claims. The company also owns five Crown-granted mineral claims and fractions adjoining or close to the Lucky Four group and holds sixty-six claims in the surrounding area. A. Teed was in charge of work on the property.

During 1950 surface exploration, diamond drilling, and a small amount of underground development were done to explore the main surface showing and to prospect for its downward extension. Diamond drilling amounted to 1,905 feet in twenty-four holes. Most of the holes were drilled from the base of the bluff on which the main showing is exposed. Three holes were drilled at another showing a little to the south, and some exploratory holes were drilled northwest of the main showing. Underground development consisted of 93 feet of tunnelling and 18 feet of crosscutting. This tunnel was driven from a point near the northwest corner of the Lucky Four No. 4, nearly 300 feet below the main showing.

A permanent camp, suitable for housing five men, was built on the crest of the ridge near the main showing at an elevation of 6,220 feet. Equipment and supplies for camp, building, diamond drilling, and mining, making a total weight of 42.5 tons, were flown to the camp in 309 helicopter trips.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 214–216.]

PITT LAKE (49° 122° S.W.)*

Gold-Silver

Standard

The Standard group of claims is held by E. A. Richardson and Don McDonald, of Pitt Meadows, and W. A. Thompson, of Vancouver. This group of claims is on the west shore of Pitt Lake, nearly 15 miles above the mouth of Pitt River. In June, 1950, an adit 204 feet long was driven westerly to explore the downward extension of two narrow veins in quartz diorite on which a shallow shaft had previously been sunk. This adit is nearly 500 feet above Pitt Lake and 100 feet below the shaft. A low angle thrust fault was cut in the adit where the projected trace of the veins should occur. At 130 feet from the portal a raise was driven

* By R. B. King.

above the fault in the same direction as the adit. It is reported that veins which appeared to be the same as those in the outcrop were located in this raise.

[Reference: *Minister of Mines, B.C.,* Ann Rept., 1947, p. 179.]

HOWE SOUND (49° 123° N.E.)*

Copper-Zinc

Britannia Mining and Smelting Co. Limited

Head office, 730 Fifth Avenue, New York, N.Y.; mine office, Britannia Beach. H. H. Sharpe, president; E. C. Roper, manager; T. M. Waterland, mine superintendent. This company owns and operates Britannia mine and mill at Britannia Beach. The following data, supplied by the management, give details of the operation in 1950. The development work totalled 11,019 feet for all sections of the mine and was made up as follows:—

	No. 8 Mine	Bluff Mine	Jane Mine	Fairview Mine	No. 5 Mine	Victoria Mine	Total
	Feet	Feet	Feet	Feet	Feet	Feet	Feet
Drifts	1,706	813	......	1,321	......	......	3,840
Crosscuts	277	220	......	326	26	......	849
Raises	1,003	1,819	10	2,609	151	279	5,871
Winzes	......	48	......	38	......	......	86
Powder-blast workings	......	126	......	247	......	......	373
Totals	2,986	3,026	10	4,541	177	279	11,019

Diamond drilling for core and for blast-hole mining totalled 45,801 feet and was made up as follows:—

	No. 8 Mine	Bluff Mine	Jane Mine	Fairview Mine	No. 5 Mine	Victoria Mine	Miscellaneous	Total
	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
Core drilling	8,667	1,691	......	4,108	......	......	874	15,340
Blast-hole drilling	......	2,529	......	26,686	1,070	......	176	30,461
Totals	8,667	4,220	......	30,794	1,070	......	1,050	45,801

Ore was broken in the various sections of the mine by different mining methods, as follows:—

	Shrinkage	Cut and Fill	Powder-blast and Cave	Blast-hole and Diamond Drilling	Open Sq. Set	Sq. Set and Fill	Total
	Tons	Tons	Tons	Tons	Tons	Tons	Tons
No. 8 mine	60,478	36,741	......	......	1,161	28,534	126,914
Bluff mine	136,699	......	103,142	239,079	......	......	479,320
Fairview mine	62,440	......	1,873	147,099	......	......	211,412
No. 5 mine	17,508	......	......	5,113	......	3,953	26,574
Victoria mine	8,794	18,194	......	......	9,094	1,038	37,120
Totals	285,919	54,935	105,015	391,691	10,255	33,525	881,340
Development	......	......	......	......	......	......	11,636
Total	......	......	......	......	......	......	892,976

Explosives and blasting accessories used are as follows: Powder, 18,131 cases; electric blasting-caps, 8,439; No. 6 blasting-caps, 277,775; safety fuse, 2,200,570 feet; primacord, 16,100 feet.

* By R. B. King.

Ventilation and dust-control work has been carried on throughout the year under a full-time ventilation engineer. Aluminium dust has been dispersed regularly in all change-rooms.

The undercutting of stopes by the application of long-hole drilling methods has been done more extensively than ever during the past year.

The safety department has carried on with its job-safety training programme. An innovation to this came when the principles of this programme were introduced in underground-safety meetings.

The Management-Labour Accident-prevention Committee functioned regularly throughout the year.

The annual competition for the Department of Mines cup was held at the Townsite on April 28th. The winner of this event competed for the Howe Sound Trophy, which was sponsored by the British Columbia St. John Ambulance Association. This competition was held at Woodfibre.

The Britannia 1950 safety records show that compensable injuries occurred at the rate of 0.859 per 1,000 shifts worked, as compared with 0.75 per 1,000 shifts worked in 1949. The severity rate was 39.7 per 1,000 shifts worked, as compared with 18.1 for 1949. No fatalities occurred during the year.

The total number of men on the mine payroll at the year-end was 567, as compared with 543 at the beginning of the year. The total number of shifts worked in the mining department during 1950 was 144,225.

The total production of all mines during 1950 was 892,976 tons, as compared to 910,994 tons in 1949.

Production: Ore milled, 858,698 tons. Gross content of copper concentrates and precipitates, and of zinc concentrates: Gold, 13,422 oz.; silver, 95,407 oz.; copper, 14,858,347 lb.; lead, 1,259,167 lb.; zinc, 21,997,209 lb.; cadmium, 108,286 lb. Copper concentrates and precipitates amounting to 28,976 tons were shipped to the Tacoma smelter. Zinc concentrates amounting to 22,025 tons were shipped to the Trail smelter. Pyrite concentrates amounting to 22,238 tons were produced. Sales in British Columbia amounted to almost 10,000 tons, exports to Mexico amounted to about 3,000 tons, and the remainder was stockpiled at Britannia Beach.

McVicar (Surf Inlet Consolidated Gold Mines Limited)

Head office, Room 72, 615 Hastings Street West, Vancouver; mine office, Squamish. Angus McLeod, superintendent. This company controls forty-three claims on Raffuse Creek. The property, reached from Squamish by 5 miles of truck-road and nearly 4 miles of pack-trail, lies at elevations ranging from 2,800 to 4,750 feet. Claims on Upper Raffuse Creek were recorded in 1923. In the Annual Report of the British Columbia Minister of Mines for 1937 B. T. O'Grady described sulphide mineralization in sheared greenstone that had been explored by trenching and by diamond drilling. The mineralization described and the assays of samples taken by O'Grady indicate the presence of copper and zinc with low silver and gold content and, locally, the presence of lead.

In 1950 surface prospecting and rock trenching were carried out on the Mamquam, Rose, and Rainstorm claims.

Diamond drilling, totalling 2,498 feet in seventeen holes, was done on the Rainstorm claim.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1937, pp. F 20–F 25.]

PENDER HARBOUR*

Copper

Cambrian Chieftain

(49° 123° N.W.) The Cambrian Chieftain group, in the Vancouver Mining Division, consists of eight full claims and one fractional claim; they are the Cambrian Chieftain, Silurian Chieftain, Little Chieftain, Canyon Chieftain, Mountain View, Gold No. 1, Gold No. 2, Tyee, and the Pine Cone Fraction. The property is 3½ miles in a direction north 24 degrees east from the head of Pender Harbour, which latter point is 46 miles northwesterly from Vancouver.

The present owners are John Cline and associates who, in the spring of 1949, formed the Caron Mining Co. Ltd. with the intention of thoroughly exploring the possibilities of the Cambrian Chieftain group. Largely due to the energy and enterprise of Mr. Cline, a good road now leads up the steep, rocky western slope of the Caren Range to the property. Branching eastward from the Gibsons–Pender Harbour road at the settlement of Kleindale, this road winds its way upward for 5.6 miles to the camp on the property. Grades reach 25 per cent in three or four places, but the road is not difficult for four-wheel-drive vehicles.

The Caron Mining Co. Ltd. is capitalized at 100,000 shares, $1 par value. At the time of writing, only four shares had been issued.

The examination of the Cambrian Chieftain group occupied two weeks.

Copper ore was discovered in 1934, on what later became the Cambrian Chieftain claim, by Fred Klein, brother of John Cline. Subsequently, a limited amount of surface work was done, and in November, 1935, three diamond-drill holes, aggregating 140 feet in length, were put down to test the best showing. These holes were located by N. E. Nelson, a former geologist of The Granby Consolidated Mining Smelting and Power Company Limited. The location of these holes is shown on Figure 6.

In the summer of 1937 the property was optioned to Sheep Creek Gold Mines Limited. This company drove two tunnels, the upper of which, 45 feet long, partially explored the main showing. The lower tunnel is 225 feet to the north and was driven 46 feet to test a separate showing.

In 1940 the Cambrian Chieftain group was optioned to the Alaska-Pacific Mining Co. Ltd. of Seattle. This company drove a tunnel 210 feet long and did a total of 1,204 feet of diamond drilling in four holes. Neither the tunnel nor the drilling was sufficiently close to the main showing to indicate the extent of the ore at that point.

The tunnel and No. 1 diamond-drill hole run easterly in the section 100 to 200 feet south of the southern boundary of Figure 6. The tunnel was started about 275 feet southwesterly from the southwest corner of Figure 6. None of the core from any of the drill holes is available to-day.

Work was resumed on the property in the spring of 1949 with the formation of the Caron Mining Co. Ltd. Attention was confined to the main showing, and in November, 1949, a shipment of ore was made to the smelter in Tacoma, Wash. An additional shipment was made in the latter part of 1950. The data for these shipments are: 1949, ore shipped, 266 tons. Gross content: Gold, 15 oz.; silver, 2,032 oz.; copper, 74,284 lb. 1950, ore shipped, 244 tons. Gross content: Gold, 9 oz.; silver, 1,334 oz.; copper, 55,303 lb.

The claims are near the top of the steep western slope of the Caren Range at a general elevation of 3,200 feet. In the vicinity of the main showings much of the timber has been burned off and the bedrock geology is reasonably well exposed. On the flatter, more easterly claims, however, there are still good stands of hemlock with minor red cedar, yellow cedar, fir, pine, and larch, and outcrops are scarce.

* By W. R. Bacon.

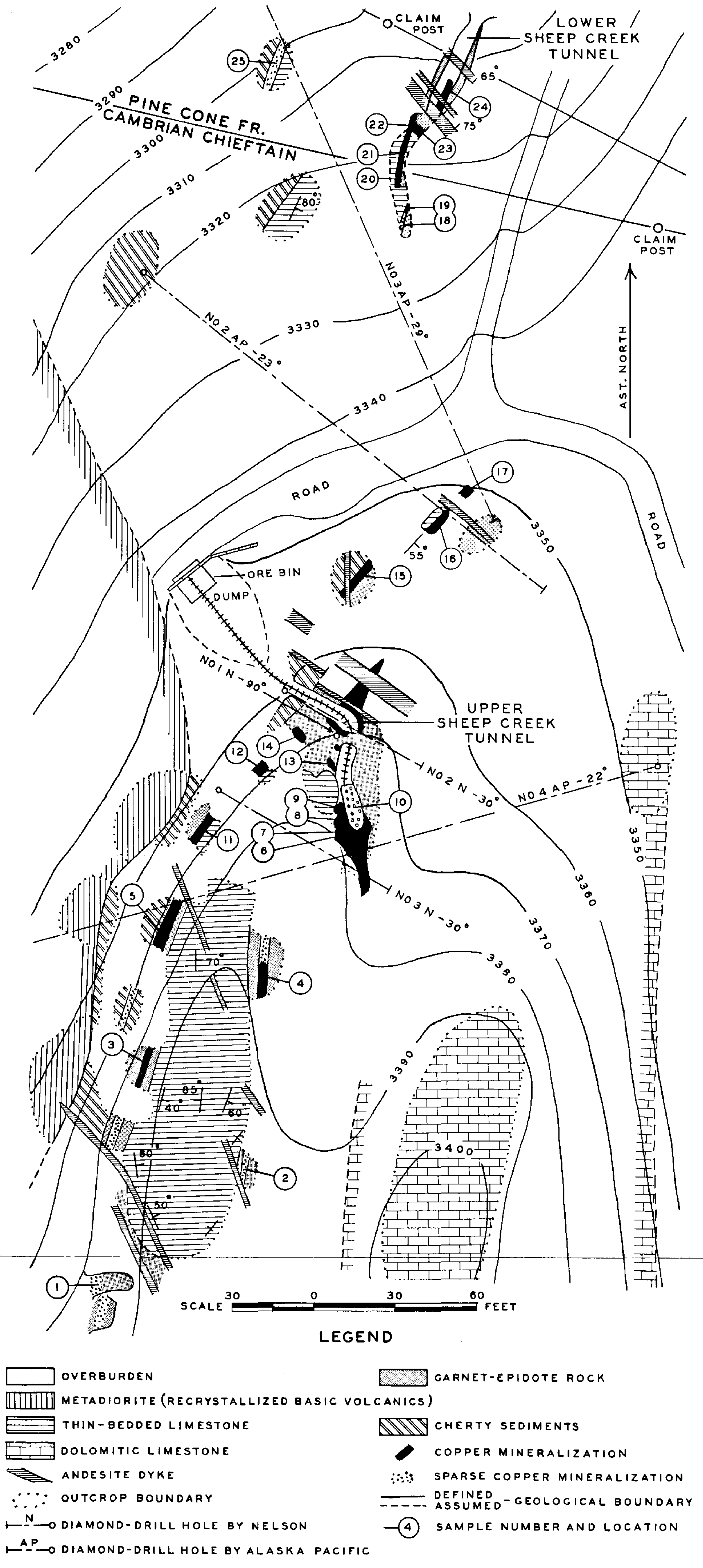


FIG. 6. CAMBRIAN CHIEFTAIN - SURFACE GEOLOGY, DIAMOND-DRILL HOLES, AND WORKINGS ON MAIN SHOWINGS.

At present a year-round water supply is not readily available. If the necessity arises, however, it should be possible to obtain water from one of several small lakes above and about a mile to the east and southeast of the main showing.

The Cambrian Chieftain is in the northwestern portion of a shallow pendant surrounded by the granitic rocks of the Coast Range. Although the pendant area has not been completely outlined, a reasonable estimate of its size would not be in excess of 12 square miles.

Rocks of volcanic origin comprise at least 95 per cent of the pendant area. They consist mainly of intermediate and basic flows, with minor amounts of pyroclastic material. With the exception of tuffs, these rocks are generally massive. Regional metamorphism has been responsible for induration, some chloritization and epidotization, and, in places, recrystallization of basic volcanics to metadiorite. The latter rock varies greatly in texture and composition and could hardly be confused with a normal igneous rock.

Thin-bedded limestone, impure chert, and dolomitic limestone are found in lenticular masses along certain horizons in the volcanic assemblage.

The prevailing strike of the rocks forming the pendant is due north, and steep to vertical dips are most common. Some rather close folding is indicated in a number of the sedimentary exposures, but nowhere has schistosity been developed to any extent.

In spite of the steep dips found in the older rocks, it is doubtful if these rocks attain depths greater than 1,000 feet. The outline of the contact between the pendant rock and the enclosing granitic rocks is highly irregular, and islands of the latter rocks are found more than a quarter of a mile within the boundaries of the pendant.

The rocks in the vicinity of the main showings (Fig. 6) are metadiorite, basalt, limestone, dolomitic limestone, and cherty sediments. Intersecting all these types are narrow, fine-grained andesitic dykes and wider diorite porphyry dykes. Several of the porphyry dykes are just south of the area represented in Figure 6, but none are within the boundaries of the figure.

The metadiorite occurs in the western part of the area represented in Figure 6. Although most of this rock is recrystallized, some relict tuffaceous banding was noted near its eastern boundary. The texture of this rock varies considerably, as does the amount of hornblende present. The metadiorite is epidotized and, to a lesser extent, chloritized; locally, silicification is prominent. Pyrite is fairly common in patches and stringers, but chalcopyrite was seen only as a few specks at one or two places.

Basalt is well exposed on a knoll to the southeast of the showings. It is dark, fine-grained, massive, and unaltered, except along its western border. Here the rock is well silicified over a distance of 25 feet, and fine pyrite is common in small patches.

Thin-bedded limestone is exposed in several outcrops adjacent to the main copper showings. Although recrystallization is general throughout most of the rock, indications of bedding have not been completely obliterated.

To the east and south of the copper showings lies a body of dolomitic limestone. Bedding is rather obscure throughout most of the body. Its minimum indicated length is 1,020 feet, and its average width is approximately 100 feet. The magnesia (MgO) content of nine grab samples taken from this body of dolomitic limestone averaged 19.8 per cent. Pure dolomite contains 21.86 per cent magnesia. The assays of the samples ranged from 18.8 per cent to 21.1 per cent magnesia.

Small outcrops of impure chert occur, mainly along the eastern border of the metadiorite.

The trend of the stratified rocks is due north, and the dip is vertical to steeply eastward. Both the andesite dykes and the diorite porphyry dykes that cut these rocks strike south 40 degrees east to due east and dip vertically or nearly so.

The locus of the best ore found to date is a minor dragfold in the thin-bedded limestone exposed on the south wall of the upper Sheep Creek tunnel. The plunge of this dragfold is southerly, but more work is required to establish the angle of plunge.

Parts of the thin-bedded limestone have been converted to rock rich in garnet and epidote. Subsequent to this alteration, fracturing has occurred, and in these fractures varying amounts of magnetite, pyrite, chalcopyrite, and blackish marmatitic sphalerite have been deposited.

Non-metallic gangue minerals other than garnet and epidote are rare. Small patches of coarse calcite and a very little actinolite were noted in a few places.

Minerals of secondary origin are fairly common. A little malachite was found in most of the mineralized outcrops, and films of chalcocite and covellite were noted along some of the stronger fractures in the Upper Sheep Creek tunnel.

Leaching has been controlled by the fractures and is highly irregular. All the mineralized outcrops show some effects of leaching, but nowhere has the process been complete. Limonite derived from pyrite and chalcopyrite is common.

In and near the main workings twenty-five channel samples were taken of the sulphide mineralization. Because of the irregular occurrence of the sulphides and the fact that most of the samples were taken across partially leached material, the assay results must be considered as only a rough guide to the tenor of the ore.

SAMPLES OF SULPHIDE MINERALIZATION

Sample No.	Width	Gold	Silver	Copper	Zinc
	Feet	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
1	3.0	Trace	0.3	0.5	Trace
2	1.0	*Nil*	*Nil*	Trace	*Nil*
3	1.0	*Nil*	*Nil*	Trace	*Nil*
4	3.0	0.01	6.1	5.4	Trace
5	3.3	Trace	5.4	2.4	*Nil*
6	5.0	0.02	4.7	13.6	0.7
7	3.4	0.01	2.5	6.9	(1)
8	5.0	Trace	1.3	4.0	(1)
9	5.0	*Nil*	1.8	5.0	(1)
10	(2)	0.04	6.6	16.8	0.8
11	3.0	Trace	5.3	12.2	*Nil*
12	1.0	Trace	2.1	13.7	(1)
13	5.0	Trace	3.1	9.4	0.5
14	5.0	Trace	3.1	6.2	*Nil*
15	2.0	Trace	3.7	8.0	*Nil*
16	5.0	0.01	5.9	17.1	(1)
17	3.0	0.01	3.9	12.5	(1)
18	1.3	0.01	5.6	8.5	0.7
19	1.0	0.02	6.7	7.7	0.3
20	1.1	0.01	10.3	26.4	0.5
21	2.0	0.01	14.2	34.1	0.4
22	2.3	0.02	13.0	30.6	(1)
23	1.0	Trace	8.2	16.9	1.2
24	0.5	0.01	14.0	27.7	*Nil*
25	1.3	*Nil*	*Nil*	(1)	*Nil*

[1] Indicates greater than a trace but less than 0.3 per cent.
[2] Muck (grab).

Britain River

(50° 124° S.E.) Britain River flows southeasterly into Jervis Inlet at the junction of Prince of Wales Reach and Princess Royal Reach. In the rugged country around Mount Diadem, 3½ miles west of the mouth of Britain River, prospecting has been carried on intermittently for many years. First official reference to this area appeared in the Annual Report of the British Columbia Minister of Mines, 1927, pages 365 and 366, wherein is given a short description of the Red Mountain group. Brief reports on the holdings of Mount Diadem Mines Limited and Britain River Mining Company Limited were included in the Annual Reports of the British Columbia Minister of Mines for 1928 and 1929.

In the summer of 1947 forty-four mineral claims were staked immediately northwest of Mount Diadem by the International Nickel Mining Company of Canada Limited. Subsequently, in June, 1949, four additional claims were staked by the same company, making a total of forty-eight claims in one block. At the present time these claims are under option to Bralorne Mines Limited. Some prospecting has been carried on by the latter company.

Bralorne Mines Limited has built a cabin near the head of No Man's Creek at an approximate elevation of 2,250 feet. This cabin is reached from the mouth of Britain River by 2¼ miles of logging road up the western bank of the river, thence by 3¼ miles of trail up the north slope of No Man's Creek. This creek empties into Britain River from the west. The precipitous nature of the trail precludes the use of animals, and all supplies must be taken in by back-packing.

The claims lie in typical rugged Coast Range terrain straddling the divide between waters flowing south into Khartoum Lake and those flowing east into Britain River. The topography has been considerably modified by glaciation, and small permanent snowfields occur at higher altitudes.

Mount Diadem viewed from the Bralorne cabin, Britain River area.

Outcrops are plentiful. Cliffs are a common feature. The northern and western sides of Mount Diadem (elevation 6,050 feet) fall away in exceedingly steep drops for 2,500 feet. Rock slides occur almost daily. On both slopes of the divide small streams cascade down precipitous rock slopes. Small stands of yellow cedar, larch, fir, and pine are present on the lower claims.

All the mineralized showings lie in or adjacent to a belt of older stratified rocks engulfed in the granitic rocks of the Coast Range. In the vicinity of the claims this belt has a true width of just over 1 mile (Fig. 7).

The rock types comprising this belt are predominantly of sedimentary origin. Thin-bedded argillites make up about 85 per cent and impure sandy beds about 15 per cent

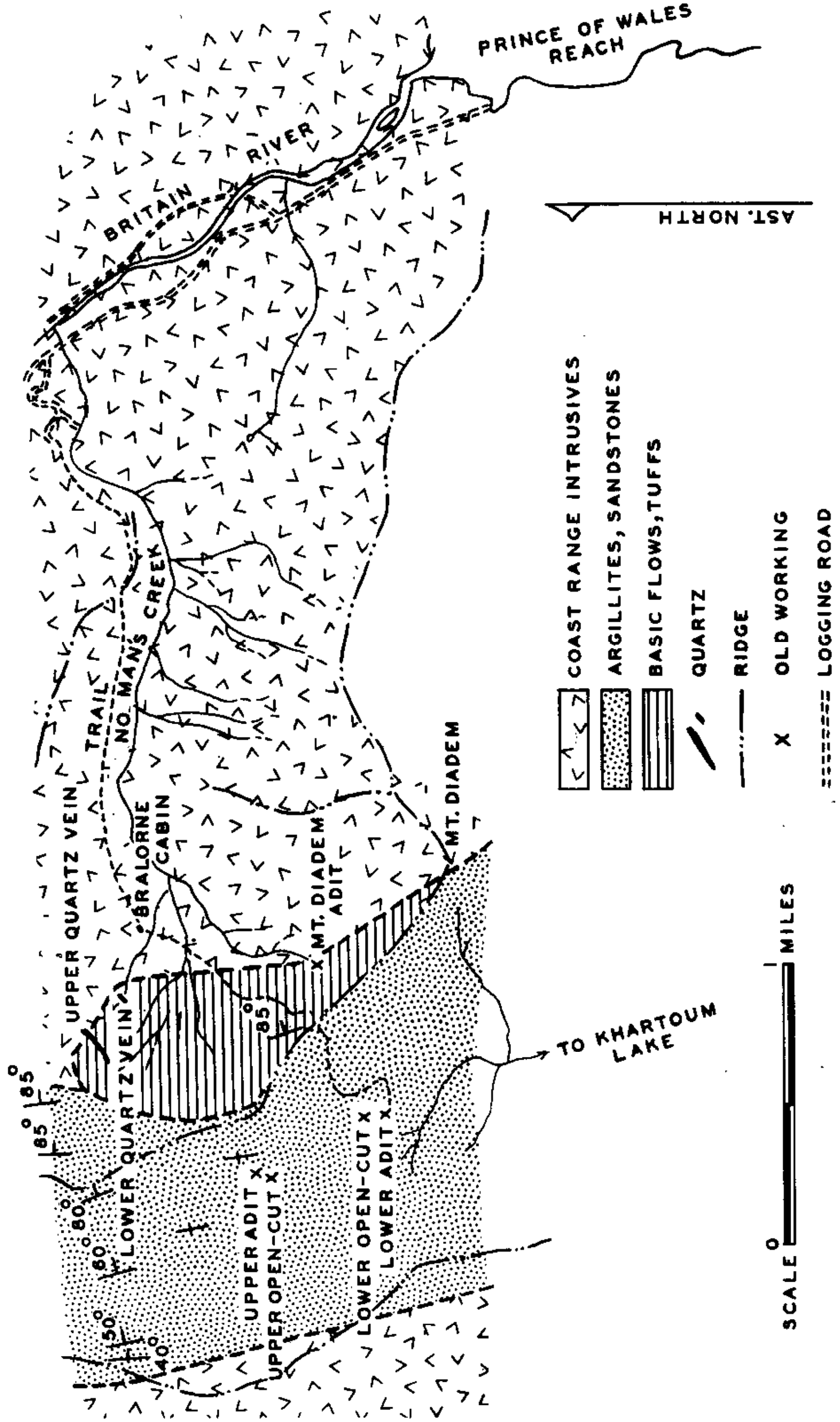


Fig. 7. Britain River area—geology.

of these sediments. A 4-inch band of conglomerate was noted near the western border of the belt.

At the head of No Man's Creek is a small area of basic flows and interbedded tuffs. The flows show evidence of partial recrystallization.

The attitude of the sediments is clearly exhibited in innumerable exposures. The beds strike north 15 degrees west, parallel to the borders of the belt, and dip vertically to steeply eastward, except at their western contact with the granitic rocks, where dips as low as 40 to 50 degrees eastward were noted. Attitudes in the volcanics, where obtainable, are conformable with those found in the sediments.

In a few sedimentary exposures, close dragfolding on a minor scale was noted, and it is possible that the sediments are tightly folded isoclinally. The present examination, however, yielded nothing of a positive nature to substantiate such a conclusion.

The degree of metamorphism in the sediments is remarkably low. Only locally has anything approaching a slate been developed, and nowhere were schists observed.

Fine-grained to medium-grained sills of intermediate composition are common throughout the stratified rocks.

Without doubt, prospectors were first attracted to the Britain River area by the reddish appearance of the mountains, some of which can be seen from Prince of Wales Reach. Subsequently, it is probable that the base-metal float in No Man's Creek and across the divide in the upper reaches of the Lois River led to the discovery of the known lodes. The only known base-metal showings are those which were found years ago. Although the area holds some promise, no lode of economic proportions has, as yet, been uncovered.

Immediately above the head of No Man's Creek, at an approximate elevation of 2,950 feet, there is an old working which will be called the Mount Diadem adit (Fig. 7) for purposes of identification. Here a crosscut is collared at the contact of the volcanics with granitic rock. The crosscut penetrates the silicified, recrystallized volcanics for a distance of 65 feet on a bearing of south 18 degrees west. At a distance of 40 feet from the collar a 2-foot shear was intersected which strikes south 70 degrees east and dips 65 degrees to the north. This shear was followed to the west by a drift 25 feet long in which pods of mineralization were encountered. The mineralization consists of galena, sphalerite, pyrite, and a very little chalcopyrite. This is the only known base-metal showing in the volcanics.

In the sediments, base-metal mineralization similar to that found in the Mount Diadem adit has been disclosed at four points. The mineralization has replaced certain beds locally.

On claim X 5, at an elevation of approximately 2,750 feet, a 30-foot adit has been driven in a north 3 degrees west direction along the east wall of a sparsely mineralized zone. Although limonite is splashed over a width of 15 feet, the zone is essentially unmineralized, except in the drift where pods of sphalerite, some galena, and minor amounts of pyrite and chalcopyrite occur.

What is probably the same zone is exposed in a small open-cut 250 feet to the north and 200 feet above the adit. Here mineralization occurs across a width of 2 feet.

On claim X 25, at an approximate elevation of 3,950 feet, a 12-foot adit has been driven in a south 30 degrees west direction and exposes 2½ feet of high-grade zinc mineralization and minor amounts of galena and chalcopyrite. The beds are contorted locally, and some shearing has developed.

A large open-cut, 200 feet south of this adit at an approximate elevation of 3,820 feet, exposes another zone of mineralization 19 feet wide. In the eastern 14 feet of this zone the mineralization is mainly pyritic, but in the western 5 feet some patches of chalcopyrite occur, and for 4 to 5 inches along the western border sphalerite is found. Galena is present in very minor amounts. Along the eastern border of this zone some minor dragfolding was observed. Continuity of this zone to the south is obscured first by the dump

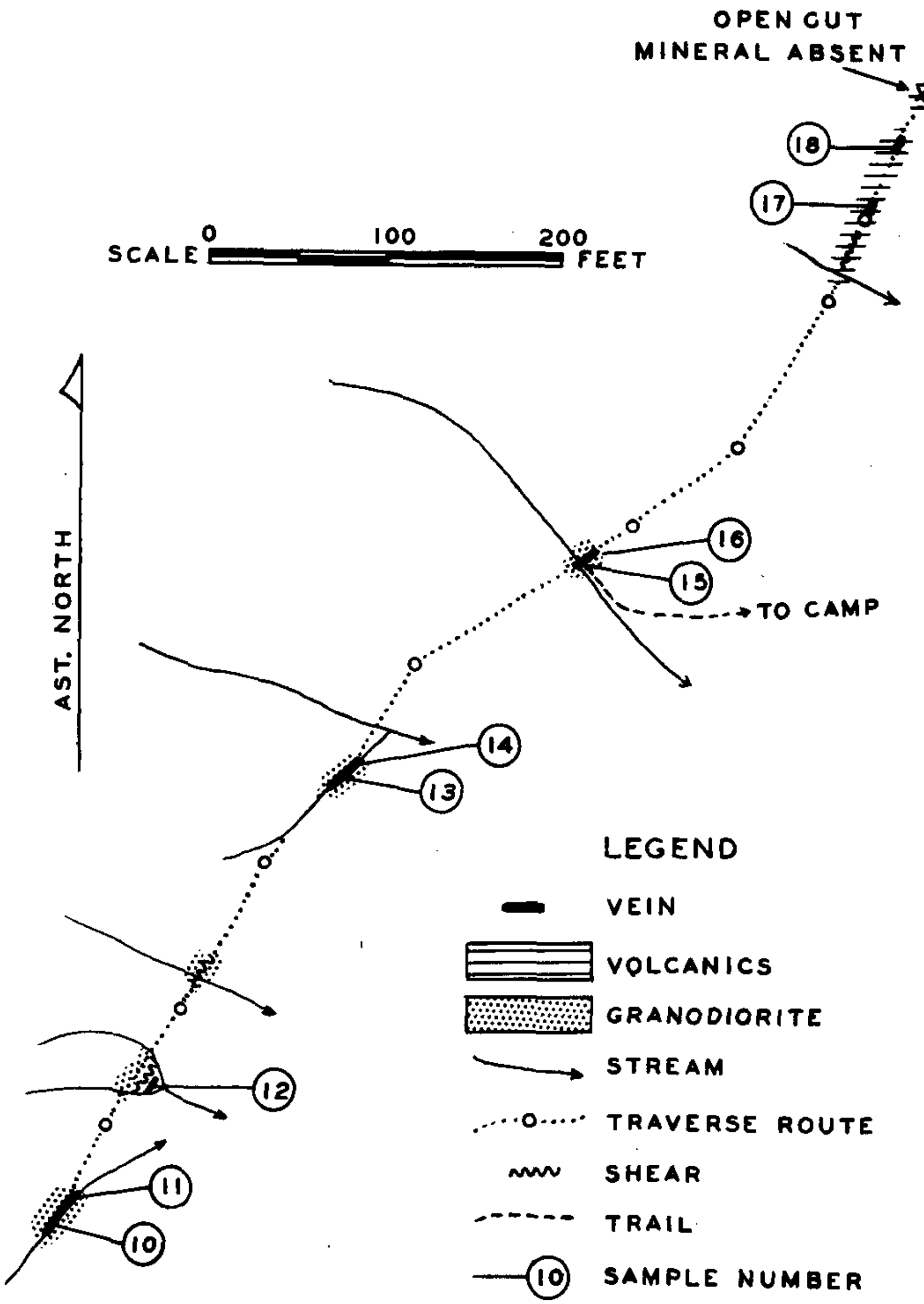


Fig. 8. Britain River—plan of upper quartz vein.

and then by overburden. To the north, however, there is much outcrop along strike and very little sign of mineralization.

The view of the writer is that the best locus for prospecting in the predominantly argillaceous sediments is between the upper and lower open-cuts. A line joining these two workings closely approximates in bearing the strike of the sediments, and some useful prospecting could be done along this line.

A report, made available to the writer, mentions a massive pyrrhotite exposure, 18 feet wide, southeast of the adit on claim X 5. Although this showing undoubtedly exists, a one-day search by the writer failed to reveal its location.

Two narrow quartz veins were examined near the head of No Man's Creek (Fig. 7). The lower showing is at an approximate elevation of 2,900 feet. Here a creek has exposed the volcanic bedrock, revealing a quartz vein 3 inches wide for a length of 32 feet. This vein strikes north 30 degrees east and has a northward dip of 50 degrees. Continuity to the northeast and southwest is obscured by overburden. The vein material is mainly quartz, slightly rusty, and contains minute amounts of pyrite and chalcopyrite. A composite sample of the vein material assayed: Gold, *nil;* silver, 1.5 oz. per ton.

The narrow shear containing the upper quartz vein is at a general elevation of 3,600 feet (Fig. 8). It has a vertical dip and can be traced along strike, north 40 degrees east, for over 800 feet. For the greater part of this distance the shear traverses various members of the volcanic assemblage, but at its northeastern end it persists in granitic rock for over 100 feet. The northwestern wall of the shear is slickensided at a number of points, and a minor amount of gouge has developed.

This shear is well exposed in six small stream beds and in the granitic cliffs at its northeastern extremity. It does not exceed 9 inches in width and averages 4½ inches. It is generally quartz-filled, although in one stream-bed exposure quartz is absent. Metallic mineralization is sparse and irregular, consisting of pyrite, arsenopyrite, and chalcopyrite. A few specks of free gold were noted.

It should be emphasized that none of the mineralization described above exhibits anything of a contact metamorphic nature. Whereas the belt of older rocks is only slightly over a mile wide where examined, it is the writer's opinion that these rocks occupy a deep trough in the granitic rocks of the Coast Range and probably persist downward for several thousands of feet.

Assays of samples taken in the workings are given in the tables below.

SAMPLES OF BASE-METAL SHOWINGS

Sample No.	Location	Width		Gold	Silver	Copper	Lead	Zinc	Remarks
		Ft.	In.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent	Per Cent	
1	Lower adit	..	..	0.01	1.8	(1)	2.7	18.6	Dump grab.
2	Lower open-cut	2	..	Trace	5.5	3.5	(1)	6.9	Channel sample.
3	Mount Diadem adit	2	..	*Nil*	3.2	Trace	4.9	2.9	Channel sample.
4	Mount Diadem adit	2	..	0.01	3.6	(1)	1.8	5.0	Channel sample.
5	Upper adit	2	6	0.01	8.9	2.0	0.6	27.5	Channel sample.
6	Upper open-cut	5	..	*Nil*	Trace	Trace	Trace	0.2	Channel—east wall.
7	Upper open-cut	5	..	0.01	0.1	(1)	Trace	1.6	Channel—east wall.
8	Upper open-cut	4	..	0.01	6.5	1.6	(1)	0.3	Channel—east wall.
9	Upper open-cut	5	..	0.01	11.6	(1)	1.1	6.0	Channel—west wall.

[1] Indicates less than 0.3 per cent.

SAMPLES FROM UPPER QUARTZ VEIN

Sample No.	Width	Gold	Sample No.	Width	Gold
	Inches	Oz. per Ton		Inches	Oz. per Ton
10	7	*Nil*	15	8	0.20
11	2	0.42	16	8	0.02
12	1	5.77	17	8	0.01
13	2	1.62	18	9	0.01
14	5	1.68			

TEXADA ISLAND (49° 124° N.W.)*

Gold-Copper

Little Billie (Vananda Mines (1948) Limited) Company office, 640 Pender Street West, Vancouver; mine office, Vananda. A. E. Jukes, president; W. B. Tobey, manager. The Little Billie mine is almost half a mile southeast of Vananda on the east shore of Texada Island. In April, 1950, W. B. Tobey was appointed manager. The workings consist of a shaft 620 feet deep serving six levels spaced at irregular intervals. The levels are driven southerly to explore an irregular limestone-diorite contact. Orebodies are mined by shrinkage stoping.

The following data, supplied by the management, give details of the operation during 1950:—

Development Advance	No. 5 Sublevel	No. 5 Level	No. 6 Level
	Feet	Feet	Feet
Drifting and crosscutting	292	13	182
Raising	—	—	175[1]

	No. 20 Orebody	No. 30 Orebody	No. 50 Orebody	Total
	Tons	Tons	Tons	Tons
Stoping	3,823	3,960	6,337	14,120
Development ore	—	—	—	841
Total ore broken	—	—	—	*14,961*

[1] In No. 20 orebody.

Production: Ore shipped, 10,010 tons; ore stockpiled, 300 tons. Gross content: Gold, 1,719 oz.; silver, 5,285 oz.; copper, 285,535 lb.

Gordon and William Two claims, Gordon and William, on the east shore of Texada Island, about 10 miles northwesterly of Anderson Bay, were located in June, 1950, by David William Cochran, of Pender Harbour. Access to these claims is easiest by boat, but they may also be reached by road and foot-trail from Vananda.

The geology of Texada Island is discussed by R. G. McConnell in Memoir 58 of the Geological Survey of Canada.

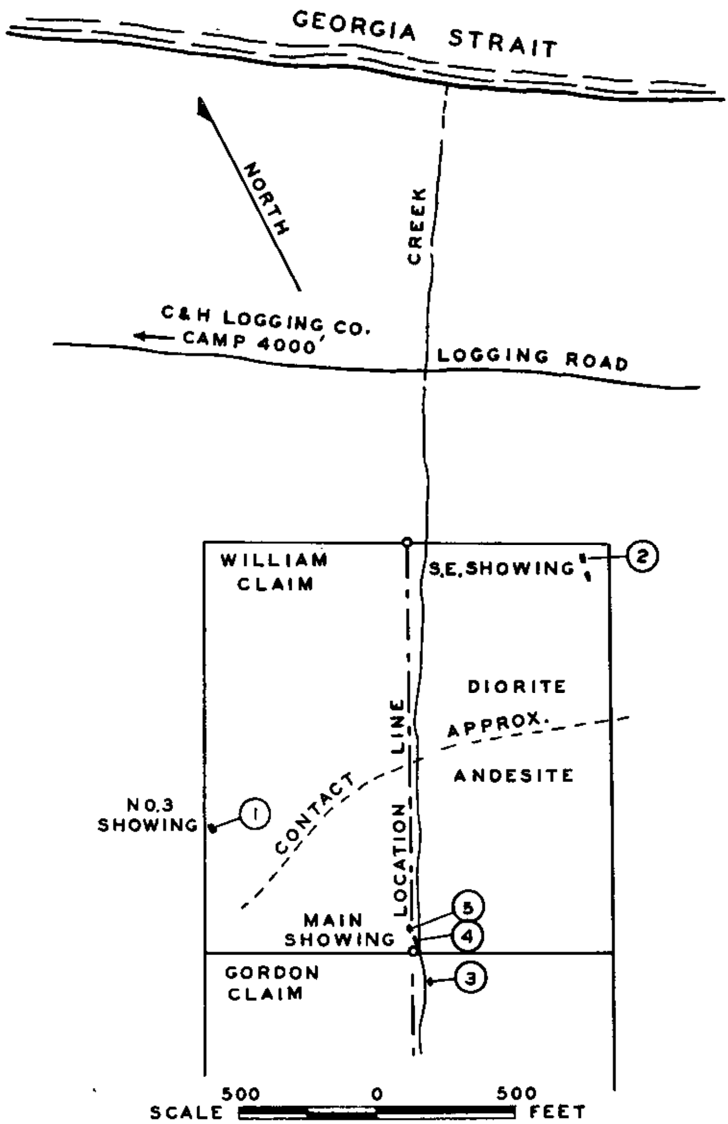
The consolidated rocks in the area are chiefly the Texada formation and quartz diorite. No exposure of the contact between these two types of rock was found.

The Texada formation is represented by fine-grained grey-green andesite that appears porphyritic on the weathered surface. Although definite flow structures were not found in the rocks on the claims, pillow structures and flow tops were located nearly a mile southeast. The " pillows " did not appear to be overturned. The flow tops strike north 80 degrees east and dip 76 degrees southward.

The andesite flows are generally massive with strong straight joints. Neither schistosity nor shearing was seen on the claims, but to the southeast, fault zones and shearing were found. The strike of the faults is nearly northeast, and the dip vertical to 80 degrees southeast. Two sets of shear planes occurred, one dipping 30 degrees northwest and the other 60 degrees northwest. These zones were about 20 to 30 feet wide.

The main intrusive rock, quartz diorite, appears to have at least two phases, one white and the other pink. Several acidic dykes, a few inches wide, were seen, and to the southeast along the logging-road a narrow pink dyke with pegmatitic characteristics was found.

* By R. B. King.



PLAN OF PART OF GORDON AND WILLIAM CLAIMS

Sample No.	Location	Width	Gold	Silver	Copper
	No. 3 Vein	Inches	Oz. per Ton	Oz. per Ton	Per Cent
1	Chip sample taken in pit	12	0.56	*Nil*	......
	Southeast Showing				
2	Chip sample	8	0.39	*Nil*	......
	Main Showing				
3	Pit 110 feet south from No. 1 post of Gordon claim	6	0.03	0.5	1.8
4	20 feet east from No. 1 post of Gordon claim	14	0.07	2.8	5.1
5	Pit 30 feet north from No. 1 post of Gordon claim	14	0.22	1.0	2.6

The three showings on the claims are: No. 3 on the west boundary of the William claim; the main, lying in the centre; and the southeast, lying in the northeast corner of the William. The positions of the showings are indicated in the plan on page 179, on which sample numbers are also indicated. Sample data and analyses are set forth in the accompanying table.

The No. 3 and the southeast showings are honeycombed quartz veins in quartz diorite. Hand specimens picked from the surface contain no trace of mineralization other than quartz or limonite and some magnetite. No. 3 vein strikes north 50 degrees east and dips 85 to 89 degrees south.

The main vein, on which most of the work has been done, is in a creek near the centre of the group and has been traced nearly 210 feet by rock trenches and stripping. The vein is in a straight definite fracture that strikes north 22 degrees east and dips 66 degrees northwest between walls of andesite slightly mineralized with pyrite. The vein filling is of quartz mineralized with pyrite, chalcopyrite, and secondary bornite.

The vein is mineralized irregularly. Some parts are well mineralized, such as that represented by Sample No. 4. Others, such as that represented by Sample No. 3, are only slightly mineralized.

VANCOUVER ISLAND*

Elk River (50° 127° S.E.)

Iron

Quatsino Copper-Gold Mines Limited A diamond-drilling and prospecting programme was started in September, 1950. H. L. Hill, consulting engineer for this company, reports that nine diamond-drill holes totalling 1,070 feet were drilled to explore a magnetite deposit and to prospect for copper mineralization along a limestone-greenstone contact.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1929, p. 379.]

Zeballos (50° 126° N.W.)

Gold

Privateer Mine Limited.—William Bowen and partners leased the surface dumps and mill of this company. Careful clean-up of the mill and pertinent buildings yielded some concentrates which were shipped to the Royal Mint. Gross content: Gold, approximately 22 oz.

Duncan (48° 123° N.W.)

Copper-Zinc

Twin J (Vancouver Island Base Metals Limited) Company office, Credit Foncier Building, Vancouver. C. Rutherford, manager; C. H. Hewat, mine superintendent. In October, 1950, the Twin J property on Mount Sicker, near Duncan, was reopened. General retimbering and cleaning up was done on the 265- and 300-foot levels. On the 300-foot level 50 feet of drift was driven toward the Richard III section and 60 feet of raise was driven to the 265-foot level. The average number of men employed was twenty.

Jordan River (48° 124° S.E.)

Copper

Sunloch and Gabbro† These two adjacent properties are near the settlement of River Jordan on the southwest coast of Vancouver Island, 45 miles by good highway from Victoria. Both were optioned in 1949 from their respective owners, The Consolidated Mining and Smelting

* By R. B. King, except as noted.
† By J. S. Stevenson.

Company of Canada, Limited, and Gabbro Copper Mines Limited, by Hedley Mascot Gold Mines Limited and are being developed as a single operation. The Sunloch property consists of thirty Crown-granted claims and the Gabbro, adjoining the Sunloch on the west, consists of twenty-three Crown-granted claims. All these claims were located between 1915 and 1920. In 1949 Hedley Mascot located ten claims and a fraction adjoining the Gabbro claims on the west.

Access

The workings are reached by a branch road, 1 mile long, that leaves the Victoria highway about half a mile east of River Jordan post office and extends to within a mile of the workings. From that point the grade for a railway track (24-inch gauge) leads past the Gabbro showings to the Sunloch showings and adits. The railway is now in disrepair, but the grade makes a good trail and with a moderate amount of work could be restored.

Development work on these properties includes numerous open-cuts and strippings, about 3,800 feet of adits, and 14,000 feet of diamond-drilling. The River adit, elevation 609 feet, and the Cave adit, elevation 608 feet, on the east side of the river, and the Centre, elevation 549 feet across the river from them, are on the Sunloch Nos. 5 and 6 claims. There are on the Gabbro two short adits—one, the Winkler, 83 feet long, at elevation 570 feet, on the Vulcan No. 2 claim adjacent to the old railway grade, and the other, the Hornet, 12 feet long, on the east bank of Sinn Fein Creek, about 100 feet northwesterly from the northwest corner of the Black Hornet claim.

The B.C. Electric Railway Company forebay at the end of the flume-line, at an elevation of 1,100 feet, about 550 feet above the principal Sunloch workings, covers about 9 acres and is used to control the flow of water through the penstocks into the power-house at sea-level at the mouth of Jordan River. This power-house generates electricity for the city of Victoria. A branch power-line from the power-house leads up the hillside and, at its closest point, is half a mile east of the Sunloch adits.

History

The discovery of copper on southern Vancouver Island dates back to 1863, when it was found at East Sooke by Capt. Jeremiah Nagle. Little work was done on the discoveries until World War I, when, between 1915 and 1918, 1,940 tons of ore, yielding 177,613 pounds of copper, is recorded as having been shipped from the two principal properties, the Willow Grouse and Copper King at East Sooke. In 1915, at the beginning of this general period of copper activity at Sooke, George Winkler, now of Victoria, made the first discovery of copper on the Sunloch at Jordan River. He was led to the discovery by finding chalcopyrite float on the beach near the mouth of the Jordan River. He succeeded in tracing the float up the difficult canyon to its source in inconspicuous outcrops of the Cave and River zones, on the steep east wall of the canyon. Further prospecting by Mr. Winkler in subsequent years resulted in finding the several other mineralized zones both on the Sunloch and Gabbro properties.

In 1917 Winkler bonded the property to the Sunloch Mining Company, which built the narrow-gauge railway, drilled the first diamond-drill holes, and did the first underground work.

In 1919 The Consolidated Mining and Smelting Company acquired control of the Sunloch Company and continued diamond drilling and underground work. Operations were suspended in 1920. By that time the River, Centre, and Cave adits totalling 3,776 feet had been driven, and holes amounting to 3,470 feet had been drilled on the Sunloch property.* On the Gabbro property the Winkler adit and the Hornet adit had been driven by 1920, and surface exploration was done in the next few years.

* *Minister of Mines, B.C.*, Ann. Rept., 1920, pp. 220, 221.

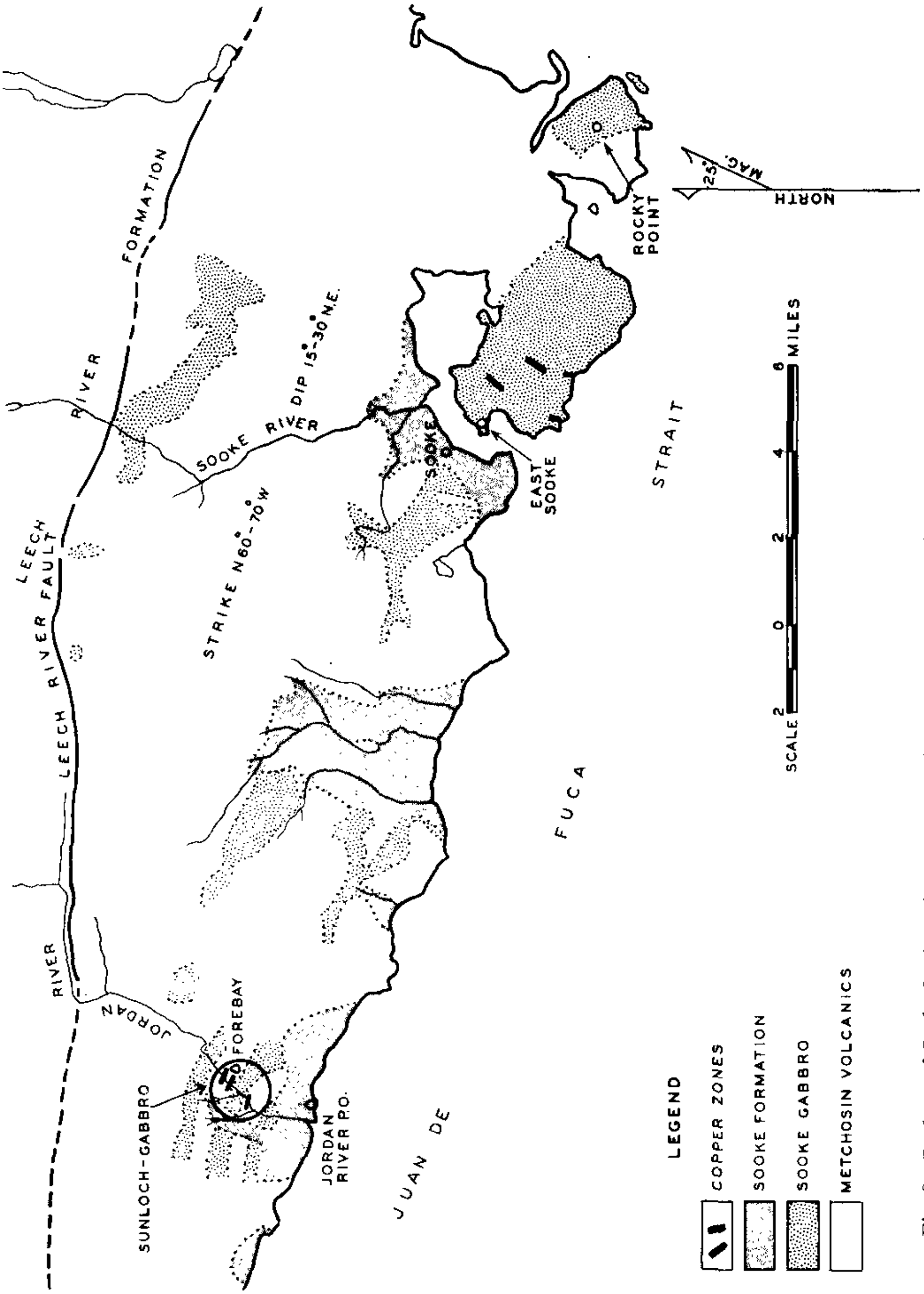


Fig. 9. Geology of Sooke-Jordan River area. Geology adapted from Sooke and Duncan sheets, Geological Survey, Canada, and company plans.

No further work was done on these properties until 1949, when Hedley Mascot Gold Mines Limited optioned the Sunloch property from The Consolidated Mining and Smelting Company and the Gabbro property from Gabbro Copper Mines Limited. Work done by Hedley Mascot on the two properties has consisted principally of diamond drilling, of which 9,354 feet was reported for 1949 and 4,082 feet for 1950. Twenty-eight holes, Nos. 15 to 36 and X-1 to X-6, aggregating 9,354 feet, were drilled before exceptionally high water in Jordan River in November, 1949, flooded desirable drilling-sites and forced suspension of drilling. Drilling was resumed in the spring of 1950, and Holes No. 37, length 1,196 feet, and No. 38, length 1,257 feet, had been drilled when the property was last examined. Subsequently, Hole No. 39 was completed; Hole No. 40 was begun and has been completed since the end of 1950. No underground work has been done by Hedley Mascot on either property.

