ANNUAL REPORT

OF THE

MINISTER OF MINES

FOR THE

YEAR ENDED 31ST DECEMBER

1924

BEING AN ACCOUNT OF

MINING OPERATIONS FOR GOLD, COAL, ETC.

IN THE

PROVINCE OF BRITISH COLUMBIA.

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by CHARLES F. BANFIELD, Printer to the King's Most Excellent Majesty.
1925.

To His Honour WALTER CAMERON NICHOL,

Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Provincial Mineralogist upon the Mining Industry of the Province for the year 1924 is herewith respectfully submitted.

WILLIAM SLOAN,

Minister of Mines.

Minister of Mines' Office,

March 5th, 1925.

Kafue Dredge, Antler Creek, Cariboo M.D.

To the Honourable William Sloan,

Minister of Mines.

SIR,—I have the honour to submit herewith my Annual Report on the Mining Industry of the Province for the year ended December 31st, 1924.

The statistical tables give the total mineral-output of the Province to date, and show in considerable detail the actual mineral production of the past year, as based on mine, mill, or smelter returns; also a summary of the production of each of the last four years, thus illustrating by comparison the progress made in productive mining during this period.

Preparation of this Annual Report had been commenced by Wm. Fleet Robertson, who for over twenty-seven years has been Provincial Mineralogist, retiring on superannuation the end of February, 1925. In the compilation of this, my first Annual Report as Provincial Mineralogist, I have therefore adhered as closely as possible to the form and style which has been practically standardized by Mr. Robertson for these Reports.

I have the honour to be,

Sir,

Your obedient servant,

JOHN D. GALLOWAY,

Provincial Mineralogist.

Bureau of Mines, Victoria, B.C.,

March 5th, 1925.

MINERAL PRODUCTION OF BRITISH COLUMBIA.

METHOD OF COMPUTING PRODUCTION.

In assembling the output of the lode mines in the following tables, the established custom of this Bureau has been adhered to, viz.: The output of a mine for the year is considered that amount of ore for which the smelter or mill returns have been received during the year. This system does not give the exact amount mined during the year, but rather the amount credited to the mine on the company's books during such year.

For ore shipped in December the smelter returns are not likely to be received until February in the new year, or later, and have, consequently, to be carried over to the credit of such new year. This plan, however, will be found very approximate for each year, and ultimately correct, as ore not credited in one year is credited in the next.

In the lode mines tables, the amount of the shipments has been obtained from certified returns received from the various mines, as provided for in the "Inspection of Metalliferous Mines Act." In calculating the value of the products, the average prices for the year in the New York Metal Market have been used as a basis. For silver 95 per cent., for lead 90 per cent., and for zinc 85 per cent. of such market prices have been taken. Treatment and other charges have not been deducted, except that in copper the amount of metal actually recovered has been taken, thus covering loss in slags.

TABLE I.—TOTAL PRODUCTION FOR ALL YEARS UP TO AND INCLUDING 1924.

Gold, placer	$ 77,382,953
Gold, lode	118,473,190
Silver	68,824,579
Copper	187,489,378
Lead	70,548,578
Zinc	32,171,497
Coal and coke	260,880,048
Building-stone, bricks, etc.	42,225,814
Miscellaneous minerals, etc.	1,431,349
Total	$859,427,386

TABLE II.—PRODUCTION FOR EACH YEAR FROM 1852 TO 1924 (INCLUSIVE).

1852 to 1895 (inclusive)	$ 94,547,241	1911	$ 23,499,072
1896	7,507,956	1912	32,440,800
1897	10,455,268	1913	30,296,398
1898	10,906,861	1914	26,388,825
1899	12,393,131	1915	29,447,508
1900	16,344,751	1916	42,290,462
1901	20,086,780	1917	37,010,392
1902	17,486,550	1918	41,782,474
1903	17,495,954	1919	33,296,313
1904	18,977,359	1920	35,543,084
1905	22,461,325	1921	28,066,641
1906	24,980,546	1922	35,158,843
1907	25,882,560	1923	41,304,320
1908	23,851,277	1924	48,704,604
1909	24,443,025		
1910	26,377,066	Total	$859,427,386

Table III. gives a statement in detail of the quantities and value of the different mineral products for the years 1922, 1923, and 1924. It is difficult to get absolutely complete statistics regarding building-stone, lime, bricks, tiles, and other miscellaneous products, but the detail figures shown in Table V. are as nearly accurate as can be obtained.

TABLE III.

QUANTITIES AND VALUE OF MINERAL PRODUCTS FOR 1922, 1923, AND 1924.

	Customary Measure.	1922.		1923.		1924.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer	Ounces	18,240	$ 364,800	20,320	$ 420,000	21,037	$ 420,750
" lode	"	197,856	4,089,684	179,245	3,704,994	247,716	5,120,535
Silver	"	7,101,311	4,554,781	6,032,986	3,718,129	8,341,768	5,292,184
Copper	Pounds	32,359,896	4,329,754	57,720,290	8,323,266	64,845,393	8,442,870
Lead	"	67,447,985	3,480,316	96,663,152	6,321,770	170,384,481	12,415,917
Zinc	"	57,146,548	2,777,322	58,343,462	3,278,903	79,130,970	4,266,741
Coal	Tons, 2,240 lb.	2,511,843	12,559,215	2,453,223	12,266,115	1,939,526	9,697,630
Coke	" "	45,835	320,845	58,919	412,433	30,615	214,305
Miscellaneous products			2,682,126		2,858,710		2,833,672
			$35,158,843		$41,304,320		$48,704,604

TABLE IV.

OUTPUT OF MINERAL PRODUCTS BY DISTRICTS AND DIVISIONS.

Names.	Divisions.			Districts.		
	1922.	1923.	1924.	1922.	1923.	1924.
No. 1 District				$10,867,144	$10,369,235	$11,012,170
Atlin, Stikine, and Liard	$ 155,271	$ 157,874	$ 153,122			
Nass River	4,561,185	5,240,086	5,024,242			
Portland Canal	5,288,469	4,121,213	4,952,955			
Skeena, Queen Charlotte, and Bella Coola	862,219	850,063	881,851			
No. 2 District				292,144	281,575	486,078
Cariboo and Quesnel	192,300	270,575	240,000			
Omineca and Peace River	99,844	11,000	246,078			
No. 3 District				1,421,850	555,131	355,664
Nicola and Vernon	1,383,143	405,603	332,693			
Yale, Ashcroft, and Kamloops	25,497	140,496	9,386			
Lillooet and Clinton	13,210	9,032	13,585			
No. 4 District				636,722	1,180,042	1,554,671
Grand Forks, Greenwood, and Osoyoos	635,722	437,657	748,486			
Similkameen	1,000	742,385	806,185			
No. 5 District				10,761,709	14,957,437	21,952,774
Fort Steele	8,871,647	12,915,722	18,757,222			
Windermere and Golden	59,406	102,092	127,538			
Ainsworth	90,954	174,900	211,566			
Slocan and Slocan City	1,358,035	1,526,194	1,270,153			
Nelson and Arrow Lake	65,925	27,035	47,567			
Trail Creek	272,967	189,439	1,510,122			
Revelstoke, Trout Lake, and Lardeau	42,775	22,055	28,606			
No. 6 District				11,179,274	13,960,900	13,343,247
Vancouver Island (Nanaimo, Alberni, Clayoquot, Quatsino, and Victoria)	10,614,505	9,944,678	9,428,015			
Mainland (Vancouver and New Westminster)	564,769	4,016,222	3,915,232			
				$35,158,843	$41,304,320	$48,704,604

TABLE V.

MISCELLANEOUS PRODUCTS AND TOTALS OF PRODUCTION, 1924.

District and Division.	Cement.	Lime and Limestone.	Building-stone.	Riprap.	Crushed Rock, Flux.	Sand and Gravel.	Pottery and Clay.	Fire, Face, and Red Brick.	Total Building Materials.	Miscellaneous Minerals.	Total Miscellaneous Products.	Total Output of Collieries.	Total Metalliferous Minerals.	Totals for Divisions.	Totals for Districts.
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
No. 1 District															11,012,170
Atlin, Stikine, and Liard													153,122	153,122	
Nass River					32,147				32,147		32,147		4,992,095	5,024,242	
Portland Canal													4,952,955	4,952,955	
Skeena, Queen Charlotte, and Bella Coola		31,250		15,601		26,891			73,742		73,742		808,109	881,851	
No. 2 District															486,078
Cariboo and Quesnel													240,000	240,000	
Omineca and Peace River												6,140	239,938	246,078	
No. 3 District			700					5,093	5,793		5,793	326,690	210	332,693	355,664
Nicola and Vernon								4,560	4,560		4,560		4,826	9,386	
Yale, Ashcroft, and Kamloops										360	360	5,500	7,725	13,585	
Lillooet and Clinton															
No. 4 District															1,554,671
Grand Forks, Greenwood, and Osoyoos		13,431							13,431	19,767	33,198		715,288	748,486	
Similkameen										2,100	2,100	800,085	4,000	806,185	
No. 5 District															21,952,774
Fort Steele												1,341,860	17,415,362	18,757,222	
Windermere and Golden													127,538	127,538	
Ainsworth													211,566	211,566	
Slocan and Slocan City													1,270,153	1,270,153	
Nelson and Arrow Lake						2,500			2,500		2,500		45,067	47,567	
Trail Creek													1,510,122	1,510,122	
Revelstoke, Trout Lake, and Lardeau				2,700		24,808			27,508		27,508		1,098	28,606	
No. 6 District															13,343,247
Vancouver Island (Nanaimo, Alberni, Clayoquot, Quatsino, and Victoria)	1,323,951	408,885	42,592			128,142	8,040	84,060	1,995,670	185	1,995,855	7,431,660	500	9,428,015	
Mainland (Vancouver and New Westminster)		1,000		37,341	113,340	120,035	200,176	183,337	655,229	680	656,909		3,259,323	3,916,232	
Totals	1,323,951	454,566	43,292	55,642	145,487	302,376	208,216	277,050	2,810,580	23,092	2,833,672	9,911,935	35,958,997	48,704,604	48,704,604

TABLE VI.—PLACER GOLD.

Table VI. contains the yearly production of placer gold to date, as determined by returns sent in by the Gold Commissioners and Resident Engineers. To these yearly amounts one-third was added up to the year 1878; from then to 1895 and from 1898 to 1909, one-fifth; and since then one-tenth, which proportions are considered to represent, approximately, the amount of gold sold of which there is no record. This placer gold contains from 10 to 25 per cent. silver, but the silver value has not been separated from the totals, as it would be insignificant.

YIELD OF PLACER GOLD TO DATE.