Production

No production has yet been made from the Sunloch and Gabbro properties. However, The Consolidated Mining and Smelting Company stored several hundred tons of development ore behind a cribbing at the portal of the Cave adit on the Sunloch.

General Statement

The writer, with one assistant, spent two weeks in the autumn of 1949 and two weeks in the summer of 1950 on the Sunloch and Gabbro properties and, in the preparation of this report, studied 115 thin sections and twenty-four polished sections under the microscope.

The kindness of the officials of Hedley Mascot Gold Mines Limited in providing full access to their maps, plans, and other information is gratefully acknowledged. In particular, the writer would like to thank J. W. Young, company geologist in charge of development work on the properties, for his many helpful suggestions concerning the geology of the properties. The writer also wishes to thank George Winkler for directing his attention to many interesting features on the Sunloch and Gabbro properties and for much information concerning their history and development.

Topography

The Sunloch and Gabbro properties are in an area of rugged topography. The Jordan River flows through the important, central part of the properties in a rocky canyon about 500 feet deep and a mile and a half long. The showings outcrop in this canyon, and the adits have been driven from one or the other of its walls at heights ranging from 15 feet to 90 feet above the normal level of the river. The river level is apt to rise 5 feet or thereabouts in a few hours during heavy rains, particularly in the autumn. Upstream from the canyon, on either side, the ground, although not precipitous, is steep.

At one time the area was heavily forested, but much of the timber has been cut from it. However, some Douglas fir and considerable hemlock still remain in and adjacent to the canyon. Outcrops are numerous and extensive in the bed of the river and on the canyon walls, but away from the canyon the surface is completely covered by a mantle of black muck and drift, and bedrock does not outcrop except in parts of creek beds. Because of this, little prospecting has been done away from the canyon.

General Geology

The general geological setting of the area of the Sunloch and Gabbro properties may best be considered in its relation to that of the larger Sooke-Jordan River area (Fig 9), of which it is a part.

The oldest rocks in the area include the Leech River formation, a series of argillites and sandstones that have been metamorphosed into slaty and quartzose schists. These rocks strike easterly and have been closely folded so that most of the strata have very steep dips. They are in contact on the south, along the Leech River fault, with the next youngest formation, the Tertiary Metchosin volcanics.

The Metchosin volcanics underlie a belt 5 to 10 miles wide which extends west-northwest across the southern end of the Island. The volcanics consist principally of basalt with some diabase. Near the Sunloch and Gabbro workings they include porphyritic and non-porphyritic, amygdaloidal varieties; beyond these properties, well-developed pillow lavas, flow breccias, and fragmental types are found. They strike from north 60 to 70 degrees west and dip 15 to 30 degrees northeastward, although in several places they may be vertical or dip steeply southward. Based on fossils found in interbedded tuffs, these volcanics are considered to be of upper Eocene age (Clapp and Cooke, 1917, p. 290); they are not to be correlated with other Tertiary volcanics on the mainland of the Province, which are Oligocene and Miocene. The Sooke-Jordan River area is the type locality for the Metchosin volcanics. Extensive areas of these volcanics have been described from the Olympic Peninsula southerly across Juan de Fuca Strait.

Tertiary marine sandstones and conglomerates fringe the western and southern coasts of Vancouver Island, and in this area they have been named the Sooke formation. These sediments tend to lie in coastal basins, most of which are drained by small streams flowing into the ocean. The Sooke sediments strike westerly (parallel with the coast) and dip from 2 to 5 degrees southerly (offshore). The age of the Sooke formation has been determined as middle Tertiary, probably belonging to the upper portion of the lower Miocene (Clapp and Cooke, 1917, p. 339).

The most unique feature of the geology of the Jordan River-Sooke area is the Tertiary Sooke gabbro, to which the copper mineralization of Jordan River and East Sooke appears to be genetically related. This gabbro occurs as several stock-like masses that trend northwesterly across the southern tip of the Island. The largest of these masses is at East Sooke. This mass is elliptical, with a major axis about 5 miles long and a minor axis about 2½ miles; other masses range down to those about a mile in diameter. Although most of the gabbro areas are circular to elliptical and are probably stocks, those on the Sunloch and Gabbro properties are definitely elongated, striking with the enclosing rocks, and may be sills. The gabbro intrudes the Metchosin basalts of upper Eocene age and is overlain by the Sooke sedimentary formation of early Miocene age, or possibly middle or upper Oligocene. Its age is therefore probably lower Oligocene (Clapp and Cooke, 1917, p. 304).

A second feature in the area of some significance is the Leech River fault. This is a reverse or thrust fault, strike easterly and dip 45 to 75 degrees northward, that extends across the full width of the Jordan River-Sooke area. Clapp (1917, p. 279) summarizes his account of this fault as follows:—

" The Leech River fault is a reverse or overthrust, nearly a strike and nearly a dip slip fault, it is of great length, at least 40 miles and possibly 140 miles long; throughout its known and assumed length it separates the comparatively unmetamorphosed Tertiary rocks from the pre-Tertiary metamorphic and plutonic rocks which lie to the north and have been pushed up over the Tertiary rocks."

The Leech River fault is accompanied by zones of slaty schists and sheared and schistose volcanics as much as 300 feet or more in width. Southerly from the fault, within the area underlain by Metchosin volcanics, other westerly trending zones of shearing and schistose rocks have been found. These include northwesterly trending zones, 300 and 200 feet wide, of schistose rock that may be seen along the B.C. Electric flume-line 4,000 and 5,000 feet respectively from the forebay. Because of the similarity of the rocks on either side of these shear zones, the nature of the displacement cannot be discovered. These shear zones, and those in which the copper deposits are found, strike northwesterly, and may be genetically related to the Leech River fault.

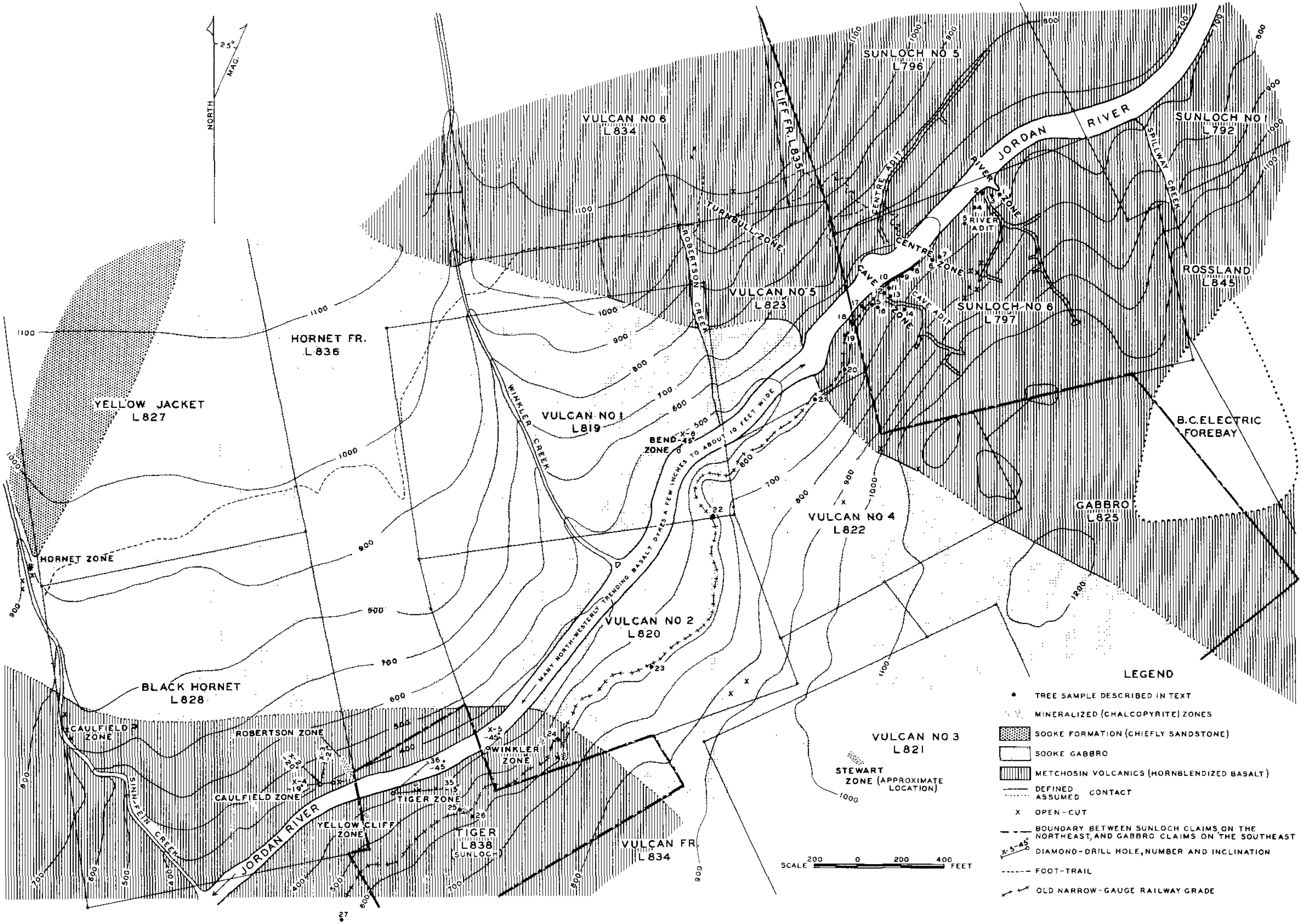


FIG. 10. SUNLOCH-GABBRO. PLAN SHOWING GEOLOGY, MINERALIZED ZONES AND WORKINGS, LOCATIONS OF TREE SAMPLES, AND SOME DIAMOND-DRILL HOLES.

GEOLOGY ADAPTED FROM COMPANY PLANS.

Detailed Geology

The copper deposits on the Sunloch and Gabbro properties occur in shear zones in the Metchosin volcanics close to a sill-like mass of Sooke gabbro (Fig. 10). Diabase dykes cut the gabbro and may also cut the Metchosin volcanics, but do not appear to be related to the copper mineralization.

Metchosin Volcanics.—Near the copper deposits, the Metchosin volcanics are predominantly basalt. As the canyon provides an abundance of well-washed outcrops and much diamond drilling has been done in the volcanics, a good opportunity is afforded to study the basalt and particularly the textural variations that occur. The basalt is fine-grained, dark greenish grey, and under the microscope is seen to consist of plagioclase and dark green hornblende; no augite was seen.

Although all the basalt in the canyon workings and drill core is partly altered to a hornblende rock, and much of it completely altered, several textural types may be recognized. An amygdaloidal type consists of basalt in which white amygdules occur either sparingly or very close together. The amygdules are so close in places that the rock must have been pumiceous when deposited. The zones in which the amygdules are closely packed together are rarely more than a few inches thick, whereas the zones of the more

SAMPLING DATA ON BALSAM AND HEMLOCK ON THE SUNLOCH AND GABBRO PROPERTIES

Sample No. (Parts A and B)	Notes	P.P.M. in Green Twigs				Copper:Zinc Ratio	
		Copper		Zinc			
		A[1]	B[2]	A	B	A	B
1	River zone	2.4	1.2	11.2	8.4	0.21	0.14
2		4.0	3.2	10.6	10.6	0.38	0.30
3		3.2	—	15.3	—	0.21	—
4	Hornblendized basalt	1.4	1.6	13.4	11.7	0.10	0.14
5		3.2	3.4	11.5	16.7	0.28	0.20
6	Centre zone	6.4	6.8	11.2	17.9	0.57	0.38
7		2.4	—	15.6	—	0.15	—
8	Hornblendized basalt	2.0	3.8	16.2	12.3	0.12	0.31
9		4.8	5.6	12.3	10.0	0.39	0.56
10	Cave zone	6.2	4.6	11.7	12.8	0.53	0.36
11		5.6	8.4	2.7	14.2	2.10	0.59
12		15.6	7.6	11.2	11.2	1.40	0.68
13		11.7	—	18.5	—	0.63	—
14		—	5.15	—	14.6	—	0.35
15	Hornblendized basalt	5.0	—	15.9	—	0.31	—
16		3.8	21.4	14.5	10.0	0.26	2.10
17		4.0	—	17.0	—	0.24	—
18		8.2	7.5	23.7	—	0.36	—
19		4.9	—	27.0	—	0.18	—
20		4.4	4.8	25.0	21.3	0.19	0.22
21	Gabbro	3.1	4.9	22.0	16.0	0.14	0.30
22		4.4	3.6	30.8	11.8	0.14	0.31
23		4.9	6.2	16.5	24.8	0.29	0.25
24	Winkler zone	8.8	10.6	15.3	18.9	0.57	0.55
25	Tiger zone	35.2	44.0	11.8	15.4	2.98	2.88
26		11.0	15.0	15.3	13.0	0.72	1.15
27	Gabbro talus	6.6	7.05	30.3	28.4	0.22	0.25
28	Larger trees, 8-inch base, at gravel pit, ½ mile southwest from Sample No. 27	6.15	9.7	45.0	32.0	0.14	0.30

[1] Balsam. [2] Hemlock.

widely spaced amygdules may be as much as 3 feet thick. The amygdules are commonly of plagioclase, but hornblende, chlorite, and clinozoisite may also occur. A porphyritic type of basalt is moderately widespread. In this type the phenocrysts are widely scattered plagioclase crystals about one-sixteenth of an inch long; however, zones several feet wide, in which the phenocrysts are small hornblende crystals, are occasionally seen. Perhaps the most widespread variety of basalt is a diabasic type that consists of distinguishable feldspar laths, one thirty-second of an inch long, intergrown closely enough to give a diabasic texture to the rock. Although the basalt has been intruded by the gabbro, the texture at or near the contacts appears to have been little affected by heat from the gabbro.

Most of the basalt on the property is massive and possesses few features that may be used in determining the structure of the lava. Pillow lavas and flow breccias useful in such studies are absent, and only a few flow contacts were seen. A flow contact between a medium-grained diabasic phase and a fine-grained phase is indicated at a depth of 266 feet in the core from Drill-hole No. 21, and in Drill-hole No. 23 a flow contact between a fine-grained diabasic phase and a phase characterized by indistinct hornblende phenocrysts is indicated at a depth of 291 feet. At a point on the east bank of the river, about 500 feet downstream from the River adit, a contact between porphyritic basalt and fine even-grained basalt was seen to strike north 10 degrees east and to dip 70 degrees northwestward. This indicates local northerly deviations of the strike and reversals in dip from the general northwesterly trend and northeasterly dips seen elsewhere in the area.

Gabbro.—Three northwesterly trending bands of gabbro occur on the property. These bands range in width from 500 to 3,000 feet, are separated by about 3,000 feet of basalt, and are known to extend along their strike for about 4 miles. The centre band, from 2,000 to 3,000 feet wide, is the widest of the three. As the copper ore on the property occurs in mineralized shear zones in the basalt along both contacts of this band of gabbro, it appears to be the most important of the three economically, and has therefore been more carefully studied than the other two bands. Further discussions of gabbro in this report will refer only to this centre band. The rock cuts along the old railway grade and the numerous outcrops in the canyon, both of which cut across the centre band, afford a good opportunity to study the gabbro from one contact to the other. As no diamond drilling has been done in the gabbro, no core from this rock is available for study.

The gabbro is a dark greenish-grey coarse-grained rock with conspicuous plagioclase crystals one-eighth to one-quarter of an inch long. The ferromagnesian mineral in the normal gabbro elsewhere in the Jordan River-Sooke area is principally augite, but on the Sunloch and Gabbro properties it is principally hornblende. However, some relicts of the primary augite remain in this gabbro as cores within crystals of secondary hornblende.

The gabbro is massive and, lacking linear or parallel alignment of either inclusions or constituent minerals, shows no evidence of flowage. In detail the mass is not homogeneous; it includes both medium- and coarse-grained phases and in places includes patches, 6 inches to several feet across, of white altered gabbro. These patches stand out in marked contrast to the predominant dark-green unaltered gabbro. Under the microscope, rock from the patches of white gabbro is seen to consist largely of scapolite and some hornblende. The scapolite has formed by hydrothermal alteration of plagioclase. Alteration of the augite to hornblende and the local alteration in the white patches of plagioclase to scapolite appear to be the only effect that hydrothermal solutions have had on the gabbro.

The northeastern contact of the gabbro with the basalt is not exposed either in the canyon or on the railway grade, but the rock within 50 feet of the probable contact is normal, relatively unaltered gabbro. The southwestern contact may be seen in the canyon. This contact is not sharply defined, but is a zone, about 50 feet wide, that consists of mixed gabbro and basalt. The basalt in the contact zone possesses a definite hornfels texture, characteristic of recrystallization by heat, a consequence of the intrusion of the gabbro into the basalt.

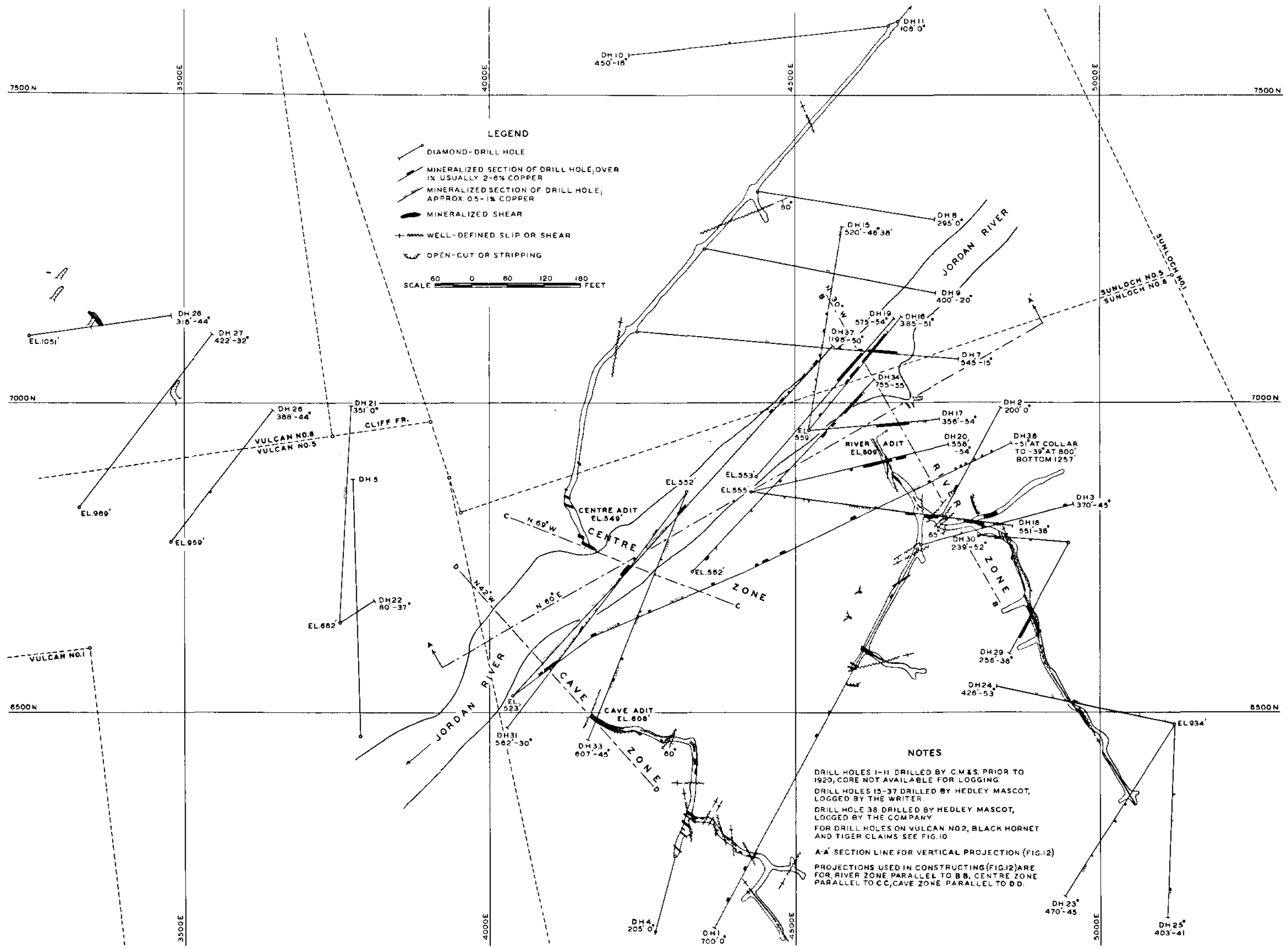


FIG. 11. SUNLOCH-GABBRO. DETAILS OF MINERALIZATION IN ADITS AND DIAMOND-DRILL HOLES ON RIVER, CENTRE AND CAVE ZONES.

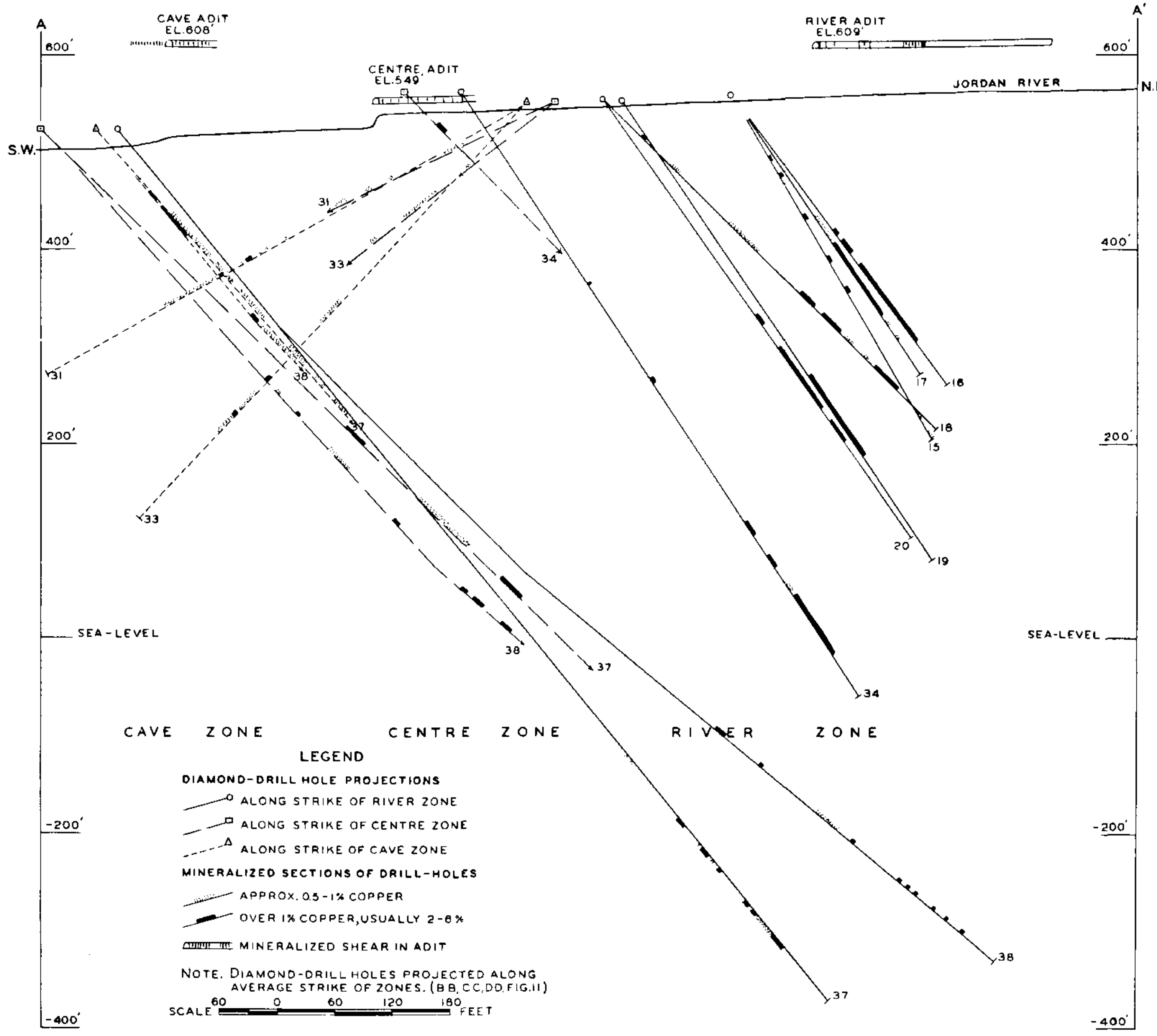


FIG. 12. SUNLOCH-GABBRO. VERTICAL SECTION ALONG A LINE BEARING N 60° E (A-A FIG. 11)

Diabase Dykes.—Many dark-green fine- to medium-grained diabase dykes are well exposed, cutting the gabbro in the canyon. The dykes generally trend northwesterly with the strike of the gabbro, but they vary, and some are almost at right angles to this general northwest trend. They range in width from a fraction of an inch to about 10 feet, but widths about 3 feet are the most common. Finely crystalline to glassy selvages, up to a quarter of an inch thick, may be seen along the walls of most of these dykes. Such selvages are characteristic of the walls of quickly chilled dykes. Under the microscope the rock away from the selvages is seen to possess a typically diabasic texture and to consist principally of plagioclase laths and stout hornblende crystals. No dykes have been definitely recognized in the basalt, but, because of their megascopic similarity to the basalt, they might easily be missed, and as some thin sections of diabasic basalt seen in the drill core are very similar in texture and composition to thin sections of known dykes, it is probable that diabase dykes also occur in the basalt.

Faults.—With the exception of the shear zones themselves, which are in all likelihood faults, there are no outstanding faults near the workings. The sharply incised canyon of the river suggests that it may be along a fault, but no evidence of such a fault has yet been found. Numerous slips and shears up to several inches wide may be seen in the adits, where some appear to offset the ore a few feet. None of these faults contain sulphides.

Ore Deposits

The ore deposits are copper-bearing shear zones in basalt, and are principally along the northeast and southwest contacts of the centre band of gabbro. The basalt for several hundreds of feet from the shear zones has been largely replaced by hornblende, and in the shear zones this hornblendized basalt has been mineralized with chalcopyrite, pyrrhotite, and pyrite. The amount of copper in the zones is variable, and not all the zones carry sufficient copper to be of economic interest. The combined gold and silver in the ore have a value amounting to about 50 cents per ton at prices prevailing in 1950, and small amounts of nickel have been reported in pyrrhotite from some of the zones.

Rock Alteration in and Adjacent to the Ore Zones.—The normal gabbro and basalt in the Jordan River-Sooke area contain only minor amounts of hornblende, and the ferromagnesian mineral is relatively unaltered augite. However, in the gabbro and in the basalt, in and near the mineralized zones, the augite has been largely altered to hornblende, and although one may find occasional relicts of augite in the gabbro, it is rare to find any in the basalt. In the same gabbro the plagioclase is largely unaltered, but in the basalt near the workings, much of the plagioclase has been replaced by hornblende.

Under the microscope the rock from the mineralized zones and near by is seen to consist principally of dark-green to light brownish-green hornblende, the augite and plagioclase having been completely replaced. The degree of alteration is spatially related to the ore zones and reaches its culmination in the completely hornblendized rock of the ore zones. The alteration of plagioclase to hornblende appears to be directly proportional to the intensity of hydrothermal alteration and varies not only across the line of strike of the shear zone but, because of lenticularity in width of shearing, also varies along the strike.

Mineralogy.—The sulphides in the ore zones include chalcopyrite, pyrrhotite, pyrite, and small amounts of molybdenite. Chalcopyrite and pyrrhotite are much more abundant than pyrite. Microscopic laths of cubanite have been noted in some specimens of chalcopyrite, and minute blebs or wisps of pentlandite have been seen in pyrrhotite. Much of the pyrite has a striking colloform texture. This texture is present in specimens taken from the adits and also from deeper parts of the drill-holes; therefore, it is not a result of deposition by surface waters. Consequently, such pyrite may be expected in much of the ore, both near the surface and at depth. A small amount of native copper, as disseminated grains and as a leaf-like coating along short slips, has been seen in core from holes beyond the mineralized zones. Magnetite, in scattered grains, is common not only in the ore zones but also beyond them, and appears to have formed as a rock mineral rather than as a hydrothermal mineral.

The ore-sulphides form a pattern of gash-like veinlets and irregular lenticular masses in the hornblende rock of the shear zones. To the veinlets, which are short and sharp-walled, Young has applied the very appropriate term " crackles."*

Some chalcopyrite veinlets also contain quartz, and from their walls, replacement has proceeded outward so that adjacent stringers coalesce and give rise to irregular masses of replacement sulphide. Where the sulphides are abundant, the associated hornblende rock is likely to be coarser-grained than average. In such places the veinlets of chalcopyrite are often accompanied by a selvage of coarse hornblende crystals about a quarter of an inch long that contrast with the much finer grain of the enclosing hornblende rock. In addition to its occurrence in veinlets and lenses, a small amount of chalcopyrite occurs as disseminated grains. Such chalcopyrite is found throughout a much greater width of shear-zone hornblende-rock than that in which the stringers and lenses of sulphide occur. The amount of copper in the disseminated grains of chalcopyrite is small, and in this particular habit the chalcopyrite is only of mineralogical interest.

The gangue includes, in addition to hornblende, several minerals that occur in small amounts with the sulphides and also form well-defined white stringers, usually only a fraction of an inch wide, both within and beyond the ore zones. Plagioclase is the most abundant mineral in these stringers. The other minerals, listed in decreasing order of abundance, include clinozoisite, chlorite, apatite, calcite, scapolite, and quartz. Small amounts of chalcopyrite are found in some stringers, even beyond the ore zones.

Ore Zones. — Prospecting has disclosed twelve (Fig. 10) zones of chalcopyrite-pyrrhotite mineralization, and although not all contain copper in economic amounts, they will be described under the heading of " Ore Zones." They are within bodies of completely hornblendized rock. The basalt was sheared, perhaps only slightly, but sufficiently to render it susceptible to alteration to hornblende rock and subsequently was further fractured to permit more localized deposition of sulphides. The ore zones grade outward from highly mineralized hornblende to only slightly mineralized rock. The extent to which a shear zone may be ore depends on the number and width of the chalcopyrite-filled fractures and on the amount of massive lenticular chalcopyrite present. Widths of mineralized shear zone, that may be considered ore, range from 3 feet to as much as 100 feet but are usually less than 50 feet. The longer sections of the ore zones, such as along the 400-foot main drift in the River adit, usually range from 1 to 4 feet (Fig. 11).

Four of the twelve ore zones are in basalt close to the northeastern contact of the centre band of gabbro; five are in basalt, close to the southwestern contact of the gabbro; and three are in areas mapped as gabbro. Most of the zones have a general northwesterly trend parallel to the strike of the basalt and the gabbro, but because the ore is cut and displaced by fractures of several different strikes and because the zones have not been fully explored, the trends of the several zones are not all known with certainty.

The ore zones appear to have steep to vertical dips. Deep drilling on the River zone indicates fairly definitely a dip from 70 to 80 degrees southwest, whereas drilling on the Centre and Cave zones suggests more nearly vertical dips for them. Outcrops and drilling on the other zones suggest that they also have steep to vertical dips.

The ore zones from northeast to southwest are those along the northeast contact of the gabbro—River, Centre (Archibald), Cave, and Turnbull; those within the gabbro—Bend, Stewart, and Hornet; those along the southwest contact of the gabbro—Winkler,

* Webster defines "crackles" as "a peculiar cracked surface common in much oriental pottery and porcelain and in some glassware; a condition of the surface of an oil painting, characterized by numerous fine cracks."

Tiger, Yellow Cliff, Robertson, and Caulfield. Three of the zones along the northeast contact—namely, the River, Centre, and Cave—have so far proved to be the most promising. Some drilling has been done on other zones, but most of it has been done and is being continued on the River, Cave, and Centre zones.

River Zone: This zone, at present the most promising of the ore zones, is toward the centre of the Sunloch No. 6 claim. It is in basalt and trends north 30 degrees west, roughly parallel to the northeastern contact of the central band of gabbro and about 1,200 feet from it. As deduced from diamond-drill hole data, this zone appears to dip from 70 to 80 degrees southwest. The zone (Figs. 11 and 12) has been explored by the River adit and by twenty diamond-drill holes—namely, Nos. 2, 3, 7, 8, and 9—drilled prior to 1920, most of them by The Consolidated Mining and Smelting Company, and Nos. 15 to 20, inclusive, Nos. 23 to 25, inclusive, and Nos. 30, 34, 37, and 38 drilled in 1949–50 by Hedley Mascot. Drill-hole No. 39, drilled during the winter of 1950–51, is also directed to intersect the River zone. The zone ranges in width from a foot to about 100 feet and is traceable along its strike for about 1,100 feet. This length includes 520 feet of shear zone followed by the River adit and an additional 570 feet indicated by diamond drilling. An open-cut and diamond drilling indicate that chalcopyrite mineralization extends for at least 200 feet above the River adit. Chalcopyrite mineralization has also been traced to a depth of about 910 feet below the level of the adit by drill-hole intersections that are 150 feet northwesterly from the portal of the adit. This gives a total traced depth of 1,110 feet for chalcopyrite mineralization in the River zone.

Cave Zone: This zone (Figs. 11 and 12) is toward the southwestern corner of the Sunloch No. 6 claim, about 700 feet southwesterly from the River zone. It trends north 40 degrees west and contains widely spaced stringers and lenses of chalcopyrite over a width of about 130 feet. This widely scattered type of mineralization has been traced by the Cave adit for about 500 feet and further extended by drilling for about 120 feet northwesterly from the portal of the adit. Little is known of its vertical extent, but Drill-hole No. 33 intersected chalcopyrite mineralization 200 feet below the level of the adit and Drill-hole No. 37 intersected mineralization under the river 250 feet below the adit. The length now indicated, including the exposures in the Cave adit and intersections in drill-holes under the river, is about 600 feet. However, a northwesterly trending line of old open-cuts and trenches that extends for 500 feet northwesterly from the southeastern corner of the Vulcan No. 6 claim exposes chalcopyrite mineralization that is possibly on the projected northwest extension of the Cave zone and would therefore extend the zone another 900 feet to give a traceable length of 1,500 feet. These workings were dug prior to 1920 and are now badly overgrown and sloughed, and the mineralization only difficultly recognizable. However, some cuts do expose rather abundant chalcopyrite mineralization. Hedley Mascot drilled Holes No. 21 and Nos. 26 to 28, inclusive, to intersect the downward extension of mineralization in the cuts but did not intersect encouraging copper mineralization.

Centre (Archibald) Zone: This zone (Figs. 11 and 12) is on the Sunloch No. 6 claim, 300 feet southeasterly from the River zone. It strikes north 70 degrees west, diagonally to the adjacent River and Cave zones; like the Cave zone, it appears to be vertical. The Centre zone may include a band of mineralization, referred to as the Gordon, that is 50 feet northeasterly from the main locus of mineralization. The Centre zone has been crosscut by the Centre adit, and has been followed by a drift, 100 feet long, in the River adit. It has also been intersected by diamond-drill holes Nos. 31, 33, 37, and 38. As seen in the Centre adit, the zone consists of a 120-foot width of widely spaced stringers of chalcopyrite. As seen in the crosscut and drift in the River adit, the zone has been mineralized by abundant chalcopyrite over a maximum width of 4 feet for a length of about 50 feet. The traced length of chalcopyrite mineralization in this zone, as measured from the Centre adit to the crosscut and drift in the River adit, is

660 feet, and the depth as measured from the Centre adit to the intersection in Drill-hole No. 38 is 320 feet.

Turnbull Zone: This zone is on the Vulcan Nos. 5 and 6 claims. It is reported to have been exposed for about 700 feet in a northwesterly trending line of open-cuts and trenches, about 150 feet southwesterly from the line of old trenches at the northwest end of the Cave zone. The cuts on the Turnbull zone were also dug prior to 1920 and are now completely overgrown and sloughed in and quite unrecognizable. A plan dated 1921 shows assay widths and values in these cuts that range from 0.36 per cent copper over 16.5 feet to 0.75 per cent copper over 6.3 feet. Hedley Mascot drilled four holes—Nos. 21, 22, 26, and 27—to intersect the downward extension of this zone, but failed to find encouraging mineralization.

Bend Zone: This zone is exposed on the north bank of the river about 200 feet downstream from the mouth of Robertson Creek. Unlike most of the other zones, it is within an area mapped as gabbro and appears to strike north 65 degrees east. This zone was found in 1949 by Hedley Mascot, who drilled Hole No. X-6 (Fig. 10) to intersect its downward extension at the river's edge. It is reported that the hole had intersected encouraging chalcopyrite mineralization before the ground became too difficult to drill with the light machine that was being used. The mineralization in this zone is traceable for 200 feet on the surface and to a depth of 40 feet.

Stewart Zone: This zone is on the Vulcan No. 3 claim on the southeast side of the river and canyon; it is about 2,000 feet southerly from the Cave zone. The work on this zone consists of several open-cuts and strippings dug about 1922. These workings are less overgrown than those on the northwestern side of the river, and the mineralization is more readily seen. No drilling has been done on this zone. The mineralization consists of moderate amounts of pyrrhotite and lesser amounts of chalcopyrite, over a width of 30 feet, and is traceable northerly in cuts for about 250 feet. The length as at present traceable in the cuts is about 250 feet in a northerly direction. Although these workings are in an area mapped as underlain by gabbro, they are in hornblende rock that is similar to that accompanying the shear zones in basalt beyond the gabbro, and it may be that the Stewart zone, like most of the other zones, is in an area of basalt.

Hornet Zone: This zone is near the northwest corner of the Black Hornet claim and has been prospected by some old strippings and a 12-foot adit dug about 1920 in the banks of Sinn Fein Creek about 1,700 feet upstream from the mouth of the creek. No diamond drilling has been done on the zone. It is close to the southwestern contact of the gabbro band but appears to be well within the general area of gabbro. However, the mineralization is in hornblende rock similar to that derived from basalt, and it may therefore be part of an inclusion or embayment of altered basalt within the gabbro. A moderate amount of chalcopyrite was seen in stringers in one open-cut and in the adit.

Southwest Contact of the Gabbro: The Winkler, Tiger, Yellow Cliff, Robertson, and Caulfield zones are in basalt. They are close to and trend along the southwest contact of the central band of gabbro. These zones were originally prospected by surface workings, but some of them have been recently diamond drilled by Hedley Mascot. The copper mineralization disclosed so far has not proved economic, and work on the showings has been suspended for the present.

Winkler Zone: This zone, about 10 feet wide, is on the Vulcan No. 2 claim, about 2,500 feet southwesterly from the Cave zone. It has been prospected by an adit 83 feet long on the east or upper side of the old railway grade and by two strippings about 50 feet below the grade; this work was done about 1920. In 1929 British Metals Corporation drilled a hole below the railway grade that intersected chalcopyrite mineralization in a short section about 100 feet below the level of the adit. In 1949 Hole No. X-5 (Fig. 10), drilled from the southeast bank of the river, intersected chalcopyrite mineralization at 40 feet. Although the position of this mineralization, 175 feet below and 320 feet northwesterly from the adit, is not quite along the strike as projected from the adit and strippings, nevertheless it may be along the downward extension of the Winkler zone.

Tiger Zone: This zone is on the Tiger claim, about 400 feet southwesterly from the Winkler zone. It has been prospected by strippings that extend intermittently from the railway grade northwesterly down to the river. Chalcopyrite mineralization belonging to this zone has been intersected in Holes Nos. 35 and 36 (Fig. 10) drilled by Hedley Mascot. The mineralized zone ranges in width from a few feet to 20 feet. Its traceable length is about 300 feet and its traced vertical extent, as measured from the railway grade to the intersections in Holes Nos. 35 and 36, is about 360 feet.

Yellow Cliff Zone: This zone, trend northwesterly, crosses the boundary between the Black Hornet and Tiger claims near the south bank of the river. It has been traced for 120 feet by pits dug by Hedley Mascot in 1949. The pits expose mineralization over a width of 8 feet. Although no drilling has been done on this zone, it appears to be one of the most promising of those along the southwestern contact of the gabbro.

Robertson Zone: This zone, not seen by the writer, is reported to trend northerly close to the line between the Black Hornet and Hornet Fraction claims. The only working reported to be on it is an open-cut, now completely overgrown, on the north bank of the river. The zone is reported to be about 12 feet wide in this cut.

Caulfield Zone: This zone is in the southeastern corner of the Black Hornet claim, directly across the river from the Yellow Cliff zone. It was prospected about 1920 by a small amount of stripping that is now badly overgrown. In 1949 Hedley Mascot drilled four short X-ray holes, Nos. X-1 to X-4, inclusive (Fig. 10), but the difficulty of finding suitable set-ups for the drill militated against obtaining conclusive results. It has been suggested that exposures of copper mineralization in the bed of Sinn Fein Creek, about half-way along the west boundary of the Black Hornet claim, may be the northwesterly continuation of the Caulfield zone. The Sinn Fein exposures are about 1,200 feet from those on the river.

Ore Tonnages

Development up to the present time, particularly the 1949–50 diamond drilling done by Hedley Mascot, has indicated ore of commercial widths and grades in the River zone below the river. By that drilling the company has outlined a composite block, consisting of three smaller blocks, measuring from 150 to 300 feet in length, from 75 to 100 feet in width, and extending to a depth of about 850 feet below the river. They estimate that these blocks may contain about 600,000 tons of ore of milling grade, containing copper and a little gold.

Deep drilling done by the company across the Centre and Cave zones suggests that below the river these zones may also contain considerable additional tonnage, but of somewhat lower grade than the ore in the River zone.

Biogeochemical Studies

Because of the widespread interest in the application of biogeochemistry in prospecting for base metals, the writer made limited biogeochemical studies on the Sunloch-Gabbro properties in the summer of 1950. The general technique of biogeochemical prospecting is based on the quantitative determination of minor or trace elements in plant or tree growth. The method used is a colorimetric, dithizone neutral mixed-colour-end-point method, as described by Warren and Delavault (1949, p. 538) and by White (1950, pp. 368, 369). For the work at Jordan River, equipment and procedures used were similar to those described by White (1950, p. 369).

The writer and one assistant spent about one week in August, 1950, collecting tree samples on the Sunloch and Gabbro properties. The work was entirely exploratory, and no attempt was made to make a comprehensive coverage of the properties. However, the results obtained did demonstrate the value of the method, in that the trees sampled indicated the presence or absence of copper mineralization in the underlying bedrock.

The tree cover on the ground near the Sunloch and Gabbro workings is extremely variable. On the canyon slopes above the railway grade, the trees are principally large hemlocks, 1 to 2½ feet in diameter at the base and several tens of feet tall. These trees lack branches that can be reached from the ground. Smaller trees are practically absent. It was therefore impossible to collect samples in such areas. However, because suitable trees are abundant along the two old railway grades, one connecting the River adit with the Cave adit and the other extending about a mile downstream from the Cave adit, this belt was selected for sampling. Although this belt is narrow, it has the advantage of crossing the local structure, and it includes the principal mineralized shear zones and the intervening unmineralized rock.

The soil along this " traverse line " is thin and consists principally of black muck a few inches deep. Glacial drift is found only as a few scattered pockets in protected depressions.

As the soil cover is thin, many of the tree roots extend completely through it into crevices in the underlying rocks. Therefore, one would expect the source of the metals in the tree growth, drawn from the soil and surface water in the soil or crevices in the underlying bedrock, to be extremely local. This appears to be so because high results were obtained from trees found only a few feet from trees giving low results.

As trees measuring from 2 to 4 inches at the base are abundant along the railway grades, this size-range was selected for sampling. For purposes of comparison and also as a check on the sampling, it was decided wherever possible to collect samples from a balsam and from a hemlock adjacent to it. Such a sample-pair included two trees no more than 5 feet apart; the results obtained indicate that this was a safe distance. The pair was given a number, the balsam being designated by "A" and the hemlock by " B " (e.g., 3A and 3B). The same number of twigs was taken from each tree and from about the same relative positions on each tree. The branches from which the twigs were broken were spaced completely around the tree and from 4 to 6 feet above the ground. Only the growth of the previous two years, as shown by nodes on the twigs, was taken.

Each sample consisted of about thirty twigs stripped of their needles and weighed about 5 grams before ashing. The analyses were made the same day the twigs were collected, and the results calculated to parts per million (p.p.m.) of fresh undried samples. The reagents used and the procedure followed are as detailed by White (1950, p. 369).

Forty-nine sample-pairs were taken, and the amounts of copper and zinc, in parts per million (p.p.m.) of fresh twigs, were determined, and copper:zinc ratios calculated for each sample. This information is summarized in the table on page 185, and the approximate position of each sample-pair is indicated in Figure 10. In the table the samples are grouped according to the mineralized zone, or unmineralized rock, over which they were taken.

A study of the table indicates that the metal values and the copper:zinc ratios are higher in groups of samples taken over the mineralized shear zones than in groups of samples taken over the intervening unmineralized rock.

The tree samples from the River zone contained less copper and zinc than those from the other zones. The writer ascribes this condition to the many bare rock bluffs and the thinness of the soil in which the only trees available for sampling on the zone were found to be growing. Samples taken from the Centre, Cave, Winkler, and Tiger zones showed higher than average metal values and copper:zinc ratios. Samples from the intervening greenstone and gabbro showed on the whole lower values and ratios than those in the mineralized zones.

Within any one group, individual samples may differ widely from the average for the group. Sample No. 18, in a group of samples taken from a section of unmineralized greenstone, is higher than the average for its group; at this sample point, it is possible that the trees may have been growing above a minor shear carrying disseminated chalcopyrite.

The high values in Sample No. 28 are difficult to explain. The trees sampled were larger than average, 8 inches at their base, and grew at the edge of a gravel pit, about 15 feet deep, half a mile from any known ore zone. Rock outcrops are entirely absent in this area, and underlying geology is unknown. It is possible that these higher than average metal values reflect an underlying orebody, but it is also possible that the higher values may be due to either the larger size of the trees as compared to those sampled along the old railway grade, or to the considerable depth of glacial material in which they were growing. Because of these differences in tree size and overburden, the values in Sample No. 28 should not be compared with those in the other samples in the table. The sampling of trees of similar size and growing in similar overburden should be extended in several directions from the gravel pit to determine whether the values of Sample No. 28 are anomalous or quite general for the area.

An interesting feature of the results is the close correspondence between the variation in metal content of adjacent balsam and hemlock.

Although it was not possible to grid-sample a large area on the Sunloch and Gabbro properties, sampling along a traverse, which crosses the principal mineralized shear zones and intervening on mineralized rock, has shown that the metal content of the trees reflects the presence or absence of important mineralization in the underlying bedrock. For the biogeochemical method to be of value in prospecting for extensions of ore zones on these properties, a type of plant growth that is uniformly distributed over the whole area to be prospected should be selected. The writer would suggest that the following tree or plant growth might be used: The bark of large hemlock-trees, a core obtained by boring into the trunks of large hemlock, or the leaves of the shrub salal (*Gaultheria shallon*). Unfortunately, wood and dead bark of trees have not proved too suitable elsewhere (Warren and Delavault, 1949, p. 541). Although the variation in metal content of salal leaves is at present unknown, the writer would suggest that, because it is so common in the coastal regions of the Province, some exploratory geochemical studies should be made using this shrub.

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Placer-mining

CONTENTS

INTRODUCTION

The 1950 season was extremely dry throughout the various placer-mining areas. Because of the early, rapid run-off, all hydraulic operations had a very short working season and no fall run. Only two dragline dredges were operating, in contrast to seven in 1949. Because of these two factors the placer-gold production would have been very greatly reduced were it not for the extremely successful year's operation by Noland Mines Limited in Atlin. This mine contributed largely in raising the annual placer-gold production to approximately the same amount as was recovered in 1949.

ATLIN*

Spruce Creek (59° 133° N.W.)

Noland Mines Limited

Company office, Royal Bank Building, Vancouver; mine office, Atlin. W. B. Milner, president; L. G. White, manager. The Noland camp is at the junction of Dominion and Spruce Creeks, 12 miles by motor-road east of Atlin. The company has acquired seventeen ordinary placer leases and two special placer leases on Spruce Creek. The Noland mine is an underground drift placer. From the shafts, two nearly parallel drifts are driven upstream in the pay channel. Crosscuts divide the area between the drifts into mineable blocks. In 1950 the drifts were advanced beyond the old workings to a point about 3,000 feet from the Eastman shaft. The channel was developed for 850 feet of length by an average width of about 150 feet. The gold-bearing gravel is trammed to the shaft, hoisted by skip, and run through a trommel and sluice-boxes.

Summary of Mine Production

	Cubic Yards Excavated	Per Cent of Total
Safety drives, ventilation, and haulage	2,923	20.5
Pillar development	6,218	43.7
Pillar extraction	5,077	35.6
Mine clean-up	23	0.2
Totals	14,241	100.0

Gravel mined and hoisted: 14,241 cubic yards. Contents: Gold, 8,252 fine oz.; silver, 1,334 fine oz. Gross value, $313,674. Average recovered grade, $22.02 per cubic yard washed. In addition, 14,744 cubic yards of stockpiled tailings were washed. Contents: Gold, 810 fine oz.; silver, 129 fine oz. Gross value, $31,168.

The hydro-electric plant, capacity 600 kilowatts, on Pine Creek, was purchased by the company, and a transmission-line 3½ miles long was strung to the mine. The change-over from diesel-electric to hydro-electric power was made in September, 1950. About sixty men were employed.

Joker, Poker, and Croker Leases

These leases were worked by V. A. Brister and his son Jack on a lay from the Isaac Mathews estate. The property is on Spruce Creek, about 8 miles by road from Atlin. Entry to the workings is by a short incline shaft to bedrock. Gravel is won by drift mining and is hoisted to the surface and sluiced. In 1950 water for the sluice-boxes was obtained from a new pipe-line which was run from the outlet of the Noland drain to the shaft collar.

Boulder Creek (59° 133° N.E.)

Boulder Creek Placers

Norman Fisher and associates operated the Boulder Creek Placers under lease from The Consolidated Mining and Smelting Company of Canada, Limited. The workings are about 3 miles by road above Surprise Lake and about half a mile below the dam on Boulder Creek. Each year as the monitors are moved upstream nearer the dam, the hydraulic head is lowered. At the present rate, in which two pits are cleaned-up each season, the limit of efficient operation will be reached in another two years.

The partners report that the recovery of gold for the 1950 season was "about average." In addition to the gold, the sluice-boxes yielded 2 tons of black sand. The black sand from Boulder Creek contains tungsten and tin, probably as wolframite and

* By F. J. Hemsworth.

cassiterite. Next season the partners intend to install an undercurrent sluice to recover more black-sand concentrate.

Otter Creek (59° 133° N.E.)

Annual assessment work was done on Otter Creek by a crew of four men under the direction of Neil Forbes. The work was financed by the Walter Johnson Company, of San Francisco, agents for Compagnie Française des Mines d'Or du Canada. Three test-holes were drilled with a 6-inch Keystone drill. The drill was set up on the east bank of Otter Creek, about 1 mile above Surprise Lake. At this point, bedrock was found to be 140 feet deep.

McKee Creek (59° 133° S.W.)

Lucky Strike Lease

Oscar Swanson and George Watt, with three employees, worked this ground on a lay from Mrs. J. M. Adams. This is an hydraulic operation and consequently is dependent on a sufficient supply of water. Due to a late, dry spring, there was a shortage of water, and during the 1950 season the monitors were operated only a few hours each day. Considerable dead work was done in preparation for next season.

Ruth and Leftover Leases.—Louis and Joe Piccola continued drift mining on the south side of McKee Creek. A new adit was driven to explore under ground previously hydraulicked by George Adams.

McKee Creek.—Bruce Morton worked a lay on the north side of McKee Creek. One 3-inch monitor was used to wash gravel into sluice-boxes. A hand-winch derrick was rigged to move the larger boulders.

STIKINE*

McDame Creek (59° 129° S.E.)

Moccasin Mines Ltd.

Company office, 5261 Stockton Boulevard, Sacramento, Calif. R. C. Henrici, manager. Because of the poor recovery of gold in 1949, the company officials decided to close the operation. No dredging was done on McDame Creek during 1950, and the dragline and washing plant were dismantled preparatory to hauling them to the Alaska Highway during the winter freeze-up.

SKEENA RIVER*

Kleanza Creek (54° 128° N.E.)

L. H. Elder, with one helper, worked on Placer-mining Lease No. 1359 on Kleanza (Gold) Creek, about 4 miles above its junction with the Skeena River. A trail from the main highway follows the north bank of the creek for 3 miles and a branch trail leads down to the creek workings. Water from a side creek is carried through 1,800 feet of 2½-inch fabric fire-hose to operate a 1-inch monitor and a home-made hydraulic lift. Gravel is washed through sluice-boxes floored with pole riffles.

Lorne Creek (54° 128° N.E.)

Messrs. Warren and Jones worked on Placer-mining Lease No. 371 near the mouth of Lorne Creek. A dragline was used to excavate gravel lying on hardpan bedrock.