1858	$ 705,000	1875	$2,474,004	1892	$ 399,526	1909	$ 477,000
1859	1,615,070	1876	1,786,648	1893	356,131	1910	540,000
1860	2,228,543	1877	1,608,182	1894	405,516	1911	426,000
1861	2,666,118	1878	1,275,204	1895	481,683	1912	555,500
1862	2,656,903	1879	1,290,058	1896	544,026	1913	510,000
1863	3,913,563	1880	1,013,827	1897	513,520	1914	565,000
1864	3,735,850	1881	1,046,737	1898	643,346	1915	770,000
1865	3,491,205	1882	954,085	1899	1,344,900	1916	580,500
1866	2,662,106	1883	794,252	1900	1,278,724	1917	496,000
1867	2,480,868	1884	736,165	1901	970,100	1918	320,000
1868	3,372,972	1885	713,738	1902	1,073,140	1919	286,500
1869	1,774,978	1886	903,651	1903	1,060,420	1920	221,600
1870	1,336,956	1887	693,709	1904	1,115,300	1921	233,200
1871	1,799,440	1888	616,731	1905	969,300	1922	364,800
1872	1,610,972	1889	588,923	1906	948,400	1923	420,000
1873	1,305,749	1890	490,435	1907	828,000	1924	420,750
1874	1,844,618	1891	429,811	1908	647,000		
						Total	$77,382,953

TABLE VII.—PRODUCTION OF LODE MINES.

YEAR.	GOLD.		SILVER.		COPPER.		LEAD.		ZINC.		TOTAL VALUE.
	Oz.	Value.	Oz.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
		$		$		$		$		$	$
1887	.....	.....	17,690	17,331	.....	.....	204,800	9,216	.....	.....	26,547
1888	.....	.....	79,780	75,000	.....	.....	674,500	29,813	.....	.....	104,813
1889	.....	.....	53,192	47,873	.....	.....	165,100	6,498	.....	.....	54,371
1890	.....	.....	70,427	73,948	.....	.....	*Nil.*	*Nil.*	.....	.....	73,948
1891	.....	.....	4,500	4,000	.....	.....	*Nil.*	*Nil.*	.....	.....	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	39,264	785,271	1,496,522	977,229	952,840	47,642	16,475,464	532,255	.....	.....	2,342,397
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	2,939,418	1,663,708	7,722,591	1,351,453	21,862,436	878,870	.....	.....	6,751,604
1900	167,152	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	4,348,603	5,151,333	2,884,745	27,603,746	4,446,963	51,582,906	2,002,733	.....	.....	13,683,044
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	4,547,536	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	2,684,544	120,092	11,454,063
1912	257,496	5,322,442	3,132,108	1,810,045	51,456,587	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	2,175,232	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	7,989,896	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	7,101,511	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	6,821,770	68,343,462	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
Total	5,742,388	118,478,190	110,767,134	68,824,579	1,119,305,581	187,489,378	1,412,791,720	70,548,578	517,061,371	32,171,497	477,507,222

TABLE VIII.—COAL AND COKE PRODUCTION PER YEAR TO DATE.

COAL.

Year.	Tons (2,240 lb.).	Value.
1836-1885	3,029,011	$ 9,468,557
1886	326,636	979,908
1887	413,360	1,240,080
1888	489,301	1,467,903
1889	579,830	1,739,490
1890	678,140	2,034,420
1891	1,029,097	3,087,291
1892	826,335	2,479,005
1893	978,294	2,934,882
1894	1,012,953	3,038,859
1895	939,654	2,818,962
1896	896,222	2,688,666
1897	882,854	2,648,562
1898	1,135,865	3,407,595
1899	1,306,324	3,918,972
1900	1,439,595	4,318,785
1901	1,460,331	4,380,993
1902	1,397,394	4,192,182
1903	1,168,194	3,504,582
1904	1,253,628	3,760,884
1905	1,384,312	4,152,936
1906	1,517,303	4,551,909
1907	1,800,067	6,300,235
1908	1,677,849	5,872,472
1909	2,006,476	7,022,666
1910	2,800,046	9,800,161
1911	2,193,062	7,675,717
1912	2,628,804	9,200,814
1913	2,137,483	7,481,190
1914	1,810,967	6,338,385
1915	1,611,129	5,638,952
1916	2,084,093	7,294,325
1917	2,149,975	7,524,913
1918	2,302,245	11,511,225
1919	2,267,541	11,337,705
1920	2,595,125	12,975,625
1921	2,483,995	12,419,975
1922	2,511,843	12,559,215
1923	2,453,223	12,266,115
1924	1,939,526	9,697,630
Total	63,598,082	$235,732,743

COKE.

Year.	Tons (2,240 lb.).		Year.	Tons (2,240 lb.).	
1895-97	19,396	$ 96,980	1912	264,333	$1,585,998
1898 (estimated)	35,000	175,000	1913	286,045	1,716,270
1899	34,251	171,255	1914	234,577	1,407,462
1900	85,149	425,745	1915	245,871	1,475,226
1901	127,081	635,405	1916	267,725	1,606,350
1902	128,015	640,075	1917	159,905	959,430
1903	165,543	827,715	1918	188,967	1,322,769
1904	238,428	1,192,140	1919	91,138	637,966
1905	271,785	1,358,925	1920	67,792	474,544
1906	199,227	996,135	1921	59,434	416,038
1907	222,913	1,337,478	1922	45,835	320,845
1908	247,399	1,484,394	1923	58,919	412,433
1909	258,703	1,552,218	1924	30,615	214,305
1910	218,029	1,308,174			
1911	66,005	396,030	Total	4,318,070	$25,147,305