John Sikora and Oscar Nelson worked Placer-mining Lease No. 1319 on Lorne Creek, about 3 miles upstream from the road. A small monitor was used to wash gravel into sluice-boxes.

* By F. J. Hemsworth.

CARIBOO*

HIXON CREEK

Hixon Placers Inc. (53° 122° S.W.) Company office, 1905 Second Avenue, Seattle 1, Wash. H. W. Hargood, president; C. J. Norris, superintendent. This property, 3 miles east of the Cariboo Highway at Hixon, is held under option from B. Briscoe, of Vancouver. In 1950, 250,000 cubic yards of overburden (clay and gravel) was ground-sluiced and hydraulicked from the south bank of Hixon Creek in an attempt to uncover what is believed to be an ancient channel of the creek. In order to provide an adequate water-supply for this operation, a ½-cubic-yard Speeder-Crawler diesel shovel has been purchased to dig three-quarters of a mile of ditch which, when completed, will be 10 feet wide and 4 feet deep.

The number of men employed between May 1st and November 21st averaged eight.

T. Sumpner.—T. Sumpner, of Hixon, is reported to have operated a suction dredge for a short period on the west side of the Fraser River, 3 miles below Canyon Creek.

AHBAU LAKE (53° 122° S.E.)

Zenda Gold Mining (Canada) Limited About 12½ square miles of placer leases on Ahbau and Lodi Lakes was transferred from Twentieth Exploration Limited to Taylor Mining Company and then purchased later by Zenda Gold Mining (Canada) Limited, of Las Vegas, Nevada. Six men were employed for a short period to test these leases. Further purchases by the company include 4 miles of leases on Sovereign Creek; six claims at Longbar on the Fraser River, 8 miles north of Quesnel; and 4 miles of leases at Darkwater on the Parsnip River. In addition, the draglines and washing plants formerly owned and operated by American Gold Fields and Beavermouth Dredging Company Limited were purchased.

WILLOW RIVER (53° 121° S.W.)

Mink Gulch.—T. Richards hydraulicked 500 cubic yards of gravel on Mink Gulch, a tributary of upper Williams Creek.

Conklin Gulch.—J. J. Gunn and one helper hydraulicked 4,000 cubic yards of gravel on Williams Creek above the mouth of Conklin Gulch.

Summit Mines Ltd.—A crew of five men under the supervision of R. H. Wallace completed nineteen Keystone-drill test-holes on Williams Creek near the Bear Lake road.

Queen of Clubs Creek.—R. Taylor sluiced 400 cubic yards of gravel on Queen of Clubs Creek.

Jack of Clubs Lake.—J. V. Englund sluiced 200 cubic yards of gravel on the south shore of Jack of Clubs Lake.

Lowhee Gulch.—O. K. Nason and four partners hydraulicked 40,000 cubic yards of gravel. An inadequate water-supply hampered operations all season.

Dragon Creek.—W. Niemi and three partners hydraulicked 20,000 cubic yards of gravel on Dragon Creek, on property leased from R. H. McDougall.

Ketch Placers.—R. H. McDougall and a crew of two men hydraulicked 25,000 cubic yards of gravel at the north end of the Devil's Canyon channel which cuts across the Burns Creek pit.

Devil's Canyon.—E. Rask hydraulicked 3,000 cubic yards of gravel on the east bank and at the headwaters of Devil's Lake Creek.

L. Bedford and one man hydraulicked 2,500 cubic yards of gravel on the Barton lease on the west rim of Devil's Canyon.

* By J. E. Merrett.

Coulter Creek.—J. M. Chouse and partner mined 190 cubic yards of gravel from an exploration drift on Coulter Creek.

I. Andracki drove a total of 60 feet of exploratory drift on two leases on Coulter Creek.

Slough Creek.—W. M. Hong and three partners, working on a percentage basis, hydraulicked 40,000 cubic yards of gravel from the Slough Creek benches near Nelson Creek.

Burt-St. Louis Placers.—A crew of three men supervised by A. St. Louis hydraulicked 5,000 cubic yards of gravel on New Creek.

Slade Creek.—Five hundred cubic yards of gravel was hydraulicked and sluiced on Slade Creek, a tributary of Tregillus Creek, on ground owned by Fook Chung and W. E. North.

Hyde Creek.—P. McColm hydraulicked 750 cubic yards of gravel near Hyde Creek on the bench lease owned by Dr. O. R. Hougen, of Vancouver.

Beaver Channels Limited.—Three men under the supervision of K. K. Langford hydraulicked 85,000 cubic yards of gravel on ground held by Beaver Channels Limited in the Aura Fina and Phantom pits, approximately a quarter of a mile south of Aura Fina Creek. This work removed overburden in order to expose gold-bearing channels.

Aura Fina Creek.—J. H. Freyer hydraulicked 500 cubic yards of gravel on Aura Fina Creek.

Pundata Creek.—T. S. Pierce sluiced 250 cubic yards of gravel on Pundata Creek. The gold recovered included a well-rounded and flattened nugget weighing 1 ounce.

Eight Mile Lake.—Maurice Anderson hydraulicked 420 cubic yards of gravel near Eight Mile Lake.

Coffee Creek.—N. Scott sank 50 feet of shaft on a lease on Coffee Creek.

Two-bit Creek.—T. Dunlop hydraulicked 200 cubic yards of gravel on Two-bit Creek.

Cooper Creek.—A. W. Frankish, of Calgary, hydraulicked 5,000 cubic yards of gravel on Cooper Creek.

Antler Creek (53° 121° S.E.)

Upper Antler Creek.—A. Holm and T. Peterson hydraulicked 1,400 cubic yards of gravel on Upper Antler Creek.

Antler Creek.—George Milbourne hydraulicked 1,000 cubic yards of gravel at the junction of Empire and Antler Creeks.

Wolfe Creek.—E. S. Dowsett hydraulicked 300 cubic yards of gravel on Wolfe Creek.

French Creek Hydraulic Placers Limited.—Company office, Room 70, 718 Granville Street, Vancouver. A crew of two men under the supervision of R. N. Van Bibber hydraulicked 5,500 cubic yards of gravel on French Creek. In addition, a drill crew operated by Yuba Consolidated Goldfields of California drill-tested ground on French Creek owned by the French Creek company.

Canadian Creek.—A. McGuire completed 70 feet of timbered drift and sluiced 130 cubic yards of gravel on Canadian Creek.

J. Holland and D. S. Ross hydraulicked 3,000 cubic yards of gravel on Canadian Creek.

Grouse Creek.—N. P. Gaines sank 40 feet of shaft on his lease on Grouse Creek.

Antler Mountain Gold Limited.—A. W. Ludditt and a crew of two men hydraulicked 2,500 cubic yards of gravel on Grouse Creek.

Murray Creek.—J. Keiler sluiced 1,000 cubic yards of gravel on Murray Creek.

Shepherd Creek.—R. D. Rees hydraulicked 1,000 cubic yards of gravel on Shepherd Creek, a tributary of Summit Creek.

Cunningham Creek (52° 121° N.E.)

Cunningham Creek.—W. Beamish and partner hydraulicked 7,000 cubic yards of gravel on Cunningham Creek approximately 6 miles below Cariboo Hudson mine.

Peter Gulch Creek.—K. Martinson and P. Edberge hydraulicked 5,000 cubic yards of gravel on Peter Gulch Creek just above its junction with Cunningham Creek.

Lightning Creek (53° 121° S.W.)

Lightning Creek.—L. Biggs completed 70 feet of prospect drifting on Lightning Creek near Houseman Creek.

H. D. Hadlund hydraulicked 12,000 cubic yards of gravel on two leases on Lightning Creek upstream from Amador Creek.

Interior Development Co. Ltd.—H. D. Hadlund hydraulicked 20,000 cubic yards of gravel on Amador Creek on property leased from Bowman Mines Limited.

Perkins Creek.—C. A. Ritchie, in partnership with W. L. Sebolt, of Wells, scraped and sluiced 10,000 cubic yards of gravel at the head of Perkins Creek.

Grub Gulch.—Ennerdale Placers, operated by F. W. Freeman and J. Hind, hydraulicked 5,000 cubic yards of gravel.

Last Chance Creek.—A. Brown, of Stanley, continued prospect drifting on the 75-foot level of his underground placer workings between Last Chance and Lightning Creeks. One hundred and eighty cubic yards of gravel was washed.

Anderson Creek.—E. M. Falck hydraulicked 400 cubic yards of gravel.

Donovan Creek.—Rottacker Placers, operated by H. Rottacker and a crew of two men, hydraulicked 25,000 cubic yards of gravel.

Campbell Creek.—E. M. Johnson hydraulicked 1,000 cubic yards of gravel.

Wingdam Creek.—E. Ernst sluiced 250 cubic yards of gravel.

Angus Creek.—S. Papp and S. Radencik installed hydraulic equipment on Angus Creek.

Trebor Placer Exploration Ltd.—Company office, 103 Royal Trust Building, Vancouver. R. D. Mueller, president and manager. The dragline dredge continued working downstream on Lightning Creek from a point a quarter of a mile east of Gagen Creek road, off the Quesnel–Barkerville road. During 1950, 80,000 cubic yards of gravel was washed. A crew of eleven men was employed. This operation closed in August, and the equipment was dismantled and stored.

Cottonwood River (52° 122° N.E. and 53° 122° S.E.)

Swift River.—H. Luff sluiced 316 cubic yards of gravel.

A. P. and S. Company.—Company office, 375 Fifteenth Street, Oakland, Calif.; mine office, Quesnel. H. W. Purkerson, manager. This company optioned ground in the vicinity of Umity Creek on the Cottonwood River from W. Jones, of Quesnel, and R. A. Nienaber, of Seattle, Wash. A small washing plant and a 3-cubic-yard dragline were installed. In 1950 a crew of ten men washed 9,500 cubic yards of gravel.

Quesnel River Area

Quesnel River.—(52° 121° N.W.) Leo LaHaye, of Quesnel Forks, sluiced 1,000 cubic yards of gravel at the Horseshoe Bend on the Quesnel River.

Morehead Creek.—(52° 121° N.W.) F. Jacobie, of Quesnel Forks, and H. C. Webber, of 475 Howe Street, Vancouver, employed a crew of three men who drifted and sluiced 10,000 cubic yards of gravel on Morehead Creek.

Lawless Creek Mining Company.—(52° 121° N.W.) Clifford V. Landon, of Seattle, Wash., and a crew of seven men hydraulicked 40,000 cubic yards of gravel on

Lawless Creek. Work completed in 1950 disclosed an ancient channel of the Quesnel River approximately 200 feet north of the present channel.

A new road was constructed from the Quesnel Forks road to a dam at the outlet of Rosette Lake.

Spring Creek.—(52° 121° N.W.) F. Fredericks, of Likely, sluiced 300 cubic yards of gravel on Spring Creek.

Likely.—(52° 121° N.W.) A. Carbillet, of Likely, sluiced 1,000 cubic yards of gravel on a bench lease near Likely.

Cedar Creek.—(52° 121° N.W.) S. G. McLean, of the McLean Construction Company, of Ashcroft, in partnership with N. Evans-Atkinson, of Likely, working the latter's leases on lower Cedar Creek, constructed 1½ miles of road and installed sluice-boxes in Cedar Creek canyon. A further 1½ miles of cuts were made with a bulldozer in order to test the ground. A crew of four men was employed.

Cariboo Metals Limited

(52° 121° N.E.) Company office, 379 Coleman Building, Seattle, Wash.; mine office, Likely P.O. This private company, managed by Alvo von Alvensleben, employed a crew of seven men from May 29th to October 30th on a group of eight leases on a bench south of Cedar Creek. The dry-land washing plant, installed in 1949, was abandoned, and the gold-bearing gravels were trucked to a sluice installed on the side of the bench. Water was elevated 125 feet to the sluice-box by pump from Cedar Creek.

During 1950, 72,000 cubic yards of gravel was removed with a 1½-cubic-yard Marion dragline. Of this total, 40,000 cubic yards was barren gravel, which was side-piled. The remaining 32,000 cubic yards was transported half a mile by three trucks to the sluice-box.

Big Canyon.—(52° 122° N.E.) T. W. Corless and two partners sluiced 1,000 cubic yards of gravel on two leases near Big Canyon on the Quesnel River. A bull-dozer was used to remove 5 feet of overburden from the gold-bearing gravel, which in turn was pushed to the sluice.

North American Goldfields Limited.—(52° 122° N.E.) Company office, 513 Royal Bank Building, Vancouver. G. A. Collins, president. Capital: 2,000,000 shares, 50 cents par value. Yuba Consolidated Goldfields of California drill-tested, with option to purchase, ground owned by this company upstream from French Flat on the Quesnel River. The option was not exercised.

Quesnel Forks Placers Incorporated.—(52° 121° N.W.) J. R. Foster, manager; H. Neilsen, superintendent. This company, financed by American capital, has optioned H. Neilsen's lease on Kangaroo Creek. In 1950 a concrete storage dam, 60 feet wide and 20 feet high, was erected on Kangaroo Creek approximately 1 mile upstream from Cariboo River. In addition, 3,400 feet of pipe, varying in diameter from 40 to 18 inches, was installed. From six to eleven men were employed.

Cariboo River.—(52° 121° N.W.) A. Anderson sluiced 2,500 cubic yards of gravel on the west bank of Cariboo River, 3 miles below its junction with Spanish Creek.

Keithley Creek (52° 121° N.E.)

Four Mile Creek.—Five thousand cubic yards of gravel was sluiced on leases owned by J. Chester on Four Mile Creek, a tributary of Keithley Creek.

Weaver Creek.—H. Asserlind and V. E. Johnson extended the west incline an additional 11 feet on their property just below the junction of Weaver and Keithley Creeks. The inclined slope now extends 47 feet from the main drift.

Barr Creek.—(52° 121° N.W.) W. M. Cudworth, of Penticton, hydraulicked 3,000 cubic yards of gravel on Barr Creek at the divide between Snowshoe Creek and Swift River.

Upper Keithley Creek.—A. E. McGregor and G. A. Goldsmith, working on their leases between Honest John and Donaldson Creeks, retimbered the collapsed drift which they had completed in 1949. This drift was extended a further 36 feet. In 1950, 2,000 cubic yards of gravel was hydraulicked.

Cariboo Keithley Gold Placers Limited.—Company office, c/o M. Anderson, 3850 Parker Street, Vancouver. K. C. F. Monckton, superintendent. A ¾-cubic-yard slack-line dragline was installed on the bank of French Snowshoe Creek, three-quarters of a mile above the Yanks Peak road bridge over French Snowshoe Creek. The purpose of the dragline is to draw gravel to the grizzly on the sluice-hopper. Fifteen hundred cubic yards of gravel was washed by a crew of three men.

LILLOOET (50° 121° N.W.)*

Fraser River

Horsebeef Placers.—(50° 121° N.E.) A. C. Hutton and associates installed a high line and scraper on the Fraser River at Horsebeef Bar, 3 miles downstream from Lillooet. A grizzly screen, feed hopper, and sluices were installed below high-water level on Horsebeef Bar. Late in November unseasonal high water washed away this construction. During operations 100 cubic yards of gravel was washed by a crew of two men.

Bridge River

Yalakom Placers Limited.—(50° 121° N.W.) G. Haycock, of Lillooet, sluiced 2,000 cubic yards of gravel on the Bridge River near Moha. A dragline was used to scrape the gravel from the river bottom.

Hurley River.—(50° 122° N.W.) Three men completed 200 feet of drift and sluiced 260 cubic yards of gravel on Hurley River near Gold Bridge on leases held by W. Haylmore.

McGillivray Creek.—(50° 122° N.E.) Mrs. L. Weeden sluiced 95 cubic yards of gravel on a lease on McGillivray Creek.

LYTTON (50° 121° S.W.)*

Kanaka Bar

E. Fox, H. Haywood, and S. Speer, of Vancouver, optioned the suction dredge owned by International Gold Master Mining Ltd. at Kanaka Bar on the Fraser River, 2 miles south of Siska. The dredge has a 4-inch intake and operates at 25 pounds vacuum for suction. In December a crew of two men and E. Fox were redesigning the plant layout.

PRINCETON (49° 120° S.W.)†

Atkinson Dredging Company Limited

Registered office, 902 Rogers Building, Vancouver. James W. Boothe, president. After overhauling the equipment, this company resumed gold-dredging operations early in May on the Similkameen River at the point where operations were suspended at the end of the 1949 season. Dredging proceeded upstream to a point about 1,000 feet west of the confluence of the Tulameen and Similkameen Rivers. Work was discontinued late in November, when there was some dispute with the Indian Department as to whether or not dredging had trespassed on the Vermilion Forks No. 1 Indian Reserve.

The dredge consists of a diesel-driven Bodinson-type washing plant having a rated capacity of 5,000 cubic yards per day and equipped with Pan American jigs for gold

* By J. E. Merrett.
† By E. R. Hughes.

recovery. The dragline shovel is a Lima 1201 with an adjustable 70- to 90-foot boom and a 3-cubic-yard Esco bucket.

Dredging was continuous during the five months of active operation. Thirteen men were employed. Production recorded: Gravel washed, approximately 150,000 cubic yards. Metal recovered: Gold (crude), 727 oz.; platinum, 111 oz.

Tulameen Dredging Company Limited

Thomas M. Gerety, president and general manager. This company rebuilt its suction-type dredge on the Tulameen River approximately 1,000 feet east of the highway bridge at Princeton. An unexpected flash flood caused by unusually heavy rains on November 26th, 1949, had carried the dredge downstream, where it was broken up on the rocks and wrecked. After the dredge had been rebuilt, preliminary dredging operations were begun on September 18th, 1950. However, due to low water, the operators decided against continuing work, and the dredge was pulled ashore on Allison Flats after only a few days of active dredging. Three men were employed.

TULAMEEN (49° 120° N.W.)*

Slate Creek Placers, Limited

E. M. Morgan, secretary-treasurer and manager. This company continued exploratory work during part of the summer on Placer-mining Lease No. 1250 about 3½ miles west of the village of Tulameen. A drift was advanced through clay, gravel, boulders, and sand in an effort to locate an old channel of Olivine (Slate) Creek. Sixty feet from the portal of the adit started in 1949 a branch drift was advanced 30 feet westerly. Ten feet west of the junction of these two drifts another branch was advanced 12 feet southerly. Work was suspended on August 11th. Three men were employed.

REVELSTOKE (51° 118° N.E.)†

French Creek Placer

This organization intends to recondition and operate the old placer properties on French Creek, approximately 70 miles north of Revelstoke. The properties are reached by trail from the Big Bend Highway. Work in 1950 was hampered by high water which remained until September. Examination then showed that the three shafts leading to the underground workings are filled. A hole was also found on a bar above the top end of the drainage underground which indicated a cave had occurred, allowing the creek to penetrate the underground workings. Work ceased September 30th. Edward H. Orser, consultant, was in charge, and six men were employed.

Selkirk Gold Placers Syndicate

This syndicate holds six placer leases along the Columbia River near Camp Creek. Four leases, Nos. 385 to 388, are on the west bank of the river and extend for 2 miles south of Kirbyville Creek. They are reached by a road which leads down to the east bank of the river from a point on the Big Bend Highway 56 miles north of Revelstoke. The other two leases are on Camp Creek, east of the Columbia River. A small crew was employed during the summer under the direction of G. S. M. Larder, but because of prolonged high water little other than trail and road work was done.

SIWASH CREEK (49° 121° N.E.)‡

Canadian American Mines Incorporated

Company office, 626 Pender Street West, Vancouver. C. A. Voight, manager. Eight placer-mining leases are held by this company on Siwash Creek and tributaries. Siwash Creek crosses the Canadian National Railway nearly 2 miles north of Yale.

* By E. R. Hughes.
† By J. W. Peck.
‡ By R. B. King.

A road nearly 2 miles long was built from the railroad up the creek to the leases. A small amount of surface exploration was carried on to test the gravel.

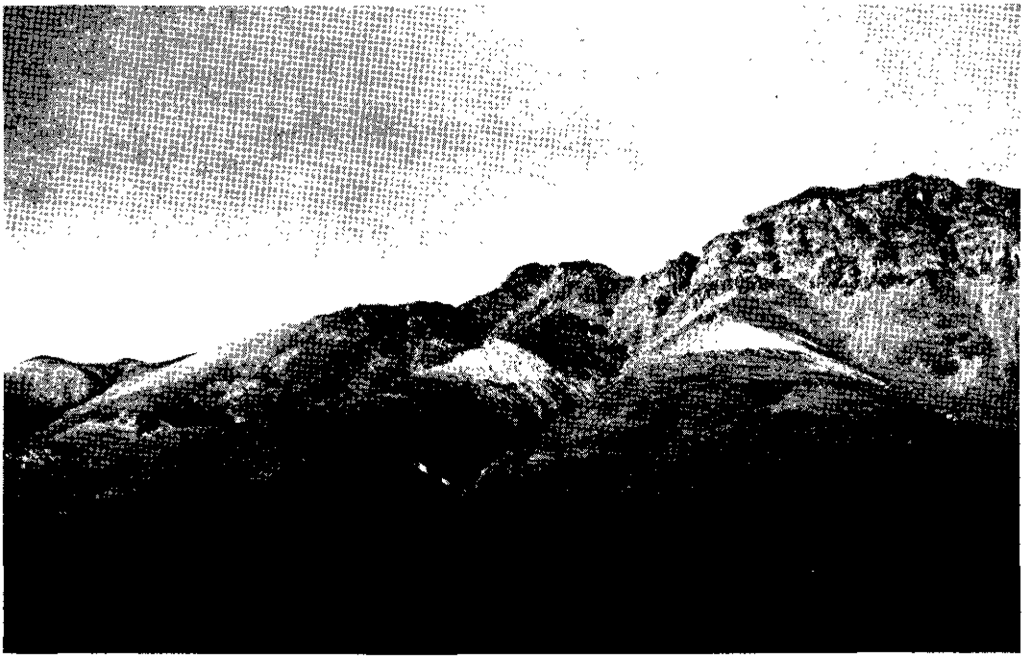
VANCOUVER ISLAND

Meade Creek* (48° 124° N.E.) In May and June of 1950 James Stanley Ford, Ronald Andrew Nilson, Howard Barker, and Ronald Theodore Nosworth staked two placer leases on Meade Creek, a south-westerly flowing stream that enters Cowichan Lake about 2½ miles west of the village of Lake Cowichan. The leases extend upstream from a point on the creek about 500 feet above the Canadian National Railway bridge and cover more than a mile of the creek bed. Most work has been done along a stretch of the creek, 2,200 feet long, between half a mile and a mile above the railway bridge. Along this section the creek flows through a shallow box canyon containing stream debris ranging from fine sand to boulders 4 feet in diameter. The work has consisted of testing the sand, by panning and sluicing, to determine its gold content. Within the canyon, fine colours are found in most pans of material from bedrock, as well as in sand among roots of trees near high-water mark, several feet above bedrock. Outside the canyon, gold is reported to have been panned from overburden on bedrock near the creek as much as 20 feet above high-water level. The colours are fine, but as many as forty are reported to have been taken from one pan.

* By J. T. Fyles.

Structural Materials and Industrial Minerals

CONTENTS



Serpentine outcrops in the McDame area.

INTRODUCTION

This section contains progress notes on properties and operations producing structural materials and industrial minerals in British Columbia. Reports on a few deposits that are not in production are also included.

For a detailed list of occurrences of the various structural materials and industrial minerals, as well as a selected group of references on these same materials, the reader is referred to Minister of Mines, British Columbia, Annual Report, 1947, pages 203 to 224.

Statistics regarding production of structural materials and industrial minerals are given in the following tables:—

Table I, page 15, sub-headings " Non-metallics " and " Clay Products and Other Structural Materials."

Table X, page 26, " Production in Detail of Structural Materials."

Table XI, page 27, " Production in Detail of Miscellaneous Metals, Minerals, and Materials."

During the year the Clayburn Company reopened their sewer-pipe and building-tile plant at Kilgard after rebuilding following the fire which destroyed the workings in 1949. The same company also opened a new firebrick plant in Abbotsford. Westroc Wool Company produced insulating slag wool steadily all year, using slag from Tacoma as the chief ingredient. Slag from the smelter slag pile at Greenwood was shipped to the Gypsum Lime and Alabastine Company plant at Calgary for use in making slag wool. The Columbia Cellulose Company began production of limestone from a new quarry on Smith Island for use in their cellulose plant at Port Edward. Columbia Gypsum Company opened up their gypsum quarry and were producing steadily by the end of the year.

Mountain Minerals Limited made test shipments amounting to 90 tons of pyrophyllite from a deposit at Semlin Siding and 43 tons of talc from a deposit at Armstrong. Both shipments were sent to the company's plant at Lethbridge, Alta.

A deposit of chrysotile asbestos was discovered north of McDame Creek. The deposit contains long fibre of spinning quality and may be large. An occurrence of vermiculite was discovered on the North Thompson River, 169 miles from Kamloops, by Canadian National Railway.

ASBESTOS

McDame Creek* (59° 20′ 129° 50′.) In June, 1950, occurrences of chrysotile fibre of good length and quality were discovered in northern British Columbia. These deposits are north of McDame Creek and about 65 miles southwesterly from Lower Post, but Watson Lake, Yukon Territory, is the nearest point where postal and other necessary services are available. Distances from Dawson Creek (Mile 0) along the Alaska Highway are 620 miles to Lower Post and 635 miles to Watson Lake. A branch road from Watson Lake serves the R.C.A.F. and commercial airport of the same name.

The asbestos deposits, described later under "Rugged Group," are reached by a branch road 70 miles long which leaves the Alaska Highway at Mile 648 and runs southerly to the Moccasin placer camp on McDame Creek. At this point the road forks, one fork going downstream about 10 miles to McDame Post at the junction of McDame Creek with Dease River, and the other going upstream about 18 miles to McDame Lake. After leaving the Alaska Highway, these roads are generally rough but passable for 4-wheel-drive vehicles and for dual-wheel trucks in the summer and autumn. From Snowy Creek, 13 miles westerly from the Moccasin camp, a road, about 12 miles long, to a camp-site below the Rugged group was constructed late in the fall by Conwest Exploration Company Limited.

* By B. T. O'Grady.

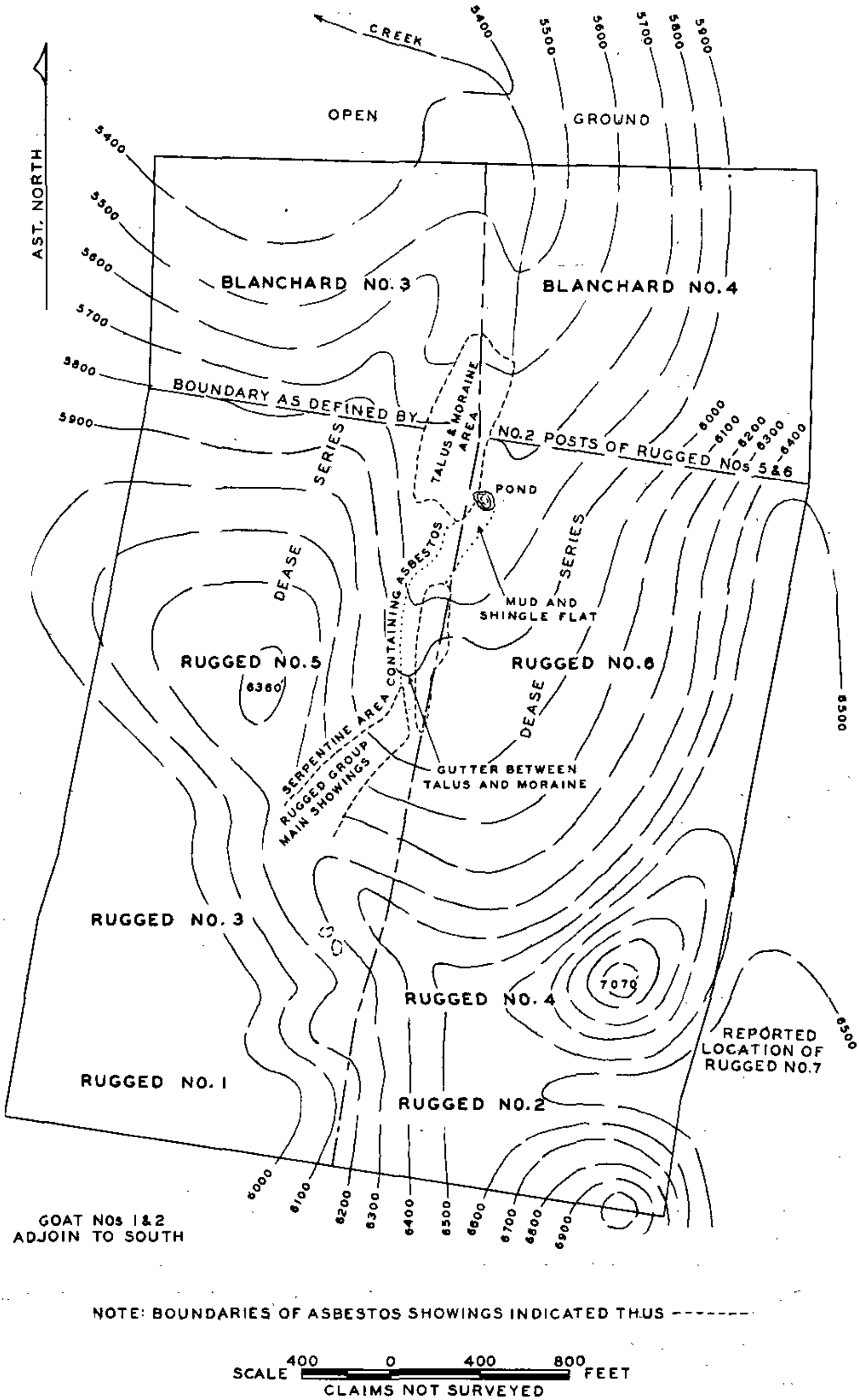


Fig. 13. Sketch showing approximate outline of Rugged Nos. 1 to 6 and vicinity.

The area has been accessible from the coast for a long time, the route being by river boat 150 miles up the Stikine River from Wrangell, Alaska, to Telegraph Creek, thence by road 73 miles to Dease Lake, and thence about 75 miles by shallow-draught boat down Dease Lake and Dease River to McDame Post, where connection may be made with the recently built road up McDame Creek. Dease River is also navigable for shallow-draught boats at certain periods between McDame Post and Lower Post, where the Dease and Liard Rivers meet.

The writer investigated the asbestos deposits during the period from July 12th to 18th. After examining the Rugged group a trip was made with horses along the serpentine belt northerly from the north fork of Troutline Creek for about 8 miles. Camp was made at the headwaters separating the drainage to Blue River and Quartzrock Creek. The return trip was made southeasterly along Quartzrock Creek and Snowy Creek to the McDame Creek road.

Claims covering the original discovery of asbestos on the Rugged group had been located by Victor A. Sittler on June 30th, 1950. Other claims were being located while the writer was in the area, and some were located subsequently. Only the original discovery had been prospected, and the Rugged group was the only property examined by the writer. Other claims located for asbestos in the area include the Blanchard Nos. 1 to 4 (John F. Blanchard), adjoining the Rugged group to the north; the Goat Nos. 1 and 2 (S. G. Bridcut), adjoining to the south; the Asbestos Nos. 1 to 4 (John Bartle), adjoining on the east; and several groups of claims on high ground 4 to 6 miles northerly from the Rugged group. These groups are the Chrysotile Nos. 1 to 4 (William G. Mossop), in a line running northerly; Olivine Nos. 1 to 4 (George Edzerza), in a line adjoining the Chrysotile on the east; Snowflake Nos. 1 and 2 (William G. Mossop), adjoining the Chrysotile on the east; Blizzard Nos. 1 and 2 (William G. Mossop) and Helen Nos. 1 and 2 (John F. Blanchard), south of the Chrysotile and Olivine claims; and Caribou Nos. 1 and 2 (Peter Hamlin), Polly Nos. 1 and 2 (John F. Blanchard), Cormier Nos. 1 to 6 (Leo Cormier), and Horseback Nos. 1 and 2 (Vic O'Brian), north of the Chrysotile and Olivine.

Three specimens from the Chrysotile and Olivine groups, said to be float and not in place, were shown to the writer. The specimens were found to consist of:—

(1) Dark serpentine, altered in part to picrolite, containing asbestos veins 1⅛ inches wide at widest but which split and surround "horses" of serpentine. The fibre is good. Fibre lengths vary from 1⅛ inches down to one-eighth of an inch.

(2) Serpentine with many small veinlets of asbestos running in all directions. Fibres vary in length from one-eighth to three-eighths of an inch.

(3) Piece of cross-fibre asbestos vein with inclusions of serpentine in vein. Fibres vary in length from three-sixteenths to five-sixteenths of an inch.

Two specimens from a showing in a creek bank on unstaked ground at the headwaters of Blue River and Quartzrock Creek were determined as follows:—

(1) Grey to dark-green serpentine with small patch of asbestos on one end,

(2) Light grey-green serpentine with small bit of asbestos on one end; the asbestos in both cases is brittle and rubs to a powder. Specimens of rock in the adjacent area consisted of serpentine (picrolite), limy serpentine, and dark-green glossy massive serpentine.

In the 4 to 6 miles then unstaked and unprospected between the Rugged and Chrysotile-Olivine groups five specimens of float consisted of serpentine with cross-fibre veins of asbestos varying in fibre length from one-sixteenth to five-sixteenths of an inch, with an average length of one-quarter of an inch. The largely unprospected serpentine belt, containing asbestos in places, therefore extends for 8 miles and may extend farther, in a northerly direction at least.

Laboratory determinations of rock and asbestos specimens from the above areas and from the Rugged group, hereinafter described, were made by J. W. McCammon, of the British Columbia Department of Mines.

Rugged Group.—This property, in the Stikine Mining Division, is on ground between 5,500 and 7,000 feet above sea-level, about 2 miles northwest of McDame Mountain, which is shown on Map 381A accompanying Geological Survey Memoir 194. The claims, as located in June, 1950, by V. A. Sittler, of Fort Nelson, consisted of the Rugged Nos. 1 to 7, to which have been added the Rugged Nos. 8 to 14 and the Rugged Fraction. These latter claims were located later in the year by W. V. Smitheringale, consulting engineer, for Conwest Exploration Company Limited, of Toronto, which company acquired the Rugged Nos. 1 to 7 claims and built the previously mentioned 12-mile branch road from Snowy Creek on the upper McDame Creek road to the temporary camp below the claims. Sittler's three associates, the Kirk brothers and H. Nelson, of Lower Post and Fort Nelson, participated in the deal with Conwest Exploration Company.

Approximate elevations above sea-level of the principal points of interest are as follows: McDame Creek road at Snowy Creek, 3,500 feet; temporary camp below claims, 4,300 feet; asbestos showings, 6,000 to 6,400 feet. Timberline elevation is around 4,500 feet. The Rugged Nos. 1 to 7 claims are entirely above timberline. They are aptly named, as their topography includes rock slides, bluffs, and talus slopes, with some small glacial cirques. The Rugged Nos. 8 to 14 claims cover the lower brushy slopes and valley of the north fork of Troutline Creek, which affords safe camp-sites on flat to gently sloping ground covered with stunted balsam-trees and brush. The only water available on the property in the summer and fall months is afforded by the north fork of Troutline Creek, about 2,000 feet below and 1 mile from the asbestos showings. This creek had a roughly estimated flow of 8 to 10 second-feet when the property was examined in July. The climate in this district is said to be transitional between the northern plateau and Coast Range types. Winters are severe, and snow probably covers the ground from November to May.

The Rugged group area is close enough to the northwesterly mapped limits of Geological Survey Map 381A to permit correlating the local geology with some assurance. Extensive exposures of granitic rocks to the west and across the creek from the property evidently represent the northern extension of the Cassiar batholith, a Jura-Cretaceous intrusive mass of great width which trends northwesterly. Specimens of these rocks from local exposures were determined as granodiorite and granite pegmatite. The bordering rocks on the eastern flank of the batholith consist essentially of sediments of the Dease series, tentatively assigned to the Permian and Pre-Permian, overlain by volcanics and minor sediments of the McLeod series of Jurassic age. Intrusive into the sediments of the Dease series are basic rocks consisting of serpentine and related rocks, including peridotite and augite porphyrite which, according to Hanson and McNaughton (1936, p. 9), are members of the McLeod Volcanics. It is mentioned by the same authority that their characteristic manner of occurrence in the Dease series is as elongated bodies of irregular shape resembling sills.

The Rugged group is underlain by the upper beds of the Dease series, and it would appear that the base of the McLeod series lies close to the eastern boundary of the property. The general trend of the sedimentary rocks of the Dease series is northerly and the dip is easterly, averaging around 50 degrees. There is evidence locally of folding and crumpling.

Two discontinuous sill-like bodies of basic rocks intrude slates, argillites, and quartzites of the Dease series on this property. The two intrusive bodies consist predominantly of serpentine but include some indefinite areas of peridotite and augite porphyrite showing little or no serpentinization.

The main serpentine body is at least 1,300 feet long, and is as much as 450 feet wide, assuming an average easterly dip of 60 degrees. It contains the only known asbestos deposit of importance on this property or in the adjacent district.

The other serpentine " sill " lies about 1,500 feet farther east; it is as much as 60 feet wide and at least 500 feet long. It contains a little slip-fibre asbestos with some amphibole asbestos along its margins, but going southerly it appears to be altered to talc. Its northern end apparently terminates in bluffs across a cirque from the main asbestos showings.

Augite porphyrite is exposed in appreciable areas on two 7,000-foot peaks, shown in the southeastern part of Figure 13, and between the two serpentine sills.

The main serpentine sill seems to grade into augite porphyrite or peridotite at its southern end. Its possible northern limit is uncertain, being obscured by talus and morainal deposits, among which are boulders containing asbestos (on the adjoining Blanchard property). Chrysotile asbestos occurs throughout this serpentine body in varying degrees, and amphibole types are abundant along its margins where it is exposed. Magnetite occurs generally throughout the serpentine and is conspicuous where asbestos veins are abundant.

Asbestos stringers in serpentine in the McDame area.

Veinlets of asbestos as much as 1½ inches wide are exposed in outcrops of serpentine. The area is rugged and between outcrops is overlain by talus. Several of the outcrops are bluffs, and these afforded opportunities to measure the fibre content in six sections. The main asbestos-bearing area has an indicated width of 400 to 450 feet. The length indicated is 900 feet, and the actual length may be greater. Exposures of asbestos-bearing serpentine are shown in Figure 14, and samples from these exposures are described on pages 212 and 214. The percentages of fibre in exposures that permitted measurement (*see* Fig. 14) are:—

Zone	Fibre Percentage	Section in Feet
A	5.0	8.2
	4.4	28.0
B	4.1	8.2
C	4.0	11.0
D	1.6	9.0
E	1.8	15.0
F	2.2	10.0

Talus overlying parts of the main showing and extending down the slope from the showing is covered by a thick mantle of "fluff,"* that is of fluffed-up asbestos derived from asbestos fibre of local origin by frost action, weathering, and exfoliation. According to W. V. Smitheringale, this fluff fills interstices among the serpentine fragments and depressions in the talus, to a depth of 4 feet or possibly more, as it was not penetrated by all test-pits sunk. Abundant fluff is apparent in the talus in an area that, from north to south, measures 900 feet, the indicated length of the main showing. From the southern 700 feet of this length, talus with abundant fluff extends southwesterly for 1,300 feet down the 32-degree slope. This extensive area is estimated by Smitheringale to contain from 14,000 to 15,000 tons of loose material with a fibre content between 10 to 20 per cent.

The following report on specimens submitted by the writer is based on studies made in the laboratories of the British Columbia Department of Mines by J. W. McCammon:—

The asbestos fibres in the samples are chrysotile and appear to be of a high-grade cross-fibre variety. In the vein the colour is yellow to dark glossy green, but when fluffed into fibres the asbestos is a good white colour. The fibres can be divided again and again almost indefinitely. They are very strong and flexible and can be twisted into threads that are almost impossible to pull apart by hand. Fibre length in the specimens varies from one-sixteenth of an inch to 1½ inches, with a fair percentage averaging 1 inch or over.

Sample No. 1.—Two specimens of cross-fibre asbestos in green serpentine.

Specimen A: Contains two main veinlets of asbestos—one varies in width from three-eighths to one-eighth of an inch and is irregular and branching; the other vein varies in width from 1½ inches down to nothing, is irregular, contains small "horses" of serpentine, and in two or three places it is divided by a parting parallel to the vein walls. The average length of fibre in the second vein is about three-eighths of an inch.

There is much magnetite in the surrounding serpentine. This serpentine is mottled dark to light green and weathers to a pale greenish white shade.

Specimen B: The main vein in this specimen varies in width from 1¾ to 1¼ inches with a maximum fibre length of 1½ inches. This vein is sheared and contains "horses" of serpentine. The specimen also contains two small veinlets one-sixteenth of an inch wide. The serpentine wallrock is mottled dark green and contains irregular concentrations of magnetite.

The asbestos fibres are very tough and twist into threads that are hard to pull apart. When fluffed up, the fibres are a good white colour.

Sample No. 2.—Two bags of loose fibre and three specimens.

Bag A: Cross-fibre chrysotile with fibres averaging 1 to 1½ inches in length. These fibres fluff up white and twist into strong threads.

Bag B: Pieces of cross-fibre chrysotile vein matter varying in width from one-quarter to three-eighths of an inch.

Largest Specimen: Contains one vein of cross-fibre asbestos three-quarters of an inch wide. This vein is sliced in the centre and splits into two veins with serpentine

* Sample described on page 214.

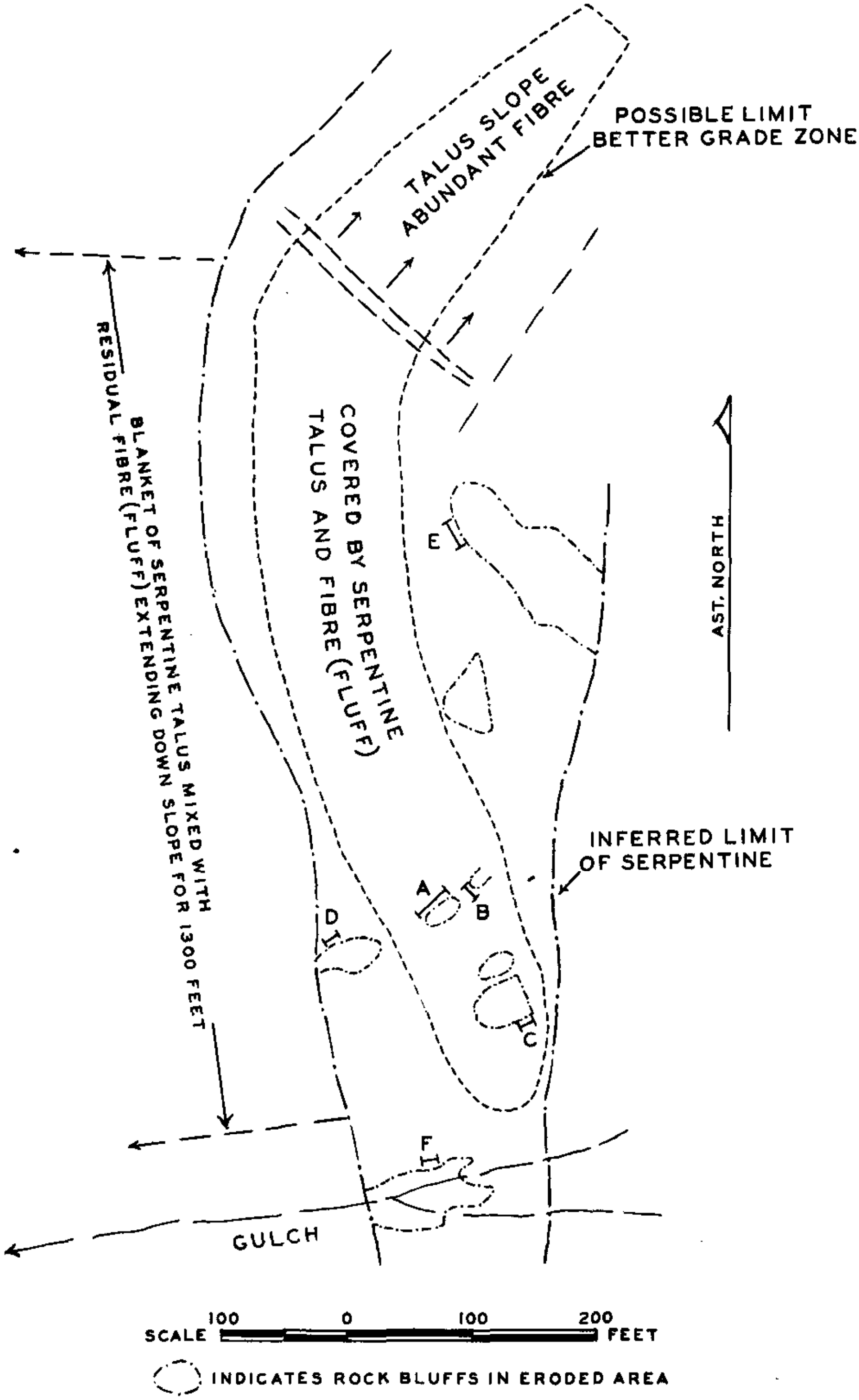


Fig. 14. Rugged group—main showings.

between. One branch thins down to nothing and the other to one-quarter of an inch. The serpentine wallrock is mottled dark green.

Medium-sized Specimen: This is a rather dirty-looking piece of dark, mottled serpentine, with one vein of cross-fibre chrysotile containing fibres up to as much as 1 inch long. Part of the vein is split to half an inch wide. A tiny veinlet, one-eighth of an inch wide, runs across the end of the specimen.

Smallest Specimen: This specimen contains a vein of cross-fibre chrysotile which varies in width from 1⅜ inches to three-sixteenths of an inch within a length of 1 inch.

The fibres in all the above specimens fluff up white and twist into very strong threads that are not brittle.

Sample No. 3.—Asbestos " fluff " from talus below main showings. This is a bag of loose, matted, greyish-white chrysotile fibres varying in length from one-quarter of an inch to 1¼ inches, with an average of about 1 inch. The fibres are strong and fluff nearly white.

[Reference: Hanson, G., and McNaughton, D. A. (1936)—Eagle-McDame area, Cassiar District, British Columbia, *Geol. Surv., Canada,* Mem. 194, p. 9.]

Asbestos, I.X.L., and Acme*

(50° 117° N.W.) The Asbestos Nos. 1 and 2 claims, recorded in the name of J. E. Lauthers; Asbestos Nos. 3 and 4 and I.X.L. Nos. 5 to 8 claims, recorded in the name of Margaret McIntosh; and the Acme Nos. 1 to 6 claims, recorded in the name of Peter Van Eynsbergen, are on the western slope of Sproat Mountain at an elevation of 4,200 feet above sea-level. The claims are 2 miles in a straight line from and 2,800 feet above Sidmouth, a small station 24 rail-miles south of Revelstoke, on the Revelstoke–Arrowhead branch of the Canadian Pacific Railway.

A side road extends for half a mile northeasterly to the base of Sproat Mountain from a point half a mile north of Sidmouth on the road up the east side of the Columbia River. From the end of the side road there is a cart-trail for three-quarters of a mile to an old pole camp. A steep pack-trail 2 miles long leads from the pole camp to the claims.

The claims are on an asbestos deposit that has been known since before 1921. Acme Asbestos Cement Ltd., 122 Sixty-seventh Avenue East, Vancouver, became interested in the property in 1949 and had a bulk sample tested by the Department of Mines, Ottawa. In March, 1950, an option on the Asbestos and I.X.L. claims was registered in the names of J. Karagut, L. Cossar, and R. Sandon, of Vancouver. Early in the summer of 1950 the Pacific Asbestos Corporation, Limited (Non-Personal Liability), was formed to investigate the asbestos deposit. Some time after the examination upon which this report is based was made, this latter company built an access road between the property and Sidmouth, established a temporary camp at the deposit, and did 1,500 feet of diamond drilling.

This report is based on eight days of field work done on the property at the beginning of July, 1950. Mapping was done by plane-table augmented by pace-compass traverses.

The asbestos occurs in a large, altered, basic igneous dyke that cuts across a series of sedimentary rocks. In the area mapped (Fig. 15) the dyke trends north and south and forms two parallel series of bluffs. Here the dyke is exposed over a length of 1,500 feet, a width of 300 feet at the south end, and a width of 700 feet at the north end. A loop traverse was run for half a mile to the north of the area mapped. Few outcrops were found, but a small bluff of talcose dyke was seen at the northern limit of the traverse. A similar loop traverse around the south end of the mapped area was run for three-quarters of a mile to the first large creek in that direction. The only outcrops found on this traverse were sedimentary rocks.

* By J. W. McCammon.

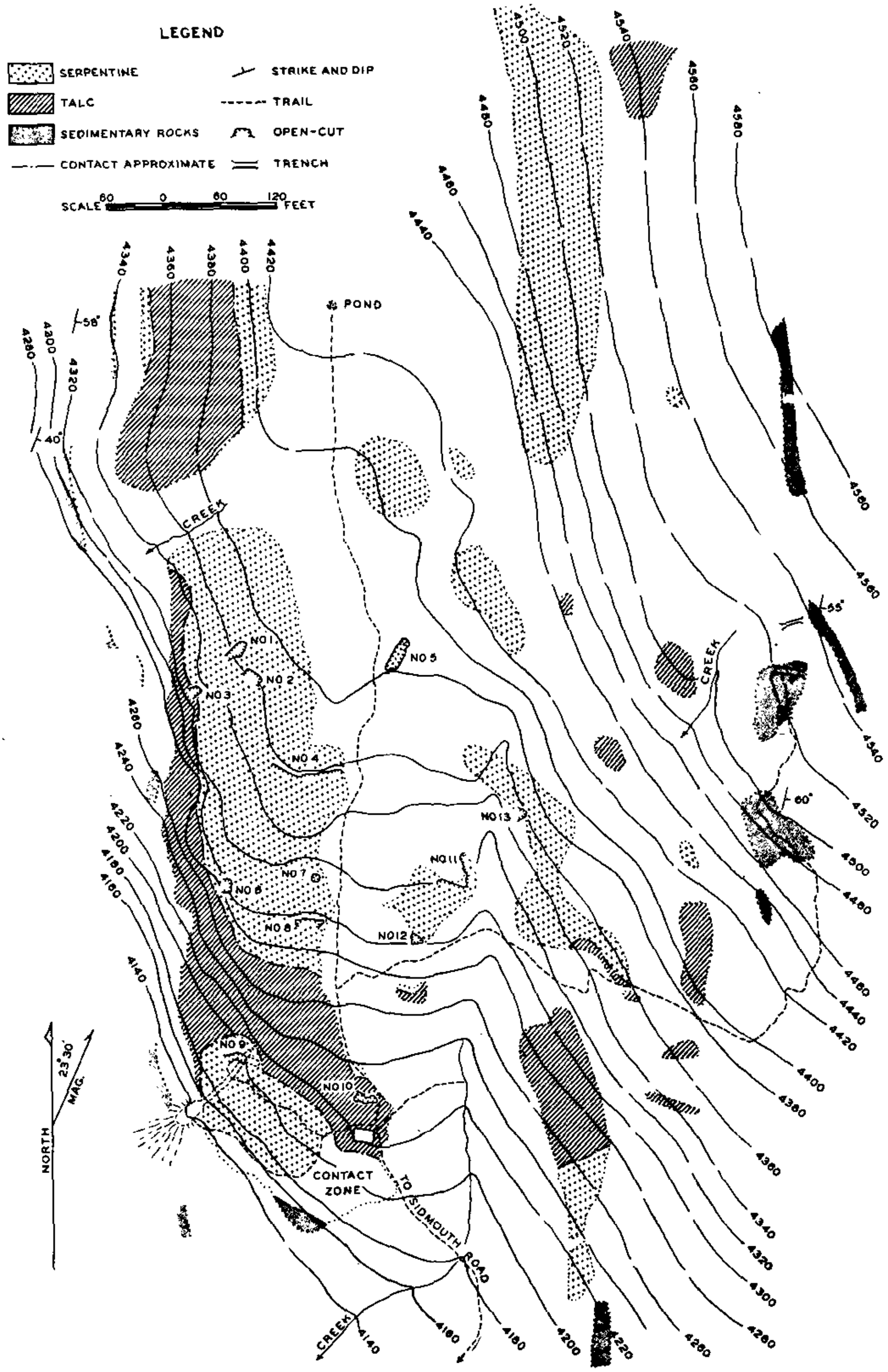


Fig. 15. Asbestos deposit, Sproat Mountain.

The dyke is altered to serpentine and talc. The serpentine occurs chiefly in the central part of the dyke. The rock in this central part has a mottled dark- and light-green appearance when freshly broken and weathers to a dirty grey shade. It is easily marked by a hammer but is brittle when struck. The mineral composition is mainly antigorite with accessory magnetite, magnesite, and olivine remnants. Fibres of chrysotile form cross-fibre veinlets and occur with minor amounts of calcite in slips throughout the rock.

Around the edges and in a zone across the strike near the south end of the mapped area the dyke is altered to talc. The colour of the talc varies from dark grey through various shades of green to pale green. When pulverized it is greyish white. In general, the talc is sheeted and has a schistose appearance; this is particularly noticeable in the old adit below Open-cut No. 9. Magnesite in grains and veinlets up to 6 inches wide is scattered through the talc. In some places the magnesite has weathered out, leaving tiny ridges of talc which give the outcrop a rough, pitted surface. The contacts between the talc and serpentine areas in the dyke are gradational, but the gradation takes place within a few feet.