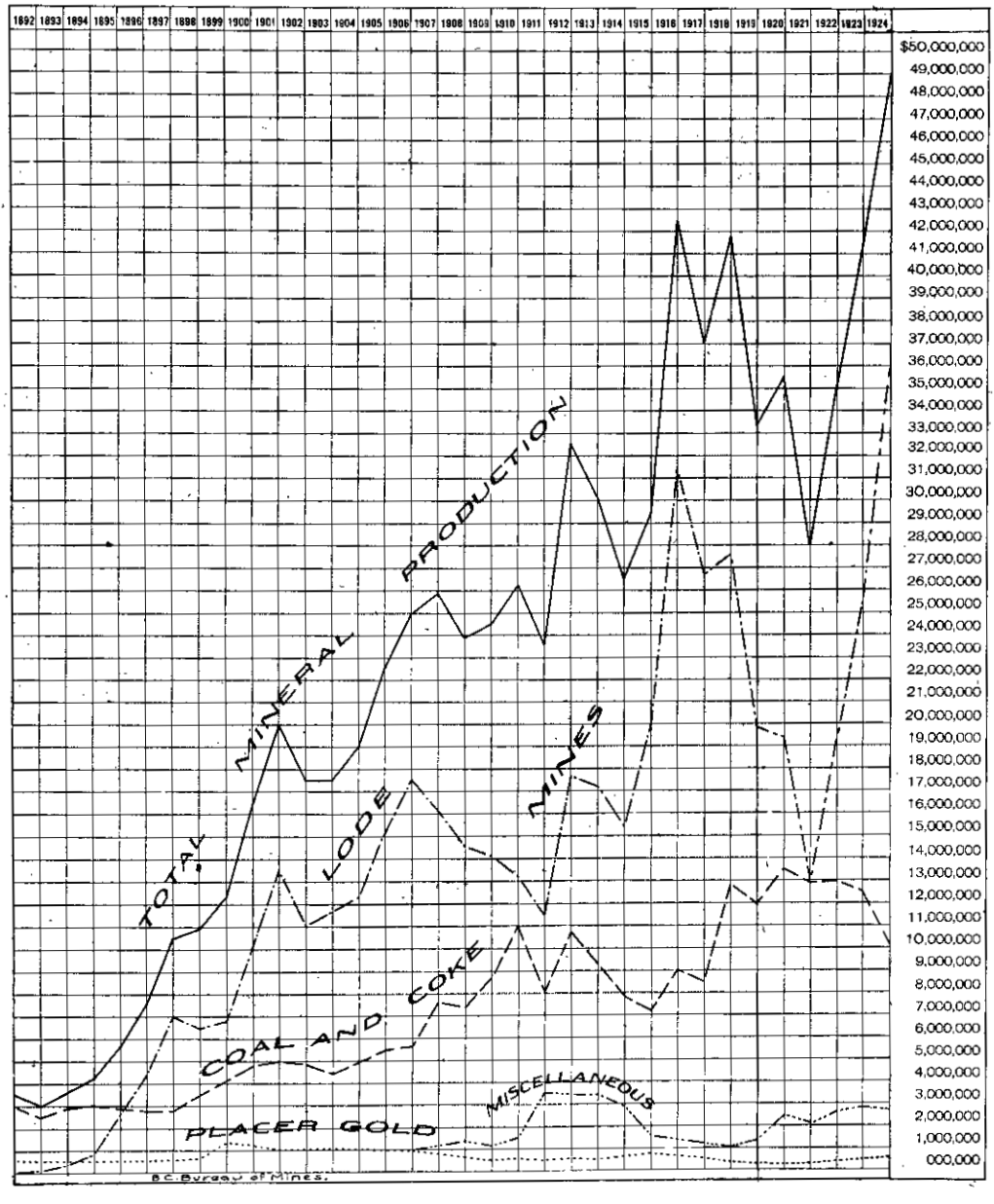
TABLE IX.—PRODUCTION IN DETAIL OF THE

DISTRICT.	YEAR.	TONS.	GOLD—PLACER.		GOLD—LODE.		SILVER.	
			Ounces.	Value.	Ounces.	Value.	Ounces.	Value.
				$		$		$
North-western District (No. 1)								
Atlin, Stikine, and Liard Divisions	1921	55	7,210	144,200	3	62	1,808	1,076
	1922	60	7,450	149,000	3	62	4,109	2,635
	1923	12	7,570	156,500	1	21	1,008	621
	1924	30	7,516	150,325	5	103	2,250	1,427
Nass River Division	1921	907,964			8,595	177,659	365,240	217,380
	1922	857,373			9,125	188,614	399,481	256,227
	1923	838,478			8,077	166,951	444,650	274,038
	1924	1,023,562			6,323	130,696	429,186	272,284
Portland Canal Division	1921	18,750			40,104	828,949	1,177,978	701,133
	1922	102,343			123,527	2,553,303	4,264,228	2,735,076
	1923	145,665			117,293	2,424,446	2,746,551	1,692,700
	1924	187,162			139,462	2,882,680	3,053,562	1,937,241
Skeena, Queen Charlotte, and Bella Coola Divisions	1921	134,574	100	2,000	36,483	754,103	20,781	12,369
	1922	105,982			35,081	725,124	17,196	10,985
	1923	88,300			29,660	613,072	17,515	10,794
	1924	85,514			34,673	716,691	15,781	10,012
North-eastern District (No. 2)								
Cariboo and Quesnel Divisions	1921		3,370	67,400				
	1922		9,615	192,300				
	1923	268	11,128	230,000	42	868	51,410	31,684
	1924		12,000	240,000				
Omineca and Peace River Divisions	1921	71	150	3,000	13	269	3,745	2,229
	1922	905	275	5,500	66	1,364	20,274	13,004
	1923		435	9,000				
	1924	1,709	500	10,000	329	6,800	282,759	166,700
Central District (No. 3)								
Nicola and Vernon Divisions	1921							
	1922	291	175	3,500	433	8,950	169	108
	1923	2			2	41	82	51
	1924	5			2	41	64	41
Yale, Ashcroft, and Kamloops Divisions	1921		50	1,000				
	1922	72	150	3,000	364	7,524	39	25
	1923	2,952	145	3,000	562	11,616	1,392	858
	1924	38	100	2,000	136	2,811	24	15
Lillooet and Clinton Divisions	1921	500	400	8,000	374	7,730		
	1922	1,588	275	5,500	373	7,710		
	1923		387	8,000				
	1924		386	7,725				
Southern District (No. 4.)								
Grand Forks, Greenwood, and Osoyoos Divisions	1921	41,658	25	500	735	15,192	160,051	95,262
	1922	46,274	225	500	17,918	370,365	211,730	135,804
	1923	45,019	240	5,000	10,934	226,006	227,047	139,929
	1924	50,315			19,589	405,150	430,435	273,076
Similkameen Division	1921		50	1,000				
	1922		50	1,000				
	1923		240	5,000				
	1924		200	4,000				
Eastern District (No. 5)								
Fort Steele Division	1921	298,516	150	3,000	1	20	546,631	325,355
	1922	360,845	150	3,000			956,028	613,196
	1923	489,876	100	2,000			1,176,683	725,190
	1924	1,033,714	260	5,200			2,801,790	1,777,512
Windermere and Golden Divisions	1921	440					18,508	11,016
	1922	862					27,004	17,320
	1923	1,336					46,340	28,559
	1924	1,413					54,791	34,750
Ainsworth Division	1921	5,523			11	227	115,772	68,907
	1922	5,265			25	517	53,736	34,466
	1923	12,980			15	310	91,478	56,378
	1924	15,003			24	496	86,750	55,036
Slocan and Slocan City Divisions	1921	5,692			19	393	188,142	111,982
	1922	46,454			224	4,630	1,104,628	708,508
	1923	62,245			361	7,463	1,086,582	669,660
	1924	58,530			365	7,545	957,245	607,295
Nelson and Arrow Lake Divisions	1921	11,048	50	1,000	3,587	74,143	2,130	1,268
	1922	5,917			2,392	49,443	7,232	4,639
	1923	523			319	6,594	6,242	3,847
	1924	2,620			98	2,026	10,794	6,848
Trail Creek Division	1921	89,107			44,980	929,737	60,184	35,822
	1922	18,982			8,256	170,651	16,638	10,672
	1923	18,568			6,983	144,339	9,701	5,979
	1924	155,543			42,620	880,956	122,474	77,700
Revelstoke, Trout Lake, and Lardeau Divisions	1921	31	50	1,000	8	165	3,871	2,304
	1922	73	50	1,000	4	83	4,521	2,900
	1923		50	1,000				
	1924	1	50	1,000			53	34
South-western District (No. 6)								
Vancouver Island (Nanaimo, Alberni, Clayoquot, Quatsino, and Victoria Divisions)	1921	1,331	25	500	104	2,150	605	360
	1922	19,900	25	500	65	1,344	14,368	9,216
	1923	33,104	25	500	120	2,480	17,341	10,687
	1924		25	500				
Mainland (Vancouver and New Westminster Divisions)	1921	47,385			646	13,355	7,943	4,728
	1922							
	1923	682,511			4,876	100,787	108,964	67,154
	1924	780,948			4,050	84,540	113,810	72,203
TOTALS	1921	1,562,645	11,660	233,200	135,663	2,804,154	2,673,389	1,591,201
	1922	1,573,186	18,240	364,800	197,856	4,089,684	7,101,311	4,554,781
	1923	2,421,839	20,320	420,000	179,245	3,704,994	6,032,986	3,718,129
	1924	3,337,105	21,037	420,750	247,716	5,120,535	8,341,768	5,292,184

METALLIFEROUS MINES FOR 1921, 1922, 1923, AND 1924.

COPPER.		LEAD.		ZINC.		TOTALS FOR DIVISIONS.				TOTALS FOR DISTRICTS.
Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	1921.	1922.	1923.	1924.	1924.
	$		$		$	$	$	$	$	$
										10,806,281
25,664	3,208					148,546				
21,693	2,903	13,000	671				155,271			
188	27	10,782	705					157,874		
		17,385	1,267						153,122	
34,067,185	4,258,398					4,653,447				
30,334,584	4,058,767	1,285	56				4,503,674			
32,950,826	4,751,509	8,513	557					5,193,055		
35,246,478	4,589,091	334	24						4,992,095	
						1,530,082				
675	90						5,288,469			
		62,191	4,067					4,121,213		
746,972	97,256	490,992	35,778						4,952,955	
748,918	93,615					862,087				
697,058	93,266						829,375			
457,522	65,974							689,840		
625,238	81,406								808,109	
										479,938
						67,400				
							192,300			
		122,680	8,023					270,575		
									240,000	
26,000	3,250	4,930	202	11,561	457	9,407				
2,800	375	30,979	1,599	21,071	1,024		22,866			
								9,000		
11,162	1,463	754,559	54,985						239,938	
										12,761
							12,558			
								92		
		1,753	128						210	
						1,000				
213	28						10,577			
843,011	121,562							137,036		
									4,826	
						15,730				
							13,210			
								8,000		
									7,725	
										719,288
432,505	54,063	51,268	2,097			167,114				
		144,251	7,443				514,112			
		161,008	10,530					381,465		
150,538	19,600	239,635	17,462						715,288	
						1,000				
							1,000			
								5,000		
									4,000	
										20,580,506
		38,066,820	1,566,933	49,319,198	1,948,108	3,834,016				
		57,743,931	2,979,587	51,672,816	2,511,299		6,107,082			
		85,676,187	5,603,222	51,940,253	2,919,042			9,249,454		
68	9	160,227,168	11,675,754	73,384,409	3,956,887				17,415,362	
		385,000	15,747			26,763				
		815,618	42,086				59,406			
		1,124,370	73,533					102,092		
		1,273,202	92,778						127,538	
		1,264,845	51,732	22,629	894	121,760				
		826,681	42,657	273,949	13,314		90,954			
638	92	1,673,847	109,470	153,904	8,650			174,900		
		1,872,112	136,421	383,751	19,613				211,566	
		1,614,425	66,030	65,984	2,606	181,011				
		7,633,624	393,895	5,164,661	251,002		1,358,035			
		7,612,544	497,860	6,249,305	351,211			1,526,194		
		5,010,871	385,142	5,381,516	250,171				1,270,153	
3,183	398	1,301	52			76,861				
252	34	176,747	9,120	14,051	683		63,919			
		210,620	13,774					24,215		
68	9	495,598	36,114	1,294	70				45,057	
2,277,392	284,674					1,250,233				
684,930	91,644						272,967			
271,091	39,092	410	29					189,439		
4,235,540	551,466								1,510,122	
		13,699	561			4,030				
		61,869	3,192				7,175			
								1,000		
		872	64						1,038	
										3,259,823
44,770	5,596					8,606				
617,691	82,647						93,707			
1,038,121	149,697							163,364		
									500	
1,411,376	176,422					194,505				
								3,363,254		
22,158,893	3,195,313								3,259,323	
23,829,329	3,102,580									
39,036,993	4,879,624	41,402,288	1,693,354	49,419,372	1,952,065	13,153,598				
32,359,896	4,329,754	67,447,985	3,480,316	57,146,648	2,777,322		19,596,657			
57,720,290	8,323,266	96,668,152	6,321,770	58,548,462	3,278,903			25,767,062		
64,845,333	8,442,870	170,384,481	12,415,917	79,130,970	4,266,741				35,958,997	35,958,997

TABLE X.


1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924
$50,000,000
49,000,000
48,000,000
47,000,000
46,000,000
45,000,000
44,000,000
43,000,000
42,000,000
41,000,000
40,000,000
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38,000,000
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7,000,000
6,000,000
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2,000,000
1,000,000
000,000
TOTAL MINERAL PRODUCTION
LODE MINES
COAL AND COKE
MISCELLANEOUS
PLACER GOLD
B.C. Bureau of Mines.

TABLE XI.

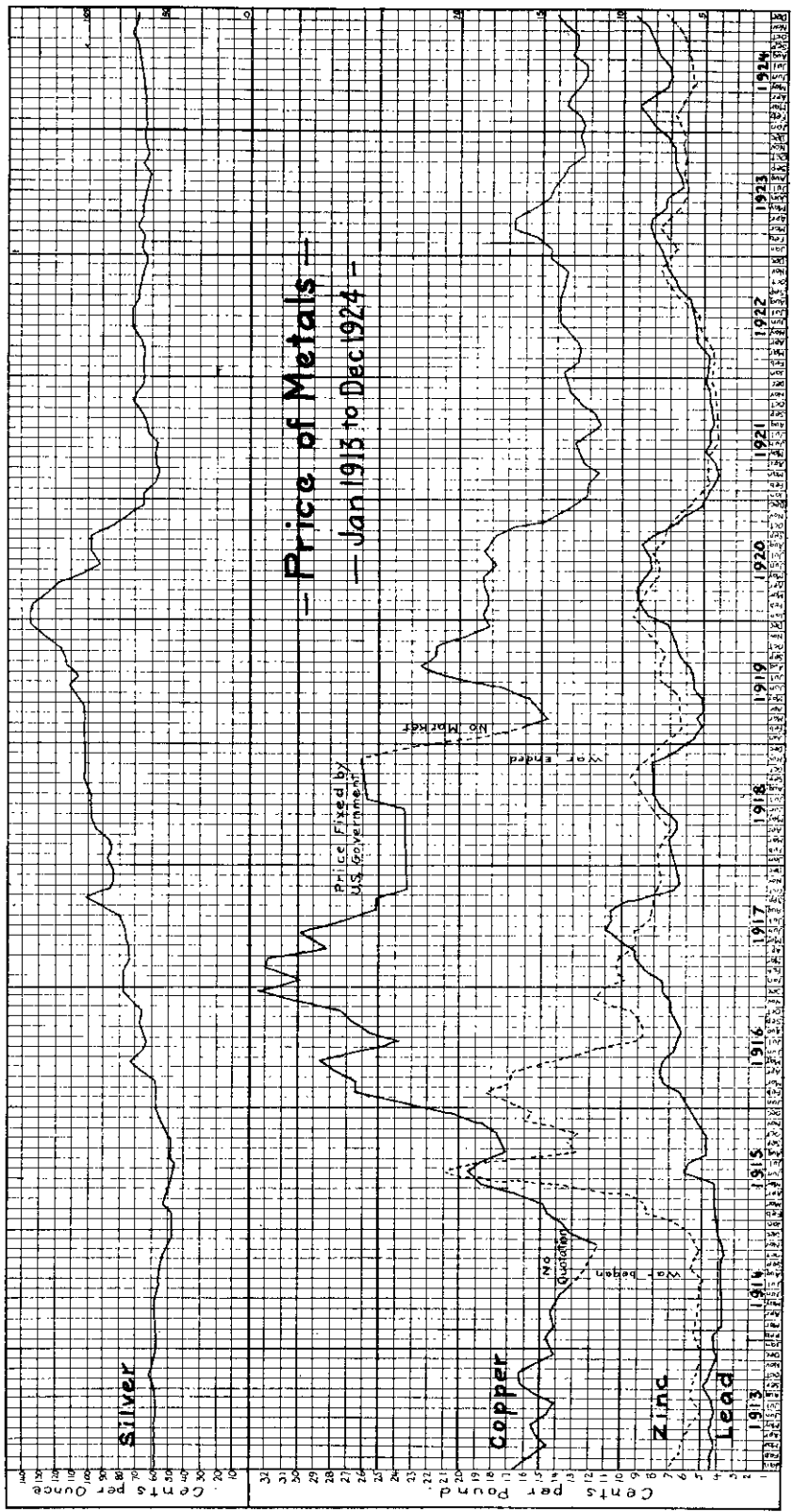
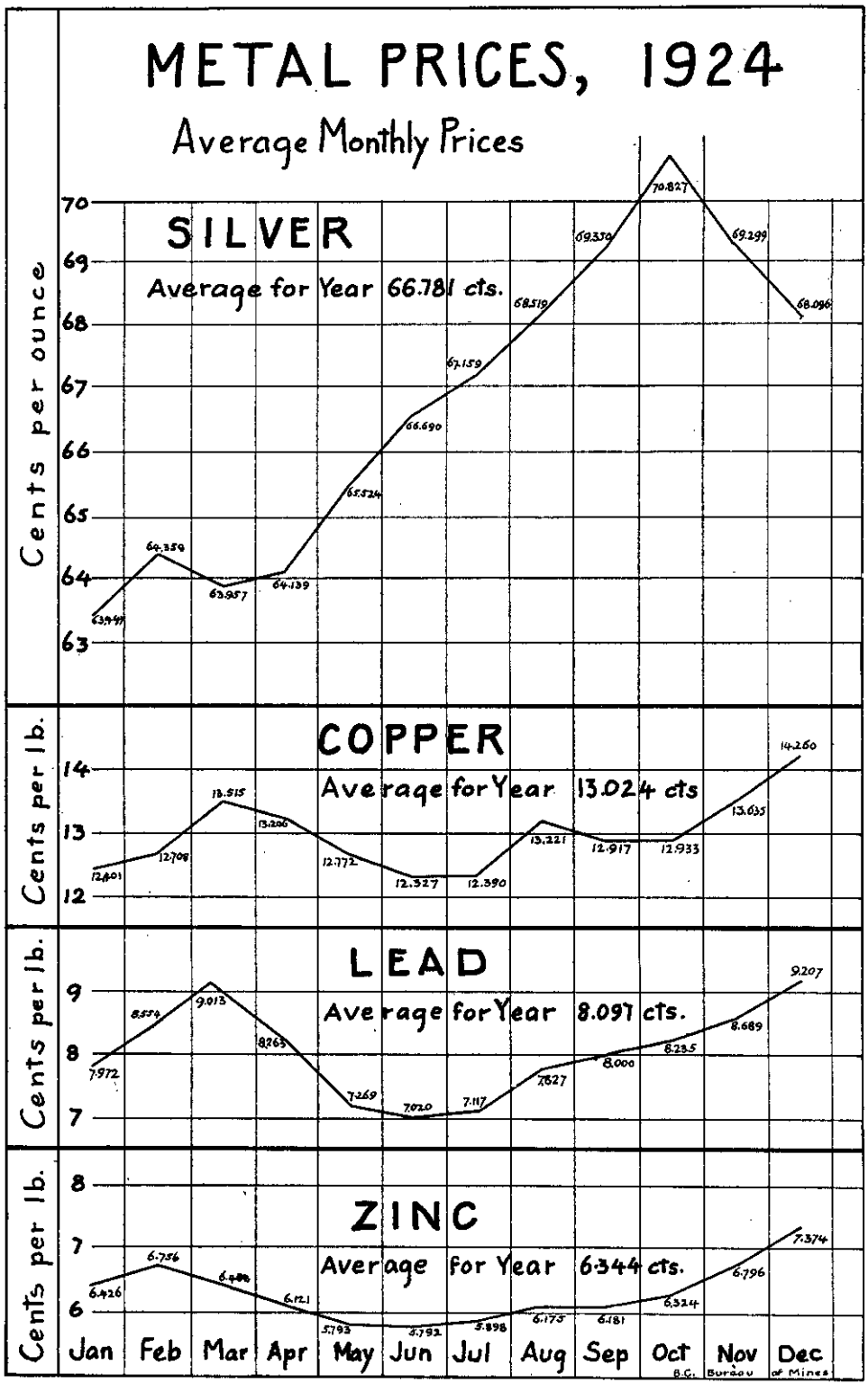

— Price of Metals —
— Jan 1913 to Dec 1924 —
Silver
Copper
Zinc
Lead
Cents per Ounce
Cents per Pound
Price Fixed by U.S. Government
No Market
No Quotation
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924

TABLE XII.


METAL PRICES, 1924
Average Monthly Prices
SILVER
Average for Year 66.781 cts.
Cents per ounce
70
69
68
67
66
65
64
63
63.949
64.359
63.957
64.139
65.824
66.690
67.159
68.519
69.330
70.827
69.299
68.096
COPPER
Average for Year 13.024 cts
Cents per lb.
14
13
12
12.401
12.709
13.515
13.206
12.772
12.327
12.390
13.221
12.917
12.933
13.635
14.260
LEAD
Average for Year 8.097 cts.
Cents per lb.
9
8
7
7.972
8.554
9.013
8.265
7.269
7.020
7.117
7.627
8.000
8.235
8.689
9.207
ZINC
Average for Year 6.344 cts.
Cents per lb.
8
7
6
6.426
6.756
6.496
6.121
5.793
5.792
5.898
6.175
6.181
6.324
6.796
7.374
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
B.C. Bureau of Mines

PROGRESS OF MINING.

The gross value of the mineral production of the Province for the year 1924 was $48,704,604, an increase from that of the preceding year of $7,400,284, or equivalent to an increase of about 18 per cent.

It is extremely gratifying to note that the above-mentioned output for the year 1924 is the greatest in the history of mining in the Province, and compares with the two previous record productions of $42,290,462 in 1918 and $41,782,474 in 1916, when the high production was due to war-time stimulus of output and war-time prices of metals.

An increased production in 1924 was shown in all metals and building materials, but a heavy decrease occurred in the output of coal and coke; this decrease was mainly due to the cessation of mining in the Crowsnest field for a large part of the year owing to a protracted strike.

The total value of the metalliferous production—that is, the metals gold (including placer gold), silver, copper, lead, and zinc—was $35,958,997, which was $10,191,935 greater than the 1923 output, or an increase of 39.6 per cent.

It is to be noted that an increased quantity of each of the above metals was made in 1924 as compared with 1923, and that the large increase in the total value of metalliferous production is due more to increased quantities of metals produced than to increased market prices of the several metals. The average prices for the year 1924 as compared with 1923 for the different metals showed increases in silver and lead, but decreases in copper and zinc; this is shown in the following table:—

AVERAGE METAL-MARKET PRICES FOR 1923 AND 1924.

Year.	Silver.	Copper.	Lead.	Zinc.
	Cents per Oz.	Cents per Lb.	Cents per Lb.	Cents per Lb.
1923	64.87	14.42	7.27	6.61
1924	66.78	13.02	8.09	6.34
Percentage increase* and decrease† in 1924	2.94*	9.70†	11.27*	4.08†

To indicate how fluctuating the markets have been, charts have been prepared to accompany this Report (Tables XI. and XII.) which show the monthly fluctuations of metal-market prices from 1913 to date.

It is quite apparent from the charts that there has been a great drop from war-days in all metal-prices, but, for all this, it is to be noted that the market prices at the end of the year 1924 are generally somewhat higher than the normal pre-war prices, at which profitable mining was carried on under pre-war conditions.

During the year 1924, as shown in Table XII., the market prices on the average increased and are now at a point where a good margin of profit for the miner is visible.

Costs of mining, including wages and supplies, have materially decreased from the war-years, and although somewhat higher than in pre-war years are now fairly constant. With good metal prices and reasonable costs, the future for mining appears bright and the industry undoubtedly will have an active year in 1925.

The prices of silver, lead, and zinc are now (February, 1925) excellent, and the best authorities agree that any material change in the prices of these metals during the next year or two will be upward rather than downward. The future of the copper market is still somewhat uncertain, but some authorities believe it will be stabilized at about the 15-cent mark.

Since 1920 the copper-mining industry has been in an unsatisfactory condition and most of the larger companies in North America have been unable to make money under the existing

conditions. Briefly, the difficulty has been that the productive capacity for copper metal has been greater than the demand. This necessitated curtailed production, causing increased costs, and the excess of copper on the market has depressed prices. By the end of 1924 this condition had been to some extent improved, as the world demand in the latter months of 1924 had practically equalled the world production and excess stocks of copper metal had been cleared away. Some of the larger copper-mines of the American Continent are not yet working to capacity and any greatly increased production may again overtax the market and reduce the price.

The increased demand for copper is not now an artificial and temporary one, as was the case with the war demand, but is now on a solid foundation. The great consuming countries for copper are the United States and Europe; in the former a natural progressive increase in demand has taken place during the last two years. In Europe the importation of copper, like many other commodities since the war, has been limited by the ability to pay, with the result that imports have been considerably below the normal pre-war demand; but the successful application of the Dawes plan to rehabilitate the finances of Europe in general, and Germany in particular, has stabilized European conditions and assisted materially in permitting the resumption of normal copper imports from America. It may be noted here that the British Columbia production of copper is marketed through New York City, which may be said to be the principal market for the world's copper.

During the copper-market depression the larger companies started an educational campaign for a more extended use of copper, which has been successful in creating a new and increased domestic market for the metal, particularly in the United States, for builders' use, roofs, etc. Some of our large producers, spurred on by sheer necessity, made economies they had not recognized as possible, and are now assured a more profitable future with the return to more normal conditions. It must not be assumed that any great increase in the price of copper will occur in the near future, but it is hoped that the world demand will keep the price at about the 15-cent level. This will encourage capacity production at existing plants in British Columbia and will probably cause the reopening of copper properties partially developed and equipped; and as the development of a copper prospect to the producing stage is the work of several years, it is now apparent that there is a demand for such properties—a demand which has been signally lacking in recent years.