Sedimentary outcrops occur on both sides of the dyke. The sediments have an average strike of north 20 degrees east and an average easterly dip of 55 degrees. Most of the exposures seen east of the dyke are quartzites and argillites. No contacts between the dyke and these sediments were seen. The sedimentary exposures west of the dyke are mainly limestone, with some quartzites and argillites toward the northern part of the map-area. Adjoining the cabin to the southwest is a contact zone with good exposures showing a gradation from talc to talc-actinolite schist to mixed schist and finally into interbedded slaty argillites and limestone.

Some shallow trenches have been dug on manganese mineralization in quartz stringers that cut a massive quartzite about 650 feet northeast of the cabin. Some barren-looking bull quartz veins were noted in the sediments 200 feet southwest of the cabin.

Chrysotile asbestos occurs scattered through the serpentine in cross-fibre veinlets and in slip-fibres along numerous small slips. The asbestos is bright yellow-green when fresh and silvery grey when weathered. It has a rather prickly, harsh feel in the mass but fluffs up into a relatively soft white material. When fibres are fluffed up, they can be twisted into strong, tough threads.

The cross-fibre veinlets occur erratically and run in all directions. It is not usual to see many veinlets close together. The veinlets vary in width from three-quarters of an inch down, the average being one-quarter of an inch or less. Most of the wider veinlets have an irregular central parting that is commonly lined with magnetite. The longest cross-fibres seen were seven-sixteenths of an inch long. The most numerous occurrences of veinlets were seen in the various open-cuts and in the serpentine bluffs northeast of Open-cut No. 5. The best section measured was in Open-cut No. 4 where, over a width of 30 inches, six veinlets gave a total width of eleven-sixteenths of an inch of asbestos.

Slip-fibre asbestos is found along numerous slips and shears in the serpentine. It shows all gradations from massive serpentine through brittle grey to tough yellow-green material. A large part of it will fluff up to fibres that can be twisted into tough threads. Fibre lengths vary from 8 inches down, with an average of 3 inches or less. Considerable magnetite, magnesite, and some calcite sometimes accompany the slip-fibre asbestos.

As is usual with asbestos deposits, an estimate of the fibre content of the rock is difficult to make. A visual estimate would indicate between 1 and 3 per cent, with selected areas running higher.

The Department of Mines at Ottawa has twice done experimental work on samples from this deposit. The first test was done in 1927 on a 300-pound sample. The general conclusions arrived at by the test were as follows:—

" The longer fibres, +2 and +4 mesh, are woody in texture, lacking in strength and could not be used for spinning, shingle, nor paper making. The only possible marketable products that could be produced from this class of fibre is cement stock, grading 0–0–5–11, and fine fibre containing a little sand, known as asbestic and used in the manufacture of finishing plaster."

The second test was run on a 524-pound sample in 1949. This sample was taken from new showings opened up in 1949 and gave better results. The fibre was found comparable to that produced in Quebec. A combination of screened products could be made, equivalent per ton of sample to 114 pounds of fibre having a shipping test of 0.0–1.3–10.2–4.5 or a 4z grade. This would be good for paper stock or slightly below shingle stock and could be used for asbestos board, tile, and shingles.

Analyses of samples of slip- and cross-fibre material, taken by the writer from Open-cut No. 4 and analysed in the British Columbia Department of Mines laboratory, are given below.

	SiO_2	MgO	Al_2O_3	FeO	H_2O+	H_2O-	Fe_2O_3	MnO
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Cross-fibre	40.84	45.25	0.90	0.30	9.95	0.74	2.20	0.07
Slip-fibre	30.61	39.84	0.98	0.38	20.22	1.40	6.09	0.58

References

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Geol. Surv., Canada, Sum. Rept., 1921, Pt. A, pp. 111A, 112A; Mem. 161, Lardeau map-area, British Columbia, p. 112 (1930).

Minister of Mines, B.C., Ann. Rept., 1921, p. 160; 1928, pp. 313, 314.

BARITE

Mountain Minerals Limited*

Company office, Morris Building, P.O. Box 273, Lethbridge, Alta. R. A. Thrall, managing director. Capital: 2,000 shares, $100 par value. This company owns one barite quarry, 7 miles by road from Parson Siding, and another near Brisco. The Parson quarry (51° 116° S.W.) was operated in the fall of 1950, and from it thirty-one cars of barite were shipped—twenty-eight to Montreal and three to Lethbridge, Alta. In addition, a small shipment was made to the Summit Lime Works at Crowsnest. The Brisco quarry (50° 116° N.E.) was idle except for the production of one trial car of barite shipped to Montreal. W. McPherson was in charge and two other men were employed.

BUILDING-STONE

Andesite

Haddington Island†

(50° 127° N.E.) J. A. and C. H. McDonald, of Vancouver, operated this quarry throughout the summer to obtain an andesite building-stone. The stone is quarried, handled by derricks, loaded on scows, and taken to Vancouver for shaping. Ten men were employed during the operating year.

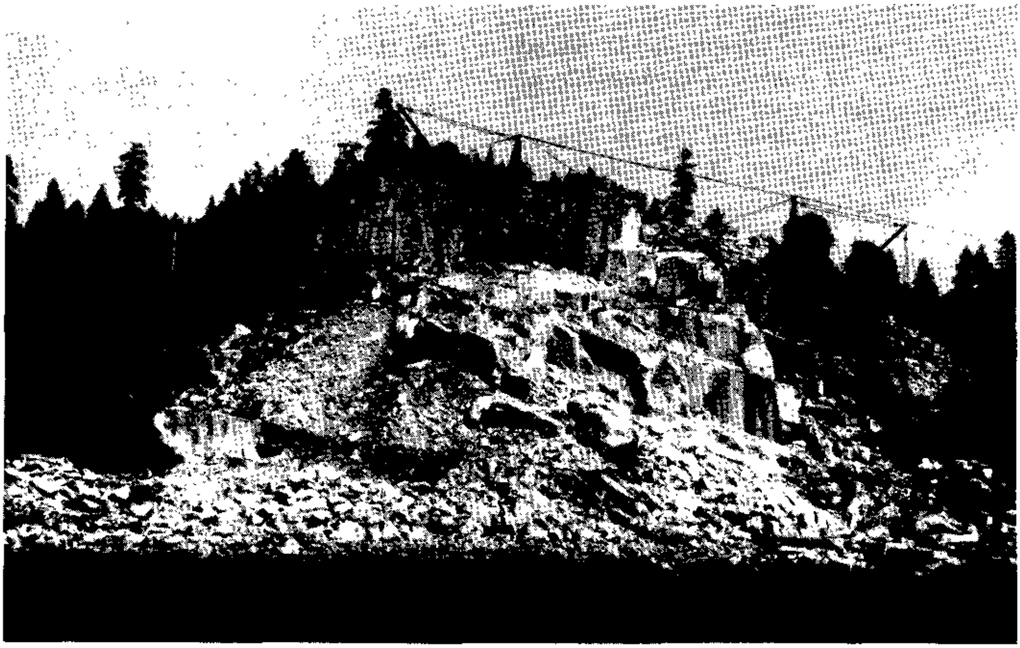
Granite

Vancouver Granite Co. Limited†

Nelson Island (49° 124° N.E.). Company office, 744 Hastings Street West, Vancouver; quarry, Nelson Island. This quarry is operated to recover dimension stone for monuments and building purposes. Stone of poor quality is sold for jetty-rock and rubble.

* By J. W. Peck.
† By R. B. King.

The rock is drilled to size then wedged or blasted for removal. Three 20-ton-capacity wooden derricks are used to load stone from the quarry face to scows. The blocks are shipped to Vancouver for cutting and finishing. The average number of men employed was eight.



The Vancouver Granite Company's granite quarry on Nelson Island.

Coast Quarries Limited*

Granite Falls (49° 122° S.W.). Company office, 1840 Georgia Street West, Vancouver; quarry office, Granite Falls. W. A. Bickell, manager; D. R. Ross, superintendent. Mr. Ross succeeded T. H. Burrows as superintendent in 1950. This company quarries granite at Granite Falls, on the Indian Arm of Burrard Inlet.

Jetty-rock, riprap, and rubble are produced. Rock, blasted from a high quarry face, is loaded by a 1-cubic-yard-capacity diesel-driven shovel into semi-cylindrical skips of 10-ton capacity. These skips are transported by a steam-driven derrick and loaded directly on scows.

A new cook-house which accommodated twelve men was built during the year. The average number of men employed was eight.

Gilpin-Nash Limited*

Indian Arm (49° 122° S.W.). Company office, 2265 Forty-first Avenue West, Vancouver. C. W. Nash, general manager; A. Shaak, production superintendent. This company started quarrying operations in August, 1949, on Lot 872, near Elsay Creek, on the west shore of Indian Arm. Jetty-rock and rubble are produced. Granite, after being blasted, is loaded by a ¾-cubic-yard diesel-driven shovel into trucks and transported to a storage bin. The rock is loaded by conveyor-belt on scows.

The average number of men employed during the operating year was ten.

Gilley Bros. Limited*

Pitt River (49° 122° S.W.). Company office, 902 Columbia Street, New Westminster; quarry office, Pitt River. J. H. Gilley, general manager; Francis J. MacDonald, superintendent. This quarry, on the east shore of Pitt River, produces granite for jetties

* By R. B. King.

and dykes. In 1950 the " coyote hole " method of breaking rock was used instead of the older " snake hole " method. During the year a coarse crushing and screening plant comprising a 42- by 60-inch jaw crusher, a 6-inch grizzly, and conveyor-belt was installed. Undersize material, −6 inches, is delivered by chute to a 60-inch-wide conveyor-belt on a movable steel frame, and thence to scows.

The average number of men employed during the year was thirty-six.

Valley Granite Products Ltd.* Cheam View (49° 121° S.W.). Company office, 114 First Avenue, Chilliwack; plant, Bridal Falls. The quarry and crushing plant are several miles east of Rosedale (49° 121° S.W.). The granite is drilled, blasted, and hand-loaded into a 1-ton-capacity car and transported to the crushing plant. A gyratory crusher, capable of crushing 10 tons an hour, has been added to the crushing section of the plant. The crushing plant has a capacity of 8 tons a shift and produces turkey, chicken, and bird grit, and stucco dash. Building-stone is also produced.

The average number of men employed was five.

CLAY AND SHALE

Bear Creek Brick Company* Surrey (49° 122° S.W.). Head office, Victoria Brick and Tile Supply Company, Vancouver; plant, Archibald Road, Surrey District. A. T. Ayling, plant manager. Surface clay is mined from a pit adjacent to the plant. Cars of 5-cubic-foot-capacity are hand-loaded and hauled to the plant. The bricks are formed by a wet-press process and placed in hacks to be weather-dried. Wood-fired scove kilns are built for burning brick.

The average number of men employed during the operating year was seven.

Clayburn Company Limited* Kilgard (49° 122° S.E.). Head office, Credit Foncier Building, Vancouver; plant office, Kilgard. R. M. Hungerford, managing director; R. Ball, superintendent. During 1950 two modern plants were completed and put into production. One plant, in which sewer-pipe and flue-lining are manufactured, is at Kilgard; the other, in which facebrick, firebrick, and special refractory shapes are made, is at Abbotsford. Modern crushing, screening, and conveying machinery is used throughout both plants. In the Kilgard plant, sewer-pipe and flue-lining are cast under hydraulic pressure through dies and are pre-dried before burning in oil-fired, down-draught, beehive kilns. In the Abbotsford plant, bricks are dry-pressed and hand-piled on flat cars and passed through a drier. From the drier the bricks pass into an oil-fired continuous tunnel kiln 450 feet long.

Clay for these plants is mined from shale members of the Huntington formation of Sumas Mountain. Two seams are mined by underground methods and one by quarrying. The three underground mines, No. 4B, No. 9, and Fireclay, are worked by room-and-pillar methods.

Clay mined during 1950 totalled 31,141 tons. Of this tonnage, 19,432 tons was used for manufacture of firebrick and 11,709 tons was used for manufacture of sewer-pipe and facebrick.

Pacific Clay Products Limited* Pleasantside (49° 122° S.W.). Office and plant, Pleasantside. J. W. Bell, owner and plant manager. This company produces common brick from clay that is mined from a shallow pit adjacent to the plant. A stiff-mud extrusion process is used to form bricks. These bricks are weather-dried before being placed in rectangular wood-fired kilns for burning. The average number of men employed during the operating year was four.

* By R. B. King.

Port Haney Brick Company Limited*—Haney (49° 122° S.W.). Company office, 846 Howe Street, Vancouver; plant, Haney. E. G. Baynes, president; J. Hadgkiss, plant manager. This company operates a large plant producing primarily structural tile and drain-tile. Facebrick and common brick have also been produced. Plastic clay is mined from open pits adjacent to the plant. A ½-cubic-yard gasoline-driven shovel digs clay from benches 10 feet high and loads it on trucks for transportation to the plant. The clay is dried in a rotary wood-fired kiln, and then conveyed to a dry pan for grinding. Bricks and tile are formed by stiff-mud extrusion process and dried in a controlled-temperature drying-room. The formed products are placed in wood-and-coal-fired down-draught beehive kilns.

The average number of men employed during the year was fifty.

Richmix Clays Limited*—Kilgard (49° 122° S.E.). Office and plant, 2890 Twelfth Avenue East, Vancouver; mine, Kilgard. G. W. Richmond, manager. Preparations to strip-mine clay pillars left by underground mining were begun in May. Overburden was removed from the upper portion of the mine near the portal and production began in December. Four men were employed.

Baker Brick and Tile Co.†—Victoria (48° 123° S.E.). Office and works, Victoria. J. V. Johnson and D. E. Smith, joint managers. The company operated its pit from March until November and its plant all year. Total clay mined amounted to 6,200 tons. The number of men employed averaged twenty-five.

Bazan Bay Brick & Tile Co. Limited.†—Saanichton (48° 123° N.E). Works at Saanichton. F. J. Eves, proprietor and manager. The pit operated from June to August and the plant from February to November. Six men were employed and 1,200 tons of clay was used.

Evans, Coleman & Evans.†—Gabriola Island (49° 123° S.W.). Company office, Vancouver; plant, Gabriola Island. F. A. Higgs, Gabriola Island, resident manager. The plant operated from March to November and used 900 tons of shale. The average number of men employed was seventeen.

GYPSUM

Gypsum, Lime and Alabastine, Canada, Limited‡—Falkland (50° 119° S.W.). Head office, Paris, Ont.; British Columbia office, 509 Richards Street, Vancouver. Norman Jessiman, British Columbia manager; Cecil J. Miller, quarry manager. This company mines gypsum at Falkland, 40 miles from Kamloops on the Vernon–Kamloops Highway and on the Vernon branch of the Canadian National Railway. Gypsum is mined from open quarries 500 to 600 feet above the railway on the steep hillside north of the village. Compressed-air jackhammers are use for drilling; 40 per cent Forcite explosive is used for blasting. Broken rock is loaded by power-shovels and transported by trucks to a crushing plant and bunkers at the railway for shipment to the company's mill at Port Mann. A 42-inch Butterworth & Lowe crusher was installed during the summer, and a new ramp and crusher building were erected. The quarries were operated throughout the year, and production was obtained from No. 2 and No. 10 quarries. At the end of the year, production had reached 400 tons daily. Twenty-nine men were employed.

Canada Cement Company§—Mayook (49° 115° S.W.). This company owns a gypsum quarry located on the Cranbrook–Fernie Highway 16 miles east of Cranbrook and a quarter of a mile northeast of Mayook. A. Howard, of Fort Steele, continued to operate the quarry under lease. Work

* By R. B. King.
† By J. W. McCammon.
‡ By E. R. Hughes.
§ By J. W. Peck.

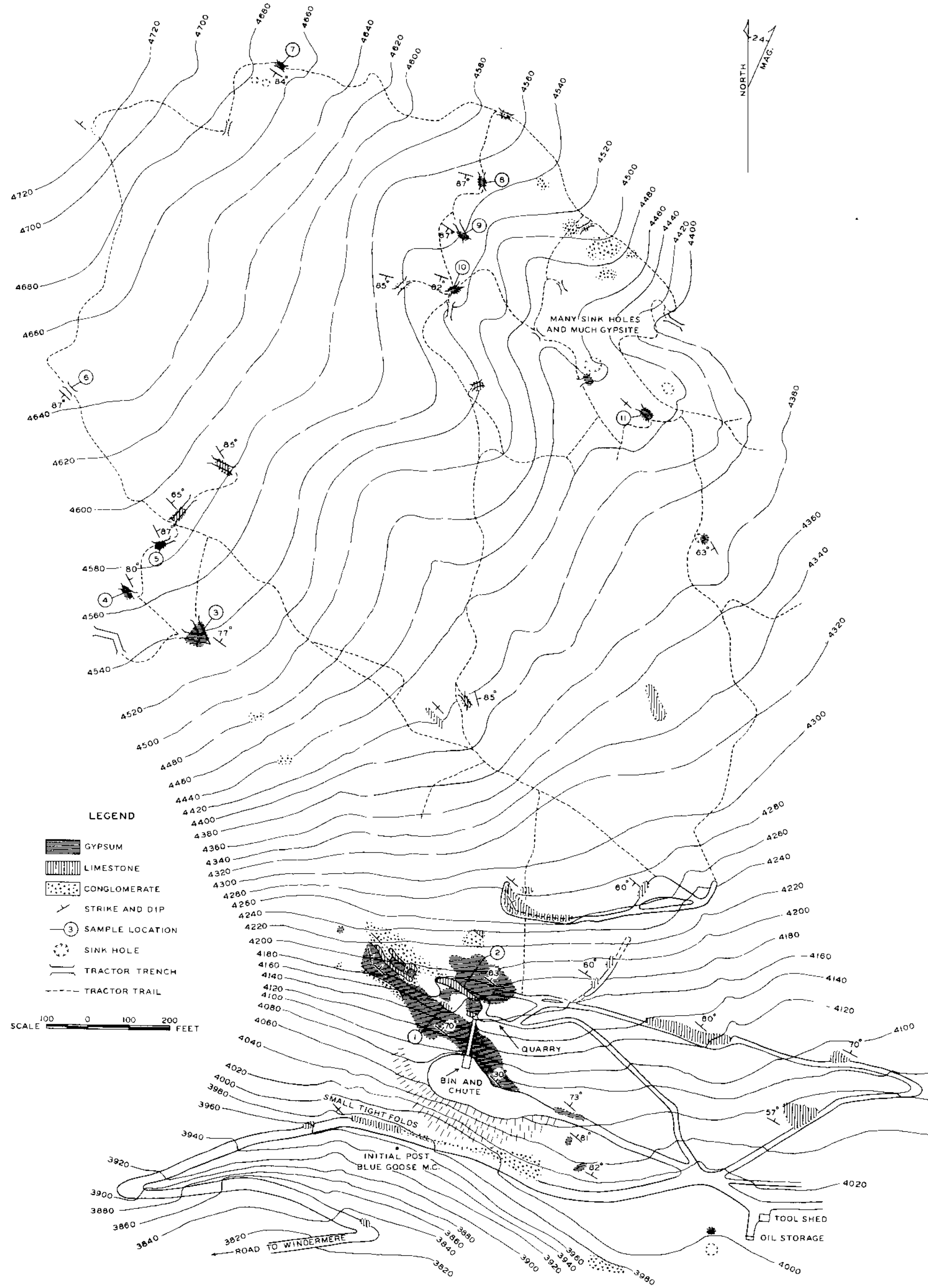
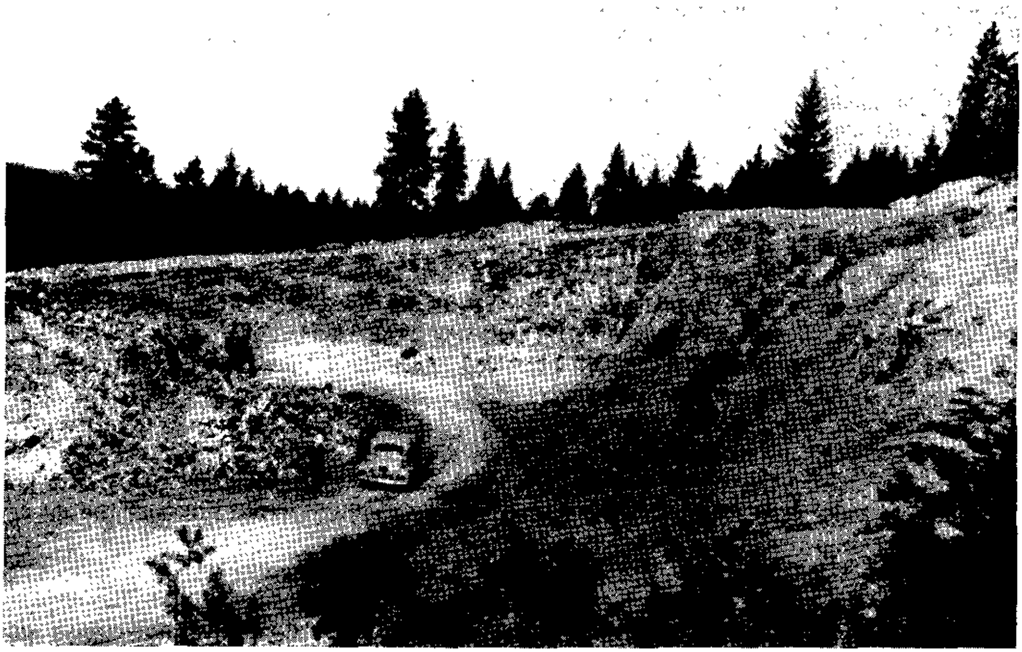


FIG.16. PLAN OF COLUMBIA GYPSUM WORKINGS.

commenced in May, and steady production of over 1,000 tons per month was maintained. After being blasted, the material is broken to 4-inch size and then trucked to Mayook for transhipping to the company's cement works at Exshaw, Alta. The number of men employed averaged five. The 1950 production was 12,048 tons.



The Canada Cement Company's gypsum quarry at Mayook.

Columbia Gypsum Products, Inc.*

(50° 115° S.W.) Head office, 517 Eagle Building, Spokane, Wash.; British Columbia office, 601 Royal Trust Building, Vancouver; quarry office, Windermere. L. G. Brown, president. At the time of writing the company holds a total of seventy-five claims, of which forty-eight are in the vicinity of Windermere Creek and the remaining twenty-seven are on the Kootenay River 8 miles northeast of the settlement of Canal Flats.

The main activity during the year centred in the Windermere Creek area, where considerable trenching was done by bulldozer, and a quarry was opened up and put into production. Some bulldozer trenching was done on the Kootenay River claims.

A description of most of the area covered by the Windermere Creek claims has been given by Cummings.† Five days in August were spent mapping by plane-table the ground in the immediate vicinity of the quarry and open-cuts.

Natural rock exposures are scarce on the property, with the result that observations were limited largely to artificial strippings. However, three natural aids—sink-holes, conglomerate, and gypsite—have proved rather reliable in tracing the gypsum. Numerous sink-holes that range from a few feet to several hundred feet in diameter and from a foot to over a hundred feet in depth form a striking feature of the topography. They appear to be restricted to gypsum zones, and massive gypsum or gypsite can usually be found in them. It has also been found that a peculiar limestone conglomerate found in the vicinity usually overlies massive gypsum. In addition, surface exposures of earthy gypsite can be counted on to overlie solid gypsum.

* By J. W. McCammon.

† *Minister of Mines, B.C.*, Ann. Rept., 1948, pp. 185–188.

Only three rock types—limestone, gypsum, and conglomerate—were seen in the area examined. The limestone is dark, almost black, and fine grained. When struck with a hammer, it emits a fetid odour. It is usually thinly bedded, with a tendency to break easily along the bedding planes. Occasionally thin seams of soft, shaly material are interbedded with the limestone. This limestone is thought to be part of the Upper Ordovician or Silurian Beaverfoot-Brisco formation.

The gypsum is grey to pale buff and sometimes white. A striped appearance due to alternate light and darker layers is characteristic. The numerous minor foldings and crumplings normally seen in masses of gypsum and explained as due to expansion on recrystallization of gypsum from anhydrite are rarely found in this deposit. One small area with very minor contortions was noted in the open-cut at Sample Location No. 3.

The conglomerate consists of angular to subangular pieces of limestone varying in diameter from a quarter of an inch to over 6 feet in a calcareous cement. It unconformably overlies gypsum to a depth ranging from a few feet to over 50 feet. The age of the conglomerate would seem most likely to be Recent.

The gypsum occurs as beds between limestone beds. At the quarry, gypsum has been exposed in an area 240 feet wide by 500 feet along the strike over a vertical range of 160 feet. Two parallel 5-foot-thick bands of limestone 10 feet apart, conformable to the bedding of the gypsum, cross the centre of the gypsum exposure. The bedding strikes northwesterly and dips steeply northeasterly into the hill. A rather conspicuous dragfold is exposed toward the northwest end of the area stripped. Around the north and west edges of the quarry the stripping has uncovered conglomerate unconformably over the gypsum and limestone bands. This conglomerate originally covered much of the quarry area but has been removed.

Thinly bedded limestone with shaly seams has been exposed in three places in road cuts south of the quarry. The strike is similar to that of the gypsum, and the dip appears to be steep to the northeast into the hill but is indistinct because of minor contortions and surface slough. Position and attitude indicate this limestone to be the stratigraphic member below the gypsum.

About 120 feet north of the quarry in a bulldozer cut, limestone is exposed for 200 feet along the strike in an attitude similar to that of the quarry showing. A dragfold corresponding in position and appearance to that noted by the quarry is present in the cut. This limestone is presumed to be the member overlying the gypsum in the stratigraphic sequence.

In the area examined, open-cuts scattered along the strike indicate that the gypsum-bed showing in the quarry extends at least 600 feet to the southeast, 1,500 feet to the northwest, and is about 250 feet thick. Paralleling the gypsum and immediately to the northeast is a conformable zone of limestone, of which the outcrop mentioned in the last paragraph is a part. Another gypsum zone, exposed by open-cuts and indicated by sink-holes, gypsite, and conglomerate, extends along a line roughly parallel to the first one about 1,000 feet northeast of it. The strike of this gypsum is northwesterly, as in the first zone, but the dip is steep to the southwest. Attitudes and relationships as shown in Figure 16 and as seen in exposures in the area southeast of that represented by Figure 16 seem to indicate that the two gypsum bands are in the limbs and probably near the closed end of a syncline that plunges to the southeast.

Mining and loading of the rock has been let out to contract. When production from the quarry started, irregular masses of low-grade clayey material were found scattered through the gypsum lying below the two 5-foot limestone bands previously mentioned. This layer was then abandoned, and operations were moved to the higher-grade material above the lime. At the time of this examination, quarrying procedure was to blast the rock down and load it by a 1¼-cubic-yard shovel into a truck which dumped the broken rock into grizzlies at the top of a chute. By means of the grizzlies a separation was made into +6-inch pieces and −6-inch pieces, and loose dirt was removed. Separate chute compartments took the sized material down to two 100-ton bins in the lower part of the quarry. From these bins, trucks hauled the rock 9 miles to the railway siding at Windermere Lake Station. Two tractors, a D-8 and TD-14, were used for cleaning up, roadmaking, and stripping. Later in the summer a 25- by 42-inch jaw crusher was installed at the quarry to crush the rock to —6-inch size before it was trucked to the railway.

The gypsum rock is high grade, with an average content in excess of 90 per cent gypsum. The processed material is slightly dark in colour and cannot be used for hard-wall finish-coat plaster, but it makes good board and undercoat. According to Cummings* the plaster produced from this gypsum is the beta type, which requires more water for setting than the commoner alpha type. To date no anhydrite has been recognized in the deposit.

Production from the quarry was intermittent until September but fairly steady thereafter. During 1950 approximately 14,300 tons of gypsum was produced. The rock was shipped to the Western Gypsum Company's plant at Calgary, to Columbia Gypsum's own processing plant at Spokane, Wash., and to the Canada Cement plant at Exshaw, Alta.

Analyses of samples taken during the examination are tabulated below:—

Sample	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	H_2O 45° C.	H_2O 215° C.	CO_2	SO_3	Ignition Loss, $-CO_2$ $+H_2O$
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
1. Across 70 feet	1.95	0.40	0.19	2.56	31.76	....	....	0.14	17.83	5.27	39.77	0.11
2. Across 90 feet	0.59	0.13	0.08	1.50	32.63	....	....	0.15	19.19	3.02	42.78	*Nil*
3. Across 33 feet	0.69	0.27	0.07	0.97	31.60	....	....	0.17	19.78	1.87	44.38	0.20
4. Across 5 feet	1.11	0.13	0.16	1.08	32.22	....	....	0.12	19.32	2.18	43.41	0.35
5. Across 4 feet	1.95	0.41	0.19	2.09	31.66	....	....	0.09	18.29	4.05	41.04	0.29
6. Across 8 feet	9.04	1.85	0.67	7.04	27.90	0.09	0.58	0.16	12.01	13.42	26.58	0.73
7. Across 5 feet	0.55	0.09	0.06	1.39	32.41	....	....	0.10	19.29	2.59	43.42	0.16
8. Across 21 feet	0.50	0.08	0.06	1.29	32.51	....	....	0.10	19.29	2.78	43.33	0.09
9. Across 10 feet	2.00	0.38	0.19	2.12	31.84	....	....	0.12	18.15	4.39	40.63	0.27
10. Across 7 feet	0.36	0.05	0.05	1.16	32.45	....	....	0.10	19.59	2.24	43.84	0.20
11. Across 8 feet	0.54	0.08	0.04	0.81	32.50	....	....	0.11	19.88	1.62	44.32	0.23

Sample numbers correspond to sample locations indicated on Figure 16.

Gypsum occurs in enormous quantities on these claims and through the area south-easterly to and beyond the Kootenay River. No attempt is made at this time to describe this over-all distribution. The Department of Mines has an engineer making a detailed areal study of the district, and the results of this study will be published later.

Little Joan (Western Gypsum Products Limited)†

(50° 115° S.W.) Head office, 504 MacArthur Building, Winnipeg. The Little Joan group of five fractional claims is located on the west side of the Kootenay River, 8½ miles by road north of Canal Flats. The property is adjacent to and northwest of Columbia Gypsum holdings in the same area. In August a short access road was built to the Little Joan No. 2 and No. 3 Fractions, where a gypsum band is exposed. Quarrying work was done by hand, and the material was trucked to Canal Flats for transhipping to the company's plant at Calgary. Two carloads were sent as a trial shipment. Two men were employed under the supervision of Martin Tiedman.

LIMESTONE AND CEMENT

Smith Island‡

Prince Rupert (54° 130° S.E.). Columbia Cellulose Company Limited opened a limestone quarry on Smith Island, about 8 miles by water from the new cellulose-pulp mill at Port Edward. The

* Personal communication.
† By J. W. Peck.
‡ By F. J. Hemsworth.

quarry is along the north shore of Tum Tsaida Inlet, a lagoon which affords safe anchorage for tugs and barges.

Coarse limerock will be used in manufacturing calcium bisulphite, which is used in the pulp digesters. From 15,000 to 18,000 tons will be required annually. The 1950 production was stockpiled, awaiting the completion of the pulp-mill.

During 1950 a camp and a small wharf were constructed. Eight men were employed under the supervision of F. J. Beale. Production: 1,295 tons.

Koeye Limestone Company.*—Namu (51° 127° N.W.). Quarry at Koeye River. A. A. Christensen, manager. The quarry operated from July to November and produced 3,500 tons of stone. Three men were employed.

Beale Quarries Limited† Vananda (49° 124° N.W.). Head office, 744 Hastings Street West, Vancouver; quarry office, Vananda. W. D. Webster, superintendent. Limestone is quarried to produce pulp rock for paper-mills and pulverized rock for agricultural and industrial uses, and for rock-dusting in coal mines. The quarry is worked in two elevations, each face being nearly 40 feet high. Quarried rock is loaded on trucks by diesel-driven shovels and transported to the plant. The rock is dumped on a grizzly that separates pulp rock from undersize or spalls. The spalls are conveyed to a stockpile and from there taken to the crushing and pulverizing plant. The pulp rock goes directly to scows for shipment.

The average number of men employed during the year was twenty-four.

Marble Bay Quarry† Vananda (49° 124° N.W.). Office and quarry, Vananda. Stanley Beale, manager. Limestone is quarried to produce rock for paper-mills. Limestone blasted from the quarry face is loaded by diesel-driven shovels of ½-cubic-yard capacity on trucks of 5- and 10-ton capacity. These trucks transport the broken rock to a grizzly which separates the fine rock from the pulp rock. The pulp rock is loaded on scows by gravity, and the spalls are trucked to a stockpile.

The average number of men employed during the year was seven.

Pacific Lime Company Limited† Blubber Bay (49° 124° N.W.). Head office, 744 Hastings Street West, Vancouver; quarry and plant, Blubber Bay. F. W. Harvie, general manager; A. M. Stewart, assistant general manager; A. A. Lee, plant superintendent. This company operates a lime quarry and a lime plant near Blubber Bay. More than half the limestone quarried is burned for lime products, the remainder is used for smelter flux, cement manufacture, and in pulp-mills.

The quarry from which limestone is obtained is nearly 2 miles from the plant, along the Blubber Bay–Vananda road. Quarry faces are less than 45 feet high. Rock is blasted by means of holes drilled both vertically down and horizontally. Broken rock is loaded on trucks and hauled to the plant.

The average number of men employed during the year was 103.

British Columbia Cement Company Limited‡ Head office, corner of Fort and Wharf Streets, Victoria. N. A. Tomlin, managing director; C. S. Williams, technical service supervisor; R. E. Haskins, works superintendent. In August, 1950, R. E. Haskins succeeded C. S. Williams as works superintendent of the Bamberton operation and as general superintendent of the Blubber Bay plant. Quarries are operated at Bamberton (48° 123° N.W.) on Vancouver Island and at Blubber Bay (49° 124° N.W.) on Texada Island to produce limestone and greenstone used in manufacturing cement.

* By J. W. McCammon.
† By R. B. King.
‡ By R. B. King and J. T. Fyles.

Blubber Bay.—(49° 124° N.W.) At Blubber Bay broken rock is loaded by diesel-powered shovels into Koehring dumptors. These dumptors transport the rock a short distance and transfer it to dump cars that are hauled over a narrow-gauge railroad to the crushing plant. The number of men employed in this quarry and plant was thirty-five.

Bamberton.—(48° 123° N.W.) At Bamberton broken rock is loaded by electric shovels into Koehring dumptors and trucks and hauled to the crushing plant. A Bucyrus-Erie blast-hole drill was installed in the lower quarry to drill vertical holes 150 feet deep and 6⅝ inches in diameter.

Limestone and greenstone have been mined during the year from three quarries—the main quarries and the upper or Fox quarry. From the Fox quarry, about 250 feet northwest of the upper main quarry,* high-grade limestone is being mined from a northerly trending lens 50 to 60 feet thick.

Diamond drilling of a deeply drift-covered area northwest of the main quarries has disclosed a steeply dipping, northwesterly trending body of limestone not known previously. The body of limestone is about a thousand feet long and more than a hundred feet wide. It is bounded on both sides by massive greenstone and contains irregular masses of greenstone and of more siliceous rocks. A quarry is being opened to mine the newly found body of limestone.

A small amount of diamond drilling has been done to test several lenses of limestone that outcrop on the shore of Saanich Inlet about a quarter of a mile north of the main quarries.

The number of men employed in this quarry was twenty.

During the company's fiscal year, December 1st, 1949, to November 30th, 1950, 181,900 tons of rock was quarried at Bamberton and 167,100 tons was quarried at the Blubber Bay quarry.

Agassiz Lime Quarry†

Agassiz (49° 121° S.W.). Hiram Cutler, owner. This quarry, nearly 2 miles southwest of Agassiz, produces agricultural limestone. Broken rock is hauled by a loader of ¼-cubic-yard capacity to the crushing plant. The daily capacity of this plant is 40 tons. The average number of men employed during the year was seven.

Fraser Valley Lime Company Limited.†—Popkum (49° 121° S.W.). J. G. Henderson, superintendent. This quarry and plant produce crushed and pulverized limestone for industrial and agricultural purposes.

The average number of men employed during the year was seven.

The Consolidated Mining and Smelting Company of Canada, Limited‡

Fife (49° 118° S.E.). Head office, Trail; quarry at Fife. G. E. Clayton, engineer; Oscar Tedesco, quarry foreman. Quarrying of limestone continued throughout the year. Compressed-air jack-hammers are used for drilling, and the material is blasted from benches; 40 per cent Forcite and 50 per cent Cilgel explosives are used for blasting. The former method of loading the rock into narrow-gauge cars was dispensed with during the year, and the mined limestone is now loaded by a gasoline shovel and transported by truck to a loading-bin on the Canadian Pacific Railway. It is then shipped to Trail to be used as a flux in the smelter. Eight men were employed.

MARL

Cheam Marl Products Limited.†—Popkum (49° 121° S.W.). A. M. Davidson, manager. Marl is mined from a deposit near the east shore of Cheam Lake. Wet marl only is produced. Two men were employed.

* For plan of main quarries, *see* Mathews, W. H., Calcareous deposits of the Georgia Strait area, B.C. Dept. of Mines, Bull. No. 23, 1947.

† By R. B. King.

‡ By E. R. Hughes.

Popkum Marl Products Limited*

Popkum (49° 121° S.W.). W. A. Munro, manager. This company, formerly known as Marlime Limited, mines marl from a deposit on the east shore of Cheam Lake. A ½-cubic-yard drag-line shovel digs marl and loads it on trucks for transportation to a drying plant. In the plant, which has a capacity of 10 tons a day, a sawdust-fired rotary kiln dries the marl. The marl is then crushed and bagged. Humus is also dried and bagged. Seven men were employed.

MICA

Brett and Bird†

(50° 119° S.E.) The Brett and Bird claims, owned by L. and D. Bird, of Armstrong, are located on a mica occurrence northeast of Armstrong. The claims are immediately north of Sneezby Creek, 1 mile east of the point where the Armstrong–Enderby Highway crosses the railway 4½ miles north of Armstrong. A side road passes within a quarter of a mile of the workings.

Development consists of three small open-cuts and a short adit, all on the Bird claim. These workings are on the western slope of a fairly open side-hill near its base, the highest open-cut being about 100 feet above the roal level.

* By R. B. King.
† By J. W. McCammon.

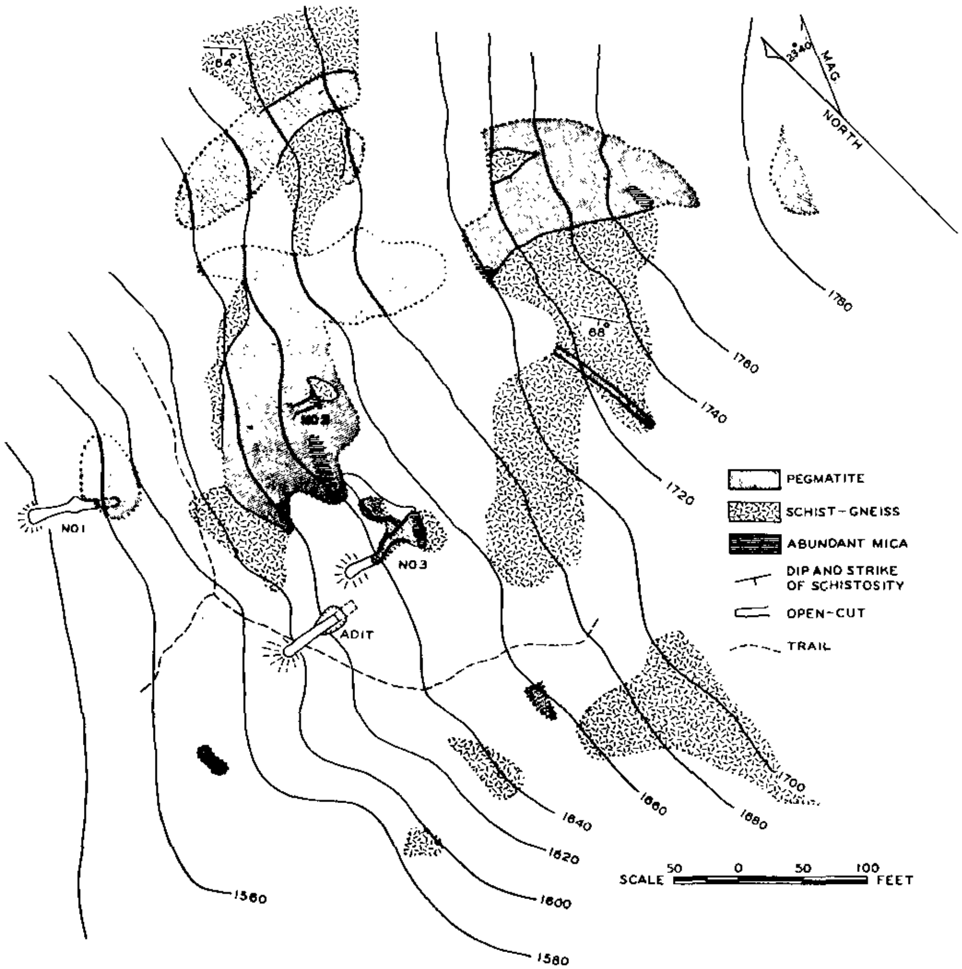


Fig. 17. Bird—mica workings.

The country rock is a medium- to dark-grey quartz-biotite schist, mapped as Salmon Arm formation of the Mount Ida Precambrian or Palæozoic group by Jones.* The schistosity frequently grades into well-developed gneissic structure. Lineation in this rock has a general strike of south 40 degrees east and a dip of 65 degrees to the southwest.

Muscovite mica occurs in a sheet-like body of pegmatite that generally cuts across the schistosity at an acute angle; but, in places where the country rock is gneissic, it tends to follow along the banding. The pegmatite body appears to have a rather flat dip to the southwest. The pegmatite exposures are irregular in shape. In some spots, erosion apparently has left isolated islands of overlying schist on top of pegmatite, while in other places both the overlying schist and the pegmatite have been removed to expose small windows of the underlying schist. This latter condition is illustrated by an outcrop just north of Open-cut No. 2, where a small low-lying patch of schist is almost surrounded by pegmatite.

The pegmatite is a light-coloured rock consisting essentially of oligoclase, orthoclase, quartz, and muscovite. The grain size varies erratically from medium to very coarse.

Muscovite, the mineral of interest on the property, occurs throughout the pegmatite; its size varies with the general grain size of the rock. The mica flakes range from a sixteenth of an inch to 5 inches in diameter. The larger flakes occur in scattered patches, as indicated in Figure 17, the most conspicuous areas being in the open-cuts. The greatest concentrations of the larger sizes of mica were observed in Open-cut No. 3 and in the outcrop immediately south of Open-cut No. 2, where books up to 4 or 5 inches in diameter occur. The mica has a greenish tinge when fresh and weathers to a silvery colour. In general, it is multiple-twinned, striated, and fractured. An occasional book produces clear pieces of sheet mica as large as an inch by an inch and a half.

Open-cut No. 1 consists of 40 feet of trench with 13 feet of adit at the east end. The rock exposed is chiefly pegmatite, but in the face of the adit a contact with underlying schist is revealed. The pegmatite in the adit is coarse grained and contains a maximum of 2 per cent of books of large-flake mica.

Open-cut No. 2, 20 feet long, cuts through pegmatite that contains muscovite mainly in tiny scales, but also has up to 3 per cent of the surface area showing flakes as large as 3 inches in diameter.

Open-cut No. 3 is 60 feet long. In the face it exposes coarse pegmatite in contact with the overlying schist. A mined-out excavation, now filled with waste, extends for 50 feet to the north from the east end of this cut. In the face of the cut several patches of mica occur as intergrown, ragged books. The patches are 1 to 2 feet in diameter and cover from 5 to 10 per cent of the exposed surface. About 200 pounds of sorted mica is piled by this cut.

An adit, 40 feet below Open-cut No. 3, has been driven about 30 feet through schist.

About 1,000 feet south of the area mapped there is an open-cut 15 feet square on a 3-foot wide pegmatite dyke that cuts through gneiss. There is a concentration of mica in books half an inch in diameter in the cut, but the mica peters out above the cut.

Approximately 100 tons of mica for grinding has been shipped from this deposit during the last eighteen years. Possibly more mica for this purpose could be mined here if a high enough market price could be obtained, but it is unlikely that sheet mica of any volume could be recovered.

SAND AND GRAVEL

Colebrook Sand & Gravel Company Limited.†—Cloverdale (49° 122° S.W.). Office and plant, R.R. 1, Cloverdale. F. Bray and J. Bray, owners and operators. Sand and gravel for making fill, concrete, and plaster are produced by this company. A ½-cubic-yard-capacity diesel-driven shovel loads gravel on trucks. Two men were employed.

* Jones, A. G.: Salmon Arm map-area, British Columbia, *Geol. Surv., Canada*, Paper 48-4 (1948).

† By R. B. King.

Greater Vancouver Sand and Gravel Company Limited*

New Westminster (49° 122° S.W.). Plant, 333 North Road, New Westminster. T. Burnett, manager; James Mutter, plant foreman. This company produces crushed and sized sand and gravel. A crushing and washing plant capable of treating 300 cubic yards of gravel a day was built during the year. Gravel is excavated by a ¾-cubic-yard diesel-driven shovel and loaded on trucks for haulage to the plant. The average number of men employed during the year was five.

Highland Sand and Gravel Company Limited*

Seymour Creek (49° 123° S.E.). Company office and plant, Lynnmour. W. J. Barrett-Leonard, manager; W. Hills, superintendent. Sand and gravel, as well as crushed and sized gravel products, are produced by this company. The sand and gravel are blasted from a 40-foot face and loaded on 5-ton trucks by two diesel-driven shovels, each of ¾-cubic-yard capacity. A crushing, screening, and washing plant is operated and produces 300 cubic yards of sized products a day.

Concrete bricks and tile are produced by this company in an adjacent plant.

The average number of men employed during the year was twenty-three.

Maryhill Sand and Gravel Company Limited*

Coquitlam (49° 122° S.W.). Company office, 902 Columbia Street, New Westminster. J. H. Gilley, manager; E. Johnston, superintendent. This company produces sand and gravel from a pit on the Fraser River near Coquitlam. Gravel is washed from gravel banks by monitors and is retained in enclosures. An electrically driven shovel of 1-cubic-yard capacity loads gravel from these enclosures on conveyor-belts that transfer it to the washing plants. The two plants for washing, crushing, and screening the gravel have a capacity of 200 cubic yards an hour.

The average number of men employed during the year was thirty-five.

Road Materials Ltd.*

Lynnmour (49° 123° S.E.). Office and plant, Lynnmour. J. E. Priest, manager. This company operates a sand and gravel pit and a processing plant for road materials. In January, 1950, the processing plant was moved to the Deep Cove Highway. Hoe-type scrapers are used to drag gravel from the pit face to a crushing plant. The sized products are hauled by truck to stockpiles or the processing plant.

The average number of men employed during the year was fourteen.

McIntyre and Harding Gravel Company Limited*

Saanich (48° 123° N.E.). Company office and plant, Royal Oak P.O., Saanich. J. Harding, manager. Sand and gravel and sized gravel products are produced by this company. Gravel is dug from a gravel bank by a diesel-driven shovel of ¾-cubic-yard capacity, loaded on trucks, and transported to a hopper. A short conveyor-belt carries the gravel from the hopper to a washing plant. This washing plant crushes, washes, and sizes 60 cubic yards of gravel an hour. The average number of men employed during the year was fourteen.

Producers Sand & Gravel Company (1929) Limited*

Albert Head (48° 123° S.E.). Company office and plant, R.R. 1, Victoria. A. Parker, manager. This company operates a large gravel pit and washing plant at tidewater nearly a mile north of Albert Head. A scraper operated on a slack-line cableway is used to loosen hard, packed gravel from a steep, high face. This gravel is loaded by a shovel, of 1-cubic-yard capacity, into a hopper. The gravel is then transported by a series of conveyor-belts to the washing plant.

During the year a completely new concrete structure was built to replace the former washing plant. The new plant has a capacity of 1,600 cubic yards in eight hours. The previous plant had a capacity of 800 cubic yards. Sand or gravel can be loaded directly to scows or transferred to stockpiles.

The average number of men employed during the year was ten.

* By R. B. King.

VERMICULITE

Verity* (52° 119° S.E.) In the summer of 1950 the O. E. French family recorded five claims, the Verity Nos. 1 to 5, on a showing of vermiculite. The claims are immediately east of the Canadian National Railway tracks at 110-Mile Post, about half-way between the flag stops of Lempriere and Pyramid Falls. Lempriere is 169 miles by rail north of Kamloops. The showings were examined near the end of September, 1950.

The claims lie on the steep mountainside that forms the east wall of the valley of the North Thompson River. Timber is plentiful and underbrush is thick. Outcrops are small, scarce, and scattered, and overburden, generally, is thick.

The country rock is augite-hornblende gneiss, probably Precambrian in age. It has a general strike of north 70 degrees east and a dip of about 20 degrees to the south. Apparently interbedded in the gneiss is a layer of what is now coarsely crystallized limestone. The vermiculite occurs as scattered books in the limestone and as an irregular zone along the upper contact of the limestone with the gneiss. The gneiss is well banded and has some layers a foot or more in thickness that consist almost entirely of augite and hornblende. In the largest open-cut the rock directly above the limestone and vermiculite consists predominantly of coarsely crystalline hornblende and calcite; whether this represents an altered basic dyke or one of the basic layers of the gneiss could not at the time be determined. No outcrops of pegmatite dykes were seen, although blocks of pegmatite up to 2 feet in diameter were noticed at the base of the slope and in a small creek valley a few hundred feet north of the open-cuts.

At the time of the examination there were two main open-cuts and four smaller ones, all on the Verity No. 1 claim.

Open-cut No. 1 was 1,800 feet east of and 300 feet higher than the railway tracks. It was 30 feet long and 15 feet wide, parallel to the strike of the gneiss. The floor and the east end of the cut exposed a crumbly, coarsely crystalline, buff-stained limestone that contains up to 10 per cent of scattered books of what is now vermiculite and 5 per cent or more of rounded, tiny, glassy crystals of fluorapatite. Toward the south side of the cut the vermiculite increases in abundance until it forms an indefinite zone as much as 2 feet wide of loose powdery material composed of micaceous flakes with small grains of limy material. This loose material grades southward into a more compact mass of black mica with abundant apatite grains. The mica, near biotite in composition, is in longish, narrow flakes of random orientation and gives the impression of being an alteration product from a mass of hornblende. Above the black mica is a small outcrop of augite-hornblende gneiss.

Open-cut No. 2 was approximately 1,100 feet to the east of and 200 feet higher than Open-cut No. 1. It was dug for 54 feet along the strike. The bottom exposed a crumbly apatite- and vermiculite-bearing limestone similar to that in the other cut. In addition, this rock contains scattered nodules of magnetite up to 2 inches in diameter. As in Open-cut No. 1, toward the south side of the trench, the percentage of vermiculite increases until it eventually forms a friable mass consisting largely of micaceous flakes. This mass was exposed over a length of 24 feet, with a maximum thickness of 54 inches near the centre. Overlying this micaceous material is augite-hornblende gneiss. At the east end of the trench a mass of coarse hornblende crystals with white calcite and apatite is directly over the vermiculite. In this cut a gradation could be seen from dark-green hornblende into a mixture of hornblende and black mica and then on into black mica and brown vermiculite.

A small open-cut, 50 feet east along the strike from Open-cut No. 2, exposed coarse calcite, hornblende, vermiculite, and magnetite. Another small open-cut 50 feet to the northeast exposed similar material.

* By J. W. McCammon.

A third open-cut some 140 feet northeast of Open-cut No. 2 exposed limestone also. In this exposure, however, the mineral composition is different. The groundmass is coarse, twinned calcite; magnetite and ilmenite are present; apatite is rare or absent; vermiculite is scarce and in small flakes of about 2 millimetres in diameter; some pyrrhotite is visible; and olivine is present in abundance as irregular grains and masses up to 2 inches in diameter.

One other open-cut was examined. It was 200 feet higher than and 400 feet east along the strike from Open-cut No. 2. This cut exposed banded gneiss. Vermiculite occurs in the rock as scattered flakes and in solid kidneys a foot to a foot and a half in length.

No rock was seen in contact with the limestone on the north, but one or two small outcrops of gneiss were seen within a few hundred feet in that direction.

One further exposure was visited about a mile east of and 2,000 feet higher than Open-cut No. 2. This was a small face of gneiss in a creek bed. A few scattered flakes of mica in this rock expanded when heated.

The vermiculite appears to be of two distinct types. In the limestone it occurs in individual books of rough hexagonal shape. The size of these books is variable, usually less than half an inch in diameter, although one 4 inches across was seen. The fresh vermiculite is dark brown, and it weathers to a golden-brown colour. It is soft, has a greasy feel, and is flexible but not elastic. A selected sample of this material had a specific gravity of 2.16, expanded six times on heating, and had a water loss of 6 per cent during expansion. The expanded material floated readily on water.