The copper-output for 1924 was 64,845,393 lb., valued at $8,442,870, an increase over last year's output of 7,125,103 lb., or about 12.5 per cent.

An enormous increase is recorded in the production of lead, the value of the output for 1924 being $12,415,917, as compared with $6,321,770 in 1923, the largest previous year's production. This great increase of 73,721,329 lb. is chiefly due to a much greater production from the *Sullivan* mine. The outlook for lead maintaining a high market price of from 9 to 10 cents a pound is excellent. Increased world demand and a difficulty in keeping production up to the demand accounts for this high price, which is about double the average pre-war price. As a result, lead and silver-lead properties are in keen demand and many companies have scouting engineers in the field to acquire such properties.

The gold-output for the year amounted to $5,541,285, an increase of $1,416,291 as compared with 1923, or 34.3 per cent. A steady increase in gold production during the last five years is to be noted, and the output is now back to the normal figure of around $5,000,000 annually.

Silver production for the year was $5,292,184, as compared with $3,718,129 in 1923, or an increase of 42.4 per cent. This increase was due chiefly to a larger output from the *Sullivan* mine and also increases from the *Premier* and *Hidden Creek* mines. Increased lead and copper production always means an increased silver-output, as the latter metal is found in association with lead and copper ores.

The considerable increase in zinc production in 1924 was due to a larger output from the *Sullivan* mine. The production was 79,130,970 lb., as compared with 58,343,462 lb. in 1923, or an increase of 35.6 per cent. The action of the Consolidated Mining and Smelting Company in lowering the treatment rates on custom zinc ore should result in a larger output of zinc ore during 1925. In addition, still further increases from the *Sullivan* mine, owned by this company, may be expected.

As noted previously, the collieries of British Columbia made a much lower output in 1924 than normal; the net production was 1,939,526 tons of coal, as compared with 2,453,223 tons in

1923, or a decrease of 21 per cent., and 30,165 tons of coke as against 58,919 tons in 1923, a decrease of 20.2 per cent.

The Coast District (including the Vancouver island and Nicola-Princeton fields) made a slightly lower output than in 1923, but the big drop was in the Crowsnest Pass District, where only about one-third of the normal production of coal was made and a little over one-half the normal coke-output. A lengthy strike tied up the Crowsnest mines for a large part of the year; later, when the mines reopened, the market had been lost and again some of the properties had to close. Early in 1925 a readjustment of wage schedules was made with the miners, lower prices were quoted for coal, and the markets regained and the mines reopened. Economic conditions now seem to be well settled in this district and a steady output of coal seems to be assured for 1925 at least.

Of the six Mineral Survey Districts into which the Province is divided, with a Resident Engineer in charge of each, the largest production was made by the Eastern District (No. 5), with a production of $21,952,774; a large part of this output is contributed by the *Sullivan* mine at Kimberley. The second largest output was made by the North-eastern District (No. 1), with a total value of $11,012,170; the largest contributors in this district are the Granby Company and the *Premier*.

It is encouraging and significant to note from the Resident Engineers' reports that prospecting, exploratory, and development work have been actively carried on in the different districts of the Province. In the older camps of the southern part of the Province, as in the Boundary, Slocan, Nelson, and East Kootenay, renewed exploration is being rewarded with material successes, and in some instances a return to active life seems probable for some of the mining sections which had been virtually abandoned.

In the northern half of the Province there has been much activity, particularly in those camps tributary to Stewart. It is expected that important developments will also take place in the North-eastern District during 1925. In the Cariboo part of this district placer production is steadily increasing and the erection of a modern bucket-dredge at Barkerville is expected to prove an incentive to much testing of known placer-gravels for working by dredging methods. From all view-points the mining industry in British Columbia is on a solid foundation and a steadily increased production may be expected in the future.

PROFITS OF MINING COMPANIES.

The following table shows the dividends declared by mining companies in the Province during the calendar years 1923 and 1924:—

Name of Company.	1923.	1924.
Premier Gold Mining Co., Ltd.	$1,738,000	$1,715,000
Consolidated Mining and Smelting Co. of Canada, Ltd.	632,022	641,043
Howe Sound Copper Co.*	198,415	198,415
Silversmith Mines, Ltd.	150,000	175,000
Wallace Mountain Mines, Ltd.	5,400	59,400
I.X.L. (Trail Creek Mining Division)	22,958	56,000
Bell (Greenwood Mining Division)	*Nil*	48,000
Apex (Slocan Mining Division)	*Nil*	1,834
Mountain Chief Mines (Slocan Mining Division)	*Nil*	1,482
Belmont-Surf Inlet Mines	62,500	*Nil*
Total for year	$2,809,295	$2,896,174

The amount of $2,896,174 shown above as distributed in 1924 by no means represents the total of net profits earned during that year. In nearly all cases substantial sums are set aside from profits to the credit of surplus and reserve accounts. Profits accruing to private companies and individual mining enterprises as a rule are not given publicity as dividends, as is the case with the large companies, so that no record of these profits, which in the aggregate are considerable, is available.

* The Howe Sound Copper Company is the holding company for the *Britannia* mine in British Columbia and the *El Potosi* mine in Mexico. Dividends paid by this company are therefore derived from the profits on operation of both mines, so that only part of the dividends paid, as shown, can be credited to the *Britannia* mine.

The following table shows the number of mines which shipped ore during the year 1924, the districts in which they are situated, and the tonnage produced in each district, together with the number of men employed, both above ground and underground.

In explanation of the table it should be said that, in its preparation, a mine employing twelve men for four months is credited in the table with four men for twelve months, so that the total given is less than the actual number of individuals who worked in the mines during the year.

TABLE SHOWING DISTRIBUTION OF SHIPPING MINES IN 1924.

	Tons of Ore shipped.	No. of Mines shipping.	No. of Mines shipping over 100 Tons in 1924.	Men employed in these Mines.		
				Below.	Above.	Total.
No. 1 District.						
Atlin, Stikine, and Liard	30	1	..	2	2	4
Nass River	1,023,562	3	3	245	104	349
Portland Canal	187,162	5	3	189	208	397
Skeena, Queen Charlotte, and Bella Coola	86,514	2	1	135	79	214
No. 2 District.						
Cariboo and Quesnel	.....	..	..	..	...	...
Omineca and Peace River	1,709	2	1	51	45	96
No. 3 District.						
Nicola and Vernon	5	1	..	1	1	2
Yale, Ashcroft, and Kamloops	36	3	..	10	12	22
Lillooet and Clinton	.....	..	..	..	..	..
No. 4 District.						
Grand Forks, Greenwood, and Osoyoos	50,315	8	5	110	117	227
Similkameen	.....	..	..	..	..	..
No. 5 District.						
Fort Steele	1,033,714	3	2	423	466	889
Windermere and Golden	1,413	4	1	23	11	34
Ainsworth	15,003	14	4	70	32	102
Slocan and Slocan City	58,530	26	12	173	93	266
Nelson and Arrow Lake	2,620	8	1	29	20	49
Trail Creek	155,543	4	3	259	84	343
Revelstoke, Trout Lake, and Lardeau	1	1	..	1	1	2
No. 6 District.						
Vancouver Island (Nanaimo, Alberni, Clayoquot, Quatsino, and Victoria)	....	..	..	..	..	..
Mainland (Vancouver and New Westminster)	780,948	1	1	544	314	858
Totals	3,397,105	86	37	2,265	1,589	3,854

In the following table of the non-shipping mines the returns are necessarily incomplete, as they include only the mines reporting to the Department, and not the prospects and properties under preliminary development, which in the aggregate give employment to a large number of men.

TABLE SHOWING NON-SHIPPING MINES AND MEN EMPLOYED IN 1924.

District.	NUMBER OF MINES.			MEN EMPLOYED.		
	Working.	Idle.	Total.	Below.	Above.	Total.
No. 1. North-western Mineral Survey District....	6	4	10	42	47	89
No. 2. North-eastern Mineral Survey District....	1	..	1	27	20	47
No. 3. Central Mineral Survey District.....	3	4	7	..	6	6
No. 4. Southern Mineral Survey District..	3	15	18	3	4	7
No. 5. Eastern Mineral Survey District.....	13	39	52	16	14	30
No. 6. Western Mineral Survey District.....	..	2	2	..	..	..
Totals	26	64	90	88	91	179

SUMMARY OF STATISTICAL TABLES.

Referring to the preceding tables of the mineral production of the Province, the following is a summary of their contents:—

TABLE I. shows the total gross value of each mineral product mined in the Province up to the end of 1924, aggregating $859,427,386. From this table it will be seen that coal-mining has produced more than any other separate class of mining, a total of $260,880,048; followed next in importance by copper at $187,489,378, and next in order is lode gold at $118,473,190, with placer gold in fourth place at $77,382,953.

TABLE II. shows the value of the total production of the mines of the Province from 1852 to 1895 (inclusive) and for each year from 1896 to 1924 (inclusive), during which period the output increased tenfold, and had a gross production for the year 1924 of $48,704,604.

The value of the total mineral production of the Province up to the end of 1924 was $859,427,386.

TABLE III. gives the quantities in the customary units of measure, and the values, of the various metals or minerals which go to make up the total of the mineral production of the Province, and also, for the purpose of comparison, similar data for the two preceding years.

The table shows that there has been this year an increase in the production of placer gold of $750 and an increase in output of lode gold of $1,415,541, making an increase of $1,416,291 in the total production of the precious metal.

The amount of silver produced this past year was 8,341,768 oz., having a gross value of $5,292,184, an increase in the number of ounces produced of 2,308,782.

The table shows an output of lead amounting to 170,384,481 lb., valued at $12,415,917, an increase in quantity of 73,721,329 lb., and an increase in value of $6,094,147.

The production of copper this year was 64,845,393 lb., valued at $8,442,870, an increase in amount of 7,125,103 lb., or about 12.5 per cent. The value of the product was more than that of the preceding year by $119,604.

The other metals are specifically mentioned under the headings which follow this summary.

TABLE IV. shows the proportions of the total mineral productions made in each of the various districts into which the Province is divided.

It will be noted that again this year the Eastern District has the honour of first place on the list, followed, in order of importance, by the Western, North-western, Southern, North-eastern, and Central Districts. The Western and Eastern Districts owe a considerable proportion of their output to the coal-mines situated within their limits, whereas, in the other districts, the production is chiefly from metal-mining.

The Western District also derives a fair proportion of its production from "Miscellaneous products," such as building materials, etc., due to the larger cities therein; this year this amounted to $2,651,764, as shown in Table V.

TABLE V. is an endeavour to show in some detail the production of those products, such as building materials, previously summarized under "Miscellaneous products," and which amounts this year to $2,833,672. Much difficulty has been found in obtaining reliable figures regarding these products, and in many cases they have had to be estimated; but, while the figures are not as complete as desired, they are at least approximate, and show what an important branch of mineral production this has become.

TABLE VI. shows the statistical record of the placer mines of the Province from 1858 to 1924, and shows a total production of $77,382,953. The output for 1924 was $420,750, an increase, as compared with the previous year, of $750.

TABLE VII. relates entirely to the lode mines of the Province, and shows the quantities and values of the various metals produced each year since the beginning, in 1887, of such mining in the Province. The gross value of the product of these mines to date is $477,507,222; this figure includes the zinc production of 1909 and all subsequent years.

TABLE VIII. contains the statistics of production of the coal-mines of the Province. The total net amount of coal produced to the end of 1924 was 63,598,082 tons (2,240 lb.), worth $235,732,743. Of this, there was produced in 1924 1,939,526 tons valued at $9,697,630. In these figures of coal production the coal used in making coke is not included, as such coal is accounted for in the figures of output of coke. The amount of coal used in making coke in 1924 was 48,007 tons, from which was made 30,615 tons of coke, having a value of $214,305, a decrease in amount over the preceding year of 28,304 tons. The total value of the output of the collieries of the Province in 1924 was $9,911,935.

More detailed statistics as to the coal production of the Province and of the separate districts are given elsewhere in this Report.

TABLE IX. gives the details of production of metalliferous mines of the Province for the years 1921, 1922, 1923, and 1924, and the districts in which such productions were made, showing the tonnage of ore mined in each district, with its metallic contents and its market value.

The total tonnage of ore mined in the Province during the year 1924 was 3,397,105 tons, having a gross value of $35,538,247, and, with the placer gold, a total value of $35,958,997.

The following table shows the tonnage of ore mined in the various Mining Divisions of the Province:—

	Tons.
Fort Steele Mining Division	1,033,714
Nass River Mining Division	1,023,562
Vancouver Mining Division	780,948
Portland Canal Mining Division	187,162
Trail Creek Mining Division	155,543
Skeena Mining Division	86,514
Slocan and Slocan City Mining Divisions	58,530
Osoyoos Mining Division	48,347
Other Mining Divisions	22,785
Total	3,397,105

In reports previous to 1910 there has been included in Table IX. the "Miscellaneous products," and in 1910 these were shown distributed to the various districts; the great increase of these products in the past few years has rendered it advisable that this table be reserved exclusively for metalliferous products, and so a new table (No. V.) was introduced in 1911, giving in some detail the output of these miscellaneous products.

In making comparisons of this table with similar tables in previous reports, the fact that "Miscellaneous" has been removed will have to be borne in mind.

TABLE X. presents in graphic form the facts shown in figures in the tables, and demonstrates to the eye the rapid growth of lode-mining in the Province, and also the fluctuations to which it has been subject.

From this table it will be seen that coal-mining increased steadily until 1909; from then until 1917 a decrease occurred, since which time progress was upward to 1920 and since then there has been a slight decrease. The curve of lode production shows on the average a steady growth, but some marked interruptions have occurred; it is satisfactory that a substantial

increase in production has occurred in the last three years. The total mineral production also shows a progressive increase, with, however, some large fluctuations.

TABLE XI. shows graphically the market-price fluctuations in each of the metals during each month from the year 1913 to 1924.

TABLE XII. shows graphically the metal prices for 1924.

GOLD.

Placer Gold. The recovery of placer gold for 1924 was $420,750, of which practically all was obtained in the North-eastern and North-western Districts, only about 7 per cent. of the total coming from the other districts. An approximate apportionment is as follows: From Cariboo and Quesnel Divisions, $240,000; Atlin, Stikine, and Liard Divisions of North-western District, $150,325; remaining parts of the Province, $30,425. This production for 1924 shows an increase over the preceding year of $750.

Until the last two years the production of placer gold in the Province steadily decreased from the output of former years of between $500,000 and $700,000, which was due largely to the economic conditions of shortage and high prices of labour and supplies. It is apparent now that the output of placer gold will soon increase to normal figures.

Gold from Lode-mining. The value of lode gold produced in 1924 was $5,120,535, as compared with $3,704,994 in 1923, an increase of $1,415,541, or about 38.2 per cent. The Portland Canal Division, of this, produced a gold value of $2,882,680, or 56.3 per cent. of the total Provincial output. The *Belmont-Surf Inlet* mine in Skeena Division produced $714,830, and the Osoyoos Division $394,983, chiefly from the *Nickel Plate;* both of these latter properties being strictly gold-mines.

The following table shows the gold production of 1922, 1923, and 1924:—

Mining Division.	1922.	1923.	1924.
	Oz.	Oz.	Oz.
Portland Canal	123,527	117,293	139,462
Skeena	35,081	29,660	34,673
Nass River	9,125	8,077	6,323
Trail Creek (Rossland)	8,256	6,983	42,620
Boundary-Yale	17,918	11,496	19,589
Coast (Southern)	....	4,876	4,090
Nelson	2,392	319	98
All others	1,557	541	861
Totals	197,856	179,245	247,716

SILVER.

The quantity of silver produced in 1924 was 8,341,768 oz., worth $5,292,184, an increase from the production of 1923 in quantity of 2,308,782 oz. and in value of $1,574,055, or 42.3 per cent.

The market price of silver advanced slightly during the year, the average price for the year being 66.78 cents an ounce, as compared with 64.87 cents in 1923.

An accompanying diagram illustrates the fluctuations of market prices (Tables XI. and XII.).

The following table shows the silver production for 1922, 1923, and 1924:—

Mining Division.	1922.	1923.	1924.
	Oz.	Oz.	Oz.
Portland Canal	4,264,228	2,746,551	3,053,562
Nass River	399,481	444,650	429,186
Slocan and Slocan City	1,104,628	1,086,582	957,245
Boundary District	211,730	228,521	430,435
Fort Steele	956,028	1,176,683	2,801,790
Ainsworth	53,736	91,478	86,750
Trail Creek	16,638	9,701	122,474
Coast (Southern)	14,368	126,305	113,810
Omineca	20,274	51,410	262,759
Windermere-Golden	27,004	46,340	54,791
Nelson	7,232	6,242	10,794
All others	25,964	18,523	18,172
Totals	7,101,311	6,032,986	8,341,768

The *Premier* mine in Portland Canal Mining Division was again the largest individual producer, with an output of 3,015,382 oz., followed by the *Sullivan* in Fort Steele Division with a production of 2,800,534 oz.

COPPER.

The amount of copper produced in 1924 shows, as compared with the previous year, an increase in quantity, with a slight decrease in the market selling-price. The production was 64,845,393 lb., which is 7,125,103 lb. more than the 1923 output; the value for this year is $8,442,870, which, compared with $8,323,266 in 1923, shows an increase of $119,604.

The following table shows the production of copper, according to districts, in 1922, 1923, and 1924:—

Mining Division.	1922.	1923.	1924.
	Lb.	Lb.	Lb.
Nass	30,334,584	32,950,826	35,246,478
Skeena	697,058	457,522	625,238
Coast (Southern)	617,691	23,197,014	23,829,329
Boundary-Yale	.....	843,011	150,538
Trail Creek Division	684,930	271,091	4,235,540
All others	25,633	826	758,270
Totals	32,359,896	57,720,290	64,845,393

The Granby Company at Anyox in 1924 produced about 54 per cent. of the total output of copper of the Province, while the *Britannia*, on Howe sound, is responsible for about 37 per cent. The remainder of the output of the Province was divided between the *Belmont-Surf Inlet* mine in Skeena Division, the Rossland camp, and the Boundary-Yale District.

Since 1920 the price of copper has been materially below that of the war-years as shown by the Table No. XI. The average price for 1924 of 13.02 cents a pound shows a decrease as compared with 1923, when it was 14.42 cents. At the end of the year, however, the price had improved to about 14¼ cents.

LEAD.

The total amount of lead produced in 1924 was 170,384,481 lb., valued at $12,415,917. This represents, as compared with the previous year, an increase in quantity of 73,721,329 lb., and in value of $6,094,147.

This represents an increase in quantity of 76.2 per cent. and an increase in value of 96.5 per cent. The average market price of lead in 1922 was 5.73 cents a pound, while in 1923 it was 7.26 cents, and in 1924 it was 8.09 cents.

The following table shows the production of lead, according to Mining Divisions, for the years 1922, 1923, and 1924:—

Mining Division.	1922.	1923.	1924.
	Lb.	Lb.	Lb.
Fort Steele	57,743,931	85,676,187	160,227,168
Slocan and Slocan City	7,633,624	7,612,544	5,010,871
Ainsworth	826,681	1,673,847	1,872,112
Windermere-Golden	815,618	1,124,370	1,273,202
Nelson	176,747	210,620	495,598
Boundary-Yale	144,251	161,008	239,635
Omineca	.....	122,680	754,559
All others	107,183	81,896	511,336
Totals	67,447,985	96,663,152	170,384,481

From the above table it will be seen that there were increases in Fort Steele, Ainsworth, Omineca, Nelson, and Windermere Divisions, with a decrease in the Slocan.

The Fort Steele District continues to head the list, producing 160,227,168 lb. of lead, which is 94.3 per cent. of the total output of the Province for the year, while Slocan-Ainsworth produced 4.4 per cent. of the Provincial production. The large output from the Fort Steele Division comes from the *Sullivan* mine.

In the Slocan the largest producer was the *Silversmith*, followed by the *Bosun* and *Ruth*.

In the Ainsworth Division the largest producer was the *Cork-Province*, followed by the *Highland, Whitewater, Florence*, and *Spokane-Trinket*.

The production from Windermere-Golden was chiefly from the *Paradise* mine.

ZINC.

The quantity of zinc produced in 1924 amounted to 79,130,970 lb., which, compared with 58,343,462 lb. produced in 1923, shows an increase of 20,787,508 lb. This production is valued at $4,266,741, which shows an increase, as compared with the 1923 value, of $987,838, or about 30 per cent.

The average price for zinc for 1924 was 6.34 cents a pound, as compared with 6.61 cents in 1923. In December, 1924, a substantial increase in the price of the metal took place, the average for the month being 7.37 cents a pound. The outlook for a good price in 1925 is most promising.

The following table shows the production of zinc, according to Mining Divisions, for the years 1922, 1923, and 1924:—

Mining Division.	1922.	1923.	1924.
	Lb.	Lb.	Lb.
Fort Steele	51,672,816	51,940,253	73,384,409
Slocan and Slocan City	5,164,661	6,249,305	5,381,516
Ainsworth	273,949	153,904	363,751
Omineca	21,071	.....	.....
Nelson	14,051	.....	1,294
All others	.....	.....	.....
Totals	57,146,548	58,343,462	79,130,970

The above table shows that practically 92 per cent. of the zinc produced in the Province in 1924 was from the Fort Steele Division. The output in this Division was made chiefly by the *Sullivan* mine, and was due to a large tonnage of ore there mined and concentrated, the concentrates from which were shipped to the company's smelting plant at Trail for electrolytic refining and the excess production to Belgium and Anaconda.