The vermiculite in the loose masses at the edge of the limestone is in small flakes that are long, thin, and more or less rectangular in shape. These flakes look as though they have been derived from hornblende prisms, in some cases directly but in other cases through an intermediate biotitic stage. Two samples of this loose material, as taken directly from the outcrop, were tested. The first is from Open-cut No. 1 and the second is from Open-cut No. 2. The results are shown below:—

	No. 1	No. 2
A. Screen analysis—		
Mesh +10	18%	9%
„ −10 +20	27%	39%
„ −20 +60	37%	43%
„ −60 +100	10%	5%
„ −100	8%	4%
B. Volume on expansion	3.2 times original	2.5 times original
C. Water loss on expansion	7.5%	5.5%
D. Vermiculite in raw material (by weight)	40%	38%

A.—The volume of a weighed sample of the raw material as taken from the outcrop was measured in a graduate. This sample was then tested in a Ro-Tap tester for seven minutes. The screen analysis obtained is shown in Part A of the table.

B.—The total weighed sample from A was heated in an electric muffle furnace at 1,800 degrees Fahrenheit until all expansion ceased. The volume of this expanded material was measured in a graduate and compared with the original volume of the same sample in A. The change in volume is shown in Part B of the table.

C.—The entire sample from B after expansion and cooling was weighed. The difference between this weight and the original weight for the sample in A gives the water loss on expansion. This is shown as a percentage of the original weight in Part C of the table.

D.—After weighing and measuring the volume of the sample in B, the expanded vermiculite was floated off with water and the residue was dried and weighed. The difference between this weight and the weight found in C gives the weight of expanded vermiculite from the original mine-run sample. This is expressed as a percentage of the original sample weight in Part D of the table.

Inspection of Lode Mines, Placer Mines, and Quarries

By H. C. Hughes, Chief Inspector of Mines

CONTENTS

PRODUCTION

The output of metal mines for 1950 was 6,782,912 tons. This tonnage was produced from 112 mines, of which fifty-eight produced 100 tons or more.

FATAL ACCIDENTS

During 1950 there were six fatal accidents connected with actual mining operations in underground metal mines, including underground placer mines. This was five less than in 1949. In addition, there was one fatal accident in a surface placer operation. A description of this accident is included.

There were 5,814 persons employed below and above ground in metal mines and 1,259 persons employed in concentrators in 1950. The ratio of fatal accidents per 1,000 persons employed was 0.85, as compared with 1.58 in 1949.

The tonnage mined per fatal accident during 1950 was 1,130,485 tons, compared with 554,131 tons in 1949.

The tonnage mined per fatal accident during the last ten-year period was 529,209 tons.

The following table shows the mines at which fatal accidents occurred during 1950, with comparative figures for 1949:—

Mining Division	Mine	No. of Fatal Accidents	
		1949	1950
Fort Steele	Sullivan	2	....
Greenwood	Waterloo	....	2
Lillooet	Bralorne	2	2
Lillooet	Pioneer	1	....
Nelson	Emerald	1	....
Osoyoos	Hedley Mascot	1	....
Similkameen	Copper Mountain	....	1
Slocan	Van Roi	....	1
Vancouver	Britannia	4	....
Totals		11	6

A drowning fatality on a placer operation at Crow's Bar on the Fraser River near Quesnel has been omitted from this table.

The following table classifies the fatal accidents as to cause and location:—

Cause	Number	Location
Falls of ground	2	Underground.
Underground haulage	1	Underground.
Gas (CO)	2	Underground.
Surface haulage	1	Surface skip.
Drowning	1	Surface placer.

On January 10th, 1950, Donald Arthur Quinn, miner and timberman, was instantly killed when struck by a fall of ground in 356 stope, 3 level in the Van Roi mine near Silverton. The ground had been tested by both Quinn and the foreman and was thought to be safe. When it fell, it exposed a concealed slip at right angles to the vein, which allowed a slab to fall out between two stulls about 8 feet apart.

On March 24th, 1950, Joseph Nelson Gallant, timberman, died as a result of injuries received when he was crushed between a motor he was operating and a post at the side of the drift in the Bralorne mine. In a statement made to the doctor before he died, Gallant said that he knew the post was there, but had forgotten to look for it.

On April 12th, 1950, Milton Cameron, placer-miner, was drowned at Crow's Bar on the Fraser River, when a boat which he was in capsized. Cameron, who was supposed to be an experienced river man, was attempting to free a cable across the river from some obstruction on the bottom.

On May 4th, 1950, George Frank Zupan, skip-tender on the Copper Mountain surface tram, died as a result of injuries received when he fell off and was run over by the skip. The tram is used to transport men and materials from the main mine to the C.P.R. station and crushing plant. At the time of the accident eight passengers were on the tram, but as they face down hill and the skip-tender rides on a small seat at the front, none of them actually saw him fall off. An unusual feature of this accident was the physique of the deceased. He was 7 feet tall, and it is possible that he had been riding with his legs over the front of the skip, with feet resting on the hoisting-rope. If his feet slipped off the cable, they would reach the ties and could have pulled him under the skip.

On June 29th, 1950, Leo Morris and Raymond Galloway, miners, died as a result of carbon-monoxide poisoning while unwatering a shaft with a gasoline-driven pump in the Waterloo mine at Camp McKinney. The pump was about 50 feet below the shaft collar. Morris went down the shaft to adjust the pump, and when he did not come back, Galloway went down to rescue him and was also overcome. The "Metalliferous Mines Regulation Act" prohibits the use of gasoline engines underground because of the danger from carbon monoxide.

On August 18th, 1950, John Fehr, miner, was instantly killed by a fall of ground in 11-51-8 stope at the Bralorne mine. The deceased and his partners had scaled and thoroughly tested the ground in the stope before Fehr had commenced to drill, and it was thought to be safe.

FATAL ACCIDENTS AND ACCIDENTS INVOLVING LOSS OF TIME

Accidents that caused the death of seven men and 388 accidents that caused injuries involving loss of more than seven days were reported to the Department. These accidents were investigated and reported upon by the Inspectors of Mines.

The following three tables classify the accidents as to cause, as to the occupation of those injured, and as to parts of the body injured. The seven fatal accidents are included in the first two tables, but not in the third.

Accidents Causing Death or Injury Classified as to Cause

Cause	Number of Accidents	Percentage of Total
Blasting	3	0.8
Breaking of staging, ladders, etc.	6	1.5
Falls of ground	73	18.8
Falling or flying material	39	10.0
Falls from ladders, staging, etc.	13	3.4
Lifting and handling materials	73	18.8
Machinery and tools	95	24.5
Slipping	58	14.9
Run of ore or waste	10	2.6
Burns and shock	4	1.0
Drowning	1	0.3
Miscellaneous	13	3.4
Totals	388	100.0

Accidents Causing Death or Injury Classified as to Occupation of Those Injured

Occupation	Number of Accidents	Percentage of Total
Underground—		
Barmen	1	0.3
Chutemen	16	4.1
Haulagemen	36	9.3
Miners	174	44.8
Muckers	45	11.6
Timbermen	22	5.7
Trackmen and pipe-fitters	12	3.1
Miscellaneous	12	3.1
Surface—		
Shops	11	2.8
Surface, general	36	9.3
Mill	23	5.9
Totals	388	100.0

Accidents Causing Injuries Classified as to the Parts of the Body Injured

Location	Number of Accidents	Percentage of Total
Head and neck	24	6.3
Eyes	14	3.7
Trunk	54	14.1
Back	75	19.8
Arms	22	5.8
Hands and fingers	73	19.2
Legs	72	19.0
Feet	37	9.7
Toes	9	2.4
Totals	380	100.0

The total of 388 accidents causing death or injury includes, in addition to those listed above, one case of non-fatal asphyxiation and seven fatal accidents.

DANGEROUS OCCURRENCES

The following dangerous occurrences were reported, as required by section 9 of the "Metalliferous Mines Regulation Act":—

On February 15th, 1950, on the 1150 level scram drift, at the Torbrit Silver mine, a slusherman blasted a rock on the grizzly without properly guarding all entrances. Three men had approached dangerously close to the grizzly when the blast occurred. Fortunately, no one was injured. The slusherman was discharged by the management, and his blasting certificate was suspended for a period of six months by the Inspector of Mines.

On March 22nd, 1950, a pipeman inadvertently entered an unused raise in the Sullivan mine which was deficient in oxygen. He became unconscious but, fortunately, was found by the shiftboss before ill effects occurred.

On March 29th, 1950, at 3821 Drift South fan, in the Sullivan mine, a disconnected grease-line caused the bearing of the fan to heat up and ignite the grease vapours, which in turn ignited the V-belt drives. The fire was contained and no further damage resulted.

On June 1st, 1950, at the central station of the main surface tramway of the Nickel Plate mine, Hedley, when the loaded skip of ore was being lowered, power was not applied to the motor and it seized, acting as a brake, and bringing the skips to a sudden stop. The flywheel effect of the headgear mechanism following the sudden stoppage of the motor caused excessive strain on the main gear and countershaft. The sudden stoppage of the drive assembly caused the upcoming portion of the skip cable to throw sufficient slack into the wheel-room to permit the rope to jump the head sheave grooves, thereby causing serious injury to the rope. The damaged cable was replaced before further work was done. Temporary repairs to the mechanism were effected on June 5th, allowing the operation of the tramway to be resumed. Passenger transportation was prohibited until permanent repairs were made. No one was injured.

During July, August, and September, 1950, sulphur-dioxide fumes were given off from 55, 25, 26, 27, 06, 07, and 08 stopes in the Sullivan mine. These fumes were given off by the oxidation of the backfill which contained about 7 per cent iron-sulphide tailings. Difficulty was encountered in confining and controlling corrosive fumes, and workmen installing ventilation pipe, fans, and seals experienced temperatures as high as 160 degrees Fahrenheit with oxygen deficiency. Mine-rescue crews with the usual equipment and with protective clothing proved very useful in doing this work.

A further report on this occurrence is given under the heading "Mine-rescue, Safety, and First Aid."

On July 21st, 1950, in the No. 6 adit of the Stannite mine, near Albert Canyon, a miner became overcome by powder fumes from a recent blast after spitting seven missed holes. He regained consciousness and travelled 20 feet before the holes began to fire. He was unconscious when found, but on recovery was found to have only numerous rock cuts.

At 3 a.m. on July 31st, 1950, a fire was discovered in the change-house of the Little Billie mine, Texada Island. The change-house was completely burned and other mine buildings were endangered. The fire was thought to have resulted from an overheated chimney. Diesel oil is used as fuel.

During October and November, 1950, muck being drawn in the 39272 Sublevel C scraper drift of the Sullivan mine became heated due to the oxidation of the ore broken by a diamond-drill blast in April. Muck temperatures reached 429 degrees Fahrenheit before the muck was removed. Special blasting precautions had to be taken.

On October 6th, 1950, in the main raise of the Reeves MacDonald mine, a surge of wet muck caused a spill to occur from the ore-pass into the parallel service raise. Four men were in the raise at the time. Three took shelter as best they could and were uninjured, but the other jumped 75 feet down the skip slide and suffered a broken leg. Concrete bulkheads have now been placed to prevent a recurrence.

On November 25th, 1950, at the shaft in the Island Mountain mine, a trammer placed a mine car on the cage for transfer to lower level. While in transit the car moved out of place in the cage, catching the timbers and causing the cage to hang up. About 500 feet of cable was let down on top of the cage before the hoistman realized that there was a hang-up. Several men, including the mine superintendent, watched the cable as it was slowly wound back, feeding it back by hand. This was accomplished without kinking the rope. It is believed the trammer had not secured the car properly in the cage.

On November 27th, 1950, in the 4000-325 drift of the Island Mountain mine, two men, cleaning up the drift, pushed a car of muck out on to the main line. They sent another man to tell the locomotive operator it was there, and that if he would stop, they would couple it to the train. The operator, having six cars in front of him, misjudged the distance and knocked the car off the track. Two other cars were also derailed. One of these hit and broke the main 6-inch air-line. The car should not have been put on the main line, but the train should have picked it up from the side-track.

On November 28th, 1950, in 39255, Sublevel E, of the Sullivan mine, a miner was overcome by powder fumes from the previous shift and had to be rescued by his partner. The miners had neglected to blow the face clear of fumes with compressed air before proceeding to work.

On December 1st, 1950, in 0-12 " E " slusher drift in the Sullivan mine, the operator of the slusher hoist, who sits on a seat attached to the hoist, was suddenly thrown over the hoist when the back hold-down bolts broke. His hard hat was severely damaged, but fortunately he did not lose consciousness and was able to prevent himself from falling down the scraper raise. The operators' seats are now not attached to the hoists.

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 1946, 1947, 1948, 1949, and 1950:—

	1946 Total	1947 Total	1948 Total	1949 Total	1950 Total	1950	
						Mines	Quarries
High explosives (lb.)	3,960,150	5,464,900	6,209,950	7,022,000	7,318,962	6,979,512	339,450
Blasting-caps	1,464,300	1,780,700	1,816,000	2,082,400	2,518,200	2,230,400	287,800
Electric blasting-caps	4,910	117,650	61,150	146,760	65,725	45,750	19,975
Delay electric blasting-caps	29,425	55,700	78,800	36,170	110,269	104,169	6,100
Primacord (ft.)	135,500	258,000	417,000	421,000	460,500	460,000	500
Safety fuse (ft.)	11,625,300	13,722,100	16,053,900	16,838,400	19,934,700	18,754,600	1,180,100

PROSECUTIONS

There were no prosecutions during 1950.

AIR-SAMPLING

Air samples were taken wherever conditions indicated the possibility of noxious gases or the oxygen content being below normal, and also to check determinations made by methane detectors, carbon-monoxide detectors, and flame safety lamps. Thirty-one samples were taken and analysed for oxygen, nitrogen, carbon monoxide, carbon dioxide, sulphur dioxide, methane, hydrogen, etc. This is the same number as taken in 1949. The wider use of the newer and more sensitive types of methane and carbon-monoxide detectors has proved of great value in the detection of small concentrations of these gases and makes it possible to dilute or remove them before they reach dangerous proportions. The sensitive detectors also greatly reduce the necessity of taking air samples for analysis.

DUST AND VENTILATION

Problems in dust-control and ventilation have continued to receive the attention of mine operators and Government departments. Complete dust-count and ventilation surveys were made in thirty-nine of the larger mines in the Province by the Silicosis Branch of the Workmen's Compensation Board; in all, fifty-three surveys were made. Over-all dust counts were generally found to be below the range where a hazard is thought to exist, reflecting a conscientious effort on the part of mine management to eliminate, as far as possible, this hazard.

Aluminium therapy treatment for the prevention of silicosis is available at nearly all mines of any size where a silicosis hazard exists.

MINE-RESCUE, SAFETY, AND FIRST AID

During 1950 the mine-rescue stations at Nanaimo, Cumberland, Princeton, and Fernie were fully maintained, with modern equipment and a trained instructor at each station. Each station is equipped with several sets of McCaa and Gibbs two-hour oxygen machines, one set of Chemox one-hour oxygen machines, Burrell all-service gas masks, methane and carbon-monoxide detectors of the latest type, and a complete supply of first-aid equipment. Supplies and equipment for charging and servicing this equipment are also maintained.

Training in the use of mine-rescue equipment is given at the stations to all who apply for it, and fully trained teams are given regular monthly practice-training as a unit, not only to keep them familiar with the use of the machines, but to teach them the value of teamwork in mine-rescue operations.

In order to better serve the West Kootenay District, where several important mines are scattered throughout a large area, a mobile mine-rescue unit, in charge of a qualified mine-rescue and first-aid instructor, was stationed at Nelson in 1950.

The unit consists of a substantial panel truck with built-in bench, cupboards, shelves, and seats. The equipment carried includes five sets of Chemox oxygen apparatus, six all-service gas masks, one H.H. inhalator, complete first-aid equipment with stretchers, blankets, flame safety lamps, and carbon-monoxide detector, and a complete supply of canisters, carbogen, and standard mine-rescue equipment. The interior is so arranged that a full mine-rescue team with all equipment can be transported to any point in the district at very short notice. Provision has also been made for carrying a stretcher patient, and with this in view the interior of the truck, as well as the driver's compartment, can be heated.

The mobile unit visits individual mines, as well as small mining centres in the district, and classes in first-aid and mine-rescue work are held at these places. This programme was started in October, and classes were held at Zincton, Sandon, Ainsworth, and Riondel. Twenty-three candidates at these centres received instruction in first aid and were granted certificates. Eleven other candidates were taking instruction but had not completed their course before the end of the year. A course in mine-rescue at Riondel, in which thirteen men received instruction, was also in progress at the end of the year. The Department feels that this unit will do much to promote mine-rescue and first-aid work in this important area.

The Sullivan and Copper Mountain mines each have one or more sets of McCaa two-hour machines, and complete sets of Chemox oxygen apparatus are maintained at Hedley, Bridge River, Wells, and Britannia. These sets are periodically checked by one of the mine-rescue instructors.

Teams trained at mines remote from the stations are visited and examined by one of the regular instructors. The Inspector of Mines and the instructor for the district arrange the course of instruction and conduct the examinations. The instructors also perform a valuable service to the mines with mine-rescue equipment, in that they periodically check the equipment at these mines to see that it is always in serviceable condition.

A certificate of competency in mine-rescue work is granted to each man who takes a full training course and passes the examination set by the Department of Mines.

During 1950, in addition to the regular teams in training, 108 men took the full training course and were granted certificates of competency, as follows:—

Cert. No.	Name	Where Trained	Cert. No.	Name	Where Trained
2371	John S. B. Gilbert	Wells.	2425	Berton H. Hall	Pioneer.
2372	Ralph Baker	Fernie.	2426	George W. Higgs	Pioneer.
2373	James Eugene Morris	Fernie.	2427	Clarke R. Humphrey	Pioneer.
2374	R. Balez	Princeton.	2428	Malcolm Hunt	Pioneer.
2375	Samuel Lockhart	Princeton.	2429	Stanley J. Hunter	Pioneer.
2376	Robert Logan	Princeton.	2430	Gordon H. Jackson	Pioneer.
2377	Thomas L. Wookey	Princeton.	2431	Alexander Kretulnicks	Pioneer.
2378	Paul Zagar	Princeton.	2432	Ernest W. Powers	Pioneer.
2379	James B. Strachan	Tulsequah.	2433	Arthur B. Taylor	Pioneer.
2380	Thomas Skomedal	Tulsequah.	2434	C. E. Brown	Nickel Plate.
2381	J. Allan Willcox	Tulsequah.	2435	A. M. Cawston	Nickel Plate.
2382	Thomas M. Parkinson	Tulsequah.	2436	J. Nickel	Nickel Plate.
2383	Robert Duffin	Tulsequah.	2437	J. S. Nickel	Nickel Plate.
2384	Edward L. Fearman	Tulsequah.	2438	W. A. Triggs	Nickel Plate.
2385	James A. Scott	Tulsequah.	2439	W. R. Wyllie	Nickel Plate.
2386	John S. Johnson	Tulsequah.	2440	R. D. Yonge	Nickel Plate.
2387	Raymond Livingstone	Alice Arm.	2441	Joseph P. Dore	Wells.
2388	Dennis Menhinick	Alice Arm.	2442	Reginald T. Ginn	Wells.
2389	Stanley Uruski	Alice Arm.	2443	John P. McKelvie	Wells.
2390	John P. McKenna	Alice Arm.	2444	Robert M. Purdy	Wells.
2391	John Iverson	Alice Arm.	2445	Stephen R. Surinak	Wells.
2392	John Harold Raven	Fernie.	2446	Frederick A. Hughes	Wells.
2393	William Corrigan, Jr.	Fernie.	2447	Joseph Robert Springall	Fernie.
2394	Harold Hughes Coop	Fernie.	2448	Robert Henry Gilmar	Michel.
2395	Donald Albert Grady	Fernie.	2449	Ray Doonanco	Michel.
2396	Leslie Frank Hockley	Fernie.	2450	Paul Doonanco	Michel.
2397	Arnold Webster	Fernie.	2451	Aldo Barsato	Michel.
2398	Patrick Graber	Copper Mountain.	2452	David Thewlis, Jr.	Michel.
2399	D. E. Hurd	Copper Mountain.	2453	Andrew Frederick Krall	Michel.
2400	W. G. Mossop	Copper Mountain.	2454	Robert Kelly Saad	Michel.
2401	James B. McKinnon	Copper Mountain.	2455	Alexander Marr Walker	Natal.
2402	Peter Wells	Copper Mountain.	2456	Robert Owen Doratty	Natal.
2403	Edward James Wiggans	Copper Mountain.	2457	Harry Flynn	Britannia Beach.
2404	Joseph H. Hastings	Bralorne.	2458	Steve Slemenski	Britannia Beach.
2405	Donald S. McLennan	Bralorne.	2459	Sidney A. Elliott	Britannia Beach.
2406	Jacob Yakimyshen	Bralorne.	2460	Leonard W. Bishop	Britannia Beach.
2407	Albert U. Mracek	Bralorne.	2461	John B. MacDonald	Britannia Beach.
2408	Adam J. Garlinski	Bralorne.	2462	Thomas Bates	Cumberland.
2409	Thomas Illidge	Bralorne.	2463	Ernest Bates	Cumberland.
2410	George Cain	Bralorne.	2464	James Loyns	Cumberland.
2411	Peter Swain	Bralorne.	2465	Joseph Fowler	Cumberland.
2412	John M. Bodenchuck	Wells.	2466	George H. Nicholas	Cumberland.
2413	Bernard D. Meek	Wells.	2467	Robert Davies	Cumberland.
2414	Peter Kwiczak	Wells.	2468	John H. Arnason	Wells.
2415	William E. Tambling	Wells.	2469	Roger J. Fagan	Wells.
2416	Sydney Ross	Wells.	2470	Bruce Garten	Wells.
2417	George Wilkie McFarlane	Kimberley.	2471	William H. Johnston	Wells.
2418	William Patrick MacDonald	Kimberley.	2472	Victor Lund	Wells.
2419	John Ekskog	Kimberley.	2473	Patrick J. O'Connell	Wells.
2420	Hans Oslie	Kimberley.	2474	William H. Reid	Wells.
2421	James Scott, Jr.	Kimberley.	2475	Thomas P. Schuks	Wells.
2422	Cyril Frederick Lyle	Kimberley.	2476	Wallie C. Shamenski	Wells.
2423	Dewi Richard Morgan	Fernie.	2477	Edward B. Smith	Wells.
2424	Lorne J. Basher	Pioneer.	2478	Gary G. Whelan	Wells.

The Mine Safety Associations in the different centres in the Province, aided by company safety engineers and Inspectors of Mines, continued to encourage and promote mine-rescue and first-aid work and safety education in their respective districts.

First-aid and mine-rescue competitions were held in Nanaimo, Princeton, Kimberley, and Lillooet.

At Nanaimo a total of four teams competed in the mine-rescue competition. These were from No. 10 mine at South Wellington (two teams), Tsable River mine, and No. 8

mine at Cumberland. The winning team was the No. 1 team from No. 10 mine, captained by J. Gilmour.

At Princeton four teams, two from Copper Mountain and two from the Nickel Plate mine at Hedley, competed. The winning team was the No. 2 team from the Nickel Plate, captained by R. Richards.

At Kimberley seven teams competed. Three teams were from the Sullivan mine, two from Michel, and one each from Coal Creek and Fernie. The Fernie team, captained by Albert Littler, won this competition.

The competition at Lillooet, originally planned for June 17th, had to be postponed until September 9th, as high water and floods made it impossible for all the teams to attend. Two teams from Bralorne, one from Island Mountain, and one from Britannia competed. The winning team, Bralorne No. 1, was captained by Albert Mracek. This was the second annual competition held by the Central British Columbia Mine-rescue Association.

Local first-aid competitions were held at Pioneer mine, Britannia, and Salmo. At Pioneer, teams from Bralorne mine competed, and at Salmo, teams from Emerald, Reeves MacDonald, and Trail competed. Teams of women, juniors, and others not directly connected with the mining industry took part in these competitions. This general participation in first-aid work is very commendable and does much to create interest in this type of work.

A feature of the Salmo meet was an actual demonstration of fire-fighting, including the rescue of a patient overcome by smoke and fumes by the Tadanac Fire Department.

The usefulness of mine-rescue equipment and trained personnel in overcoming unusual conditions was clearly demonstrated in the Sullivan mine at Kimberley. The conditions resulted from the formation of large quantities of SO_2 gas from the oxidation of backfill material containing about 7 per cent of iron-sulphide tailings. The following report submitted by J. R. Giegerich, general superintendent of the Sullivan mine, on the conditions and how they were overcome is given here as it is of much general interest:—

"The SO_2 gas resulted from the oxidation of the float rock fill which contains approximately 7 per cent iron sulphides. The float fill was introduced into three stopes—25-27 stope, 55 stope, and 06-08 stope. The 55 stope started giving off SO_2 gas on June 21st, 1950; 06-08 stope started giving off SO_2 gas on July 17th; and 25-27 stope started giving off SO_2 gas on August 1st.

"In order to keep the fumes confined and away from the mine airways, it was necessary to construct many temporary seals and to utilize certain drifts to conduct the fumes to the main ventilation raises. Brattice-cloth seals would only last a few days and had to be replaced with gunite seals. The drifts used for conducting the fumes were necessary for mine operation and 18-inch aluminium ventilation pipe was constructed to conduct the fumes to the ventilation raises.

"The fumes attacked the aluminium pipe in a very short period of time, and stainless-steel pipe was then used. Contamination drifts have now been driven in the footwall and hangingwall to conduct the SO_2 gases to the ventilation raises.

"When the fumes first started in June, we had four 6-man teams of mine-rescue men available for the fume-control work. Every man on the teams has been used in this work. The rescue men have worked in extremely high temperatures and very high concentrations of SO_2. In some areas the air was found deficient of oxygen.

"The McCaa oxygen breathing apparatus could not be used due to the acid effect on the metallic parts. All-service gas masks and Chemox apparatus have been used for all work in gas areas. The timers could not be used on either apparatus as the fumes destroyed their effectiveness in a few days. The fumes often destroyed the clothes of the rescue men, and the heat in certain areas required the men to apply petroleum jelly to certain parts of their bodies before going into the fumes. Special all-wool suits and plastic gauntlet-type gloves are now provided. Mine-rescue men are provided with watches.

" We have found that the most efficient and safe method for working in highly contaminated areas is to use a 6-man team. Three men work in the contaminated area while the other three men remain at a near-by fresh-air base. A special signal apparatus on a reel is used, which contains 800 feet of cord. This apparatus is equipped with a buzzer and a red light which is used to signal the men at the fresh-air base. The teams synchronize their watches and relieve each other at regular periods. In areas of lower concentrations where the all-service masks are used, it may be possible for six men to work together. At present there is a 6-man team on the day and the afternoon shifts and two mine-rescue patrolmen on the night shift. All seals are regularly inspected for possible leaks or damage, and all areas are patrolled for possible escape of the SO_2 gas.

" This work has been continuous since the fumes first started in June, and to date we have used 2,500 all-service canisters and 550 Chemox canisters. All equipment is continuously maintained in first-class condition and an adequate number of canisters are kept on hand.

" The Wolf safety lamps are used at all times when the men are working in contaminated areas as a safeguard against possible low-oxygen areas. All men are physically examined by the local doctors periodically, and to date no one has lost any time through an accident due to this gas. The mine-rescue men are very well trained and experienced in this work and have demonstrated the value of this special training."

Ryan Trophy

The John T. Ryan Regional Safety Award for the metal mine with the lowest accident record for 1950 was won by The Granby Consolidated Mining Smelting and Power Company's mine at Copper Mountain. The award was presented to the men and officials of the company at the annual Mine-rescue and First-aid Competition held in Princeton on June 9th, 1950.

The award for coal mines was won by the No. 10 mine, South Wellington, of the Canadian Collieries (Dunsmuir) Limited, and was presented at the annual Mine-rescue and First-aid Competition held in Nanaimo on June 3rd, 1950.

Coal-mining

By Robert B. Bonar, Senior Inspector of Coal Mines

CONTENTS

PRODUCTION

The output of the collieries is given in short tons. The output of the coal mines of the Province for the year 1950 was 1,756,667 tons, a decrease of 160,629 tons or 8.3 per cent from 1949; 274,854 tons of the total output came from strip mines at Michel, Tent Mountain, and Princeton.

Vancouver Island collieries produced 575,228 tons, a decrease of 28,070 tons or 4.6 per cent from 1949.

The Northern District production was 25,121 tons, an increase of 1,377 tons or 5.8 per cent over 1949.

The Nicola-Princeton District production was 17,929 tons, a decrease of 33,749 tons or 6.5 per cent from 1949.

The East Kootenay District production was 1,138,389 tons, a decrease of 100,187 tons or 8.1 per cent from 1949.

OUTPUT AND PER CAPITA PRODUCTION, 1950

Colliery and Mine	Gross Output Mined during Year (Tons)	Days Worked	Total Number of Employees	Daily Output per Employee (Tons)	Yearly Output per Employee (Tons)	Number of Employees Underground	Daily Output per Underground Employee (Tons)	Yearly Output per Underground Employee (Tons)
Comox Colliery (No. 8 mine)	216,385	223	422	2.30	512	344	2.82	629
Tsable River Colliery	99,256	223	136	3.27	730	121	3.68	820
South Wellington No. 10 mine	214,858	250	211	4.07	1,018	176	4.88	1,220
White Rapids mine	33,078	135	120	2.04	276	110	2.23	300
Bright mine	1,978	84	10	2.35	198	10	2.35	198
Chambers mine	2,239	180	4	3.11	560	3	4.15	746
Loudon mine	989	203	4	1.21	247	4	1.21	247
Lewis mine (Timberlands)	672	189	2	1.78	336	2	1.78	336
Deer Home mine	474	96	2	2.47	237	2	2.47	237
Wellington mine (Carruthers)	623	191	2	1.63	311	2	1.63	311
Stronach mine	1,640	213	6	1.27	273	5	1.54	328
Furnace Portal mine	1,195	153	3	2.60	398	2	3.90	597
Cassidy mine	1,841	221	5	1.67	368	4	2.08	460
Tulameen Collieries Ltd.	11,048	64	84	2.05	131	65	2.66	170
Taylor Burson mine	4,400	272	5	3.23	880	4	4.04	1,100
Coldwater mine	1,145	176	7	0.93	163	5	1.30	229
Black mine (strip)	25	....	2	......	......	......	......	......
Old Princeton Colliery (strip)	1,311	108	4	3.03	328	......	......	......
Bulkley Valley Collieries	12,563	201	31	2.01	405	22	2.84	571
Reschke mine	4,941	215	8	2.87	617	7	3.28	706
Peace River mine	5,632	261	8	2.69	704	6	3.59	938
Gething mine	1,985	140	9	1.57	220	7	2.02	285
Elk River Colliery	304,943	204	403	3.72	758	317	4.71	961
Michel Colliery (underground)	559,928	226	704	3.52	795	527	4.70	1,062
Michel strip mine	248,768	......	54	......	4,607	......	......	......
Hillcrest Mohawk Collieries (strip)	24,750	......	15	......	1,650	......	......	......

Collieries of Vancouver Island Inspection District

The output of Vancouver Island Collieries was 575,228 tons. Of this amount, 125,834 tons or 21.9 per cent was lost in preparation for market, and 4,329 tons or 0.7 per cent was consumed by the operating companies as fuel. The total sales amounted to 472,690 tons, which was made up of 445,065 tons from current production, plus 27,625 tons taken from stocks. Of the amount sold in competitive market, 452,718 tons was sold in Canada, and 19,972 tons was sold in the United States.

Collieries of the Nicola-Princeton District

The gross total of 17,551 tons produced in the collieries of the Nicola-Princeton District was sold in Canada.

Collieries of the Northern District

A total of 25,287 tons was sold in Canada from the Northern District; 62 tons was used by the operating companies as fuel, and 228 tons was taken from stock held over from 1949, the output for 1950 being 25,121 tons.

Collieries of the East Kootenay District

The output of the collieries in the East Kootenay District was 1,138,389 tons. Of this amount, 88,429 tons or 7.7 per cent was lost in preparation for the market, 15,196 tons or 1.3 per cent was consumed by the operating companies as fuel, and 213,218 tons or 18.7 per cent was used in making coke.

Output and per Capita Production in Various Districts, 1950

District	Gross Output Mined during Year (Tons)	Total Number of Employees at Producing Collieries	Yearly Output per Employee (Tons)	Number of Men Employed Underground in Producing Collieries	Yearly Output per Underground Employee (Tons)
Vancouver Island District	575,228	928	620	785	733
Nicola-Princeton District	16,593	96	173	74	224
Northern District	25,121	56	448	42	598
East Kootenay District	864,871	1,107	782	844	1,024
Whole Province	1,481,813	2,186	678	1,745	849

NOTE.—The above table deals only with coal mined from underground operations. Coal-stripping operations and the men employed at strip mines are not included.

Output per Man-shift, Underground Mines, 1940–50

Year	Man-shifts[1]	Tonnage	Average per Man-shift (Tons)
1940	671,794	1,667,827	2.48
1941	623,970	1,802,353	2.89
1942	662,505	1,938,158	2.92
1943	773,088	1,786,152	2.31
1944	703,384	1,767,989	2.51
1945	627,110	1,518,673	2.42
1946	596,631	1,463,640	2.45
1947	496,727	1,485,476	2.99
1948	434,074	1,281,530	2.95
1949	520,188	1,589,131	3.05
1950	460,159	1,481,813	3.22

[1] Includes both surface and underground workers.

The following table shows the production and distribution of coal by the various collieries and districts, also distribution of men employed, compiled from returns furnished by the owners:—

Collieries of British Columbia, 1950—Production and Distribution, by Collieries and by Districts (in Short Tons)

Mine	Gross Output	Washery Loss	Net Output	Used under Companies' Boilers, etc.	Used in Making Coke	Stocks: On Hand First of Year	Stocks: On Hand Last of Year	Stocks: Added To	Stocks: Taken From	Sales: In Canada	Sales: In U.S.A.	Sales: Elsewhere	Sales: Total Sales
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Vancouver Island District													
Canadian Collieries (D.) Ltd.—													
Comox Colliery (No. 8 mine)	216,385	44,340	172,045	2,210	—	13,730	1,506	—	12,224	172,143	9,916	—	182,059
Tsable River Colliery	99,256	23,852	75,404	970	—	6,945	1,483	—	5,462	75,544	4,352	—	79,896
South Wellington No. 10 mine	214,858	54,301	160,557	962	—	9,338	1,163	—	8,175	162,997	4,773	—	167,770
White Rapids mine	33,078	2,677	30,401	187	—	2,527	—	—	2,527	31,810	931	—	32,741
Bright mine	1,978	664	1,314	—	—	—	357	357	—	957	—	—	957
Chambers mine	2,239	—	2,239	—	—	—	—	—	—	2,239	—	—	2,239
Loudon mine	989	—	989	—	—	—	—	—	—	989	—	—	989
Lewis mine (Timberlands)	672	—	672	—	—	—	—	—	—	672	—	—	672
Deer Home mine	474	—	474	—	—	—	—	—	—	474	—	—	474
Wellington mine (Carruthers)	623	—	623	—	—	—	—	—	—	623	—	—	623
Stronach mine	1,640	—	1,640	—	—	—	—	—	—	1,640	—	—	1,640
Furnace Portal mine	1,195	—	1,195	—	—	—	—	—	—	1,195	—	—	1,195
Cassidy mine	1,841	—	1,841	—	—	—	406	406	—	1,435	—	—	1,435
Totals, Vancouver Island District	575,228	125,834	449,394	4,329	—	32,540	4,915	763	28,388	452,718	19,972	—	472,690
Nicola-Princeton District													
Tulameen Collieries Ltd.	11,048	—	11,048	—	—	—	—	—	—	11,048	—	—	11,048
Taylor Burson mine	4,400	—	4,400	—	—	—	—	—	—	4,400	—	—	4,400
Coldwater mine	1,145	—	1,145	—	—	—	20	20	—	1,125	—	—	1,125
Black mine (strip)	25	—	25	—	—	—	—	—	—	25	—	—	25
Old Princeton Colliery (strip)	1,311	—	1,311	—	—	—	—	—	—	1,311	—	—	1,311
Totals, Nicola-Princeton District	17,929	—	17,929	—	—	—	20	20	—	17,909	—	—	17,909
Northern District													
Bulkley Valley Collieries	12,563	—	12,563	62	—	808	272	—	536	13,037	—	—	13,037
Reschke mine	4,941	—	4,941	—	—	—	—	—	—	4,941	—	—	4,941
Peace River mine	5,632	—	5,632	—	—	—	308	308	—	5,324	—	—	5,324
Gething mine	1,985	—	1,985	—	—	—	—	—	—	1,985	—	—	1,985
Totals, Northern District	25,121	—	25,121	62	—	808	580	308	536	25,287	—	—	25,287
East Kootenay District													
Crow's Nest Pass Coal Co. Ltd.—													
Elk River Colliery	304,943	23,616	281,327	3,623	—	25	88	63	—	242,687	34,954	—	277,641
Michel Colliery	808,696	61,843	746,853	11,573	213,218	4,469	637	—	3,832	488,486	37,408	—	525,894
Hillcrest Mohawk Collieries (strip)	24,750	2,970	21,780	—	—	—	—	—	—	21,780	—	—	21,780
Totals, East Kootenay District	1,138,389	88,429	1,049,960	15,196	213,218	4,494	725	63	3,832	752,953	72,362	—	825,315
Grand totals for Province	1,756,667	214,263	1,542,404	19,587	213,218	37,842	6,240	1,154	32,756	1,248,867	92,334	—	1,341,201
Coke													
Crow's Nest Pass Coal Co. Ltd.—													
Michel Colliery	156,186	—	—	—	—	6,740	16,186	9,446	—	78,028	68,712	—	146,740

Collieries of British Columbia, 1950—Men Employed, Distribution by Collieries and by Districts

Mine	Supervision and Clerical			Miners			Helpers			Labourers			Mechanics and Skilled Labour			Boys			Total Men Employed		
	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. 8 mine)	20	9	29	167	—	167	—	—	—	93	39	132	61	29	90	3	1	4	344	78	422
Tsable River Colliery	8	—	8	50	—	50	—	—	—	20	10	30	43	5	48	—	—	—	121	15	136
South Wellington No. 10 mine	11	4	15	87	—	87	—	—	—	61	19	80	17	9	26	—	3	3	176	35	211
White Rapids mine	7	—	7	65	—	65	—	—	—	23	7	30	15	3	18	—	—	—	110	10	120
Bright mine	1	—	1	6	—	6	—	—	—	1	—	1	1	1	2	—	—	—	9	1	10
Chambers mine	1	—	1	2	—	2	—	—	—	—	—	—	—	1	1	—	—	—	3	1	4
Loudon mine	1	—	1	3	—	3	—	—	—	—	—	—	—	—	—	—	—	—	4	—	4
Lewis mine (Timberlands)	—	—	—	2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
Deer Home mine	—	—	—	2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
Wellington mine (Carruthers)	—	—	—	2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
Stronach mine	1	—	1	4	—	4	—	—	—	—	1	1	—	—	—	—	—	—	5	1	6
Furnace Portal mine	—	—	—	2	—	2	—	—	—	—	—	—	—	1	1	—	—	—	2	1	3
Cassidy mine	1	—	1	3	—	3	—	—	—	—	—	—	—	1	1	—	—	—	4	1	5
Totals, Vancouver Island District	51	13	64	395	—	395	—	—	—	198	76	274	137	50	187	3	4	7	784	143	927
Nicola-Princeton District																					
Tulameen Collieries Ltd.	1	9	10	44	—	44	13	—	13	5	5	10	2	5	7	—	—	—	65	19	84
Taylor Burson mine	1	—	1	2	—	2	2	—	2	—	—	—	—	—	—	—	—	—	5	—	5
Coldwater mine	1	2	3	2	—	2	2	—	2	—	—	—	—	—	—	—	—	—	5	2	7
Black mine (strip)	—	—	—	—	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
Old Princeton Colliery (strip)	—	—	—	—	2	2	—	2	2	—	—	—	—	—	—	—	—	—	—	4	4
Totals, Nicola-Princeton District	3	11	14	48	4	52	17	2	19	5	5	10	2	5	7	—	—	—	75	27	102
Northern District																					
Bulkley Valley Collieries	2	4	6	9	—	9	10	—	10	1	2	3	—	3	3	—	—	—	22	9	31
Reschke mine	1	—	1	3	—	3	2	—	2	1	1	2	—	—	—	—	—	—	7	1	8
Peace River mine	1	—	1	3	—	3	2	—	2	—	2	2	—	—	—	—	—	—	6	2	8
Gething mine	1	—	1	2	—	2	2	—	2	—	3	3	1	—	1	—	—	—	6	3	9
Totals, Northern District	5	4	9	17	—	17	16	—	16	2	8	10	1	3	4	—	—	—	41	15	56
East Kootenay District																					
Crow's Nest Pass Coal Co. Ltd.—																					
Elk River Colliery	22	15	37	176	—	176	—	—	—	45	50	95	75	15	90	—	5	5	318	85	403
Michel Colliery	35	33	68	245	—	245	—	—	—	74	61	135	173	82	255	—	1	1	527	177	704
Michel strip mine[*]	—	6	6	—	—	—	—	—	—	—	14	14	—	34	34	—	—	—	—	54	54
Hillcrest Mohawk Collieries (strip)	—	1	1	—	—	—	—	—	—	—	1	1	—	13	13	—	—	—	—	15	15
Totals, East Kootenay District	57	55	112	421	—	421	—	—	—	119	126	245	248	144	392	—	6	6	845	331	1,176
Grand totals for Province	116	83	199	881	4	885	33	2	35	324	215	539	388	202	590	3	10	13	1,745	516	2,261

NOTE.—U.=Underground; A.=Above ground; T.=Total.

Coal-preparation Plants

The primary object of preparation plants is to remove from the raw coal all rock and other non-combustible material that would reduce the calorific value of the fuel. A second practice followed at many modern plants is blending the different grades or sizes, or the products from different seams, to form a fuel for a specific purpose, such as stoker fuel.

Elk River Colliery.—The equipment of the cleaning plant, housed in a steel and brick structure 120 by 100 feet and 68 feet high, includes two furnaces for heating the air supplied to the driers, two Ty-Rock 6- by 16-foot sizing screens, three Vissac jigs, two Vissac driers, one M.C. centrifugal drier, three Ty-Rock dewatering screens, two boom-loaders, and three box-car loaders. The capacity of the plant is 2,000 tons in eight hours.

The raw coal is transported from the rotary dump by belt-conveyor to the picking-table, then carried directly by a 42-inch belt-conveyor to the screens whereby the coal is sized and the —¼-inch slack removed. When necessary the coal from the picking-table may be switched to the 300-ton storage bin. The bin is used extensively in handling a portion of the afternoon-shift coal because the preparation plant is idle on that shift. The slack is by-passed directly to railway cars, but the coarser sizes are passed through the Vissac jigs for the removal of rock and other non-combustible material, then over the dewatering screens to the driers, whereby most of the surface moisture is removed. The plant is equipped so that the different sizes, after being dried, may be segregated or blended to suit the market demands.

Michel Colliery.—The preparation plant, erected in 1938, is capable of treating a maximum of 380 tons of coal per hour of operation. The coal is sized by shaking and vibrating screens prior to being transported to the rock-removing jigs. All sizes above ¼-inch are treated on three Vissac jigs, and those below ¼-inch are diverted to an American Coal Cleaning pneumatic table. The moisture adhering to the washed coal under 1⅝-inch size is removed by a stream of air delivered to four Vissac driers at a temperature of approximately 700 degrees Fahrenheit. To keep the liberation of dust to a minimum in subsequent handlings, the coal, as it is loaded into railway cars, is sprayed with hot oil.

Comox Colliery.—This preparation plant at Union Bay is of the wet type throughout and handles the output from the Comox No. 8 and Tsable River mines.

A reciprocating feeder delivers the coal from the track bin on to a 30-inch belt-conveyor, which in turn transports the coal to a two-deck 6- by 14-foot Ty-Rock screen that has 1¼-inch and 3/16-inch perforations whereby the coal is sized to +6-inch, 1¼- to 3/16-inch, and —3/16-inch. All sizes above 3/16-inch are treated by two Vissac jigs for the removal of rock, and the —3/16-inch is diverted to four Masco wet-type cleaning-tables.

The coarser sizes in the refuse are crushed and recirculated through the cleaning plant for recovery of the coal that formerly adhered to the rock. The washed coal is again screened to size before loading for market. Because of the difference in densities in the raw material coming from the two mines, each coal is, of necessity, treated separately.

Nanaimo Preparation Plant.—This plant, situated near the site of the Old No. 1 mine tipple, is of the wet type and handles the coal from the No. 10 South Wellington mine.

The coal is brought to the plant in railway cars from the respective mines and is dumped on to a feeder conveyor of the plate type that transports the coal to a Hummer screen, wherein the —¼-inch slack is removed and diverted to Deister tables for rock removal. From these tables the slack is loaded into railway cars. All sizes above ¼-inch are treated in two Howe cones, and after cleaning, the coal is again sized by a shaker screen before it is loaded into railway cars.

LABOUR AND EMPLOYMENT

During 1950, 2,261 persons were employed in and about the coal mines of the Province, a decrease of 45 from 1949.

On account of the 5-day week being in force throughout the Province at the largest mines, and the legal holidays, the maximum number of working-days is rated at 254. In the Vancouver Island District approximately 8.6 per cent of the possible working-days was lost because of the lack of demand for coal. In the East Kootenay District the loss of working-days averaged 15.3 per cent, due mainly to the severe weather conditions experienced in the early part of the year and to shortage of railway cars at certain periods.

COMPETITION FROM COAL PRODUCED OUTSIDE OF BRITISH COLUMBIA

During 1950 the shipment of Alberta coal to British Columbia totalled 873,558 tons, coke shipped was 13,951 tons, and briquettes 40,036 tons. The following table shows the amount of Alberta coal brought into British Columbia during the past ten years:—

Year	Short Tons	Year	Short Tons
1941	304,928	1946	982,413
1942	652,222	1947	899,403
1943	963,000	1948	945,700
1944	678,960	1949	891,132
1945	868,396	1950	873,558

Of the 1,341,201 tons of British Columbia coal marketed, 345,635 tons was sold for industrial uses in Alberta, Saskatchewan, Manitoba, Ontario, and Yukon Territory; 359,574 tons was sold for railroad use in Canada; 19,793 tons was sold for railroad use in United States; 93,619 tons was exported to the United States; and 9,623 tons was sold for ships' bunkers. The amount sold for domestic and industrial uses in the Province was 512,957 tons.

ACCIDENTS IN AND AROUND COAL MINES

During 1950, 2,261 persons were employed in and around coal mines, including strip-mining operations. Five fatal accidents occurred during the year, as compared with one during 1949. The number of fatal accidents per 1,000 persons employed was 2.21, compared with 0.43 in 1949, 2.04 in 1948, 0.82 in 1947, 1.73 in 1946, 2.05 in 1945, 1.06 in 1944, 2.80 in 1943, 4.23 in 1942, and 1.47 in 1941. The average for the ten-year period was 1.87.

The number of fatal accidents per 1,000,000 tons of coal produced during 1950 was 2.8, compared with 0.52 in 1949.

The following table shows the collieries at which fatal accidents occurred during 1950, with comparative figures for 1949:—

Name of Company	Name of Colliery	1950	1949
Canadian Collieries (D.) Ltd.	No. 8 mine, Comox Colliery	1	—
Canadian Collieries (D.) Ltd.	White Rapids	1	—
Crow's Nest Pass Coal Co. Ltd.	Michel Colliery	2	1
Crow's Nest Pass Coal Co. Ltd.	Elk River Colliery	1	—
Totals		5	1

The following three tables classify the fatal accidents in coal mines in 1950 as to cause, as to quantity of coal mined per accident, and as to inspection districts.

Fatal Accidents Classified as to Cause

Cause	1950		1949	
	Number	Per Cent	Number	Per Cent
By falls of roof and coal	1	20.00	1	100.00
By mine cars and haulage (underground)	1	20.00	—	—
By falling while carrying rail	1	20.00	—	—
By coal-cutter haulage pin pulling out and striking man	1	20.00	—	—
By falling off icy railway car	1	20.00	—	—
Totals	5	100.00	1	100.00

Fatal Accidents Classified as to Quantity of Coal Mined

Cause	1950		1949	
	Number of Fatal Accidents	Coal Mined per Fatal Accident*	Number of Fatal Accidents	Coal Mined per Fatal Accident*
		Tons		Tons
By falls of roof and coal	1	1,481,435	1	1,589,131
By mine cars and haulage (underground)	1	1,481,435	—	—
By falling while carrying rail	1	1,481,435	—	—
By coal-cutter haulage pin pulling out and striking man	1	1,481,435	—	—
By falling off icy railway car	1	1,481,435	—	—
Average	1	296,287	1	1,589,131

* Excludes coal from strip mines.

NOTE.—There were no fatal accidents in strip-mining operations in the years 1950 and 1949.

Fatal Accidents Classified as to Inspection Districts

District	Number of Deaths from Accidents					Totals	
	Falls of Roof and Coal	Mine Cars and Haulage	Falling while Carrying Rail	Coal-cutter Haulage Pin Striking Man	Falling Off Railway Car	1950	1949
Vancouver Island	—	1	—	1	—	2	—
Nicola-Princeton	—	—	—	—	—	—	—
East Kootenay	1	—	1	—	1	3	1
Northern	—	—	—	—	—	—	—
Province, 1950	1	1	1	1	1	5	—
Province, 1949	1	—	—	—	—	—	1

Ratio of Accidents

District	Accident Death Rate			
	Per 1,000 Persons Employed		Per 1,000,000 Tons of Coal Mined	
	1950	1949	1950	1949
Vancouver Island	2.15	—	3.47	—
Nicola-Princeton	—	—	—	—
East Kootenay	2.55	0.88	2.63	0.81
Northern	—	—	—	—
Province, 1950	2.21	—	2.84	—
Province, 1949	—	0.43	—	0.52

During 1950 there were five fatal accidents—four connected with actual operations in underground coal mines and one in the railway yard connected with a colliery.

On February 27th, 1950, Giovanni Ferrarelli, tracklayer's helper at Elk River Colliery, was helping to carry a rail when he slipped and apparently suffered internal injuries. He resumed work after the accident but suffered a relapse and died on July 5th, 1950.

On February 28th, 1950, William Dutka, miner, was fatally injured at Michel Colliery. Dutka, on being warned by partner that some roof was about to fall, jumped across the conveyor, but was struck by a post which was dislodged by the falling rock. He died on March 5th, 1950.

On July 4th, 1950, Thomas Easterbrook, while operating a coal-cutter at White Rapids mine, was struck on the back by the haulage pin that pulled out. He died on July 6th, 1950.

On August 2nd, 1950, Frederick Simister, pipe-fitter at the Comox No. 8 mine, was struck and fatally injured by a trip of cars while walking along a level. He died after admission to the hospital the same day.

On November 19th, 1950, Andrew Nestuk, labourer at Michel Colliery by-product plant, was found dead alongside a railway coke car. He had been wetting the coke in the car, which had been on fire, when he apparently fell from the top of the car and was fatally injured.

Including the above-noted fatal accidents, 510 accidents involving loss of more than seven days were reported to the Department by the management of the various mines. All these accidents were investigated and reported by the Mine Inspectors.

The following three tables classify the accidents in coal mines in 1950 as to occupations of the men involved, as to cause, and as to injury. The fatal accidents are included in the total.