In the Slocan Division the heaviest shipper was the Silversmith Mines, Limited, with a production of 3,260,112 lb. The next largest shipper was the Standard Silver-Lead Mining Company.

The figures for Ainsworth show an increase for that Division.

There was no zinc produced in the Omineca Division during 1924.

OTHER MINERALS.

Iron. So far there has been no metallic iron produced in British Columbia, but it has been strongly advocated in many quarters that the conditions are favourable for the establishment of an iron-smelting plant somewhere on the British Columbia coast. So far nothing definite has materialized, though there is apparently a prospect of such a plant being established. As is well known, there is on the Coast, in the aggregate, an adequate supply of magnetite-iron ore, quite sufficiently free from impurities as to be within the "Bessemer limit" to supply ore for such a plant.

The shipments of iron made during 1924 were 68 tons bog-iron ore from the *Iron King*, Alta lake, Vancouver Mining Division.

Platinum. The well-known fact of the wide occurrence of platinum throughout the Province in connection with our placer-gold deposits gives reasonable hope that such may be found in payable quantities and justifies further investigations. As far as reports received indicate, the only output this year is about $2,100 worth from the Similkameen District.

Molybdenite. Since the Armistice the market is dormant, like other metal prices, but nominal quotations vary from 45 to 50 cents a pound. No advice has been received of any shipment this year.

Chromite. In 1918 about 800 tons of chromite ore, carrying from 30 to 45 per cent. chromic oxide, was shipped from the *Mastodon* claim, Grand Forks Division; and a deposit on Scottie creek, near Clinton, was opened up, but no shipments were made. With the end of the war the market for chromite temporarily collapsed, as large stocks were available, with no purchasers in sight. It is believed that no ore was shipped since that date.

Manganese.—No manganese was produced in 1924.

Non-metallic Minerals. No fluorspar concentrates were shipped from the *Rock Candy* group, in the Grand Forks Division. This property is owned by the Consolidated Mining and Smelting Company. The growth of this property has been very interesting during the last two or three years. It is now equipped with an efficient concentrating-mill, which produced concentrates carrying about 88.5 per cent. calcium fluoride and 5.3 per cent. silica, and having a total value of about $100,000. The mineral is shipped to Trail smelter and is used for making hydrofluoric acid, which is used in the lead-refinery, and to other points in Canada and to the United States.

The Lillooet Soda Company produced 40 tons of sodium carbonate.

Deposits of hydromagnesite in the Clinton Division, which are reported to be large and of great purity, have attracted considerable attention during 1924.

Arsenic.—The *Nickel Plate* mine recovered 248 tons of arsenic oxide in 1924.

Talc.—Some 165 tons of talc was mined and ground in the Victoria Mining Division, for which product there appears to be a large demand.

Iron Pyrites.—At the *Sullivan* mine in East Kootenay 1,943 tons of iron pyrites was mined and shipped to Trail.

COAL.

The gross production of coal in 1924 was 1,987,533 long tons, of which 48,007 tons was made into coke, leaving the net production at 1,939,526 tons. These figures show a decrease, as compared with 1923, of 555,454 tons gross and of 513,697 tons net. The quantity of coke made

was 30,615 tons, which is a decrease of 28,304 tons as compared with 1923. For purposes of comparison the following table is shown:—

	1919.	1920.	1921.	1922.	1923.	1924.
Coal, gross.....tons, 2,240 lb..	2,408,948	2,696,774	2,569,639	2,580,915	2,542,987	1,987,533
Less made into coke "	141,407	101,649	85,644	69,072	89,764	48,007
Coal, net..... "	2,267,541	2,595,125	2,483,995	2,511,843	2,453,223	1,939,526
Coke made..... "	91,138	67,792	59,434	45,835	58,919	30,615

Summarizing the Provincial gross production of coal, the following table shows the output:—

	1921.	1922.	1923.	1924.
Vancouver Island mines .....tons, 2,240 lb.	1,625,931	1,754,656	1,574,663	1,486,332
Nicola-Princeton mines ..... "	183,153	270,890	227,393	226,455
Crowsnest mines..... "	759,755	554,361	740,531	273,518
Omineca-Peace River .... "	800	1,008	400	1,228
Total quantity of coal mined.. "	2,569,639	2,580,915	2,542,987	1,987,533
Less made into coke..... "	85,644	69,072	89,764	48,007
Net quantity of coal produced "	2,483,995	2,511,843	2,453,223	1,939,526

In addition to the above net production of coal, there was made by the collieries the coke production shown in the following table:—

	1921.	1922.	1923.	1924.
Vancouver Island collieries.....tons, 2,240 lb.	*Nil*	4,435	*Nil*	*Nil*
Nicola-Princeton collieries..... "	*Nil*	*Nil*	*Nil*	*Nil*
Crowsnest District collieries..... "	59,434	41,400	58,919	30,615
Total coke production.. ... "	59,434	45,835	58,919	30,615

As will be seen from the above figures, the net coal production this year is 513,697 tons less than it was in 1923.

The greater part of the gross Provincial coal production is still being mined by three companies—the Crow's Nest Pass Coal Company of East Kootenay, the Canadian Collieries (Dunsmuir), and the Western Fuel Corporation of Vancouver island, which mined, collectively, 75 per cent. of the gross output.

Of the other collieries: In the Coast District, on Vancouver island, the Pacific Coast Coal Mines, Limited, is still closed down; the Nanoose Collieries, Limited, produced 89,463 tons; the Granby Company, from its colliery near Cassidy, produced 212,470 tons; and King & Foster, conducting operations at the Old Wellington, made a production of 15,885 tons; and, in addition, the East Wellington Coal Company produced 53,726 tons. In the Nicola Valley section of the district the Middlesboro Colliery Company mined 60,408 tons; the Keystone Coal Company, Limited (formerly the Fleming Coal Company), produced 4,930 tons; the Princeton-B.C. Colliery Company, Limited, 9,862 tons; the Coalmont Colliery, 149,080 tons; the Tulameen Valley coal-mine produced 1,075 tons; and the Clear Mountain Coal Company, 1,100 tons.

In the Omineca District the Telkwa Collieries, Limited, shipped 1,228 tons. Returns from the Peace River coal property were not received in time for inclusion in this Report. These two properties for convenience have been included in the Coast District figures. The Aveling coal property did not ship during 1924.

In the East Kootenay District, in addition to the Crow's Nest Pass Coal Company, which produced 245,830 tons, the Corbin Coals, Limited, produced 27,688 tons.

The collieries of the Coast District, including the Nicola-Princeton and Telkwa fields, are to be credited this year with about 80 per cent. of the total coal-output.

The gross output of the collieries of the Province for the past year was, as already stated, 1,987,533 tons, which includes 5,019 tons of coal added to stock.

Of this gross amount, there was sold for consumption in Canada, 1,382,166 tons; sold for consumption in the United States, 209,686 tons; sold in other countries, *nil;* making the total coal sales for the year 1,591,852 tons of 2,240 lb.

In addition to the coal sold, there was used in the manufacture of coke 48,007 tons, and used under companies' boilers, etc., 170,715 tons; while 171,940 tons was lost in washing and screening.

The coke sales of the Province for the past year amounted to 30,919 tons, which includes 304 tons taken from stock, leaving a total production of coke of 30,615 tons.

The following table indicates the markets in which the coal and coke output of the Province was sold:—

Coal.	Coast District.	Crowsnest Pass District.	Total for Province.
Sold for consumption in Canada ..... tons, 2,240 lb.	1,253,305	128,861	1,382,166
" export to United States ..... "	139,012	70,674	209,686
" export to other countries ..... "	*Nil*	*Nil*	*Nil*
Total coal sales	1,392,317	199,535	1,591,852
Coke.			
Sold for consumption in Canada ..... tons, 2,240 lb.	*Nil*	22,687	22,687
" export to United States ..... "	*Nil*	8,232	8,232
" export to other countries ..... "	*Nil*	*Nil*	*Nil*
Total coke sales	*Nil*	30,919	30,919

Collieries of Coast District.

The collieries of the Coast District, which includes those on Vancouver island and in the Nicola-Princeton fields, and two small collieries, one in Omineca District and the other in Peace River District, mined 1,714,015 tons of coal in 1924, of which 4,299 tons was added to stock, making 1,709,716 tons distributed from these collieries in 1924. This amount was distributed thus:—

	Tons.	Tons.
Sold as coal in Canada	1,253,305	
Sold as coal in United States	139,012	
Sold as coal in other countries	*Nil*	
Total sold as coal		1,392,317
Used under companies' boilers, etc.		145,459
Used in making coke		*Nil*
Lost in washing, etc.		171,940
		1,709,716
Plus coal added to stock		4,299
Gross output		1,714,015

The total coal sales of the Coast collieries for the year show, as compared with the sales of the previous year, a decrease of 65,531 tons, equivalent to about 4 per cent.

The coal sold in Canada by the collieries of the Coast District this year shows a decrease of 1,636 tons, or about 0.10 per cent. less than the preceding year; the amount exported to the United States was 63,895 tons less than the preceding year, a decrease of about 30 per cent.

No coke was produced in the Coast District this year.

On Vancouver island six companies produced coal this year—the Canadian Collieries (D.), Limited, the Western Fuel Corporation of Canada, Limited, the Granby Consolidated Mining, Smelting, and Power Company, the Nanoose-Wellington Collieries, Limited, the Old Wellington, and the East Wellington Coal Company; the majority of these companies each operate two, or more, collieries. The combined gross output of the Island collieries was 1,486,332 tons.

In the Nicola and Princeton coalfields of the Coast District the Middlesboro Colliery Company produced 60,408 tons of coal; the Keystone Coal Company, 4,930 tons; the Princeton Colliery, 9,862 tons; the Coalmont Collieries, 149,080 tons; the Tulameen Valley coal-mine, 1,075 tons; and Clear Mountain Coal Company, 1,100 tons. The total output of this portion of the sub-district was 226,455 tons.

The Telkwa Collieries produced 1,228 tons. The Aveling coal property did not ship during 1924.

EAST KOOTENAY COALFIELD.

There were only two companies operating in this district this past year—the Crow's Nest Pass Coal Company, operating two separate collieries, which together mined 245,830 tons; and the Corbin Coal and Coke Company, which mined 27,688 tons; making a gross output for the district for 1924 of 273,518 tons of coal.

The amount of coal actually distributed was 272,798 tons, which, together with 720 tons added to stock, shows the total production of 273,518 tons.

Of this gross tonnage, 48,007 tons was used in the manufacture of coke, of which there was produced 30,615 tons (2,240 lb.) and 304 tons taken from stock.

The following table shows the distribution made of the coal of this district:—

	Tons.	Tons.
Sold as coal in Canada	128,861	
Sold as coal in United States	70,674	
Total sold as coal		199,535
Used by the companies in making coke		48,007
Used by the companies under boilers, etc.		25,256
		272,798
Plus coal added to stock		720
Gross output		273,518

BUILDING MATERIALS.