ACCIDENTS CLASSIFIED AS TO OCCUPATION

Occupation	Number of Accidents	Percentage of Accidents
Underground—		
Miners	227	44.5
Drillers and facemen	9	1.8
Conveyormen and muckers	22	4.3
Haulagemen	72	14.1
Trackmen and mechanics	25	4.9
Supervisors	28	5.5
Timbermen	27	5.3
Coal-cutters	14	2.7
Miscellaneous	8	1.6
Surface—		
Shops	15	3.0
Surface	30	5.9
Preparation and coke-ovens	23	4.5
Miscellaneous	10	1.9
Totals	510	100.0

Accidents Classified as to Cause

Cause	Number of Accidents	Percentage of Accidents
Fall of ground	145	28.4
Fall of material and flying material	57	11.2
Lifting and handling equipment and material	120	23.5
Machinery and tools	70	13.8
Slipped and tripped	75	14.7
Falling off staging and platforms	15	2.9
Miscellaneous	28	5.5
Totals	510	100.0

Accidents Classified as to Injury

Injury	Number of Accidents	Percentage of Accidents
Head and neck	30	6.0
Eyes	17	3.4
Trunk	82	16.3
Back	76	15.0
Arms	28	5.5
Hands and fingers	97	19.2
Legs	109	21.5
Feet	35	7.0
Toes	31	6.1
Totals	505	100.0
Fatal	5	
Total	510	

EXPLOSIVES

The following table shows the quantity of explosives used in coal mines during 1950, together with the number of shots fired, tons of coal produced per pound of explosive used, and the average number of 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 (Pounds)	Coal Mined (Tons)	Total Number of Shots Fired	Average Tons of Coal per Pound of Explosive Used	Average Pounds of Explosive per Shot Fired
Comox Colliery (No. 8 mine)	52,150	216,385	86,000	4.15	0.66
Tsable River Colliery	54,100	99,256	64,000	1.83	0.84
South Wellington No. 10 mine	62,900	214,858	60,950	3.41	1.03
White Rapids mine	9,150	33,078	20,000	3.61	0.45
Bright mine	—	1,978	—	—	—
Chambers mine	400	2,239	700	5.59	0.57
Loudon mine	1,600	989	1,628	0.62	0.98
Lewis mine (Timberlands)	1,200	672	1,500	0.56	0.80
Deer Home mine	150	474	275	3.16	0.54
Wellington mine (Carruthers)	600	623	840	1.04	0.71
Stronach mine	1,600	1,640	1,600	1.02	1.00
Furnace Portal mine	700	1,195	900	1.70	0.78
Cassidy mine	1,100	1,841	2,250	1.67	0.50
Totals for district	185,650	575,228	240,643	3.10	0.77

Nicola-Princeton District

Tulameen Collieries Ltd.	400	11,048	926	27.62	0.43
Taylor Burson mine	150	4,400	150	29.33	1.00
Coldwater mine	1,550	1,145	1,550	0.74	1.00
Black mine (strip)	—	25	—	—	—
Old Princeton Colliery (strip)	300	1,311	300	4.37	1.00
Totals for district	2,400	17,929	2,926	7.47	0.82

Northern District

Bulkley Valley Collieries	3,660	12,563	2,928	3.43	1.25
Reschke mine	1,600	4,941	1,100	3.08	1.45
Peace River mine	1,100	5,632	1,600	5.12	0.70
Gething mine	1,240	1,985	2,000	1.60	0.62
Totals for district	7,600	25,121	7,628	3.30	1.00

East Kootenay District

Elk River Colliery	23,800	304,943	25,150	12.81	0.95
Michel Colliery	71,420	808,696	65,941	11.32	1.08
Hillcrest Mohawk Collieries (strip)	—	24,750	—	—	—
Totals for district	95,220	1,138,389	91,091	11.95	1.04
Totals for Province	290,870	1,756,667	342,288	6.03	0.84

Quantity of Different Explosives Used

	Lb.
Monobel of different grades	283,417
Permissible rock powder	7,603
Total	291,020

MACHINE-MINED COAL

During the year 1950 mining-machines produced approximately 871,367 tons or 50 per cent of the total output from underground mining. All strip-mine coal is removed by mechanical means.

District	Number Driven by		Type of Machine Used	
	Electricity	Compressed Air	Chain Undercutting	Puncher Type
Vancouver Island	—	30	27	3
Nicola-Princeton	—	7	—	7
Northern District	1	5	2	4
East Kootenay	—	48	17	31
Totals	1	90	46	45

In addition to the above, 211 air-picks were used in the mines of The Crow's Nest Pass Coal Company.

SAFETY LAMPS

There were 2,298 safety lamps in use in the mines of the Province. Of this number, 195 were flame safety lamps and 2,103 were approved electric lamps, mostly the Edison model.

Approved Safety Lamps—Electric and Flame

The following is a list of approved safety lamps, electric and flame:—

The Wolf lamp, flame type.

The Koehler lamp, flame type.

The Edison electric lamp (cap) as Approval No. 18 of the United States Bureau of Mines, and all Edison cap lamps up to and including Model P, carrying the Approval Certificate No. 26 of the United States Bureau of Mines; Model R-4, Approval No. 29.

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 nine coal mines and underground at six. A total of 19,222 horsepower was used in and about these mines. Detailed information as to how and where this power is used is given in the report of the Electrical Inspector of Mines.

VENTILATION

Information regarding the quantity of air passing in the main airways and working-places in the various mines is given in the reports of the District Inspectors. Blasting operations are not allowed in working-places where methane can be detected on the flame of a safety lamp.

In a few instances it has been necessary for the District Inspector to issue orders prohibiting blasting, but where a gas-cap was detected on the flame of a safety lamp the fireboss usually stopped blasting operations immediately. It has been found on inspection visits that generally the quantity of air passing through the airways is adequate to meet requirements.

METHANE DETECTION

The principal instruments used to detect small percentages of methane gas in the mines are the Burrell gas detector and the M.S.A. detector.

Regular tests are made on every shift in the working-places and roadways by the firebosses and other mine officials, principally by means of the flame safety lamp. Every candidate for a miner's certificate must show a thorough knowledge of the flame safety lamp, of handling it safely, and the method of testing for methane gas before he is given a certificate.

MINE-AIR SAMPLES

In addition to regular tests made by use of the flame safety lamp and methane detector, the Inspector of Mines in each district takes mine-air samples regularly in main return airways and the return airways of the various splits, so that a complete record may be kept of the condition of the air passing through the mine. During 1950 twenty-nine samples were taken.

INSPECTION COMMITTEES

The provisions of the "Coal-mines Regulation Act," section 65, General Rule 14, require that an inspection committee of workmen shall inspect the mines regularly on behalf of the workmen and make a true report of the conditions found. In all the larger mines of the Province this rule is fully observed and copies of the reports are sent to the Inspector for the district. The work of these committees is valuable and assists in furthering the interests of safety at the various mines.

COAL DUST

The danger of accumulations of coal dust on the roadways and in the working-places is fully realized, and as a rule the regulations regarding the control of coal dust are fully carried out. Large quantities of limestone dust are used continually in the larger mines to combat this hazard, and the roadways are periodically cleaned of dust.

Dust samples are taken regularly from roof, side, and floor of mine roadways and analysed for combustible content. The reports of the analyses are forwarded to the Inspector. In 1950, 1,795 dust samples from the various mines were analysed, and in all these samples the incombustible content was well over 50 per cent.

DIESEL LOCOMOTIVES

Early in August, 1950, the first diesel underground locomotive to be used in any mine in British Columbia made its trial runs in No. 9 mine, Elk River Colliery, The Crow's Nest Pass Coal Company Limited.

The locomotive is a 15-ton 100-horsepower North British type, and is fully permissible for use in coal mines. To date its performance has been satisfactory.

DANGEROUS OCCURRENCES

On March 7th, 1950, in No. 9 mine, Elk River Colliery, William Waller, fireboss, heard a dull thud on firing a shot in No. 5 split off No. 7 room, No. 5 Slope district. On returning to the face for examination, he saw a heavy yellow smoke issuing from the coal broken by the shot. Further examination revealed the charred remains of a cartridge paper wrapper. Four cartridges of powder had been placed in the shot-hole, but apparently a portion of these burned instead of detonating.

On April 8th, 1950, a runaway trip consisting of four cars of supplies travelled a distance of 300 feet down the main slope, "B" South (Slope district), Michel Colliery. A ventilation door was smashed, temporarily disrupting the ventilation, and four sets of timber were dislodged. One of the cars was damaged. The runaway was apparently due to negligence on the part of the rope-rider.

On April 20th, 1950, a small ignition of methane gas occurred at the back of the broken coal immediately after the firing of a top breaking-in shot in the coal on No. 1 Left level, off No. 3 Right level, No. 8 mine, Comox Colliery. The hole was loaded with 10 ounces of Polar Monobel explosive, and the flame extinguished itself after a few seconds.

On June 12th, 1950, ignition of methane gas was observed at the back of the cut following the firing of a top breaking-in shot in the coal on No. 1 Left wall off No. 3 Right level, No. 8 mine, Comox Colliery. The shot-hole had been loaded with 10 ounces of Polar Monobel explosive. The flame extinguished itself within a few seconds.

Following the above two occurrences, recommendations were put into effect which included improved blocking of the cut coal to prevent fractures at the back of the cut, and more careful attention to the drilling of shot-holes, to plugging the back of holes with rock dust, and to general safety precautions by shot-firers.

At 8 p.m. on November 25th, 1950, a watchman at the Michel Colliery discovered smoke in the coal-preparation plant, but could not see any visible signs of flame. Investigation disclosed that under the No. 5 drier a loose plank and coal dust around it were smouldering. Prompt action extinguished the fire and no damage was done.

BUMPS

Indications of a "bump" or "bumps" having occurred around the Nos. 4 and 6 West roadways, No. 1 East mine, Elk River Colliery, were found on March 12th, 1950, following a week-end stoppage of work. Track was damaged on the No. 4 West parting, several sets of timber were broken, two ventilation doors were damaged, and sufficient force was developed to derail a number of cars standing on the parting. The track at the entrance to No. 6 West roadway, as on the slope between Nos. 4 and 6 West roadways, was heaved about 12 inches, and several timbers were damaged.

There were no men in the mine at the time of the occurrences, but it was reported by some residents of the village of Coal Creek, which is near by, that two distinct earth tremors were felt about 5 p.m. on March 12th, the probable time of the bumps.

In No. 1 East mine, Elk River Colliery, at 11.40 a.m. on November 23rd, 1950, a heavy bump occurred, centring around the approach to the No. 6 West parting. No one was injured, but the damage was quite extensive, with a general heaving of the floor within 150 feet, and in some parts practically to the roof. Sixteen men, who were inby at the time of this occurrence, were able to work their way out through old workings an hour later. The ventilation was not disrupted, neither was there any quantity of gas liberated by the bump. Considerable discomfort was experienced by the trapped men, however, from the shock of the bump and the quantity of fine coal dust suspended in the ventilating current for about fifteen minutes following the occurrence.

It was thought that a contributory cause to the bump was the presence of a comparatively large pillar of coal in the vicinity of the occurrence, and steps were taken to split the pillar. Mining in that area consists entirely of pillar drawing.

Two other bumps, both of a minor nature, were also reported and investigated during the year. One at the No. 1 East mine on April 18th and one in the No. 9 mine on October 23rd, both at Elk River Colliery. Two miners were involved in the former, one sustaining a slight injury. No material damage was caused in either case.

PROSECUTIONS

Date	Colliery	Occupation of Defendant	Offence Charged	Judgment
Mar. 23	Michel (Crow's Nest Pass Coal Co. Ltd.)	Miner	Jumped off man-trip while in motion	Fined $27 and costs.
Aug. 8	White Rapids (Canadian Collieries (D.) Ltd.)	Fireboss	Loaded and fired more than one shot simultaneously	Fined $75 and costs.
Aug. 18	Michel (Crow's Nest Pass Coal Co. Ltd.)	Bratticeman	Took flame safety lamp into mine before it was examined	Fined $10 and costs.
Aug. 18	Michel (Crow's Nest Pass Coal Co. Ltd.)	Miner	Creating a disturbance in the mine	Fined $10 and costs.

SUPERVISION OF COAL MINES

During 1950 seventeen companies operated twenty-six mines, employing 1,745 men underground. In the supervision of underground employees there were 7 managers, 14 overmen, and 98 firebosses, or approximately 1 official for every 14 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	No. 8 mine and Tsable River mine, Comox Colliery (Cumberland)	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.
Old Wellington	No. 9 mine (Wellington)	Canadian Collieries (D.) Ltd.
Chambers-Extension	Chambers (Extension)	R. H. Chambers.
Cassidy-Wellington	Cassidy mine (Cassidy)	A. H. Carroll.
Taylor Burson	Jackson No. 1 mine (Princeton)	Taylor Burson Coal Co. Ltd.
Hat Creek	Hat Creek (Lillooet)	Canada Coal and Development Co. Ltd.
Bulkley Valley	Bulkley Valley (Telkwa)	Bulkley Valley Collieries.
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.
Coldwater	Coldwater No. 3 mine (Merritt)	S. Gerrard.
Black Prince	Black mine (Princeton)	R. B. Savage.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS

First-, Second-, and Third-class Certificates and Mine Surveyors' Certificates

The Board of Examiners was formed on July 10th, 1919. At present it consists of H. C. Hughes, Chief Inspector of Mines, chairman; E. R. Hughes, Inspector of Mines, member; and Robert B. Bonar, Senior Inspector of Coal Mines, secretary and member.

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. The examinations are held at least once a year, and oftener if necessary. One examination was held on May 17th, 18th, and 19th, 1950.

The total number of candidates at these examinations is as follows: For first-class certificates, 1 (failed); for second-class certificates, 4 (3 passed); for third-class certificates, 6 (5 passed); for mine surveyors' certificates, 4 (4 passed).

The following is a list of the candidates who were successful in the various classes:—

Second class: William H. Davey, James E. Morris, and James Fairley.

Third class: Robert O. Doratty, Alfred James Garraway, Paul Kusnir, Cirino L. Salvador, and Arnold Webster.

Mine surveyor: René J. Diamond, Richard Justin Gregory, and Samuel A. Scott.

In addition to the above, interchange certificates were granted without full examination to the following candidates who held coal-mine official certificates of equal rating from other Provinces or from Great Britain:—

First class: Anthony R. C. James.
Third class: Edward J. Thomas.
Mine surveyor: L. Dwarkin.

Examinations for Certificates of Competency as Coal-miners

In addition to the examinations and certificates already specified as coming under the Board of Examiners, the Act further provides that every coal-miner shall be the holder of a certificate of competency as such. Examinations are held regularly in the coal-mining districts, and no certificate is granted where the candidate has failed to satisfy the Board as to his fitness, experience in a coal mine, and a general working knowledge of the English language.

During 1950 there were 146 candidates for coal-miners' certificates; of these, 138 passed and 8 failed to qualify.

In addition to the certificates granted above, substitute certificates were issued to those who had lost their original certificates.

Permits to act as coal-miners, as provided by the Act, have been granted to younger men by Inspectors in their respective districts. This method allows promising men with less than one year's experience underground to work at the coal face as miners under the guidance of an experienced miner.

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 to an applicant, after satisfactory examination, a provisional certificate as a coal-miner, 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.

NOTES ON COAL MINES

VANCOUVER ISLAND INSPECTION DISTRICT

By A. R. C. James

The output of coal during the year from the Vancouver Island inspection district was 570,613 short tons. This is a decrease of 5 per cent from the output for 1949 but is well above the average for the past five years. Production from the mines in the Nanaimo area shows a decrease of 18 per cent in the 1949 tonnage and may be expected to continue to decline fairly rapidly, as this coalfield is almost exhausted so far as workable deposits of any size are concerned. The labour force employed in the Nanaimo mines is also declining rapidly and at the end of the year amounted to only about 250 men, as compared with 432 men five years ago.

The output of the Cumberland mines reached 310,756 tons, an increase of 8 per cent over the 1949 tonnage, and the highest output since 1944. This was achieved in spite of a considerably reduced labour force in the mines. At the end of the year only 558 men were employed, as compared with 721 in 1944. The labour force declined rapidly from 1940–47 but has remained fairly constant over the past three years. A shortage of trained and qualified junior mine officials in the Cumberland mines became evident toward the end of 1950. The present staff of officials is of relatively high average age, and few young men have come forward in recent years to qualify for these duties.

So far as fatal and serious accidents are concerned, the figures for 1950 are far from encouraging. Two fatal and eight serious accidents occurred, this being the highest rate for some years. Four of these accidents were due to falls of ground, three involved mechanical haulage (including one fatal), one was caused by shot-firing and resulted from a direct contravention of the "Coal-mines Regulation Act," and two were due to other causes. Four of these accidents could probably have been avoided had reasonable care and forethought been exercised.

In addition to the above serious and fatal accidents, 360 minor accidents were reported and investigated, representing a 13-per-cent decrease from the figure for 1949.

Two dangerous occurrences were reported, and brief details of these are given in the progress notes on No. 8 mine, Comox.

The annual mine-rescue and first-aid meet organized by the Vancouver Island Mine Safety Association was held at Nanaimo on June 3rd. Four teams competed in the rescue competition, and a high standard of performance was maintained. The winning team was the No. 10 mine team captained by J. Gilmour, and the No. 8 mine team captained by L. Cooper came second. In the first-aid competition, the Department of Mines Cup was won by the No. 8 mine senior first-aid team captained by T. Robertson. At this meet the Ryan Cup Trophy was awarded to No. 10 mine for its safety record in 1949.

Canadian Collieries (Dunsmuir) Limited F. Ronald Graham, chairman of the board, Vancouver; Norman R. Whittal, president, Vancouver; Harry R. Plommer, managing director, Nanaimo; E. O. T. Simpson, general superintendent, Cumberland; J. A. Quinn, district superintendent, Cumberland. During 1950 this company operated No. 10 mine at South Wellington, White Rapids mine at Extension (which was closed on July 28th), and Bright mine at Cassidy, the latter being at present in the prospecting and development stage. In the Cumberland district the company operated No. 8 mine and Tsable River mine. Descriptions of these operations and progress notes on them are given in the following pages according to district.

NANAIMO (49° 123° S.W.)

No. 10 Mine, South Wellington.—W. Frew, manager; J. Wilson, overman; A. Hannah, H. Kirkpatrick, T. Jordan, F. Johnston, J. McArthur, and W. Roper, firebosses.

The Douglas seam is worked at this mine, which is now nearing the end of its productive life. The 1950 output came entirely from pillar extraction, which is now converging rapidly on the main haulage roads, and no further development work has been done. Notwithstanding this, the mine maintained its position as the chief producing mine on Vancouver Island for the first half of the year. In 1950 total production amounted to 214,858 short tons over a working period of 250 days. The average number of employees was 160 underground and 35 on the surface.

Despite the fact that extensive pillar extraction has resulted in heavy crushing on many roadways, working conditions in general were found fairly satisfactory in the course of inspections. Ventilation was found generally satisfactory and the mine normally free of accumulations of methane. Air measurements taken at the last inspection in December showed a total quantity of 103,500 cubic feet per minute passing in the main returns for the use of 160 men during the three-shift period of twenty-four hours.

Ninety-four samples of dust were gathered from the various roadways, and all these samples indicated a much higher incombustible content than the minimum standard set by the Coal-dust Regulations. Sixty tons of limestone dust was used to combat the coal-dust hazard on the roadways, and approximately 20 tons was used for tamping shots.

First-aid requirements have been maintained at a satisfactory standard. In addition to the main first-aid room adjacent to the lamp-room, emergency stations are located at strategic points both underground and on the surface. Two mine-rescue teams of six men each have kept up regular practices at the mine-rescue station at Nanaimo.

Eighty-one accidents were reported and investigated. None of these were fatal, two were serious, and the remainder were classed as minor. No blowouts or dangerous occurrences were reported.

White Rapids Mine, Extension.—A. Newbury, manager; J. T. Brown, overman; A. Bennett, J. Marrs, T. McCourt, A. Kirkham, M. Brodrick, and A. Dunn, firebosses. This mine is in Sections 3 and 4, Range 1, in the Cranberry District, approximately 9 miles by road from Nanaimo. Due to the difficulty of economic working consequent on the thinness of the seam and other factors, the mine was closed down permanently on July 28th and all materials and machinery were withdrawn from the underground workings.

The Wellington seam was worked, and at the time of abandonment there were four longwalls, each 300 feet long. The coal, which was from 24 to 30 inches thick, was undercut by machine and was conveyed along the faces by Meco shaker-conveyors and loaded into cars at the road-heads. Production in 1950 amounted to 33,078 short tons over a working period of 135 days with a crew averaging 114 men underground and 11 on the surface.

Thirty-one accidents were reported and investigated, one of which was fatal, one serious, and the remainder minor.

Bright Mine, Cassidy.—W. Frew, manager; A. Dunn, H. Brodrick, and J. Unsworth, firebosses. This mine is in Sections 1 and 2, Range 7, in the Cranberry District near Cassidy, and approximately 9 miles south of Nanaimo. The operation has been undertaken with the intention of prospecting and, if possible, working a virgin area of the Douglas seam which lies immediately to the south of the old Granby No. 2 mine workings.

Operations were commenced in April, 1950, when a two-stage electrical turbine pump of 600 gallons per minute capacity was installed at the old Granby No. 2 slope to unwater the old workings and open up the old slope, which runs due south at an average pitch of 18 degrees to the boundary of Granby No. 2 workings. Unwatering was completed by the end of July, a number of caves having been cleared from the old slope. The coal face is at the lower end of the slope, some 400 feet from the portal. The indications were at first extremely disappointing, and as the slope was driven forward into solid ground, it appeared that the seam had been entirely displaced by rock. A diagonal heading was then set off from the bottom of the old slope in a southeasterly direction. As this heading was driven forward, it passed out of the barren area within the first 20 feet and has since continued in coal for 180 feet, the seam section being up to 14 feet thick and fairly typical of the Douglas seam. In November a start was made to drive the main slope forward again, and by the year-end it had been driven 130 feet. The indications are now that it is passing out of the barren ground. A crosscut from the diagonal has been driven to a point on the line of the main slope 50 feet in front of the present head end and has proved 6 feet of coal. A total of 440 feet of drivage was done during the year.

The roof, floor, and general conditions are typical of the Douglas seam, and the seam pitches at about 9 degrees in a southerly direction. At the present stage of development, it is not possible to say what the prospects for this mine are likely to be.

A compressor and a hoist have been installed at the mine, both being driven by 100-horsepower gasoline engines.

Production in 1950 amounted to 1,978 short tons over a working period of 105 days with a crew averaging nine men. Working conditions were found generally satisfactory in the course of inspections. Ventilation is at present obtained by natural flow through the old workings and to the end of the year proved quite satisfactory. No methane was detected. Two minor accidents were reported and investigated.

Eight minor accidents were reported and investigated from the various surface departments of the company in the Nanaimo area during the year.

Chambers No. 4 Mine, Extension

R. H. Chambers and associates, operators; R. H. Chambers, fireboss. This mine is in the Extension district, and the Wellington seam is worked. The workings are confined to a small barrier pillar between the old Extension No. 1 and No. 3 mines. Operations throughout the year were entirely pillar extraction, and the workings are now within 200 feet of the bottom of the main slope. Production in 1950 amounted to 2,252 short tons over a working period of 180 days with a crew averaging four men. Working conditions were found fairly satisfactory during the course of inspections, and no accidents were reported.

Deer Home No. 2 Mine, Extension

R. H. Hamilton and associates, operators; R. H. Hamilton, overman. This mine is near the old Vancouver slope in the Extension district and is operating in a small section of outcrop pillars left in this area when the old Extension No. 3 mine was abandoned. Work is confined to pillar extraction. Production in 1950 amounted to 433 short tons over a working period of ninety-six days with a crew of two men. The mine was closed down for four months during the summer because of lack of orders. General working conditions were found fairly satisfactory during the course of inspections. No accidents were reported.

Furnace Portal Mine, Harewood

J. Biggs, operator and fireboss. This mine is on the Harewood Ridge and is operating in a small area of outcrop pillars left by former operators. Production in 1950 amounted to 1,195 short tons over a working period of 153 days with a crew averaging four men. General working conditions were found satisfactory in the course of inspections, and no accidents were reported during the year.

No. 7 Mine, Cassidy

J. McKellar and associates, operators; F. Apponen, fireboss. This mine is at Cassidy on Range 7, Section 2, and the eastern 500 feet of Range 6, Section 2, in the Cranberry District. It is a new mine and commenced production at the end of 1949. The area being worked consists of virgin coal in a seam which lies from 50 to 60 feet stratigraphically above the Douglas seam. The seam dips at approximately 20 degrees in a southerly direction, and averages 7 feet in thickness, including two rock bands. The upper band of rock is 6 inches thick, and the lower one is up to 1½ feet thick. The roof of the seam is a strong conglomerate.

The coal is mined by blasting it off the solid, and a Huwood compressed-air-operated rotary drill is used to drill the shot-holes. The coal is hand-loaded into cars which are hauled to the surface by a small gasoline-driven hoist. A total of 800 feet of drivage was done during 1950; the mine now comprises a main slope 250 feet long dipping 16 degrees southwest with three levels driven off on each side of the slope at approximately 50-foot centres, the longest of these now being 150 feet. A counter to the main slope connects with an air-shaft, 20 feet deep, from the surface. Natural ventilation is supplemented when necessary by a small fan at the top of the air-shaft, operated by a 3-horsepower Fairbanks gasoline motor.

Production during 1950 amounted to 1,750 short tons over a working period of 221 days with a crew averaging five men. General working conditions were found satisfactory in the course of inspections, and no accidents were reported during the year.

No. 8 Mine, Timberlands

J. R. Wilson and G. Lewis, operators; J. R. Wilson, fireboss. This mine is operating in the Wellington seam in a small area of outcrop coal that was left when the No. 8 mine was abandoned by Canadian Collieries (Dunsmuir) Limited. Production in 1950 amounted to 668 short tons over a working period of 189 days with a crew of two men. Working conditions were found generally satisfactory in the course of inspections. No accidents were reported during the year.

North Wellington (49° 124° S.E.)

Loudon's No. 5 Mine

W. Loudon and associates, operators; W. Loudon, fireboss. This mine is on the opposite side of the ridge from the old No. 9 mine in the Wellington district and is operating in a small area of coal near the outcrop in the upper Wellington seam. Production in 1950 amounted to 965 short tons over a working period of 203 days with a crew averaging four men. Working conditions were usually found satisfactory during the course of inspections. No accidents were reported during the year.

Carruthers and Wakelam No. 3 Mine

R. B. Carruthers and W. Wakelam, operators; R. B. Carruthers, fireboss. This mine is in the immediate vicinity of the Loudon mine and is also in the upper Wellington seam adjacent to the old No. 9 mine abandoned workings. Production in 1950 amounted to 615 tons over a working period of 191 days with a crew of two men. Working conditions were found satisfactory in the course of inspections. No accidents were reported during the year.

Stronach No. 2 Mine

C. Stronach, operator; H. Gilmour, fireboss. This mine is in a section of the upper Wellington seam adjacent to the old No. 9 mine. Most of the output during 1950 has come from pillar extraction. Production amounted to 2,025 short tons over a working period of 213 days with a crew averaging six men. Working conditions were usually found satisfactory in the course of inspections. No accidents were reported during the year.

Comox (49° 124° N.W.)

Canadian Collieries (Dunsmuir) Limited

No. 8 Mine, Comox Colliery, Cumberland.—J. S. Williams, manager; J. Weir, acting overman; L. Cooper and J. W. Smith, shiftbosses; T. Robertson, A. Dean, A. Maxwell, D. Waddington, T. Shields, A. Jones, J. Vaughan, F. Coates, C. Williams, P. Queen,

J. Queen, J. Clarkson, T. Wynne, J. Knowles, and J. Christie, firebosses. This mine is close to the Lake Trail Road, 2½ miles from Courtenay and 2 miles east of the mine camp at Bevan. During the latter part of the year No. 8 mine became the leading coal-producing mine on Vancouver Island, with an average daily output of 975 tons. The whole of the output was obtained from the No. 2 seam, whose average thickness is 3 feet 9 inches, including rock bands, and which lies at a depth of 700 feet from the surface at the shafts. The seam pitches at a gradient of 6 degrees in a northeasterly direction. It is reached by two shafts, each 1,000 feet deep, which penetrate to the lower or No. 1 seam, where operations are at present suspended due to heavily faulted ground. The mine is worked entirely by the longwall system. In December eight longwall faces were in operation, four being 300 feet long, two 250 feet long, and two 225 feet long. Production in 1950 amounted to 213,610 tons over a working period of 223 days with a crew of 320 men employed underground and 27 on the surface.

During 1950 the management has continued the policy initiated in 1949 of installing belt-conveyors for both face and roadway conveying. Four new Huwood 26-inch bottom-belt-loading-type face conveyors were installed on Nos. 1 and 2 Left walls off No. 3 Right level, together with two Huwood 30-inch troughed-belt roadway conveyors. On November 20th a Huwood 30-inch troughed-belt conveyor was put into operation on No. 3 Right level as a trunk conveyor. The two roadway conveyors deliver coal on to this trunk conveyor, which in turn delivers the coal into cars at a central loading point near the top of the North incline. These improvements mark a step forward toward greater efficiency in production and greater safety as a result of freedom from noise on the coal face and from haulage accident hazards on the roadways. Additional precautions, however, are called for in dealing with dust, the fire hazard, and the adequate fencing of conveyor machinery.

In addition to these four new belt-conveyor installations, another Huwood face and roadway conveyor has been in use throughout the year on No. 5 Right wall and level on the south side of the mine. On April 4th a Huwood longwall loading-machine was put into operation on this wall but was removed on August 17th, as the results under those particular conditions were not satisfactory as compared with hand-loading on to conveyors. On the remainder of the longwall faces, Meco shaker-conveyors are still in use. The coal is loaded directly into cars at the road-heads and hauled outby to the main inclines by small hoists. Throughout the mine the coal is cut to a depth of 5 feet 8 inches at a height of 17 inches above floor level by Anderson Boyes longwall coal-cutting machines.

An additional Mavor & Coulson Joy loader was acquired during the year, and this, together with another Joy loader and two Goodman duckbill units, has been employed on development work. A total length of 1,100 feet of longwall face has been developed during the year.

Working conditions were generally fairly satisfactory, except for occasions when small emissions of gas were encountered. Under the latter conditions, blasting was always suspended pending the removal of all visible gas-caps from the general body of the air. The state of the main airways of the mine was found satisfactory. At the last inspection in December, air measurements showed a total of 154,000 cubic feet per minute passing in the main returns for the use of 320 men in the full three-shift period of twenty-four hours. An air sample taken in December at the upcast shaft bottom indicated 0.72 per cent of methane in the general body of the return air. Two hundred and eighteen samples of dust were taken from the various roadways during the year; all the samples showed a higher incombustible content than the minimum set by the Coal-dust Regulations. One hundred and fifty-eight tons of limestone dust was used during the year; 106 tons was used for treating roadways, and the remainder was used on the faces and for tamping shots. Water sprays are employed on the belt-conveyor systems and at other points for keeping down air-borne dust.

First-aid arrangements have been maintained at a satisfactory standard, and twenty-one employees are qualified to render first aid to the injured. A well-equipped first-aid room is available on the surface. One mine-rescue team of six men has kept up regular monthly practices at the Cumberland Mine-rescue Station.

One hundred and sixty-two accidents were reported and investigated, a decrease of 20 per cent from the total for 1949. One of these was fatal, three were serious, and the remainder were classed as minor. Two dangerous occurrences were reported, both of which were investigated fully. The incidents occurred in April and June and took place on No. 1 Left wall off No. 3 Right level on the north side of the mine. Both involved small ignitions of methane at the back of the cut immediately following the firing of a shot in the coal. After full investigation, various remedial measures were put into force.

Tsable River Mine.—S. J. Lawrence, manager; T. Eccleston, A. Somerville, M. Brown, A. Cullen, L. Hutchinson, M. Frobisher, and W. Herd, firebosses. The mine is in the Tsable River area, approximately 5 miles west of Buckley Bay. It operates in the upper or westerly portion of the Tsable River coalfield, being separated from the lower or easterly part by a buried ridge of volcanic rocks projecting up into the coal measures. Both these parts of the Tsable River field are separated from the Cumberland coalfield by a large " want," the seams having been eroded, and coarser sediments deposited in their place. The seam section being worked is 8 feet thick and contains several bands of shale of varying thickness. Its pitch averages 9 degrees in a northwesterly direction.

As developed at present, the mine broadly comprises a main slope and three counter slopes driven on the dip of the seam for 2,880 feet from the portals, and a series of pairs of levels driven off to the right and left from the main slope at approximately 450-foot intervals. The method of working is a modified form of room and pillar.

Early in 1950 the main slope was advanced 60 feet and encountered a 20-foot upthrow thrust fault. In May the existing workings to the west of the main slope were discontinued due to an increasing thickness of rock bands in the seam section. Work was then concentrated on the east side of the mine and on prospecting and developing the area beyond the fault at the bottom end of the main slope. In June the driving of the left (west) counter slope through the fault was started, and by December 600 feet had been driven. The right counter slope was also driven for 300 feet beyond the fault, and the two roadways connected by a crosscut. The seam beyond the fault has proved to be 10 feet thick, with four shale bands totalling about 2 feet in thickness.

Total development work done during the year has amounted to 9,185 feet of drivage, which includes the main slope and counter slope, levels, counter levels, and crosscuts. In most cases the coal is conveyed from the faces by shaker-conveyors to a convenient loading point on one of the levels, where it is loaded into cars. Four Goodman duckbill units are used, and four Anderson-Boyes shortwall coal-cutting machines. Where conditions are unfavourable for undercutting the coal by machine, it is blasted off the solid. Twelve Climax compressed-air-operated rotary drills are used for drilling shot-holes.

At the end of April extraction of the coal pillars, between Nos. 1 and 2 Right levels on the east side of the mine, was commenced. An effort was made to obtain maximum recovery of coal, and a longwall coal-cutting machine was utilized to assist in this work. By the end of the year the operation was completed, and it is estimated that 85 per cent of the available coal was extracted.

Total production for the mine for 1950 amounted to 97,146 tons over a working period of 223 days with a crew of 110 men employed underground and 15 on the surface.

The ventilation has generally been found satisfactory. It was further improved at the beginning of August by the installation of a larger fan at the mouth of the old prospect slope. This fan is a 50-inch-diameter Keith-type fan, and an air measurement taken in the fan drift in December showed that it was circulating 44,000 cubic feet of air per minute against a 3-inch water-gauge. The previous fan is being retained as a stand-by.

In contrast to some of the seams of the Cumberland field, this seam appears to give off very little methane at the depths now worked. Frequent tests made with a safety lamp during inspections failed to reveal any appreciable amounts in the general body of the air either in the working-places or in the main returns.

Although the workings are mainly naturally damp, 63 tons of limestone dust was used during the year for tamping shots and dusting the coal faces.

First-aid arrangements have been maintained at a satisfactory standard. A well-equipped first-aid room is provided on the surface, and an ambulance car is kept at the mine in constant readiness for an emergency. Three qualified industrial first-aid attendants are employed, one on each shift, and a number of other employees hold first-aid certificates.

A trained mine-rescue team of six men is maintained, which attends periodic practices at the mine-rescue station at Cumberland.

Conditions at the mine were generally satisfactory in the course of inspections. Fifty-five accidents were reported and investigated, a 15-per-cent increase over the 1949 total. Two of these accidents were classed as serious, and the remainder as minor.

Twenty-one accidents, all minor, were reported from the various surface departments of the company in the Cumberland area, and all 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 their reports were forwarded to the office of the Inspector through the courtesy of these committees.

NICOLA-PRINCETON INSPECTION DISTRICT

By E. R. Hughes

The production of coal from this district during 1950 was the lowest recorded for any full year since coal-mining operations were commenced in 1907. The greatest loss in production during the year came as the result of the closing on April 3rd of the Pleasant Valley No. 4 mine, Princeton, operated by Tulameen Collieries Limited. The only underground operations being conducted at the end of the year were at the Jackson No. 1 mine, operated by the Taylor Burson Coal Company Limited, and the Coldwater No. 3 mine at Merritt. Joseph P. Wukelick employed four men to hand-strip coal from a surface excavation at the old Princeton Colliery, and in December four men commenced to hand-strip coal from a surface excavation at the Black mine. Surface improvements and some underground exploratory work were done by the Collins Gulch Collieries Limited, south of Tulameen. The underground workings at the inactive Granby Colliery No. 1 mine were resealed, and the machinery and equipment were removed from the property.

No fatal accidents occurred in the coal mines in this district during the year. Two compensable accidents were reported; one of these was classed as serious.

There were no prosecutions under the "Coal-mines Regulation Act" during the year, nor were there any dangerous occurrences to report.

The Similkameen Valley Mine Safety Association held its annual field-day competitions at the Memorial Park, Princeton, on Saturday, June 10th. Four teams competed in the mine-rescue event, which was won by a Nickel Plate team captained by R. E. C. Richards.

Princeton (49° 120° S.W.)

Tulameen Collieries Limited

Head office, 716 Hall Building, Vancouver. Thomas M. Wilson, manager; David M. Francis, overman; Arthur Hilton, Thomas Bryden, Frank Bond, William Forsyth, and A. M. Allan, firebosses. The Pleasant Valley No. 4 mine, about 2 miles west of Princeton, was operated by this company until April 3rd, when mining was discontinued. After this date all material was taken out of the mine. The entrances to the intake and return airways were sealed, and the mine was abandoned. The chief reason given for the shutdown was the termination of the contract to supply coal to The Granby Consolidated Mining Smelting and Power Company Limited's steam-electric power plant near Princeton. The Granby Company was able to purchase cheaper slack coal from Alberta.

Pleasant Valley No. 4 Mine.—Until the mine was closed, development was being continued in that part of the Main, or No. 1, Princeton seam lying between the abandoned Pleasant Valley No. 2 mine and the old Tulameen Nos. 2 and 3 mines, and 605 feet vertically below the seam formerly mined at the abandoned Pleasant Valley No. 1 mine. The No. 1 North section, where pillar extraction had been completed, was sealed off in February.

The face of No. 3 slope was advanced to a point 1,150 feet due east from the junction of the Nos. 2 and 3 slopes. Nos. 6 to 12 North levels, inclusive, were advanced northeasterly from the No. 3 slope toward the Tulameen River barrier pillar and had reached points varying from 400 to 600 feet from the river. A counter to No. 3 slope was completed between No. 5 North and No. 7 South levels. The face of No. 3 slope is under a cover of approximately 1,000 feet; this is the greatest depth yet attained in mine workings in the Princeton coalfield.

In Nos. 6 to 12 North levels, inclusive, the coal varies in thickness from 5 feet 8 inches to 6 feet and includes five bands of impurities totalling from 4 to 7 inches. A section of the seam at the face of No. 3 slope, measured on March 29th, is representative of the seam in that area, and is as follows: Shale roof; bony coal, 7 inches; coal, 19 inches; clay, one-quarter of an inch; coal, 7 inches; clay, half an inch; coal, 6 inches; clay, half an inch; coal, 4 inches; clay, half an inch; coal, 20 inches; clay, 5 inches; coal, 6 inches; clay floor. The seam dips southeasterly on a grade of 21 degrees in the workings to the rise of No. 1 North level. The grade gradually diminishes as depth is gained, and the dip from No. 1 North level to No. 12 North level is reduced to 18 degrees southeasterly. An analysis made at the Department of Mines laboratory in Victoria of a sample of coal taken from the face of No. 11 North level on November 15th, 1949, was: Moisture, 16.6 per cent; volatile combustible matter, 30.6 per cent; fixed carbon, 41.9 per cent; ash, 10.9 per cent; sulphur, 0.7 per cent; heat value, 9,825 British thermal units.

All coal-cutting in development places was done with post-type punching-machines, and in pillar-drawing operations the coal was usually blasted from the solid. The broken coal was hand-loaded into mine cars which were hand-trammed to sidings on the levels, and the cars were then hauled to the surface by an electric hoist on the tipple. No mechanical loading or conveying was used underground.

Methane in explosive concentration was given off from the face of No. 4 crosscut, No. 12 North level, during February. The emission continued for several days. Smaller amounts of explosive gas were found at the faces of two other working-places in the lower workings at the time of the same inspection in February. Analysis of the air in the main return airway, taken on February 10th, showed a methane content of 0.2 per cent, and the volume of air passing at that time was 35,000 cubic feet per minute.

At the time the mine was closed, sixty-six men were employed, and the daily production of coal was 165 tons.

Taylor Burson Coal Company Limited

Jackson No. 1 Mine.—James Fairley, overman; Arthur Hilton, fireboss. This mine is on the south half of Lot 88, 4½ miles southwest of Princeton and half a mile south of the presently inactive Taylor No. 1 mine. A five-year lease dated March 24th, 1942, was granted to C. H. Jackson, Kelowna, under the provisions of the "Coal and Petroleum Act." The lease was renewed for a period of three years from March 24th, 1947, and has again been renewed for a period of three years from March 24th, 1950.

The property includes the south half of Lot 88 and the southeast half of Lot 86, Yale Division of Yale District, and contains 480 acres. Under agreement with Mr. Jackson the Taylor Burson Coal Company Limited obtained a lease in 1947 to mine coal from the seam where mining operations are now being conducted.

The portal of the main adit is at an elevation of 3,047.3 feet and is at the southwest corner of the south half of Lot 88. The seam in which work is presently being done is reached through a cross-measure adit driven 170 feet southeasterly from the surface at the tipple. Contact with the seam is made at right angles to the strike at a point 20 feet from the southern boundary of the property; consequently, all underground development is necessarily northward from the adit. Operations were continuous throughout the year, and the face of the Main level was advanced to a point 1,220 feet northeasterly from the cross-measure adit. A counter level parallels the Main level, with the necessary crosscut raises for ventilation. The mine is ventilated by natural means which, so far, has been found to be sufficient for the requirements of this small operation. At a point on the Main level 510 feet northeasterly from the cross-measure adit a ventilation raise was driven on the full pitch of the seam and through the surface gravels 225 feet to the outside.

The seam dips 50 degrees southeasterly and strikes north 22 degrees east in the portion of the coalfield so far developed at this mine. A section of the seam at the face of the Main level, measured on September 20th, is representative of the seam in that area, and is as follows: Shale roof; bony coal, 8½ inches; coal, 11 inches; bone, 1 inch; coal, 7 inches; shale, 3 inches; coal, 16 inches; bone, 1 inch; coal, 10 inches; shale, half an inch; coal, 9 inches; clay, half an inch; coal, 16 inches; clay, 1 inch; coal, 3 inches; bentonite, 5 inches; dirty coal, 2 inches; sandstone floor. Total thickness of the seam is 94½ inches.

No methane was found during any of the inspections made in 1950. The average monthly output was 325 tons, and a crew ranging from four to thirteen men was employed.

Princeton Colliery No. 1 Mine

Joseph P. Wukelick employed four men to hand-strip coal from a surface excavation formerly made by Fred Mannix and Company, Limited, on the site of the old Princeton Colliery, No. 1 mine, on Lot 1822, adjoining the town of Princeton to the south. Operations were confined to mining coal by hand during the winter, and 1,320 tons of coal was produced.

Black Mine

In December R. B. Savage and three partners commenced to hand-strip coal from a surface excavation at the Black mine, on Lot 87, 6 miles southwest of Princeton and about half a mile south of the Jackson No. 1 mine, on the site of the former underground workings known as the Black mine. The underground workings were completely removed by the stripping operations of Fred Mannix and Company, Limited, during 1948 and 1949. The present operation consists of mining coal by hand from an area previously stripped of overburden. Twenty-five tons of coal was produced.

The Granby Consolidated Mining Smelting and Power Company Limited

A. S. Baillie, president, Copper Mountain; W. I. Nelson, general manager, Allenby.

Granby Colliery, No. 1 Mine.—This mine is about 6 miles west of Princeton, near the Hope–Princeton Highway. Because of high operating costs and labour troubles this mine was closed 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 provided 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.

In June, 1947, 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 of that year before repairs were completed and without any coal having been mined.

During 1950 an attempt was made to recover the electric hoist from the top of the slope, but because of heavy caving the cost of recovery would have been prohibitive, so the project was abandoned and the mine entrances were again sealed. The two houses near the mine, one occupied by the manager and the other by the watchman, were sold and removed to Princeton. The machinery and equipment were removed from the mine, and the property was abandoned.

Coalmont (49° 120° S.W.)

Collins Gulch Prospect

Coal Licences Nos. 17 and 18, covering the north half of Lot 294, and the north half of Lot 293, both in the Yale Division of Yale District, were renewed for one year. The licences were assigned from Francis Glover and Stuart Ney to the Collins Gulch Collieries, Limited. Coal is exposed on both sides of Collins Gulch on Lot 294, 2 miles west of Coalmont and 2 miles south of Tulameen, at a point approximately 1½ miles from the Tulameen River and about 800 feet above the river. The gulch cuts through the strike of the coal measures, and at the point of exposure the coal seams dip toward the south.

Coal was discovered on Collins Gulch over fifty years ago. The early work done in this area included an adit driven into the hillside on the east side of the gulch. The entrance to this adit caved, so that the extent of the workings could not be ascertained. During 1948 Glover and Ney did some prospecting on an outcrop on the west side of the gulch and built a road from near the Hayes and Vittoni prospect into the new showing. A large seam of coal is incompletely exposed, but it is believed that this is the principal seam that was developed at the now abandoned Coalmont Colliery. In 1949 a truck-road was built from the Blakeburn road to Collins Gulch, a distance of about 3 miles. This road was improved by the Public Works Department in 1950.

Underground work was commenced in 1950, and two adits were started from the west side of Collins Gulch near the western boundary of Lot 294 and the eastern boundary of Lot 293. The upper adit was driven westerly on the seam for 60 feet and the lower adit was driven westerly on the seam for 40 feet. The work done is not sufficient to determine the full thickness of the seam and the extent of the included impurities. The gulch in the vicinity of the adits was cribbed over and filled to form a mine yard. A 50-ton coal-bunker was built, and a cabin was erected. Francis Glover was in charge of the work, and a crew of four men was employed. Work was suspended for the winter.

Merritt (50° 120° S.W.)

Coldwater Coal Mines

Robert Murray, fireboss. This property, formerly operated by the Middlesboro Collieries, Limited, is about 1 mile south of the city of Merritt. Present activity is confined to the Coldwater No. 3 mine, about half a mile east of the old Middlesboro Colliery office. During the first seven months of the year the property was operated by C. E. Thomas. There was no output during August and September, and when production was resumed in October the property was operated by S. Gerrard and partners.

Coldwater No. 3 Mine.—This mine is in the No. 3 seam, which underlies the No. 2 seam. The seam is 28 to 30 inches thick, has a hard sandstone roof, and pitches 22 degrees in a southeasterly direction. A sample of the coal, taken in 1948 by the operator and analysed by the British Columbia Electric Railway Company, Limited, gave a heat value of 14,337 British thermal units.

The new slope, started in 1946, was advanced to a point 350 feet from the portal. The first 120 feet of the slope is on a gradient of 14 degrees, and the lower 230 feet on a gradient of 12 degrees. Four levels have been started from the south side of the slope and are named respectively Nos. 1, 2, 3, and 4 Right levels. No. 1 Right level was driven 430 feet southeasterly from the slope to a fault and stopped. At the end of the year the face of No. 2 Right level had been advanced to a point 490 feet from the slope and had reached the fault encountered in No. 1 Right level. No. 3 Right level face was advanced 340 feet from the slope, and the face of No. 4 Right level had reached a point 40 feet from the slope. The four levels have been advanced parallel to the original Middlesboro No. 3 mine Main level, and ventilation crosscuts have been driven to connect the levels. Ventilation crosscuts also connect No. 1 Right level to the abandoned workings of the old Middlesboro No. 3 mine.

Coal is blasted from the solid and is then hand-loaded into 1-ton cars which are hand-trammed along the levels to the Main slope. The cars are then hauled up the slope by a gasoline-operated hoist on the surface. Ventilation is natural and has, so far, been sufficient for such a small operation. No methane has yet been detected in the mine workings. The average monthly production, for the ten months of operation, was 107 tons. Four men were employed underground and one on the surface.

East Kootenay Inspection District

By D. R. Morgan

The Crow's Nest Pass Coal Company Limited

T. G. Ewart, president, Fernie; Thomas Balmer, vice-president, 305 Great Northern Railway Building, Seattle, Wash.; T. H. Wilson, general manager, Fernie; H. Wilton-Clark, general superintendent, Fernie; A. L. McPhee, treasurer, Fernie; W. R. Prentice, secretary, Fernie. The above company operates two collieries in this district, the Elk River Colliery at Coal Creek and Michel Colliery at Michel.

Elk River Colliery.—(49° 114° S.W.) James Littler, manager. This colliery comprises four mines, each operating in a different seam. The combined underground operations are under the direct supervision of three overmen, one shiftboss, and fifteen firebosses.

No. 1 East Mine.—Carmichael McNay, overman; Leonard Brett and John Cairns, firebosses. The major operation at this mine, which is the oldest working mine at the colliery, consists of the extraction of pillars formed during the earliest working of the mine. The pillars are of long standing, and as the coal is friable it is worked to advantage with pneumatic picks. No shot-firing operations are carried out.

All the coal is loaded directly into cars by hand, and the cars are hauled by horses to partings, where they are formed into trips. The entire output of the mine is then brought from these gathering points by a compressed-air hoist to the end of an endless rope system, now only 450 feet from the mine portal, which lowers the trips on a surface incline to the level of the old Coal Creek tipple. From there it is taken by steam locomotive to the Elk River preparation plant, 4,000 feet away.

The mine is ventilated by an electrically driven Sirocco double-inlet fan, with provision made for any necessary reversal. The fan delivers 92,000 cubic feet of air per minute into the mine, of which 63,000 cubic feet is supplied to the working-faces for a total crew of seventy men and twenty horses. The remaining 29,000 cubic feet is circulated throughout the abandoned workings. Very little methane is given off by the pillars during their extraction, and the ventilation was generally good during the year. On account of the difficulty in erecting stoppings in the numerous old roadways encountered, the ventilating current in some areas was rather sluggish. For this reason, considerable coal dust held in suspension was evident at times in some working-places.

To prolong the life of the mine, two exploratory roadways from the No. 1 West district were commenced in the latter part of the year. These are being driven in the seam in a southerly direction with the view of mining an area of coal left in that locality.

As reported in more detail under " Dangerous Occurrences," a heavy bump occurred, fortunately without injury to any of the working crew, at the entrance to the Nos. 4 and 6 West districts on November 23rd. Two other minor bumps were also reported during the year but did little material damage.

No. 4 Mine.—James Morris, shiftboss. All production from this mine, which is operated on the retreating system and single shift, was obtained from a panel of workings off an incline, driven inby the old No. 3 incline.

Rooms have been driven on a slight inclination in favour of the load to the right and left of this incline, and splits for connecting the rooms have been driven on the pitch. These splits later form longwall faces for the extraction of the pillars that, with the exception of an occasional shot, are worked to advantage by pneumatic picks. The coal is conveyed from the rooms and longwall faces by shaker-conveyors to the incline, on which it is transported by a series of belt-conveyors to a loading point on the main entry. The coal is then loaded into cars and hauled by horses to the mine portal, a short distance away from the tipple rotary dump.

The coal is of good quality, but the erratic distribution of the ash content and frequent appearance of thin rock bands complicate the preparation of the output for market. Very little methane is given off by the coal. The shale roof conditions are variable, and necessitate a systematic method of close timbering.

The mine is ventilated by a Sirocco double-inlet fan that produces 30,000 cubic feet of air against a water-gauge of 1 inch, which has been found adequate throughout the year. This fan is reversed in the winter season to act as a blower, in order to prevent the formation of ice on the main entry.

No. 9 Mine.—Daniel Chester, overman; Ralph Larner, John Sweeney, William Waller, Albert Littler, James Corrigan, Paul Kusnir, and Ralph Baker, firebosses.

This mine, operating in the No. 9 seam, is one of the major producers at the colliery, and since the coal is of excellent quality, preparations are being made to increase the production.

Considerable geological difficulties are being encountered in the development of the workings. The seam in the main and counter levels, which advanced 1,200 feet during 1950, is still thin and was intersected by an 11-foot downthrow fault approximately 300 feet back from the present face. Progress is being maintained in the levels, however, and two inclines (Nos. 7 and 8) are being driven, inby the fault, to prove the seam to the rise of the level.

Most of the production during the year was mined from the No. 5 Slope and No. 6 Incline sections, by the room-and-pillar system. The coal is mined by radial-punching machines and pneumatic picks, blasted, and conveyed to loading points on the level or rooms by shaker, chain, and belt-conveyors, where it is loaded into cars. From the slope section these cars, after being formed into trips, are hauled to the main level by a compressed-air hoist, situated at the top of the slope.

Since August the entire production of the mine was hauled from the gathering points on the main level to the mine portal by a North British 100-horsepower diesel locomotive. This is the first diesel locomotive to be used underground in coal mines in British Columbia. Several tests and samples of the exhaust gases and mine air have been taken at different periods in conjunction with the operation of the locomotive, and each one has been satisfactory. When the locomotive is not in use, it is stored in the locomotive shed outside the portal of the mine. Due to the severity of the winters in the locality, suitable heating arrangements have been installed in the building.

Preparations are being made to electrify this mine in the near future, and some of the equipment has already arrived for installation. Because it is thought that, when the mine is working at its intended capacity, the present tipple arrangements will not cope with the production, preparations are being made to install a rotary tipple on the main level, 400 feet inside the portal. The entire production of the mine will be dumped there and will be conveyed by belts to the retarding conveyor outside. The latter will convey the coal down the mountainside to the colliery preparation plant.

The mine is ventilated by a Jeffrey centrifugal fan, producing 50,000 cubic feet of air per minute against a ventilating pressure of 1.5 inches of water-gauge. This has been found to be adequate under present conditions, although isolated small accumulations of gas near the roof were found on a few occasions at some of the working-faces, usually because of defective bratticing. The maximum number of men employed on any one shift at this mine was sixty-five, together with three horses. A rock raise 140 feet long, pitching 80 degrees, was completed in the latter part of the year to improve the ventilating system of the inner section.

No. 3 Mine.—James Anderson, overman; James Brown, Brindley Morris, William Verkerk, David Brown, Roger Girou, and Kenneth Kniert, firebosses.

This mine, operating in the No. 3 seam, is also one of the major producers at the colliery. Most of the coal was mined from the No. 4 Incline and No. 1 Slope sections. The former panel was developed despite considerable difficulties encountered in passing through faulted ground. Splits were driven off the level toward the outcrop to the left of the incline, and pillars were formed. When the levels had advanced 1,400 feet from the incline, it was decided to commence extracting the pillars. The coal is generally mined by pneumatic picks but, when necessary, radial-punching machines are used. Because the coal is friable, only occasional shots are necessary. Shaker-conveyors are used for conveying the coal from the splits and pillars, which is then transferred to belt-conveyors which convey it to a loading point on the main entry.

In the slope section the roof conditions are more favourable, although some faulted ground was found in the lower section. Up to the present, all operations have been concentrated on development work, chiefly to the left of the slope, and no pillars have yet been extracted. Rooms are driven on level course, being connected by splits for ventilation, and will be used later as longwall faces. The rooms and splits are cut where necessary by radial-punching machines, but since the coal is friable, pneumatic picks are used to advantage, only occasional shots being required. Up to a few months ago gas was being given off freely by the coal but has diminished considerably. The coal is transported by shaker and belt conveyors to loading points in the rooms, and the loaded cars hauled in trips up the slope to a parting on the main entry by a compressed-air hoist. From the parting on the main entry the trips are hauled to the mine tipple by an Atlas battery locomotive.

In the inner section of the mine, four inclines have been started near the faces of the main entry. These inclines, Nos. 5, 6, 7, and 8, were to be driven to the outcrop of the seam, an approximate distance of 2,500 feet. It was decided, however, to abandon the Nos. 5 and 6 inclines after they had advanced 250 feet because it appeared that the Nos. 3 and 4 seams converge at this point and any further advancement of the two inclines would strike abandoned workings in the No. 4 mine. Bore-holes which were drilled verified that both workings were in the same seam. The Nos. 7 and 8 inclines, being inby these workings, are proceeding.

The mine is ventilated by a Jeffrey Aerodyne fan which produces 90,000 cubic feet of air per minute in the mine against a water-gauge of 1.8 inches. In general the ventilation was fairly good the latter part of the year.

To segregate the coals from the No. 3 and No. 9 mines, the erection of a 500-ton steel bunker was started late in 1950. At the end of the year the excavation was completed, and part of the concrete foundations were poured.

During the year 1,550 pounds of Polar CXL-ite, 21,250 pounds of Polar Monobel No. 4, 1,000 pounds of Polar Monobel No. 14, and 25,150 electric detonators were used at the colliery in coal and rock blasting. Six misfired shots were reported.

To neutralize the coal dust, 209 tons of limestone dust was applied to the underground roadways of the mines. Monthly samples of the mine dust were collected throughout the year and analysed. All the samples were above the minimum requirements of incombustible content as set by the Coal-dust Regulations.

Monthly inspections were made at all mines by the Miners' Inspection Committees, and a copy of each inspection report was forwarded 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 in order.

MICHEL COLLIERY.—(49° 114° N.W.) William Chapman, manager; Irving Morgan, senior overman; John Whittaker, afternoon shiftboss; Stephen Lazaruk, night shiftboss.

This colliery is the major coal-producer in the East Kootenay District and comprises five mines operating in three seams and a coal-stripping operation on the west flank of Baldy Mountain, 2½ miles northwest of Michel. The underground mines are developed on each side of a pair of rock tunnels, along one of which the entire production of the mines is hauled by compressed-air locomotives to a modern preparation plant. The combined underground operations are under the direct supervision of three overmen, two shiftbosses, and twenty-three firebosses.

"A" East Mine.—William Gregory, overman; Harry Saunders, Frank McVeigh, Thomas Taylor, Richard Hughes, and J. Krall, firebosses.

This mine, which operates on the left side of the tunnels, is on the eastern limb of the Michel syncline. The seam is from 10 to 12 feet thick, and the method of working is room and pillar on the retreating system. Apart from a small main pillar extraction above the main east level, all the production for the year was obtained from the Nos. 1 and 5 Slope sections. The extraction of the pillars from the No. 5 Slope section, which has been the major producer of the mine for some time, was completed in September. Development of the No. 1 Slope section proceeded fairly rapidly, and in order to maintain the output, extraction of some of the pillars was commenced on the completion of the No. 5 Slope section. The roof in general is weak and several small faults were encountered but, wherever possible, duckbill loaders and shortwall coal-cutters are used to drive the rooms and splits. The coal is friable and gassy, so shot-firing operations are minimized and pneumatic picks are used to advantage. The coal is transported to loading points on the levels by shaker and chain conveyors, loaded into trips of cars, and hauled up the slope by a compressed-air hoist.

Certain difficulties were experienced during the year with the ventilation of this mine. On January 30th the No. 3 old Sullivan fan, which ventilated this mine and the slope district in the "B" South mine, broke down due to mechanical failure. It was replaced by a new Jeffrey Aerodyne fan, the latter being put into operation on February 22nd. In the intervening period, operations were continued by placing the mine on the "A" West mine ventilating system. The new fan was run at a capacity of 90,000 cubic feet of air per minute until the end of October, when it was found necessary, due to adverse conditions brought about chiefly by seasonal changes, to increase the capacity to 120,000 cubic feet per minute against a water-gauge of 3.8 inches. This brought about a marked improvement in the ventilation.

"A" South Mine.—Harry Corrigan, overman; Roger Pasiaud and Harry Batchelor, firebosses. All coal mined during the year was extracted from pillars along the main south level. Due to the depletion of the coal reserves, all production was suspended at this mine in October, and the men transferred to the other mines. A small party of men was still employed at the end of the year sealing off the old workings.

"A" West Mine.—Harry Corrigan, overman; Reginald Taylor, Robert Taylor, Frederick Simister, James Walsh, and Mario Pettoello, firebosses.

This mine, the largest producer of the colliery, is operated on the eastern limb of the Michel syncline. It comprises two sections known as Nos. 2 and 4 Belt Road sections.

The major operation in the No. 2 Belt Road has been the extraction of pillars on the retreating system and is rapidly nearing completion. The roof in general has been weak, requiring the closest attention of all concerned. The coal is mined chiefly by pneumatic picks, only occasional shots being required. The broken coal is loaded into shaker-conveyors at the faces and transferred on to a series of belt-conveyors and to a loading point on the main west level.

The development of the No. 4 Belt Road district is being rushed to completion in order that production in this mine may be maintained at the present level when the reserves in No. 2 Belt Road are depleted. Rapid progress was made in driving four inclines off the No. 4 Belt Road to develop a large district toward the northern outcrop. The inclines and crosscuts are mined by shortwall coal-cutters and blasted, and the coal is loaded by duckbill loaders on to chain and shaker conveyors to be transferred to the loading point on the main west level by a series of belt-conveyors. The entire production of the mine is loaded at this point, and large trips are hauled to a parting in the rock tunnel by compressed-air locomotives.

The ventilation in general was found to be good, and is maintained by a Sirocco double-inlet fan, producing 65,000 cubic feet of air per minute against a 1.4-inch water-gauge. To further improve the ventilation, operations were commenced in November to drive the face of the No. 4 Belt Road through to the outcrop.

No. 3 Mine.—Harry Corrigan, overman; Roger Pasiaud and Harry Batchelor, firebosses.

This mine, operating in the No. 3 seam, is being developed on the western limb of the Michel syncline. The seam is 5½ feet thick, hard, of good quality, and has a fairly strong shale roof. The average inclination varies from 35 to 40 degrees but is higher in places. In the present stage of development, four raises are being driven on the pitch. They will ultimately reach the northern outcrop and provide the necessary airways before any large-scale operations can be commenced.

The mine is operated on a single-shift basis, and in 1950 the raises were advanced 900 feet each. The faces of the raises are now 1,200 feet up from the main north level and still have an estimated 1,500 feet to go to reach the outcrop. The coal is mined by radial-punching machines, blasted, and conveyed by shaker-conveyors and angle chutes to a loading point on the main north level. A few small faults were encountered. The influx of water during seasonal changes caused difficulties, in that the coal was wet and during the winter months froze in transit to the preparation plant.

The mine, at present, is ventilated as a separate split by the same fan as the "A" West mine. The ventilation was found satisfactory throughout the year.

" B " South Mine (No. 3 Incline and No. 1 Raise Districts).—Walter McKay, overman; Henry Eberts, Sidney Hughes, Douglas Graham, David Thewlis, Sr., Daniel Bobchuk, Frederick Nash, Thomas Krall, and T. Slee, firebosses.

This mine is operated in the " B " seam on the western limb of the Michel syncline. The seam averages 5½ feet in thickness, is of excellent quality, has a strong shale roof, and an inclination of 30 degrees.

In the No. 3 Incline section all operations consist of the extraction of pillars on the retreating system. The pillars in the No. 200 raise were completed, and the extraction of the incline blocks is now in progress. Some pillars that remained off the old No. 6 room farther outby are also being extracted and will prolong the life of the section. The pillar coal is cut by longwall coal-cutting machines and conveyed to a loading point on the main south level by shaker and belt conveyors. Very little gas is given off by the coal, and the natural ventilation was found to be adequate throughout the year.

The development of the No. 1 raise panel was completed during 1950, and the pillars are being extracted rapidly. Radial-punching machines were operated to mine the raises, splits, and rooms, following which the coal was blasted and loaded, where possible by duckbill loaders, on to conveyors. The pillars are cut by longwall coal-cutting machines and pneumatic picks, and the coal is transferred to a loading point on the main south level by shaker and chain conveyors. This district is a separate split to the No. 3 Incline district and was ventilated naturally at the beginning of the year. However, considerable difficulties were experienced at that time due to intermittent reversal of the ventilation brought about by fluctuations in the surface temperatures, and it was decided to install a Sheldon fan. The fan was put into operation in April, resulting in a marked improvement in the ventilation. The quantity of air produced was 30,000 cubic feet per minute against a 1.05-inch water-gauge and was found adequate.

Due to the rapid depletion of the coal reserves in these two districts, another panel of workings is being developed off the No. 3 raise inby the No. 1 raise section. As yet it is in the early stages of development.

"B" South Mine (Slope District).—William Gregory, overman; Thomas Owen, John McInnes, and William Davey, firebosses.

This district is operated to the dip of the main south level, and the major operations are the extraction of pillars. The coal is friable and is worked to advantage by pneumatic picks, no shot-firing operations being needed, except an occasional shot in rock work. The coal is loaded and conveyed by conveyors to loading points in the rooms and hauled in trips of cars to the main south level by a compressed-air hoist. Two headings were driven from the No. 10 Right room and connected to the main south level, inby the No. 1 raise. It is intended to utilize these headings as slopes later in the development of another slope district inby.

Ventilation difficulties similar to those described in the "A" East mine were also experienced at this district, it being on the same ventilating system. During the period of breakdown of the fan, however, a booster fan was used in the airway to enable operations to be continued.

During 1950, 55,959 pounds of Monobel No. 4, 14, 608 pounds of Monobel No. 14, 853 pounds of Polar CXL-ite, and 65,941 electric detonators were used at the colliery in coal and rock blasting. Nine misfired shots were reported.

Five hundred and four tons of limestone dust was applied to roadways at the various mines to minimize the coal-dust hazard and for tamping shots.

Monthly examinations were made by the Miners' Inspection Committees at all mines, and copies of their reports were forwarded to the District Inspector's office 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 and found in order.

BALDY MOUNTAIN STRIP MINE.—Daniel Coleman, foreman. The coal deposit in this locality is of considerable magnitude, ranging in thickness from 80 to 100 feet. It is of good quality, although some sections have inferior coking properties; a high percentage of lump coal is produced. The coal is loaded by a diesel-driven Northwest 1½-cubic-yard shovel and conveyed in 15-ton trucks for 4½ miles along a company road to the colliery tipple. A heavy blasting operation was successfully carried out in this mine on May 1st. Twenty-six holes, 6 inches in diameter and ranging in length from 35 to 100 feet, were drilled in the seam to the footwall. The holes were loaded with 16,800 pounds of Forcite (40 per cent) and blasted by primacord. Loading operations were continued until late in the year without further shot-firing in the coal.

Extensive diamond-drilling operations were carried out during the summer on Baldy Mountain at the northern extension of the present strip mine with a view to further stripping operations. The results of the bore-holes were very satisfactory.

A series of diamond-drill holes was also bored to determine the position of the "A" seam at the foot of Erickson Mountain above the colliery preparation plant.

To facilitate handling the strip-mine coal, a new truck dump was constructed at a sufficient distance from the strip-mine bin to allow the installation of a crusher between the two points. A steel hopper, of 25-ton capacity, was erected at the new dumping point. The hopper is discharged by a reciprocating feeder on to a 36-inch belt that conveys the coal to a double-roll crusher. The coal is then conveyed by the existing flight-conveyor, which was extended to the crusher, to the strip-mine bin.

Another alteration that was completed during the year was the installation of a 6- by 14-foot Ty-Rock screen to screen the coal as it leaves the bin. This makes it possible to segregate the "fines" of the strip and underground coals whenever their different coking qualities make separation necessary.

This new dumping and crushing arrangement has a capacity of 150 tons of strip-mine coal per hour.

Hillcrest Mohawk Collieries, Ltd.

Henry Miller, general superintendent, Bellevue, Alta. Coal has been obtained at various times during 1950 in this company's stripping operation on the interprovincial boundary at Tent Mountain, near Corbin. The major operation of the mine is in Alberta, but the seam, which is 100 feet thick and dips 65 degrees, crosses the boundary into British Columbia for a very short distance before outcropping on the mountainside. As the quantity of coal available on the British Columbia side did not warrant building extensive roads for its recovery, an arrangement was made with The Crow's Nest Pass Coal Company, the property-owners, by the above company to operate this extension.

NORTHERN INSPECTION DISTRICT

By A. R. C. James

Telkwa (54° 127° N.E.)

Bulkley Valley Collieries Limited

F. M. Dockrill, managing director. This property is on Goat Creek, about 7 miles from Telkwa. The market is confined to the district between Prince George and Prince Rupert, the coal being transported by truck from the mines to the railway at Telkwa.

No. 2 Mine.—H. Bankhead and A. Robinson, firebosses. This mine is situated on the west bank of Goat Creek about 270 feet above the river. It is operated in the Betty seam, which dips northwesterly on a pitch of 7 degrees. The seam is 13 feet thick and contains two bands of rock, 2½ and 1½ inches thick. The top 2 feet of coal is left to form the roof.

Operations during the year were confined to pillar extraction, and it is expected that this work will be completed and the mine closed down in 1951.

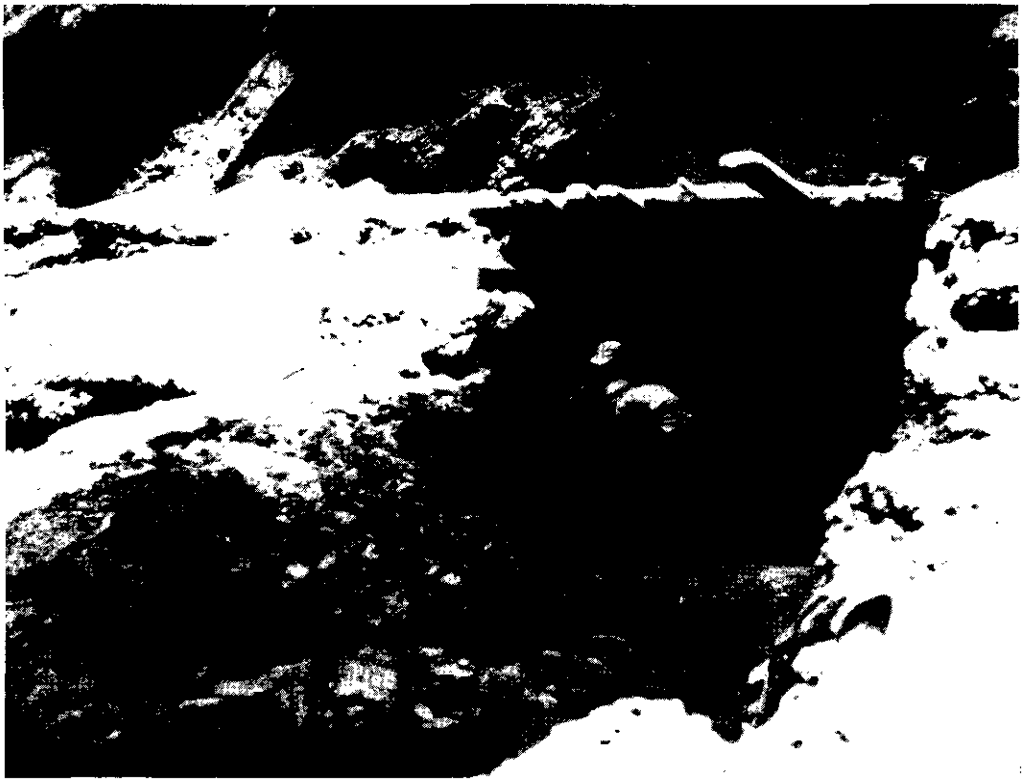
The coal in the development plans is cut by two Ingersoll-Rand radial-punching machines, and the coal in the pillars is blasted from the solid. The coal is hand-loaded into mine cars which are hand-trammed from the faces to sidings off the main slope and hauled to the surface by a small Canadian Ingersoll-Rand compressed-air hoist.

The average monthly production for this mine from January to November was 940 tons. In December thirty-three men were employed underground and six on the surface.

Conditions at the mine were found satisfactory in the course of inspections, and no accidents were reported.

No. 3 Mine.—A. H. Dockrill and D. M. Francis, firebosses. This is a new mine, in the Betty seam on the east side of Goat Creek, about 7 miles from Telkwa. The seam outcrops on a steep hillside on the east side of the creek valley about 300 feet above the creek. The outcrop is synclinal in form, and the portals of the new mine are at the base of the syncline. The seam is 11 feet thick with three rock bands totalling about 7 inches in thickness. It dips at an angle of approximately 7 degrees in an easterly direction from the outcrop. The immediate working area was diamond drilled during the summer and, from the data obtained, the operators estimate that they have an area of about 23 acres which they have reason to hope may be free of any major faulting or other disturbances.

During the latter half of the year the construction of the surface tipple was completed. The coal is brought down about 250 feet from the mine portal by a gravity chute to a small intermediate hopper, and from here by an electrically driven Mavor & Coulson 15-inch scraper chain-conveyor to the storage bin.



Timbering the portal of the main slope at the Bulkley Valley Collieries' new No. 3 mine.

By the middle of November a start was made in driving the main slopes. It is intended to work the mine on a mechanized room-and-pillar system, and a considerable amount of modern electrical plant and machinery has been acquired. The coal is cut by a Mavor & Coulson Samson shortwall coal-cutter with a 7-foot jib, and shot-holes are drilled with a Siemens Schukert E 47 rotary electric drill. The coal is conveyed to the head of the tipple by Mavor & Coulson 15-inch scraper chain-conveyors. All electrical plant switchgear is of modern design and is Buxton-certified flameproof.

In December the mine was producing about 40 tons of coal per day. Ten men were employed underground and one on the surface.

Conditions at the mine were found satisfactory during the last inspection, and no accidents have been reported.

CARIBOO

Bowron River (53° 121° N.W.)

Bowron Coal Company Limited D. Wells, president. This property is on Lot 9596, on the Bowron River about 40 miles east of Prince George. Activities during the year have been confined to improving the road and to driving a prospect level. The level, 7 by 9 feet, has been driven 48 feet in the upper portion of the Six Foot seam, the roof of this seam forming the side of the level. Mr. Wells informed the writer that it had been found difficult to continue the underground work due to lack of lamps and mechanical drilling equipment, and that such work had been discontinued at the end of the summer. Air-compressor equipment and a supply of electric cap-lamps have since been obtained, and it was the operator's intention to transport them to the site as soon as the road surface was fit for the transportation of this equipment.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1948, pp. 233–240.]

PEACE RIVER (56° 122°)

Peace River Coal Mines Ltd. Lloyd Gething, managing director; Lawrence Gething, fireboss. This property is situated on Larry Creek, on the western slope of Portage Mountain, at the upper end of Peace River canyon, about 18 miles by road from Hudson Hope. The mine, known as Canyon No. 1, is operating in the so-called Murray seam in the lower portion of the Gething formation. The seam dips about 3½ degrees in a southwesterly direction. It is 7 feet 2½ inches thick, and contains 6-inch and 4½-inch bands of clay ironstone.

The workings are approached through two slopes. The one on the west side of the property is at present the main haulage slope and is driven in a southerly direction 178 feet. The other slope, known as No. 6 Incline, is situated 800 feet to the east and was driven through to the surface from the workings in 1949; it is 560 feet long and runs in a southwesterly direction. It is the intention of the operators to use this latter slope as their main haulage. A main haulage level connects the lower ends of the two slopes. A panel of seventeen pillars has been worked to the rise of this main level, but after partial extraction these were abandoned, and a new area of virgin coal is being opened up to the east of No. 6 Incline. The main haulage level has now been driven for 200 feet to the east of No. 6 Incline, and the company has started opening a series of rooms at 45-foot centres, which are to be driven 28 feet wide for a distance of 300 feet to the rise by means of the Goodman duckbill and shaker-conveyor equipment acquired by this company in 1949. The coal is cut by an Ingersoll-Rand radial-punching machine, and shot-holes are drilled with a Huwood compressed-air rotary drill. Other mechanical equipment includes two Huwood pneumatic picks. Power is supplied by a diesel-driven Gardner-Denver air compressor of 364 cubic feet capacity.

The average monthly production of this mine from January to November amounted to 374 tons. In November six men were employed underground and three on the surface.

Conditions at the mine were found satisfactory in the course of inspections. One accident was reported and investigated.

King Gething Mines Quentin F. (King) Gething, operator and fireboss. This property is on the eastern slope of Portage Mountain, about 12 miles by road from Hudson Hope and 72 miles from Fort St. John. The present mine, known as the King Gething No. 3 mine, was started in April, 1949. The seam being worked is 8 feet thick, including clay ironstone that varies in thickness from a few inches to a foot. Where thick and near the floor, the clay ironstone is left down, otherwise it is mined out. The seam pitches 16 degrees in an easterly direction.

An adit has been driven for 330 feet due north along the strike of the seam. Four raises, set off at approximately 70-foot centres, have been driven for 75 feet to the rise off the main adit level. A counter level, parallel to the main level and 75 feet to the rise of it, has been driven in from the surface for 110 feet. As it advances, this counter level connects up with each raise, thus establishing a natural ventilation circuit and a second means of egress. A total of about 420 feet of drivage has been completed during the year.

The coal is mined by blasting it from the solid. Mechanical equipment consists of a drill and a Sullivan jackhammer. Power is supplied through a small air compressor of 60 cubic feet capacity driven by a 25-horsepower gasoline motor.

A new mine camp was constructed in the early part of the year near the tipple.

Average monthly production from January to November, inclusive, amounted to 163 tons. In November four men were employed underground and two on the surface.

Conditions at the mine were found to be fairly satisfactory in the course of inspections. No accidents were reported.

Reschke Coal Ltd. J. Reschke, operator; A. J. Garraway, fireboss. This property is situated on a steep hillside on the southern spur of Butler Ridge, about 23 miles by road from Hudson Hope and 83 miles from Fort St. John. Operations were confined to the No. 2 mine. The seam worked is 5 feet thick and contains two thin rock bands in the top 6 inches. It pitches at 43 degrees.

An adit level has been driven in from the surface 800 feet along the strike of the seam, this being the main haulage level. An upper level, 330 feet above the main level, has been driven in from the surface for 270 feet to provide a return airway and alternate means of egress.

The coal is worked from a series of 30-foot-wide rooms set off from the lower level at 50-foot centres and driven on the full pitch. Eleven of these rooms have now been finished and sealed off; the No. 12 room is used as a manway raise, and in November Nos. 13, 14, and 15 rooms were being worked.

The coal is cut by two Ingersoll-Rand R 47 radial-punching machines and is transported by gravity chutes into cars on the main level, from which it is brought out of the mine by horse haulage. Mechanical equipment includes two Davis compressed-air-operated rotary coal drills and a jackhammer. Power is supplied by an air compressor driven by a 100-horsepower diesel engine.

Average monthly production from January to November, inclusive, amounted to 372 tons. In November six men were employed.

Conditions were found fairly satisfactory in the course of inspections, and no methane has been detected. No accidents have been reported.

Inspection of Electrical Equipment and Installations at Mines and Quarries

By L. Wardman, Electrical Inspector of Mines

CONTENTS

INSPECTIONS AND INVESTIGATIONS

The following is a summary of the inspections of electrical installations made during 1950 at metalliferous mines, concentrators, coal mines, and quarries.

The number of inspections made during 1950 is as follows:—

	Number Inspected	Number of Inspections Made
Metalliferous mines	34	35
Concentrators or mills	20	26
Coal mines	6	6
Washing plants	1	1
Industrial mineral mines	2	2
Quarries	8	8
Dredges	1	1
Placer mines	1	1
Totals	73	80

Dangerous Occurrences

There were no dangerous occurrences or accidents involving electrical equipment during the year.

Prosecutions

There were no prosecutions involving infractions of the electrical regulations during the year.

SUMMARY OF REPORTS OF INSPECTION

The following paragraphs summarize the contents of the reports of electrical inspections for the year. The observations, comments, and recommendations made have been grouped and condensed to cover generally the subject under each heading. Rules or parts thereof are quoted from the Canadian Electrical Code to show the infraction. The rule number is not given because they are not always identical in both the coal-mines and metalliferous-mines electrical regulations.

Maintenance

Neglecting to maintain electrical equipment in safe and proper working condition is one of the most common malpractices. Often electrical equipment is installed and allowed to run until a breakdown occurs. An organized inspection and maintenance programme will usually avoid considerable loss of time. Machines which give indication of becoming defective can be attended to at the first opportunity, and minor repairs can be made on the spot. A maintenance programme at most mines would only be a part-time job for one electrician. At several mines such a programme is carried on.

Temporary Electrical Installations

There were six major as well as several minor installations of temporary wiring which required replacing with permanent wiring. The Canadian Electrical Code rules: " Temporary wiring and equipment, which is not in compliance with these Rules may be used but only when under competent supervision, or protected by suitable barriers or warning signs while it or neighbouring wiring is alive and accessible to unauthorized persons, such temporary installation shall be made permanent and in compliance with these Rules within a time designated by the Inspector."

Supply-stations

This section covers transformer-stations and main distribution switchgear centres.

Two station enclosures required completing; one required a lock on the gate, and one required more space in front of the switchgear to allow sufficient room for safe operation and maintenance.

The following rules of the Canadian Electrical Code were not observed:—

"No persons, other than those authorized by the Owner, Manager, or Superintendent, shall enter an electrical supply station or interfere with the workings of any machine, transformer, motor, or apparatus connected therewith, and when the authorized persons are not present the door of such room shall be kept securely locked.

"Adequate working space and means of access clear of all obstruction and free from any danger shall be provided and maintained about all electrical equipment. Where adjacent to exposed live parts such working spaces shall be so arranged that they will not be used as passageways. All handles intended to be operated shall be conveniently placed for that purpose. The working spaces shall, where practicable, have minimum horizontal dimensions when adjacent to exposed live parts within 8 ft. of the floor, as follows:—

Item	Spacing	
	On One Side of Aisle (Feet)	On Both Sides of Aisle (Feet)
150 volts or less to ground	1.5	2.5
Above 150 volts to ground	2.5	4
300 to 750 volts in supply station	2.5	3
Above 750 volts in supply station	3	5"

In addition to the above, four supply-stations had wet floors. A wet floor increases the chance of electric shock. It is imperative that such floors be kept dry, or if that is not possible, a suitable platform should be installed from which to operate the switchgear or do maintenance work.

Power Circuits

Under this heading will be covered mechanical protection, service entrances, identification of circuits, switches used as storage cabinets, horsepower rating of switchgear, wiring of different systems in the same gutter or conduit, grounding, ground detecting device, trailing cables, and motors.

Mechanical Protection.—Power-circuit conductors should have mechanical protection against mechanical injury. In buildings (excepting supply-stations) and underground, this protection should extend throughout the length of the conductors. However, it has been observed that splice-box covers, terminal boxes, gutter-box covers, and switch-box covers have been omitted, leaving the conductors exposed. Should the insulation on the conductors become damaged, anyone coming in contact with that part of the conductor could easily receive an electric shock. Also, if the mechanical protection is depended upon for a grounding medium, the continuity of ground is broken where portions of it are omitted.

Service Entrances.—At one property a new service entrance was installed for each motor supplied. One supply service only of the same potential and characteristics shall be run to any building from the same system. Special dispensation is allowed under certain conditions; for example, where an auxiliary service is required for fire-pumps, emergency lighting, or in buildings of very large area.

Identification of Circuits.—Circuits were inadequately identified at four properties. The Canadian Electrical Code rules: "All control and protective devices shall be readily and safely accessible to authorized persons; they shall be so located, labelled, or marked as to afford means of identifying circuits or equipment supplied through them."

Overcurrent Protection.—The conductor between the buses and the branch-circuit fuses should be as short as possible and should be in accord with the following Canadian Electrical Code rule:—

"Automatic overcurrent devices shall be installed at the supply ends of all feeders, sub-feeders and branch-circuits which are reduced in section except when the overcurrent device in the larger conductor properly protects the smaller conductor."

One installation was not in accordance with this rule.

Wiring between Gutters and Switches.—Two installations were wired so that the wiring from a gutter to a branch-circuit switch passed through another switch not in any way connected with the circuit. This is not approved practice; wiring should be run directly from the nearest point on the bus in the gutter to the branch-circuit switch controlling that branch circuit.

Switches Used as Storage Cabinets.—One very poor practice quite often seen is the use of switch cabinets as storage cabinets for such articles as gloves, tools, spare parts, oil, and grease.

Switch cabinets are designed with a cubic content calculated to be satisfactory for the efficient and safe operation and maintenance of the switch mechanism. Filling what apparently appears to be surplus space with combustible material or conductive material introduces a fire hazard in the first instance and a possibility of short circuit in the second instance.

Horsepower Rating of Switchgear.—The horsepower rating of switchgear must be taken into consideration when selecting a fused disconnecting switch for a motor branch circuit; ampere rating alone is not sufficient. The Canadian Electrical Code requirements are: "Each motor shall be provided with starting and/or control equipment rated in horsepower not less than the motor rating."

Several switches having a horsepower rating less than the motor rating have been found in use. These switches gave considerable trouble because of excessive heating and burning of contacts and had to be replaced with switches of proper rating.

Wiring of Different Systems in the Same Gutter or Conduit.—Two systems inspected were found to have wiring of different systems and voltages in the same gutter and conduit. This practice can only be permitted in accordance with the following Canadian Electrical Code rule:—

"Except by special permission as noted below, conductors of different systems shall not occupy the same box, cabinet, or auxiliary gutter unless a barrier of sheet steel of not less than No. 16 U.S. Sheet-metal Gauge or its equivalent of suitable insulating material be used to divide this space in order to separate the conductors of different systems, or unless the conductors be intended for the supply and control of remotely controlled devices, all conductors are insulated for at least the same voltage as that of the circuit of highest potential involved and none of the lower potential conductors are directly connected to any lighting branch-circuit. If a barrier be used, it shall be rigidly fastened to the gutter unless an approved device assuring positive separation of the conductors be used. Special permission to vary from the foregoing shall be obtained in the following cases:—

"(1) A double-throw switch as used in some emergency lighting systems.

"(2) The supply and control conductors of remotely controlled devices when not insulated for the same (maximum) voltage.

"(3) In the case of supply and control of remotely controlled devices where the voltage exceeds 4,500 volts between conductors."

Grounding. — The Canadian Electrical Code requires that "All metallic parts of electrical apparatus and system equipment which are normally dead and insulated from live or current-carrying parts of the system unless effectively protected by a grounded or insulated covering made of fire-resisting material shall be adequately grounded by connection to a grounding system above ground near the entrance to the mine."

Eleven installations were not in accordance with this rule.

Ground Detecting Device.—The Canadian Electrical Code requires that "On all ungrounded distribution systems over 300 volts suitable instruments or devices shall be installed and maintained for indicating the presence of ground faults."

This rule is observed very well now, and it was necessary to advise the management of only one company to comply with the rule.

Trailing Cables.—With the exception of numerous cable connectors being omitted, the general condition of most trailing cables was found to be good.

At one mine 9-conductor individually shielded trailing cables have been put into service. One of these cables replaces three smaller cab-tire cables. It incorporates three No. 4 B. & S. gauge power conductors, three No. 14 B. & S. gauge control conductors, two No. 14 B. & S. gauge lighting conductors, and one No. 8 B. & S. gauge grounding conductor. The outer sheath is a neoprene jacket having an over-all diameter of approximately 1.52 inches.

The individual shields act as a double barrier between any two conductors.

The transformer supplying the lighting circuit is on the load side of the disconnecting switch, so that all conductors are dead when the disconnecting switch is open.

Motors.—Generally, motors were found to be in satisfactory condition, except that some required guards over the couplings and others required terminal boxes.

Lighting Circuits

The main faults found in lighting were overfusing of circuits and the fusing of neutral conductors.

Four installations required maintenance and improvement, and one installation of temporary wiring required replacing with permanent wiring.

Several switch installations required protection against moisture.

Hoists

The power wiring for two hoists had deteriorated and required attention. The overspeed and limit switch controls on three hoist installations required adjusting to operate effectively. The limit-switch circuit on one hoist was so arranged that the back-out switch by-passed all limit switches when in either back-out position, which allowed the operator to run the hoist through the limits in the other direction if he forgot to return the back-out switch to the off position after backing out of a limit. The circuit must be so arranged that only the limits in the direction entered are by-passed by the back-out switch.

Locomotives

Ineffective controller-handle latches and controller interlocks, and inoperative or missing headlights were the main defects found on locomotives. "Every locomotive, engine, trolley or motor car shall be equipped with a head light or head lights. All made-up trains shall be equipped with a suitable tail-light."

Electrical Blasting

The defects found in blasting systems were an isolating switch used where a switch opened by gravity is required (blasting circuits must be energized through a switch which will open by gravity when the closing force ceases to be applied); blasting leads used both for blasting and lighting purposes (blasting leads must be used for blasting purposes only); blasting leads grounded (stray current may be picked up through the grounding conductor); blasting leads not short-circuited; blasting switches not locked (someone may tamper with the switches when the blasting circuit is being connected).

TEST-LAMPS

Occasionally electric lamps are found being used for testing. Electric lamps are not approved for testing because, if accidentally used on a higher voltage than for which designed, the lamps may explode and the flying glass may injure the person using them.

HEATING

Lamps are often used for heating in wooden cabinets installed underground. Such lamps shall be guarded to prevent combustible material from coming in contact with them. It is more satisfactory to use a resistance heater which does not reach a temperature that will ignite combustible material.

Electric heating systems shall not be installed in explosive storages. Such places may be heated indirectly by electricity, but the heat must be transmitted by some medium such as water.

FIRE PROTECTION

Fire-extinguishing equipment is not always installed where required by the following rules:—

"Where installed electrical apparatus presents a fire hazard each room or space shall be provided with an adequate approved fire-extinguishing appliance, conveniently located and conspicuously marked. No chemical appliance which has not been approved for use on live parts shall be placed in a room containing electric apparatus or exposed lines unless a sign is mounted at the appliance warning against its use on electrical fires.

"Fire buckets of suitable capacity, filled with clean dry sand, stone dust, or other such satisfactory fire quenching material, shall be kept ready for immediate use at or in every place containing equipment as covered by these Rules where they can be effectively used."

PACIFIC REGIONAL COMMITTEE

A meeting of the Pacific Regional Committee on the Canadian Electrical Code, Part V, was held in Vancouver on April 19th, 20th, and 21st, 1950, to discuss problems in connection with the application and interpretation of the Code. The following members were present: L. Wardman (chairman), Electrical Inspector of Mines; S. C. Andrews, Canadian Collieries (Dunsmuir) Limited; R. Commons, The Crow's Nest Pass Coal Company Limited; G. Ford, Bralorne Mines Limited; W. H. Miller, The Granby Consolidated Mining Smelting and Power Company Limited; C. H. Watson, Britannia Mining and Smelting Co. Limited.

The local representatives of manufacturing and supply companies and a representative from the British Columbia Mining Association were invited to attend, and the following took advantage of the opportunity: R. A. Benson, Canada Wire and Cable; L. A. Hunt, Bepco Canada, Ltd.; C. C. Simpson, Northern Electric Co.; R. C. Hardie, Canadian General Electric Co. Ltd.; J. Tames and E. Piercy, Westinghouse Electric; C. H. Mitchell, Mining Association of British Columbia.

The meeting opened with the reading of the minutes from the previous meeting.

A brief explanation of the application of the Code and the function of the various committees connected with the Code was made.

Many short discussions took place, and such things as the colour code for wiring, interpretation of various rules, ground fault equipment, control equipment, motor protection, cables and cable certificates, and bonding were discussed the first day.

The morning of the second day was spent discussing whether the regulations requiring vaults, fire-doors, etc., for oil-filled transformers installed underground were necessary.

It was thought by one member that Buckholtz relays could be used in many installations and the other forms of protection reduced or eliminated. It was pointed out that relays occasionally failed, and therefore the other forms of protection could not be dispensed with.

The afternoon of the second day was taken up with the following:—

The use of air-break and oil-break switchgear was discussed, with particular reference to the maximum system voltage on which air-break switchgear could be used.

The regulation which requires a special room underground in coal mines for battery-charging was questioned. It was thought by some that battery-charging could be done along the roadways if permissible equipment was used.

An explanation of the ruling which prohibits the connection of underground telephone systems in coal mines to commercial systems was requested. It was pointed out that the purpose of the ruling was to prevent lightning discharges being carried underground by the telephone conductors.

Different types of trolley-guards were discussed with respect to the most suitable material to use.

At the third session an opinion was expressed that it might be possible to have flit plugs manufactured in Canada. It was pointed out that such plugs would not carry a flameproof certificate.

The remainder of the third session was taken up with a discussion of different types of trailing cables and ground leakage protection.

Five new members were added to the Committee, and the membership is now as follows:—

L. Wardman, Electrical Inspector of Mines, Department of Mines, Victoria, B.C.

S. C. Andrews, chief electrician, Canadian Collieries (Dunsmuir) Limited, Union Bay, B.C.

R. Commons, chief electrician, The Crow's Nest Pass Coal Company Limited, Fernie, B.C.

G. Ford, chief electrician, Bralorne Mines Limited, Bralorne, B.C.

W. H. Miller, foreman electrician, The Granby Consolidated Mining Smelting and Power Company Limited, Copper Mountain, B.C.

M. A. Thomas, branch electrical engineer, Sullivan mine, The Consolidated Mining and Smelting Company of Canada, Limited, Kimberley, B.C.

C. H. Watson, chief electrician, Britannia Mining and Smelting Co. Limited, Britannia Beach, B.C.

R. A. Benson, Canada Wire and Cable, 1494 Powell Street, Vancouver, B.C.

R. C. Hardie, industrial engineer, Apparatus Division, Canadian General Electric Co., Ltd., 1095 Pender Street West, Vancouver, B.C.

L. A. Hunt, general manager, Bepco Canada, Ltd., 1120 Hamilton Street, Vancouver, B.C.

C. C. Simpson, manager, Power Apparatus Sales, Northern Electric Co., Ltd., 150 Robson Street, Vancouver, B.C.

C. H. Mitchell, secretary, Mining Association of British Columbia, 837 Hastings Street West, Vancouver, B.C.

The concensus was that the meeting had been a success, and it was moved that other meetings of this nature should be held in the future.

NOVA SCOTIA AND PITTSBURGH TRIP

In order to make a study of permissible coal-mine electrical installations, the writer was sent to Nova Scotia in November. The return journey was made via Pittsburgh in order to visit the United States Bureau of Mines testing-station.

Three mines operated by the Dominion Steel and Coal Co. Ltd. were visited, and the main types of electrical equipment—namely, coal-cutters, drills, conveyors, loaders, fans, and pumps—were observed in operation, under conditions which could be attained or even bettered here. The system of power distribution and transformer housing was also studied.

Adequate ventilation, an effective dust-control programme, and good maintenance of the electrical equipment are necessary to make its use safe. The electrical staff must be large enough to handle adequately routine inspections, maintenance, repairs, and new installations.

In Nova Scotia a wetting agent is used on the coal-cutters to lay the dust. Formerly only water was used; now, with the wetting agent, approximately a fifth of the amount of water is necessary to lay the dust effectively.

In permanent roadways electrical-power cables are suspended from fixed clevis-type single-groove porcelain insulators. The use of readily breakable material has been allocated to roadways where falls of ground may occur. Permanent roadways are supported by steel arches or by steel beams and posts.

All armoured power cables are insulated for 6,600 volts, the highest voltage in use, so that they may be used on either secondary or primary circuits. This adds to the efficiency and safety of the system.

Both British and American manufactured equipment is used. The distribution switchgear is of British manufacture, and much of the face equipment and tugger hoists are of American manufacture.

The Dosco Coal Company casts its own splice boxes for connecting lengths of armoured cable. Joy connectors are used extensively for trailing cables.

Where splice boxes are so far from the surface that hot compound cannot be carried to them, a " cold pour " compound is used. It consists of two liquids which, when mixed, solidify.

Electrification, diesel-power haulage, and multiple shot-firing, have greatly improved the efficiency of coal-mining.

At the United States Bureau of Mines the equipment used in testing electrical apparatus for permissibility was examined, and a piece of electrical equipment was observed under test.

Electrical equipment submitted for test is carefully examined and measured to determine whether it meets specifications, after which it is tested by exploding in it a mixture of methane and air while it is surrounded by an explosive atmosphere. During this test no flame must be seen to issue past the flanges or past the journals, neither must the explosive atmosphere surrounding the piece be ignited. This test is repeated ten times.

At the United States Bureau of Mines a test of roof acceleration by the action of explosives was witnessed. The new method of roof support by roof bolting was seen. It leaves a clean unobstructed roadway.

The method of testing permissible explosives for permissibility was observed.

ELECTRICAL POWER

During 1950 electrical power was used at twenty-two concentrators, on the surface at thirty-seven metalliferous mines and underground at twenty-five of these mines, at one placer mine, on one dredge, in six quarries, and in two clay mines.

Two coal mines were closed in 1950. These were Tulameen Collieries Pleasant Valley No. 4 mine, at which operations ceased on March 31st, and Canadian Collieries (Dunsmuir) Limited White Rapids mine, at which operations ceased on July 28th.

The Canadian Collieries (Dunsmuir) Limited Bright mine was opened for exploration work and the Bulkley Valley Colliery was electrified at the end of the year.

During the year electrical power was used on the surface at nine coal mines and underground at six of these mines.

A total of 19,222 horsepower used in combined surface and underground operations at coal mines is distributed as follows:—

Above Ground	Average Horsepower	
Compressed air	8,311	
Ventilation	1,320	
Hoisting	2,066	
Haulage	817	
Coal washing	2,824	
Coal screening	251	
Pumping	506	
Coke production	1,137	
Miscellaneous	532	
Total		17,764
Underground		
Haulage	658	
Pumping	695	
Coal-cutters	70	
Conveyors	34	
Miscellaneous	1	
Total		1,458
Total for surface and underground		19,222

MINE ELECTRICAL INSTALLATIONS

Following is a brief general description of new electrical installations and of additions and improvements to existing installations. A complete description of electrical installations not mentioned here may be found in previous Reports of the Minister of Mines.

PLACER MINES

Spruce Creek (59° 133° N.W.)

Noland Mines Limited

A complete electrical-power system was installed during 1949 and 1950. A power plant consisting of a self-regulating 110/440-volt 3-phase Palmer generator direct-connected to a 150-horsepower diesel engine was installed. However, it was found that this plant was inadequate to handle the full load that was thrown on it at times, so the hydro-electric plant belonging to the Discovery Mining and Power Company was acquired. This plant consists of an 800-horsepower horizontal waterwheel, manufactured by William Hamilton Limited, Peterborough, Ont., driving a 600-kva. 4,600-volt 3-phase 60-cycle a.c. generator.

Three 50-kva. 4,600/2,300–575-volt 60-cycle single-phase type F power transformers, which are part of the power-plant equipment, were moved to the mine. These were originally used as a portable transformer-station by the Discovery Mining Company.

The remainder of the equipment received with the power plant was one 15-kva. and two 5-kva. 4,600/2,300–220/115-volt type F lighting transformers.

The washing plant consists of a belt-feeder driven by a 2-horsepower motor, a pump driven by a 7½-horsepower motor, and a 15-foot by 44-inch trommel screen which was originally driven by a 15-horsepower motor but is now driven by a 10-horsepower motor through a 3–1 Radicon gear-reducer. The 15-horsepower motor is now used to drive a model 5L3/VP4 Paramount centrifugal pump which supplies water for the sluicing plant.

The gravel is hoisted with a Wild two-drum hoist driven by a 40-horsepower motor. Only one drum is used.

For underground haulage a 1½-ton battery locomotive is used. A 5-horsepower locomotive-battery charging unit is situated at the shaft bottom.

Ventilation of the underground workings was originally taken care of by a 3-horsepower fan situated in the headframe. Later a No. 300 type fan driven by a 5-horsepower Higgs motor was installed for better ventilation.

A 75-horsepower C.G.E. 900-r.p.m. 440-volt 3-phase 60-cycle slip-ring motor complete with controller, grids, and oil circuit-breaker has been purchased to drive the 75-brake-horsepower type 40 Ingersoll-Rand air compressor when hydro-power is available.

Miscellaneous electrical equipment consists of a timber saw driven by a 2-horsepower motor, a lathe, a table saw, and a planer, each driven by a 1-horsepower motor.

Cariboo (53° 122° N.W.)

A.P. & S. Placer

This company started operations on the Cottonwood River in September. The washing-plant components are driven by electric motors, which are supplied from a Murphy diesel electric generating unit. The generator is a 150-kva. 480-volt 3-phase 60-cycle unit made by the Electric Manufacturing Company, Minneapolis, Minn. The washing-plant components are as follows: A winch driven by a 3-horsepower motor; a 4-inch pump driven by a 10-horsepower motor; a 10-inch pump driven by a 50-horsepower motor; a trommel screen driven by a 40-horsepower motor; and a stacker driven by a 5-horsepower motor.

Current for lighting is supplied at 110 volts through a 5-kw. transformer.

LODE MINES

Taku River (58° 133° N.W.)

Polaris-Taku (Taku River Gold Mines Ltd.).—Some reorganization of the roasting and cyanide plant was done and the 750 level transformer-station was completed. At the end of the year the management was preparing to suspend mining operations.

Tulsequah Chief (The Consolidated Mining and Smelting Company, Limited, of Canada) The 15-horsepower d.c. plant, which was installed to provide lighting for the camp and power for the shops, has been replaced with a U.D. 18-A International Harvester diesel power unit driving a 50-kw. 550-volt 3-phase a.c. Palmer generator. A Hertner 7.5 kw. motor-generator set with single-circuit panel and Exide MP 2 control unit was installed for charging the locomotive battery. A Mancha little trammer is used for haulage. A 15-horsepower fan was installed for mine ventilation, and a 3-horsepower motor driving a 1 cubic-foot-per-minute pump was installed to pump oil.

Portland Canal (56° 130° S.E.)

Silbak Premier Mines Limited.—A tram is being built on the Indian mine property, which will be run by a 50-horsepower 440-volt wound-rotor motor. A No. 2 B. & S. gauge feeder-line has been installed to supply the motor.

No alterations have been made to the electrical installations at the Premier mine.

Alice Arm (55° 129° N.W.)

Torbrit Silver Mines Limited A double-drum E. Long hoist driven by a 125-horsepower 440-volt 3-phase 60-cycle wound-rotor English Electric motor was installed. It is supplied with electrical power from three 50-kva. 13,200–480/240-volt single-phase 60-cycle English Electric transformers through a distribution centre consisting of an 800-ampere air circuit-breaker and two Cemco 200-ampere safety switches. A 5-kva. transformer was installed for lighting.

Hazelton (55° 127° S.W.)

Silver Standard Mines Limited A new bunk-house and residences were built which necessitated an increase in camp lighting capacity. Two 7½-kva. 440–220/110-volt transformers were installed in the carpenter-shop to supply the " upper " and " lower " camp circuits. These transformers are connected in delta with a 7½-kva. transformer which supplies the mill lights. This arrangement replaces two 7½-kva. transformers which served the mill building and camp lighting circuits.

A lathe driven by a 2-horsepower 440-volt 3-phase Westinghouse motor and a drillpress driven by a 1½-horsepower 440-volt 3-phase Robins & Myres induction motor were installed in the compressor building.

A Mancha trammer was purchased, and a 3-kw. Hertner charger was installed for charging locomotive batteries.

The speed of the ore-feeder in the crushing plant was made variable by replacing the 2-horsepower master gear motor with a 2-horsepower English Electric wound-rotor motor with rheostat control.

A unit cell driven by a 2-horsepower 440-volt English Electric motor was installed in the grinding circuit.

A filtrate pump driven by a 1-horsepower 440-volt motor and a sump pump driven by a 2-horsepower 440-volt motor were added to the mill equipment.

CARIBOO

Wells-Barkerville Area (53° 121° S.W.)

Island Mountain Mines Company Limited

Trouble was experienced with drum flanges breaking on the old hoist, so a 54-by-60 Nordberg-Bertram two-drum mine hoist was installed late in the year. This hoist was formerly used by the Berens River Mines at Favourable Lake, Ont. A new 200-horsepower 2,300-volt 3-phase 60-cycle wound-rotor General Electric motor was purchased to drive the hoist. Included with the motor is a 2,300-volt primary panel and a seven-step secondary panel.

The addition of the hoist made necessary the following changes to the electrical system and power plant:—

A 150-kva. 480–2,300-volt single-phase 60-cycle transformer was added to the step-up transformer bank to make it a full delta and bring it to full capacity.

The main transmission-line from the transformer-station to the mine portal was changed to handle 120 amperes at 2,300 volts.

A 450-horsepower General Motors marine-type diesel direct-connected to a 300-kva. 480-volt 3-phase 60-cycle 1,200-r.p.m. General Electric generator was installed in the power plant.

Cariboo Gold Quartz Mining Company Limited

To improve ventilation underground, a 36-inch Sheldon Vane axial 20,000-cubic-foot fan driven by a 20-horsepower 1,800-r.p.m. 440-volt motor was installed on the 1600 level. Preparations are being made to install underground a 200-imperial-gallons-per-minute pump driven by a 75-horsepower 440-volt 3,600-r.p.m. totally enclosed motor. A 3-conductor No. 4/0 B. & S. gauge 600-volt working-pressure galvanized-wired-armoured cable 650 feet long has been installed in the shaft. The pump will be installed early in 1951.

BRIDGE RIVER (50° 122° N.W.)

Bralorne Mines Limited

The following alterations and improvements were made to the electrical system. The 60-horsepower sinking-hoist was moved from the Empire shaft to the Crown shaft. Two 150-kva. 4,600/2,300–400-volt single-phase transformers have been moved from the Empire transformer-station to the 2073 transformer-station which was cut midway between the Empire and Crown shafts on the 2000 level. A third 150-kva. single-phase transformer is on hand to be installed.

Three 50-kva. 4,600/2,300–440-volt single-phase transformers have been installed at the Empire 2000 level station.

A 600-kva. 2,300–4,600-volt 3-phase transformer has been installed in the Empire hoist-room but is not yet connected. When this transformer is connected, it will supply the 2000 level Empire station and 2073 station at 4,600 volts, thus doubling the primary distribution voltage and increasing system efficiency.

A 75-horsepower motor was installed on the 2000 level to drive a Jeffrey Aerodyne ventilating fan which delivers 70,000 cubic feet of air against a water-gauge of 5 inches.

A new lamp-house for eighty Edison mine lamps was completed at the Empire mine office.

Wayside (L.A.P. Mining Company Limited)

The reconstruction of the electrical system has been commenced and a new transformer-station has been built. It is a four-pole structure with a platform 5 feet above the ground for the transformers. The new station is well away from the mill and mine buildings and will therefore reduce the fire hazard. The three 50-kva. 2,300–440-volt and the one 5-kva. 2,300–110-volt single-phase 60-cycle Canadian

General Electric transformers and the one 30-kva. 2,300–110-volt single-phase 60-cycle Westinghouse transformer have been moved from the old transformer-station to the new one, and new overhead lines have been installed.

Copper Mountain (49° 120° S.W.)

The Granby Consolidated Mining Smelting and Power Company Limited

The following alterations and improvements have been made above and below ground at the Copper Mountain mine. The efficiency of the haulage system has been increased by the addition of two new 10-ton 250-volt Goodman trolley locomotives, type 188-30-68T. Eleven Ingersoll-Rand model 4MMD slusher hoists powered by 50-horsepower 440-volt motors have been moved from exhausted ore blocks to the 9-4 block, 13N block, 40 block, 37A block, and 7-10 block. All equipment has been moved from the surface steel-shop to a new building near the crushing plant. This shop contained equipment for sharpening Vibresist steel. Later in the year a change was made to Copco steel and equipment, and a small sharpening-shop was put underground. Only 5 horsepower in small single-phase 220-volt motors is required for this work.

A new primary 3-conductor 300,000-cubic-foot cambric-insulated lead-sheathed wire-armoured 2,500-volt cable 1,100 feet long was installed from the surface switch-room to the main substation on 6 level via the new surface raise. This supplies all a.c. power underground and was installed to by-pass No. 1 shaft.

Two single-conductor 750,000-c.m. 2,500-volt cambric-insulated lead-sheathed wire-armoured cables were also installed in the raise to supply a portion of the direct current to the haulage locomotives.

The steam-heating system at the crushing plant was replaced by thirteen electric hot-water radiators with 1,500-watt 220-volt immersion-type heaters. All oil-circulating systems have been fitted with immersion electric heaters.

At the Granby mill, Allenby, the following equipment was installed: A new bank of McKay-Downey cells driven by five 10-horsepower motors; a new filter conveyor and 3-horsepower motor; and a new car-mover hoist and 10-horsepower motor in the filter plant.

All circuits in the filter plant were overhauled and new bus bars were installed. The pole-line to the Granby Colliery was removed and the equipment dismantled. The pole-line to the Tulameen Colliery was removed.

Hedley (49° 120° S.E.)

Nickel Plate (Kelowna Exploration Company Limited)

Three 20-horsepower 440-volt 3-drum 20 MNM-3G Canadian Ingersoll-Rand slusher hoists having a rope speed of 175 feet per minute and using 42-inch scrapers were placed in operation. To sink a 46-degree incline for a distance of 350 feet, a single-drum hoist having a rope speed of 200 feet per minute and powered by a 20-horsepower Howell 440-volt wound-rotor motor was installed on the 4150 level. A small property called the French Mine Division, which is near the Nickel Plate mine, began producing in the spring. The following equipment was installed: A Holman 500-cubic-feet-per-minute 800-r.p.m. 2-stage water-cooled vertical compressor driven by a 100-horsepower 440-volt Canadian General Electric motor through a V-belt drive; a 6-by-20 Ingersoll-Rand jaw crusher driven by a 20-horsepower 440-volt Canadian General Electric motor; a 3-drum Canadian Ingersoll-Rand type MNM-2F slusher hoist driven by a 15-horsepower 440-volt motor, which is used to scrape ore approximately 100 feet from the working-faces to the crusher; a conveyor driven by a 1½-horsepower motor; a sample crusher driven by a 1-horsepower motor.

The lighting circuits are supplied through a 7½-kw. 440–220/110-volt transformer.

Beaverdell (49° 119° S.E.)

Highland Bell Limited

A new mill was built and began operating in September. A blueprint of the proposed electrical installation was received in July and was approved. In August the nearly completed installation was inspected and found satisfactory. The power plant is a Ruston Hornby diesel driving a 219-kva. 440-volt 3-phase 60-cycle a.c. generator. The crushing plant consists of a coarse-ore feeder driven by a 1-horsepower motor; a coarse-ore conveyor driven by a 2-horsepower motor; a screen driven by a 1½-horsepower motor; a picking-belt driven by a 1-horsepower motor; a jaw crusher driven by a 15-horsepower motor; an exhaust-fan driven by a 1-horsepower motor; and a fine-ore conveyor driven by a 3-horsepower motor.

The mill consist of a fine-ore feeder driven by a 1-horsepower motor; a ball mill driven by a 50-horsepower motor; a duplex jig driven by a ¾-horsepower motor; a Dorr classifier driven by a 5-horsepower motor; a 1-inch D.V.C.S. pump and a 2-by-2 S.R.L. pump, each driven by 1½-horsepower motors; six lead cells driven by three 3-horsepower motors; two 1-inch D.V.C.S. pumps and a 4-foot conditioner, each driven by a 2-horsepower motor; six zinc cells driven by three 3-horsepower motors; two dry 12-inch cones and three wet 12-inch duplex cones; a No. 12 Simplex A.F. feeder and a No. 2 Cornel blower, each driven by a ¼-horsepower motor; a 4-foot 4-disk filter driven by a 1-horsepower motor; a vacuum pump driven by a 10-horsepower motor; and a sump pump driven by a 3-horsepower motor.

Miscellaneous items are four unit-heaters requiring four ¼-horsepower motors; a drillpress powered with a 1-horsepower motor; a saw and a lathe, each driven by ½-horsepower motors; a cooling-water pump driven by a ¼-horsepower motor; an oil-pump driven by a 2-horsepower motor; a 2-by-1½ water-pump driven by a 5-horsepower motor; and a hot-water pump driven by a ¼-horsepower motor.

A washing classifier and a sump pump may be installed in the crushing plant later.

Rossland (49° 117° S.W.)

Bluebird (Rossland Mines Limited)

A Gardner-Denver compressor (220 cubic feet at 125 pounds pressure, 870 r.p.m., 5-inch stroke, L.P. 6-inch cylinder, H.P. 4¾-inch cylinder) driven by a 50-horsepower 220-volt General Electric induction motor was installed to provide air for sinking an inclined shaft. The switchgear consists of an isolating switch, metering panel, and compensator.

Power is purchased from the West Kootenay Power Company. Three 15-kva. 2,300–220-volt transformers step down the potential for the motor.

Nelway (49° 117° S.E.)

Reeves MacDonald Mines Limited

Two hundred and twenty feet of No. 000 B. & S. gauge 3-conductor 2,300-volt cambric-insulated lead-sheathed wire-armoured self-supporting cable has been installed through a diamond-drill hole to a transformer-station near the underground hoist-room. The cable will carry power at 2,300 volts and will be continued down the shaft. Six 25-kva. 2,300–440-volt transformers and one 5-kva. 2,300–220/110-volt transformer have been moved from a temporary position above ground to the transformer-station. They are connected delta-delta and will supply the hoist motor and the slusher hoists in the upper workings.

Ten houses have been built and wired.

SALMO (49° 117° S.E.)

Jersey (Canadian Exploration, Limited)

Preparations have been made to install a 2,300-volt distribution system underground. The main underground distribution centre will consist of a main and four subfeeder oil circuit-breakers and disconnect. The subfeeders will supply four 37½-kva. 2,300–440-volt transformer banks which in turn will each supply two 20-horsepower slushers. A new outside transformer-station consisting of two 25-kva. 2,300–440-volt transformers connected in open delta was installed to supply shops and battery-charger.

A new 30-kva. 2,300–440-volt 3-phase transformer will be installed at the compressor-house.

SANDON (49° 117° N.E.)

Victor (Violamac Mines (B.C.) Limited)

A mill was built on the property and put into operation in December. The power plant is a 1,200-r.p.m. Caterpillar diesel electric set installed in the mill. It generates 56.5 kva. at 110/200 volts, 3-phase, 60 cycles. The main motor in the mill is a 30-horsepower 220-volt General Electric which drives, through a line shaft, a vacuum pump, a blower, a ball mill, two drag classifiers, a bucket elevator, and a set of rolls.

The remaining equipment consists of a feeder-belt driven by a 1-horsepower motor; two elevators, each driven by a 2-horsepower motor; an American filter driven by a 1-horsepower motor; lead flotation cells and zinc flotation cells driven by two 3-horsepower motors; a lead jig and a zinc jig, each driven by a 3-horsepower motor; a lead-concentrate pump, a zinc-concentrate pump, and a filter pump, each driven by a 1-horsepower motor; and a trommel screen driven by a 3-horsepower motor.

RETALLACK-THREE FORKS (50° 117° S.E.)

Lucky Jim (Zincton Unit, Sheep Creek Gold Mines Limited)

An Ingersoll-Rand 17-by-10½-by-10 VEH2 360-r.p.m. 100-pounds-pressure compressor direct-connected to a 150-horsepower English Electric motor was moved from the Queen mine to Zincton and installed in the power-house. The motor, which was a 2,300-volt motor, has been reconnected for the 440-volt system used at Zincton. The 30-horsepower underground electric hoist has been moved to the top of the new inclined winze.

Whitewater (Kootenay Belle Gold Mines Limited)

A 150-horsepower motor continuous direct-connected through a Falk No. 14-F coupling to a 125-kw. Electric Machinery Company generator was installed in the power plant. In connection with the above, a synchrostat, automatic voltage regulator, and a switch panel were installed. The switch panel consists of individually operated disconnects, air circuit-breaker, current and potential transformers and meters, and synchronizing equipment. A sink-float plant was installed early in the year to increase the milling capacity. The following equipment was installed: A 4-inch pump driven by a 25-horsepower motor; a magnetic separator driven by a 3-horsepower motor; a 1½-inch pump driven by a 5-horsepower motor; a demagnetizer driven by a 2-horsepower motor; two conveyors, each driven by a 3-horsepower motor; a densifier driven by a 2-horsepower motor; densifier rakes driven by a ½-horsepower motor; a cone driven by a 5-horsepower motor; two screens, each driven by 5-horsepower motors; a screen driven by a 1½-horsepower motor; a drag driven by a 1½-horsepower motor; an elevator driven by a 5-horsepower motor; and a compressor driven by a 40-horsepower motor.

KEEN CREEK (49° 117° N.E.)

Cork Province (Base Metals Mining Corporation Limited)

A Murphy 153-horsepower 6-cylinder diesel driving a 90-kw. 440-volt self-regulating generator, a hoist having a rope speed of 275 feet per minute and driven by a 40-horsepower 440-volt motor, and a pump driven by a 20-horsepower 440-volt motor were installed and put into operation early in the year. Later in the year, construction of a mill was commenced. A second 153-horsepower 6-cylinder Murphy diesel direct-connected to a 90-kw. 440-volt generator and a 4-cylinder Murphy diesel direct-connected to a 60-kw. generator will be installed to take care of the increased load.

Power from the power-plant switchboard is distributed through a 400-ampere bus gutter to a 30-ampere switch feeding a lighting transformer, a 200-ampere mine service switch, a 30-ampere switch feeding a 7½-horsepower water-pump, and a 400-ampere main switch serving the mill and crushing plant panels.

The following electrical equipment will be installed in the mill and crushing plant: A 1½-horsepower fine-ore feeder motor; a 75-horsepower ball-mill motor; a 2-horsepower classifier motor; three 5-horsepower lead-flotation cell motors; a 3-horsepower zinc-conditioner motor; four 5-horsepower zinc-flotation motors; a lead-concentrate pump and a zinc-concentrate pump, each driven by a 2-horsepower motor; a 1-horsepower filter motor; a 2-horsepower filtrate-pump motor; a 15-horsepower vacuum-pump motor; a 1-horsepower sump-pump motor; a 2-horsepower coarse-ore feeder motor; a 3-horsepower Dillon screen motor; a 20-horsepower jaw-crusher motor; and a 3-horsepower conveyor motor.

AINSWORTH (49° 116° N.W.)

Yale Lead & Zinc Mines Limited.—A new mill and sink-float plant are being built. Plans for the electrical installation were not received by the end of the year, so details of this installation will be given in the 1951 Annual Report.

RIONDEL (49° 116° N.W.)

Bluebell (The Consolidated Mining and Smelting Company of Canada, Limited)

The 30-horsepower 550-volt 900-r.p.m. hoist motor and reduction gear was replaced with a 75-horsepower 550-volt motor and reduction gear. The capacity of the underground distribution system was increased by the installation of a second 1/0 B. & S. gauge 3-conductor wire-armoured cable. It will be paralleled with the other 1/0 B. & S. gauge cable when necessary to distribute the pump load, and for this reason both cables are of the same length and of like impedance. Two 1/0 weatherproof 3-phase overhead lines, strung on the same poles between the power plant and the portal, feed the two cables.

During the year one 40-horsepower, one 20-horsepower, and two 7½-horsepower pumps have been installed on the 375 level; two 40-horsepower, one 20-horsepower, and one 15-horsepower pumps have been installed on the 300 level.

A new warehouse, bunk-house, and cafeteria are under construction.

KIMBERLEY (49° 115° N.W.)

Sullivan (The Consolidated Mining and Smelting Company of Canada, Limited)

The improvements and additions made to the electrical installations at the Sullivan mine and mill are as follows:—

SULLIVAN MINE.—*Underground.*—Two 200-horsepower and two 25-horsepower 575-volt motors with automatic controls and starting equipment were installed for the centrifugal pumps in the new 2850 level pumping-station. To supply this station with 550-volt power, approximately 380 feet of 3-conductor 500,000-

c.m. drained-type paper-insulated lead-sheathed steel-wire-armoured cable was installed from the 2850 substation near No. 1 shaft. Installed in this substation is a 300-kva. Askarel-filled 3-phase 6,900/2,300–575-volt L.N.S. transformer fitted with a G. & W. gang-operated fused switch on the primary and a 400-ampere 600-volt "nofuz" breaker on the secondary.

Approximately 1,900 feet of 3-conductor 4/0 B. & S. gauge 8,000-volt varnished-cambric-insulated lead-sheathed steel-wire-armoured cable was installed from the 3800 crushing plant substation down 3902 incline to the 3350 level to feed the 33503 substation.

The installation of a 300-kva. 6,900/2,300–575-volt 3-phase type L.N.S. Askarel-filled transformer to replace two 250-kva. oil-filled single-phase 2,200–550-volt transformers in the 33503 substation is in progress.

A similar 3-phase transformer is under installation at the 3500 level substation, No. 1 shaft, as a replacement for three 100-kva. oil-filled single-phase 2,300–575-volt transformers which were temporarily installed there.

Operations at the 33503 winze were discontinued during the first half of the year. The 150-horsepower hoist motor and controls were dismantled and are now being temporarily installed at the collar of the new No. 2 shaft for timbering and construction work in the shaft.

Temporary alterations have been made in the location of the control board and magnet motor-generator set at the 3350 station of the 3902 conveyors to permit the construction work to proceed on the extension of this conveyor system to the 2850 level. Two additional 200-horsepower 550-volt induction-motor-driven units will be installed to complete this extension.

Operations at the surface coarse-crushing plant were discontinued early in the year, and one 150-horsepower jaw-crusher driving motor with controls and the 15-ton electric crane are being moved from this plant to the new 2850 underground crushing plant.

Two banks of three 50-kva. transformers were removed from wooden chute platforms in 3956 drift and 3915 drift and reinstalled in approved fireproof enclosures.

The shaft signal system for 3927 raise was rewired.

The electric blasting procedure was revised to obtain better co-ordination of the work of the various departments concerned. A new type of safety ohmmeter manufactured by Evershed & Vignoles Limited is being tried out for more accurate testing of large and complex electric blasting hook-ups which are arising from the use of short-period delay caps.

A severe corrosion problem was encountered on the main power feeder cable to the new 3800 level crushing plant, where this cable enters the mine through 39-H-1 B raise. This raise is used as a return airway for the contaminated air which contains SO_2 fumes, given off from the oxidation of the sulphide tailings mixed with the float in the new method of backfilling. Additional clamps were installed on this cable in the raise as a temporary measure. New cable is on order, and work is proceeding to reroute, as soon as possible, this 6,900-volt feeder down No. 1 shaft and along 3904 crosscut to where it can be connected into the existing cable in 3821 drift north.

Relocation of the 2,300-volt tie-line cable between the South End and North End, on the 3900 level, is in progress so as to permit a more convenient and efficient interconnection with a new 3-conductor 300,000-c.m. 4,000-volt armoured feeder cable which is being installed down No. 1 shaft and along 3904 crosscut to 3900 drift north. The purpose of this change is to arrange that the bulk of power, fed at 2,300 volts into the mine, may be supplied from the new No. 1 shaft substation, and thereby permit the moving of the Sullivan Hill substation approximately 2,500 feet southward, where it will be clear of the new open-pit mining operations.

Surface.—Because open-pit operations have been commenced near the site of the Sullivan Hill substation, it was found necessary to arrange for the moving of this substation, as mentioned previously. It was also necessary to do considerable rerouting of surface 66-kv. and 2.3-kv. lines in this area. Much of this work has been completed, with the exception of moving the substation. Because of the rearrangement of the 2.3-kv. feeder cables, it has been possible to reduce the transformer capacity at the Sullivan Hill substation from six 300-kva. transformers to three 300-kva., which has permitted setting up the new substation without completely dismantling the old, and without interference to the power-supply.

A second 1,500-kva. 66,000–2,300-volt 3-phase unit substation has been installed at the No. 1 shaft substation but has not yet been connected into service. This new unit will supply the No. 1 shaft hoist and two 600-horsepower compressors. When this load is removed from the bank of three 1,000-kva. 66,000–6,900/2,300-volt transformers, these transformers will be changed over to 6,900 volts secondary operation.

A new section of 66,000-volt line was built between the 3700 portal substation and the Sullivan mine substation, and the old 66,000-volt line which passed through a congested residential section of Kimberley was dismantled.

SULLIVAN MILL.—The installation of electrical equipment for the 115-foot thickener on the East side of the mill was completed. This equipment consisted of two 15-horsepower, two 40-horsepower, one 20-horsepower, and one 10-horsepower motors with starting and protective equipment.

A 450-foot 3-conductor 500,000-c.m. paper-insulated lead-sheathed cable was installed to feed the distribution centre for this installation from the main substation.

The installation of a new Cemco air circuit-breaker switchboard was completed in the concentrator substation to replace the old oil circuit-breakers which had become obsolete and unsafe. The new circuit-breakers have a rated interrupting capacity of 75,000 kva. Incorporated in each cubicle is a current-limiting reactor which limits the short-circuit current under all conditions to less than this rating. Twenty-one of these breakers have been installed with the following load current ratings: One 1,600-ampere, one 1,000-ampere, and nineteen 800-ampere.

The installation is in progress of 250 feet of 500,000-c.m. feeder cable, starting switch, and 250-horsepower motor for second Symons cone crusher in 3800 underground crushing plant.

To feed 550-volt power to the assay-office service, 400 feet of 3-conductor, 4/0 B. & S. gauge, paper-insulated lead-sheathed double-steel-tape-armoured cable buried in the ground was installed between the rolls plant and the office.

A cinder-brick wall with fire-resistant doors was installed between the 3800 crushing plant and the transformer-substation chamber.

A considerable number of obsolete motor safety switches which did not carry horsepower ratings were replaced with approved safety switches.

FORT STEELE (49° 115° N.W.)

Estella Mines Ltd.—A cook-house, combined office and bunk-house, dry, warehouse, and workshops have been built at the mine. Lighting and power are supplied by a 28-horsepower 3-cylinder Lister engine belt-connected to a 15-kw. 220-volt 3-phase 60-cycle Higgs Motors alternator.

A 1½-ton battery locomotive is used for tramming.

SPILLIMACHEEN (50° 116° N.E.)

Silver Giant (Silver Giant Mines Limited)

A new mill and power plant are under construction. The power plant consists of a 500-horsepower General Motors diesel direct-connected to a 375-kva. 440-volt 3-phase Electric Machinery Company generator. Plans to install another generating unit are being prepared, as it is thought that more power will be required. The present power-station switch panel will consist of three oil circuit-breakers. The first will supply the crushing-plant motors; the second will supply the mill motors; and the third will supply a pump 3,000 feet from the power plant. A bank of 440–2,200-volt transformers will step up the potential for transmission, while a bank of 2,200–440-volt transformers will step down the potential for the pump motor.

The crushing equipment will consist of a 1-horsepower coarse-ore feeder motor; a 50-horsepower jaw-crusher motor; three 7½-horsepower conveyor motors; a 3-horsepower screen motor; a 50-horsepower gyratory-crusher motor; a 3-horsepower motor generator set energizing a magnet.

In the mill there will be a main distribution panel and two subdistribution panels. The main panel will consist of a 600-ampere main switch and 400-ampere gutter; three 30-ampere switches and across-the-line starters; one 60-ampere switch and one 100-ampere switch supplying the two subdistribution panels; and one 600-ampere disconnecting switch and oil circuit-breaker, together with manual controller for starting the 125-horsepower ball-mill motor. The three 30-ampere switches supply the fine-ore feeder 2-horsepower motor, the unit cell 7½-horsepower motor, and the classifier 5-horsepower motor.

No. 1 subdistribution centre will supply the flotation section of the mill and consists of a 100-ampere gutter, four 60-ampere switches, and two 30-ampere switches, each with an across-the-line starter. The 60-ampere switches control four 10-horsepower flotation-cell motors. One 30-ampere switch supplies a 5-horsepower flotation-cell motor, and the other supplies a 3-horsepower concentrate-pump motor.

No. 2 subdistribution panel will supply the filter section of the mill and consists of a 100-ampere bus and seven 30-ampere switches and across-the-line starters. The following equipment will be supplied: A 2-horsepower thickener motor; a 1-horsepower filter motor; a 1-horsepower filter-agitator motor; a 3-horsepower filter-blower motor; a 7½-horsepower vacuum-pump motor; a 3-horsepower filtrate-pump motor; and a 5-horsepower sump-pump motor.

Much of the above-mentioned equipment will be taken from the Mascot mill at Hedley.

COAL MINES

EAST KOOTENAY (49° 114° S.W.)

Michel Colliery (The Crow's Nest Pass Coal Company Limited)

At the No. 2 compressor-room of the power-house in which one 600-horsepower and one 450-horsepower compressors are installed, the installation of permanent wiring and switchgear has been completed. A 3,000-volt, 2/0 B. & S. gauge, armoured cable was used, with each unit fed through an individual circuit-breaker and controller at each motor. Lighting transformers have been moved from inside to outside of switch-room basement, and all temporary wiring has been removed. The starting equipment for the 100-horsepower motor driving No. 3 fan has been placed in a separate concrete switch-room.

A new distribution centre has been installed at No. 1 and No. 2 ovens at the by-product plant. This installation consists of a 400-ampere 2,200-volt oil circuit-breaker mounted in a cubicle connected through a 3-conductor, No. 1 B. & S. gauge, 3,000-volt varnished-cambric-insulated lead-sheathed double-steel-tape-armoured cable to two 150-kva. 2,300–230-volt transformer banks. The secondaries are connected to the 600-ampere distribution bus gutters with 500 M.C.M. rubber-covered cables in 3-inch conduit from each bank. The two banks are paralleled in the distribution gallery by removable bus links. There is also provision to remove either bank from the line by removable bus links in an emergency.

The above installation was completed December 31st, 1950. All starting equipment will be moved to the new locations as operations permit.

Elk River Colliery (The Crow's Nest Pass Coal Company Limited)

Preparations are under way for the electrification of No. 9 mine. One hundred and twenty feet of 250 M.C.M. 3,000-volt varnished-cambric-insulated lead-sheathed steel-wire-armoured cable was installed between the main circuit-breaker in the power-house and the substation. Two 500-kva. 3-phase 2,300–6,600-volt Parsons transformers have been installed in the substation. Between the substation and No. 9 mine 2,000 feet of overhead power-line consisting of three No. 2 B. & S. gauge copperweld line wires and one overhead No. 2 B. & S. gauge copperweld ground wire were installed. Two sets of lightning arresters have been installed. The line is protected with 7,000-volt 100-ampere expulsion fuses at each end.

A 3-conductor, No. 2 B. & S. gauge, 7,000-volt paper-insulated lead-sheathed steel-wire-armoured cable has been installed between the overhead line and circuit-breaker at the mine portal.

No electrical work was done underground, as the switchgear had not arrived by the end of the year.

Telkwa (54° 127° N.E.)

Bulkley Valley Collieries Ltd.

Permissible electrical equipment was purchased during the summer, installed, and put into operation late in the fall. Power is purchased from the British Columbia Power Commission, at 440 volts. The electrical equipment consists of the following:—

Underground.—One Seimen-Schukert E-47 drill with BTD-9 drill panel; one Mavor & Coulson 27 HYT Samson shortwall chain coal-cutter with 7-foot plain jib; three Mavor & Coulson 15-inch scraper chain-conveyors; one 200-ampere Mavor & Coulson oil circuit-breaker; three type A.435 Mavor & Coulson room switches; one type A.238 Mavor & Coulson gate end box with blinding cover; three type A.381 Mavor & Coulson start-stop push-button stations; three type A.381 Mavor & Coulson push-pull stop push-button stations; and one D-198-C link box.

Surface.—One Pickrose hoist, size 2, single drum, single speed; 15-horsepower 440-volt 3-phase 60-cycle motor; one 10-horsepower, type K, 1,800-r.p.m. 3-phase 60-cycle Fleck Bros. motor; one 400-ampere switch; one 400-ampere bus gutter; two 200-ampere switches; and one DIC magnetic switch.

A new mine has been started to suit mechanized mining methods, and at the end of the year two entries about 60 feet long had been driven.

Nanaimo (49° 123° S.W.)

No. 10 Mine, South Wellington (Canadian Collieries (Dunsmuir) Limited).—The 20-horsepower Westinghouse motor on the scraper conveyor at the tipple was replaced with a 25-horsepower C.G.E. motor.

Bright Mine, Cassidy (Canadian Collieries (Dunsmuir) Limited)

In order to unwater the mine for the purpose of exploration work, the following equipment was installed temporarily: Three 20-kva. 220–440-volt C.G.E. transformers were installed on the surface; a 60-horsepower C.G.E. 3,600-r.p.m. 440-volt induction motor operating a Canadian Allis-Chalmers 2-stage, type H.Y.C., size 4 by 3, 3,600-r.p.m. pump delivering 500 gallons per minute against a 300-foot head was installed underground on the main slope. The motor is controlled by a K 20 C.G.E. oil circuit-breaker on the surface and a line starter and push button underground.

A 3-conductor, No. 4 B. & S. gauge, cab-tire cable was installed from the transformers to the pump. A separate conductor is used for grounding non-current-carrying parts of motor and line starter.

Comox (49° 124° N.W.)

Tsable River Mine (Canadian Collieries (Dunsmuir) Limited).—A 75-horsepower 2,200-volt motor was installed on a new ventilating fan. Use of the 35-horsepower 440-volt motor was discontinued. The two 25-horsepower pump motors temporarily installed underground were replaced with a 35-horsepower motor.

BRITISH COLUMBIA DEPARTMENT OF MINES
LIST OF PUBLICATIONS

The publications listed are available for distribution except as noted. Recent publications for which no charge is made may be obtained from the Department's offices at Victoria, Vancouver, and Nelson.

PRICES

A small reserve stock of each Annual Report or Bulletin is set aside; the greater part of each issue is distributed free of charge. When the free stock has been exhausted, copies may be obtained from the reserve stock on payment of the price set. The price for a cloth-bound copy of an Annual Report is $1. The Provincial sales tax of 3 per cent must be collected on all sales of publications within the Province. If a charge is made, application for the Annual Report or Bulletin should be made to the Department of Mines, Victoria, B.C., and should be accompanied by the proper sum, including the tax.

INDEXES

Index to Annual Reports of the Minister of Mines of British Columbia for the years 1874 to 1936, inclusive. (By H. T. Nation.) Paper bound, $1; cloth bound, $2.

Index to Annual Reports of the Minister of Mines, 1937–43, and Bulletins Nos. 1–17. (By H. T. Nation.) Paper-bound copies, 50 cents each. Cloth-bound copies, out of print.

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			1927	Free	
1897			*1928*	Free	*$1.00*
1898–1900			1929	Free	
1901			1930	50c.	
1902–1906			1931		
1907			1932		
1908	50c.		1933	Free	1.00
1909	50c.		*1934*	Free	1.00
1910	50c.		1935	50c.	1.00
1911			1936	[1]	1.00
1912			1937	[1]	1.00
1913			1938	[1]	1.00
1914			1939	Free	1.00
1915	*50c.*		*1940*	Free	*1.00*
1916	Free		1941	Free	1.00
1917	Free		1942	Free	1.00
1918	Free		1943	Free	
1919	50c.		1944	Free	1.00
1920	Free		1945	Free	1.00
1921	Free		*1946*	Free	1.00
1922	Free		1947	Free	1.00
1923	Free		1948	Free	1.00
1924	50c.		1949	Free	1.00
1925			1950	Free	1.00
1926					

[1] Parts A to F, bound separately in paper, are available (free) for the years 1936, 1937, and 1938. Part G, "Inspection of Mines," is not available for these years.

BULLETINS, OLD SERIES

Bulletin No. 2, 1918: Bumps and outbursts of gas. (By George S. Rice.)
Bulletin No. 2, 1919: The commercial feasibility of electric smelting of iron ores in British Columbia. (By Alfred Stansfield.)
Bulletin No. 2, 1932: Report on McConnell Creek placer area. (By Douglas Lay.)

MISCELLANEOUS

Special Reports on Coal-mine Explosions. (By George Wilkinson, Thomas Graham, and James Ashworth.) 1918.
Report on Snowflake and Waverley-Tangier Mineral Properties. (By J. D. Galloway.) 1928.
Report on Mineral Properties of the Goldside Mining Company. (By B. T. O'Grady.) 1935. Out of print.
Elementary Geology applied to Prospecting. (By John F. Walker.) Revised, 1946. 50 cents.
Possibilities for Manufacture of Mineral Wool in British Columbia. (By J. M. Cummings.) 1937.
Lode-gold Deposits of the Zeballos Area. (By J. S. Stevenson.) 1938. Out of print.
Preliminary Investigations into Possibilities for Producing Silica Sand from British Columbia Sand Deposits. (By J. M. Cummings.) 1941.
Iron Ores of Canada: Vol. I, British Columbia and Yukon. (By G. A. Young and W. L. Uglow, Geological Survey, Canada, Department of Mines.) 1926.

BULLETINS, NEW SERIES, STARTING IN 1940

(Free, except as noted.)

Bulletin No. 1: Aiken Lake Area, North-Central B.C. (By Douglas Lay.) 50 cents.
Bulletin No. 2: Placer-gold Deposits, Wheaton (Boulder) Creek, Cassiar District. (By Stuart S. Holland.) 50 cents.
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.) 50 cents.
Bulletin No. 5: Mercury Deposits of British Columbia. (By John S. Stevenson.) Out of print.
Bulletin No. 6: Geology of Camp McKinney and the Cariboo Amelia Mine. (By M. S. Hedley.) Out of print.
Bulletin No. 7: Lode-gold Deposits of the Upper Lemon Creek Area and Lyle Creek-Whitewater Creek Area, Kootenay District. (By R. J. Maconachie.) Out of print.
Bulletin No. 8: Preliminary Report on the Bedwell River Area. (By H. Sargent.) 50 cents.
Bulletin No. 9: Molybdenite in British Columbia. (By John S. Stevenson.) Out of print.
Bulletin No. 10: Tungsten Deposits of British Columbia. (By John S. Stevenson and staff of the Department of Mines.) Revised.
Bulletin No. 11: Fraser River Tertiary Drainage-history in relation to Placer-gold Deposits. II. (By Douglas Lay.)
Bulletin No. 12: Reconnaissance in the Area of Turnagain and Upper Kechika Rivers. (By M. S. Hedley and Stuart S. Holland.)
Bulletin No. 13: Supplementary Report on Bedwell River Area. (By H. Sargent.)
Bulletin No. 14: Coal Analyses of British Columbia. (By James Dickson.)
Bulletin No. 15: Hydraulic Mining Methods. (By Stuart S. Holland.) 50 cents.

Bulletin No. 16: Dragline Dredging Methods. (By Stuart S. Holland.) 50 cents.

Bulletin No. 17: An introduction to Metal-mining in British Columbia. (By Officers of the Department.) To be reprinted.

Bulletin No. 18: Specimens and Samples—Their Treatment and Use. (By Officers of the Department.)

Bulletin No. 19: The Tuya-Teslin Area, Northern British Columbia. (By K. DeP. Watson and W. H. Mathews.)

Bulletin No. 20: Lode-gold Deposits—

Part II: South-eastern British Columbia. (By W. H. Mathews.) Revised, 1948.

Part III: Central Southern British Columbia. (By M. S. Hedley and K. DeP. Watson.)

Part IV: South-western British Columbia—exclusive of Vancouver Island. (By J. S. Stevenson.) Revised, 1946.

Part V: Vancouver Island. (By J. S. Stevenson.) Revised, 1946.

Part VI: North-eastern British Columbia and Cariboo and Hobson Creek Areas. (By S. S. Holland.) Revised, 1946.

Bulletin No. 21: Notes on Placer-mining in British Columbia. (By Officers of the Department.)

Bulletin No. 22: Geology of the Whitewater and Lucky Jim Mine Areas. (By M. S. Hedley.)

Bulletin No. 23: Calcareous Deposits of the Georgia Strait Area. (By W. H. Mathews.)

Bulletin No. 24: Geology and Coal Resources of the Carbon Creek-Mount Bickford Map-area. (By W. H. Mathews.)

Bulletin No. 25: The Squaw Creek-Rainy Hollow Area. (By K. DeP. Watson.)

Bulletin No. 26: Report on the Stanley Area, Cariboo Mining Division. (By Stuart S. Holland.)

Bulletin No. 27: Geology and Mineral Deposits of the Zeballos Mining Camp, British Columbia. (By John S. Stevenson.)

Bulletin No. 28: Placer Gold Production of British Columbia. (By S. S. Holland.)

SPECIAL REPORTS

Special reports on certain properties were advertised in the Annual Reports 1936 to 1941, inclusive, as available on application. A list of those still available will be supplied on request. The text of a report is either in mimeographed or typewritten form, and ozalid prints can be made of maps or other drawings. Copies of reports still available will be supplied at 10 cents per page of typewritten or mimeographed copy, excepting that the charge for any mimeographed report shall not exceed 25 cents. Additional charges will be made for prints of maps. Requests for these Special Reports, accompanied by the proper sum, should be addressed to the Chief of the Mineralogical Branch.

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

Maps showing the approximate locations of placer-mining leases and mineral claims held by record may be seen at the Central Records Offices at Victoria and Vancouver. Prints are obtainable on request made to the Chief Gold Commissioner at Victoria, and accompanied by the proper sum. The charges are: Full sheet, $1; half-sheet, 50 cents; quarter-sheet, 25 cents. The sales tax of 3 per cent is payable on these charges. The maps conform to the reference and mineral-reference maps issued by the Lands Department in size and geographical detail and correspond as to numbers.

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 of the Mineralogical Branch.

LIST OF LIBRARIES

Department publications are being sent to the following Government departments and legislative, university, and public libraries:—

CANADA

Government departments—
- Department of Mines and Technical Surveys, Ottawa.
- Department of Resources and Development, Ottawa.
- 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 and Industrial Development, Regina, Saskatchewan.
- Department of Mines and Minerals, 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.
- Provincial Library, Victoria, British Columbia.

University libraries and museums—
- Dalhousie University, Halifax, Nova Scotia.
- Acadia University, Wolfville, Nova Scotia.
- Laval University, Quebec, Quebec.
- McGill University, Montreal, Quebec.
- Queen's University, Kingston, Ontario.
- Royal Ontario Museum of Geology and Mineralogy, Toronto, Ontario.
- University of Toronto, Toronto, Ontario.
- University of Manitoba, Winnipeg, Manitoba.
- University of Montreal, Montreal, Quebec.
- University of Saskatchewan, Saskatoon, Saskatchewan.
- University of Alberta, Edmonton, Alberta.
- University of British Columbia, Vancouver, British Columbia.

Public libraries—
    Public Library, Halifax, Nova Scotia.
    Public Library, Montreal, Quebec.
    Public Library, Toronto, Ontario (Reference Division).
    Public Library, Edmonton, Alberta.
    Public Library, Calgary, Alberta.
    Public Library, New Westminster, British Columbia.
    Nelson Municipal Library, Nelson, British Columbia.
    Public Library, Prince Rupert, British Columbia.
    Public Library, Prince George, British Columbia.
    Public Library, Vancouver, British Columbia (Science and Industry Division).
    Public Library, Victoria, British Columbia.

ENGLAND

British Columbia House, Regent Street, London, England.
Canada House, London, England.
Joint Library, Institution of Mining Engineers, Finsbury Circus, 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 25, D.C.
    The Interior Department Library, Washington 25, D.C.
    United States Geological Survey, Washington 25, D.C.
    California State Division of Mines, Ferry Building, San Francisco, California.
    Oregon State Department of Geology and Mineral Industries, 702 Woodlark Building, Portland, Oregon.
    Washington State Division of Mines and Geology, Olympia, Washington.
    Idaho State Bureau of Mines, Boise, Idaho.
University and society libraries—
    Columbia University, New York 27, New York (Document Division).
    University of California, Berkeley, California (Document Division).
    Engineering Societies Library, 29 West Thirty-ninth Street, New York, New York.
    State University of Iowa, Iowa City, Iowa.
    Montana School of Mines, Butte, Montana.
    Oregon State College, Corvallis, Oregon.
    University of Washington, Seattle, Washington.
    University of Nevada, Reno, Nevada.
Public libraries—
    New York Public Library, New York, New York.
    Free Library, Philadelphia Zone 3, Pennsylvania.
    Public Library, Boston, Massachusetts.
    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 and for the conducting of short courses of lectures in practical geology and mineralogy. The Act also provides for the expenditure of public moneys for the construction, reconstruction, or repair of trails, roads, and bridges to facilitate the exploration of the mineral resources of any mining district, or the operation and development of any mining property.

"MINERAL ACT" AND "PLACER-MINING ACT"

FREE MINERS' CERTIFICATES

Free miners' certificates must be obtained before any person can prospect for mineral and locate and record mineral claims in British Columbia.

Any person over the age of 18, and any joint-stock company incorporated or registered in British Columbia, may obtain a free miner's certificate on payment of the required fee.

The fee to an individual for a free miner's certificate is $5 for one year. To a joint-stock company having a capital of $100,000, or less, the fee for a year is $50; if capitalized beyond this, the fee is $100. If the company has no stated capitalization, the fee is $100.

The free miners' certificates run from date of issue and expire on the 31st day of May next after its date, or some subsequent 31st day of May (that is to say, a certificate may be taken out a year or more in advance if desired). Certificates may be obtained for any part of a year, terminating on May 31st, for a proportionately less fee. The possession of this certificate entitles the holder to enter upon all lands of the Crown, and upon any other lands on which the right to so enter is not specially reserved, for the purpose of prospecting for minerals, locating claims, and mining.

In the event of a free miner allowing his certificate to lapse, his mining property (if not Crown-granted) reverts to the Crown (subject to the conditions set out in the next succeeding paragraph), but where other free miners are interested as partners or co-owners the interest of the defaulter becomes vested in the continuing co-owners or partners *pro rata,* according to their interests.

Six months' extension of time within which to revive title in mining property which has been forfeited through the lapse of a free miner's certificate is allowed. This privilege is given only if the holder of the property obtains a special free miner's certificate within six months after the 31st of May on which his ordinary certificate lapsed. The fee for this special certificate in the case of a person is $15 and in that of a company $300.

It is not necessary for a shareholder, as such, in an incorporated mining company to be the holder of a free miner's certificate.

"MINERAL ACT"

All minerals occurring in place are acquired under the "Mineral Act," but limestone, marble, clay, sand, gravel, earth, building or construction stone, coal, petroleum, and natural gas are not considered as mineral.*

* Limestone, marble, etc., are disposed of by lease under the provisions of the "Land Act." Coal is disposed of under the provisions of the "Coal Act" and petroleum and natural gas under the "Petroleum and Natural Gas Act." These Acts are under the administration of the Department of Lands and Forests, Victoria, B.C.

A mineral claim is a piece of land not exceeding 1,500 feet square and fifty-one and sixty-five one-hundredths acres in area. The angles must be right angles unless the boundaries, or one of them, are the same as those of a previously recorded claim.

No special privileges are allowed for the discovery of new mineral claims or districts.

A mineral claim is located by erecting two "legal posts," which are stakes having a height of not less than 4 feet above ground and squared 4 inches at least on each face for not less than a foot from the top. A tree-stump so cut and squared also constitutes a legal post. A cairn of stones not less than 4 feet in height and not less than 1 foot in diameter 4 feet above the ground may also be used as a legal post. Upon each of these posts must be written the name of the claim, the name of the locator, and the date of location. On No. 1 post, in addition, the following must be written: "Initial post. Direction of Post No. 2 [*giving approximate compass-bearing*]. feet of this claim lie on the right and feet on the left of the line from No. 1 to No. 2 posts." If cairns are used, these particulars must be legibly written or inscribed on paper or on other durable material and placed in the cairn within a weather-poof can or other suitable container. Numbered metal identification tags must be attached to both posts at the time of staking, or if cairns are used, tags must be placed in the containers within the cairns.

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 location is not recorded within the time prescribed in the Act, it is open for relocation, but if the original locator wishes to relocate, he must obtain the written permission of the Gold Commissioner, for which he shall pay a fee of $10. A free miner may at any time abandon a mineral claim by giving notice in writing of his intention to abandon to the Mining Recorder and upon payment of a fee of $10. 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 mining division 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 legal posts (*see* under "Mineral Act") 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:—

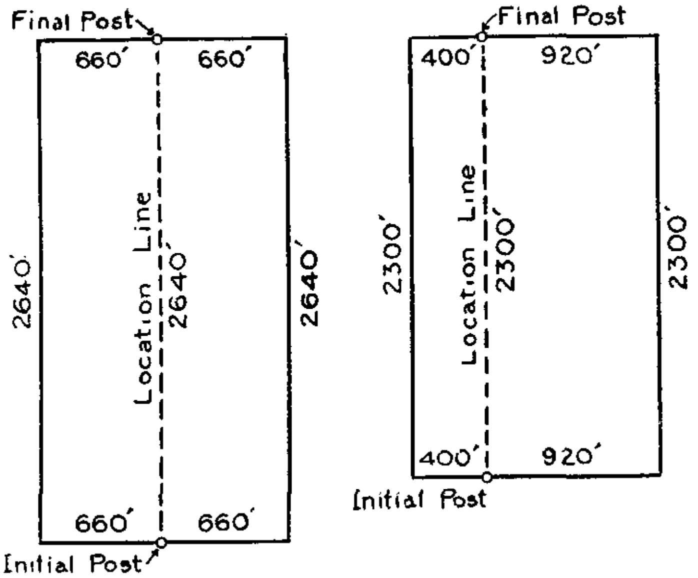
"105. (1) For the purpose of locating a placer leasehold, a line to be known as the 'location line' shall be marked on the ground by placing a legal post at each end, one post to be known as the 'Initial Post' and the other as the 'Final Post.' The direction of the location-line may change at not more 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.

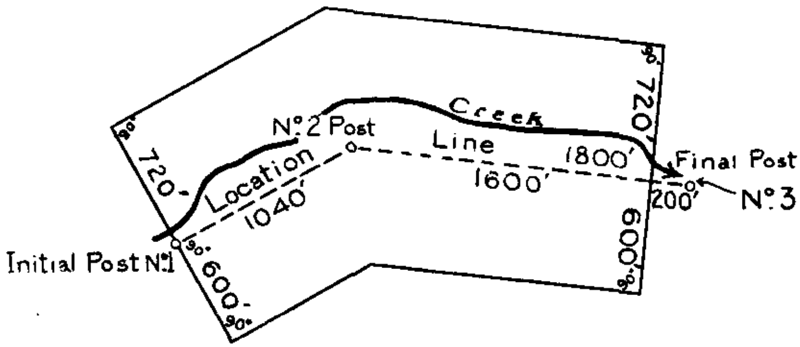
"(2) Upon the initial post and the final post shall be written the words 'Initial Post' and 'Final Post' respectively, together with the name of the locator and the date of the location. On the initial post shall also be written the approximate compass-bearing of the final post, and a statement of the 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."

At the time of location a metal identification tag must be affixed to the "initial post" and to the "final post," or if cairns are used the tags must be placed in the containers within the cairns.

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 have 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 safe working conditions by practical regulations.

The Act was completely revised and rewritten in 1948, and several additions and changes were made to bring it into conformity with modern practice. The additions and changes include: Rules providing for precautions against coal-dust underground and in cleaning plants; a new section governing surface coal-stripping operations; revised rules governing electrical installations; and provisions for the use of internal-combustion engines of the diesel type underground, where the equipment and the conditions maintained render this form of power unobjectionable.

The powers of Inspectors under this Act are similar to those provided under the "Metalliferous Mines Regulation Act."

EXPLOSIVES

Dominion Order in Council No. 2903, requiring a permit to maintain a magazine or purchase explosives on the authority of a Provincial Mines Inspector, has been repealed.

"MINES RIGHT-OF-WAY ACT"

This Act provides for access to mining property. It provides for the obtaining of a right-of-way for any road, railway, aerial, electric, or other tramway, surface or elevated cable, electric or telephone pole-line, chute, flume, pipe-line, drain, or any right or easement of a like nature.

"IRON AND STEEL BOUNTIES ACT"

The Lieutenant-Governor in Council may enter into an agreement with any person whereby the Crown will pay to that person, out of the Consolidated Revenue Fund, bounties on pig-iron and steel shapes when manufactured within the Province, as follows:—

(*a*) In respect of pig-iron manufactured from ore, on the proportion produced from ore mined in the Province, a bounty not to exceed three dollars per ton of two thousand pounds:

(*b*) In respect of pig-iron manufactured from ore, on the proportion produced from ore mined outside the Province, a bounty not to exceed one dollar and fifty cents per ton of two thousand pounds:

(*c*) In respect of steel shapes of commercial utility manufactured in the Province, a bounty not to exceed one dollar per ton of two thousand pounds.

Bounty, as on pig-iron under this Act, may be paid upon the molten iron from ore which in the electric furnace, Bessemer or other furnace, enters into the manufacture of steel by the process employed in such furnace; the weight of such iron to be ascertained from the weight of the steel so manufactured.

Bounty on steel shapes under this Act shall be paid only upon such steel shapes as are manufactured in a rolling-mill having a rated productive capacity per annum of at least twenty thousand tons of two thousand pounds per ton. The total amount of bounties paid under clauses (*a*) and (*b*) is limited to $200,000 in any one year or $2,000,000 in the aggregate; and the total amount of bounties paid under clause (*c*) is limited to $20,000 in any one year or $200,000 in the aggregate.

"INDIAN RESERVES MINERAL RESOURCES ACT"

This Act validates an agreement between the Dominion and the Province whereby mineral rights on Indian reserves, upon surrender by the Indians, shall be administered by the Province, subject to the laws of the Province. A free miner wishing to prospect on Indian reserves must obtain the approval of the Gold Commissioner for the mining division in which the reserve is situated and also of the Indian Agent for such reserve.

"PROSPECTORS' GRUB-STAKE ACT"

In this Act "grub-stake" means money, food supplies, clothing, powder, tools, or any other thing necessary to the business of prospecting. "Prospector" means any person who is a British subject and who is the holder of a valid free miner's certificate; who has been honourably discharged from any of His Majesty's Services or has been resident in the Province during the year preceding any application for a grub-stake.

Information regarding grub-stakes may be obtained from the Department of Mines, Victoria, B.C., or from any Mining Recorder, Mining Engineer, or Inspector of Mines of the Department.

No grub-stake granted to one applicant shall exceed $300 in value in any one year, but the grub-stake may be increased, if an applicant is required to travel to or from the area in which he is to prospect, by an amount sufficient to cover such travelling expenses. The total in no case shall exceed $500 in any year. Applicants are required to identify some of the commoner rocks and minerals.

Provision has been made for the establishment and operation of one or more mining training camps at suitable locations within the Province.

"TAXATION ACT"

(Procedure in applying to lease a Reverted Crown-granted Mineral Claim.)

"147. (1) Where property which consists of a mineral claim has been forfeited to and vested in the Crown under the provisions of this Part, it shall be lawful for the Gold Commissioner for the mining division in which the mineral claim is situate to grant a lease* thereof to any person for the term of one year upon payment of the sum of twenty-

* Application for lease must be made to the Gold Commissioner for the mining division in which the mineral claim is situate; a list of the offices of the Gold Commissioners is given on page 314.

five dollars, and, upon payment of a further sum of twenty-five dollars, to grant a renewal of the lease for a further term of one year commencing on the expiration of the former lease, but for no longer period.

"(2) No person shall be entitled to hold as lessee under this section more than eight claims in the same mining division at the same time.

"(3) No lease granted under this section shall be transferable.

"(4) Subject to the rights of any person to the surface or a portion of the surface of the mineral claim, the lessee shall, during the continuance of his lease, but no longer, have the right to enter, prospect, and mine upon the claim for all minerals, precious and base, save coal and petroleum, and for that purpose shall have all the rights of a free miner under the 'Mineral Act.'

"(5) Where the Gold Commissioner has granted a lease to any person under this section, he shall forthwith notify the Surveyor of Taxes, giving the name of the mineral claim, the name of the lessee, and the date of the lease, and the Surveyor of Taxes shall enter the particulars furnished him by the Gold Commissioner in a proper book to be kept by him for that purpose.

"(6) The lessee may at any time before the expiration of his lease apply for and obtain a Crown grant of the mineral claim upon payment of all taxes, costs, expenses, and interest which remained due and unpaid on the mineral claim on the date of its forfeiture to the Crown, together with a sum equal to all taxes and interest which would have accrued due in respect thereof from the date of the lease to the date of the application for a Crown grant had the claim been regularly assessed in like manner as it appeared upon the assessment roll for the year last preceding the date of the forfeiture, and also with a fee of twenty-five dollars for the Crown grant: Provided that if the lessee establishes to the satisfaction of the Gold Commissioner that he has expended upon the claim in mining-development work a sum of not less than two hundred dollars a year during the continuance of the lease, then the payment of the sum in respect of taxes and interest from the date of the lease to the date of application for a Crown grant shall not be required: Provided further that if the lessee is the holder of a number of adjoining mineral claims not exceeding eight, and establishes to the satisfaction of the Gold Commissioner that a sum equal to two hundred dollars a claim of the full number of adjoining mineral claims has been expended upon one or more of the adjoining mineral claims in mining-development work for each year during the continuance of the leases, then the payment of the sum in respect of taxes and interest from the date of the lease to the date of the application for a Crown grant shall not be required.

"(7) The lessee shall be entitled to a Crown grant according to the acreage and description of the claim specified in the original Crown grant thereof under which the claim was held prior to the date of forfeiture, but subject to the prior rights of any other person.

"(8) Where the lessees under this section of a number of adjoining mineral claims, not exceeding eight, file with the Gold Commissioner a notice of their intention to perform on any one or more of the claims all the mining-development work that otherwise might be required in respect of all the claims, and where the lessees thereafter establish to the satisfaction of the Gold Commissioner that a sum equal to two hundred dollars a claim of the full number of the adjoining claims has been expended upon one or more of the adjoining claims in mining-development work for each year during the continuance of the leases, then the payment of the sum in respect of taxes and penalties from the date of each of the leases to the date of the application for a Crown grant shall not be required."

TAXATION OF MINES

Crown-granted mineral claims are subject to a tax of 25 cents per acre. The tax becomes due on July 2nd in each year, and if unpaid on the following October 31st is deemed to be delinquent.

Mines are subject to a tax at the rate of 4 per cent on income derived from mining operations.

For further particulars *see* the " Mining Tax Act," also the " Public Schools Act," which are obtainable from the King's Printer, Victoria, B.C

The Federal Government now collects the income tax for the Provincial Government.

ROYALTIES

All minerals mined from lands covered by records of mineral claims and placer claims and by placer-mining leases issued after the 1st day of May, 1948, are subject to payment of such royalties as may be fixed by regulation made by the Lieutenant-Governor in Council from time to time. The amounts of royalties to be paid have not yet been set. Properties subject to the payment of royalties are exempt from payment of the 4-per-cent tax under the " Mining Tax Act."

" FOREST ACT "

In 1939 the " Provincial Parks Act " was repealed and the administration of Provincial parks brought under the " Forest Act." Under this Act the Lieutenant-Governor in Council may constitute any portion of the Province a Provincial park and may also extend, reduce, or cancel any park created before or after the amendment to this Act.

The Act provides for three classes of parks to be known as " A," " B," and " C " Class parks.

Lands included in Class "A" and Class " C " parks are reserved from pre-emption, sale, lease, or licence under the " Land Act " and with respect to mining are so reserved unless the consent of the Lieutenant-Governor in Council is obtained, and then only subject to further provisions of the Act.

No holder of any mineral claim in a Class "A" or Class " C " park may obtain a Crown grant of the surface rights of a mineral claim.

All mineral claims in any Class "A" or Class " C " park shall be subject to such terms and conditions and restrictions, including cutting and use of timber, as the Lieutenant-Governor in Council may from time to time prescribe.

The restrictions on prospecting and mining in Class "A" and Class "C" parks do not apply in the case of Class " B " parks.

Where, in the opinion of the Minister of Lands and Forests, the safety of life and property is endangered through the hazardous condition of the forest-cover or the occurrence or spread of forest fire, the Minister may declare a district closed for travel and prospecting so long as the hazard exists.

LIST OF PRICES CHARGED FOR ACTS

(Sales, within the Province, amounting to 15 cents or more, are subject to the British Columbia sales tax.)

	Price
Department of Mines Act	$0.15
Mineral Act	.25
Placer-mining Act	.25
Metalliferous Mines Regulation Act	.50
Coal-mines Regulation Act	.70
Mines Right-of-way Act	.15
Iron and Steel Bounties Act	.15
Indian Reserves Mineral Resources Act	.15
Prospectors' Grub-stake Act	.15
Taxation Act	.75
Forest Act	.80
Greater Vancouver Water District Act	.40
Security Frauds Prevention Act	.30
Coal Sales Act	.15

OFFICES OF GOLD COMMISSIONERS

Mining Division	Gold Commissioner's Office
Ainsworth	Kaslo.
Alberni	Alberni.
Atlin	Atlin.
Cariboo	Barkerville.
Clinton	Clinton.
Fort Steele	Cranbrook.
Golden	Golden.
Greenwood	Grand Forks.
Kamloops	Kamloops.
Lillooet	Lillooet.
Nanaimo	Nanaimo.
Nelson	Nelson.
New Westminster	New Westminster.
Nicola	Kamloops.
Omineca	Smithers.
Osoyoos	Penticton.
Peace River	Victoria.
Quesnel	Williams Lake.
Revelstoke	Revelstoke.
Similkameen	Princeton.
Skeena	Prince Rupert.
Slocan	Kaslo.
Stikine	Victoria.
Trail Creek	Rossland.
Vancouver	Vancouver.
Vernon	Vernon.
Victoria	Victoria.

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VICTORIA, B.C.
Printed by Don McDiarmid, Printer to the King's Most Excellent Majesty
1951

2,820-551-6566