The output during 1924 of structural materials, such as cement, lime, building-stone, sand and gravel, brick and other clay products, was more than in the preceding year, being $2,810,580 as against $2,809,292.

Approximately 90 per cent. of the total production of building materials comes from the Coast District, and the larger part of this finds its markets in the Coast cities.

It is probable that an output amounting to about $1,500,000 represents the steady yearly demand for these materials for use in repairs, renewals, and various small demands, with a little more construction-work in 1924.

Cement production was greater than in 1923 by $162,046.

Building-stone. The production of building-stone in 1924 is valued at $43,292. Excellent building-stone of various sorts is found in abundance in almost every part of the Province; the fact of its widespread distribution has, however, been somewhat against the establishment of large quarrying industries, as a sufficient local supply could always be obtained, and, except within reach of the larger cities, few regularly equipped quarries have been opened.

On the Coast, chiefly between Vancouver island and the Mainland, there are several well-equipped quarries taking out granite, sandstone, and andesite, all of excellent quality. These quarries supply the stone building material of the Coast cities and exports are also made to the United States.

Red Brick. The production of red brick during 1924 was about 7,913 M.; the price varies from $12 to $16 a thousand, according to quality and demand. This small output shows very clearly that but little construction-work has been carried on. It is probable, however, that a considerable quantity of brick is still imported into the Province.

Firebrick. The only company producing firebrick in the Province is the Clayburn Company, Limited, with a plant at Clayburn. The fireclay is found here as a bed occurring in bedded rocks of Eocene age. Shales, sandstones, and conglomerates, all but little consolidated, make up this sedimentary series. The shales are quarried or mined for brick-making and one bed is an excellent fireclay. Associated with these rocks is a bed of lignite which is sufficiently good to be used for firing the boilers of the plant. Firebrick is the principal manufactured article produced by this company, but, in addition, considerable quantities of paving-brick, tiles, drain-pipes, fireclay blocks and shapes, and prepared fireclay are made.

Lime. The manufacture of lime is conducted in a small way at a large number of points in the Province, but only on the Coast has any attempt been made at more extensive operations. In the neighbourhood of Victoria, on Esquimalt harbour, two kilns are in operation, and there are two kilns on Saanich inlet. On Texada island —in addition to the plant at Marble bay—a new and extensive plant was erected at Blubber bay a few years ago. The limestone being used is of exceptional purity, but in some instances the limestone-beds are cut by igneous dykes which have to be rejected, and this somewhat increases the cost of quarrying.

The production of lime and limestone for 1924 is valued at $454,566, as compared with $480,210 in 1923. Of this, about $13,431 worth of limestone was quarried for use as smelter flux by the Consolidated Mining and Smelting Company and $41,844 worth quarried by the paper and pulp mills for their own use.

Crushed Rock and Gravel. The returns for crushed rock indicate a decreased demand for this material, the value of the 1924 production being $145,487; some of the plants have not been in operation for the past two or three years. During the boom years of 1911 and 1912 a number of well-equipped plants were put up near Vancouver and Victoria for supplying washed sand and gravel, properly screened to size. Some of these companies use a system of mining the gravel by hydraulic streams and carrying the product to the screens by the water used. The sand and gravel production in 1924 was $302,376.

BUREAU OF MINES.

WORK OF THE YEAR.

The work of the Bureau of Mines naturally increases year by year, this growing activity being due to the following causes: The extension of the mining area of the Province, with the proportional increase in the number of mines; the increasing desire of the outside public for the free information which the Bureau supplies with regard to the various mining districts and camps, and the appreciation by the prospector of the fact that he may obtain, gratis, a determination of any rock or mineral which he may send to the Bureau.

The routine work of the office, and the preparation and publication of the Report for the year just ended, followed by the examination in the field of as many of the mines and mining districts as the season would permit, together with the work of the Laboratory, fully occupied the staff for the year.

Shortly after the close of the year a noteworthy change occurred in the staff of the Bureau of Mines by the retirement of William Fleet Robertson, who had held the position of Provincial Mineralogist since 1898. The position was filled by the appointment of John D. Galloway, who was formerly Assistant Provincial Mineralogist from 1913 to 1917 and later Resident Engineer of No. 2 Mineral Survey District. During Mr. Robertson's long tenure of office—over twenty-seven years—the mining industry of the Province advanced materially and no one laboured harder than he to assist its growth on a legitimate and sound basis. For many years Mr. Robertson made examination trips to all the active mining districts of the Province; in later years the growth of mining made necessary the appointment of Resident Engineers to supplement and extend his work. Mr. Robertson is well and favourably known by a large mining fraternity—by no means confined to British Columbia—through the twenty-six Annual Reports which were issued under his supervision.

The permanent staff of the Bureau now consists of the Provincial Mineralogist, John D. Galloway, M.Sc.; the Provincial Assayer and Provincial Analyst, D. E. Whittaker; J. Adams as laboratory assistant; H. T. Nation, general office assistant; and H. Pearson, clerk.

MINERAL SURVEY DISTRICTS AND RESIDENT ENGINEERS THEREOF.

During the session of 1917 the Hon. the Minister of Mines brought in the "Mineral Survey and Development Act," which was passed on May 19th, 1917, and under the provisions of which the Province was divided into six Mineral Districts, to each of which there was appointed a Resident Mining Engineer with headquarters at a centrally located point in such district.

In the district to which he was appointed the Resident Mining Engineer is expected to devote his whole time to the performance of the duties of his office, and to carry on continuously a mineral survey of his district, keeping records of the same and of the mining and mineral developments taking place, and at the same time to assist prospectors and others with such advice as may be necessary and may come within the scope of a mining engineer's work.

Aside from special reports which may be called for by the Minister, the Resident Mining Engineers are expected annually to make a comprehensive report covering all matters relating to mining, mine development, and prospecting that have occurred within the year in their respective districts.

These annual reports of the Resident Mining Engineers are given later in this general Report, and form the basis of the information given in respect to the mineral industry and its development within the Province.

The following are the six Mineral Districts into which the Province is divided, with the Mining Divisions included in each and the location of the permanent office of the district, with the name of the Resident Mining Engineer appointed to each district:—

The North-western Mineral Survey District (No. 1) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Atlin, Stikine, Liard, Skeena, Nass River, Portland Canal, Bella Coola, and Queen Charlotte; and shall have its permanent survey station and office at the City of Prince Rupert. Resident Mining Engineer, Geo. A. Clothier, B.Sc.

The North-eastern Mineral Survey District (No. 2) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Omineca, Peace River, Cariboo, and Quesnel; and shall have its permanent survey station and office at Hazelton. Resident Mining Engineer: The successor to John D. Galloway has not yet been appointed.

The Central Mineral Survey District (No. 3) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Clinton, Lillooet, Kamloops, Ashcroft, Nicola, Vernon, and Yale; and shall have its permanent survey station and office at the City of Kamloops. The Resident Mining Engineer is Angus W. Davis, B.A.Sc.

The Southern Mineral Survey District (No. 4) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Similkameen, Greenwood, Grand Forks, and Osoyoos; and shall have its permanent survey station and office at the City of Grand Forks. Resident Mining Engineer, Philip B. Freeland.

The Eastern Mineral Survey District (No. 5) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Golden, Windermere, Fort Steele, Ainsworth, Slocan, Slocan City, Trout Lake, Nelson, Arrow Lake, Revelstoke, Lardeau, and Trail Creek; and shall have its permanent survey station and office at the City of Revelstoke. Resident Mining Engineer, A. G. Langley, B.Sc.

The Western Mineral Survey District (No. 6) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Nanaimo, Alberni, Clayoquot, Quatsino, Victoria, Vancouver, and New Westminster; and shall have its permanent survey station and office at the City of Nanaimo. Resident Mining Engineer, W. M. Brewer.

GEOLOGICAL INFORMATION.

By an arrangement made at the time the Province of British Columbia entered Confederation, all geological investigations and mapping in the Province would be carried on by the Geological Survey of Canada; this agreement has been fully adhered to by the Dominion Government and has proved of great benefit to the mining industry of the Province. Each year a number of geological parties are kept in the field and in the aggregate a vast amount of information is available to the prospector and the mining engineer in the many excellent reports and maps covering British Columbia which have been issued by the Geological Survey of Canada.

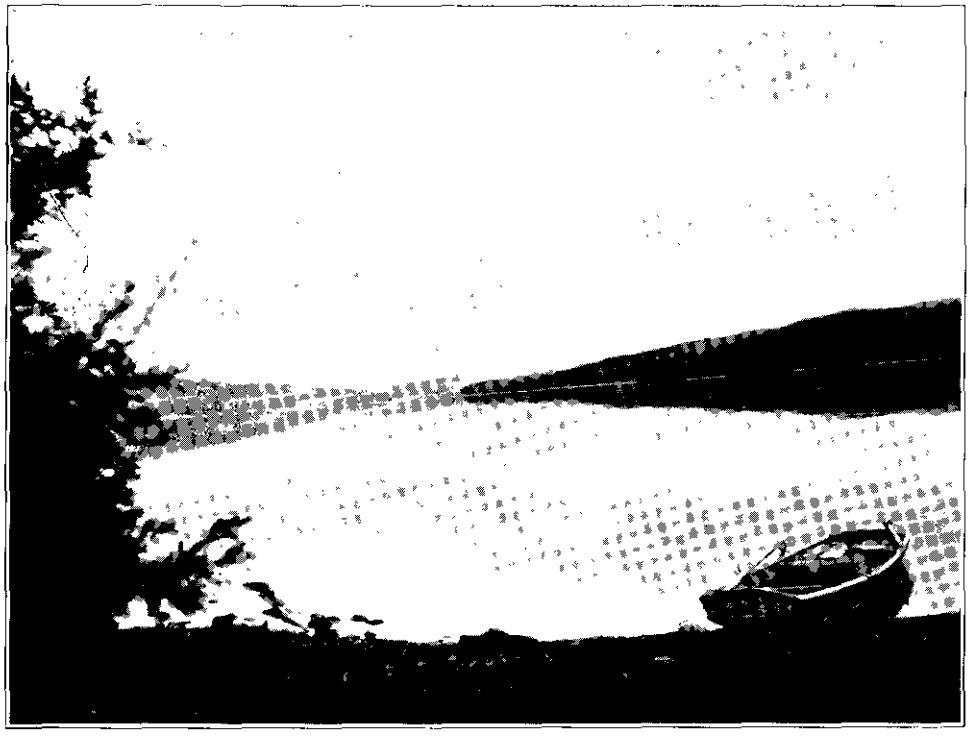
ASSAY OFFICE.

The following is a summary of the work of the Assay Office of the Bureau of Mines for the year 1924 as reported by the Provincial Assayer, D. E. Whittaker:—

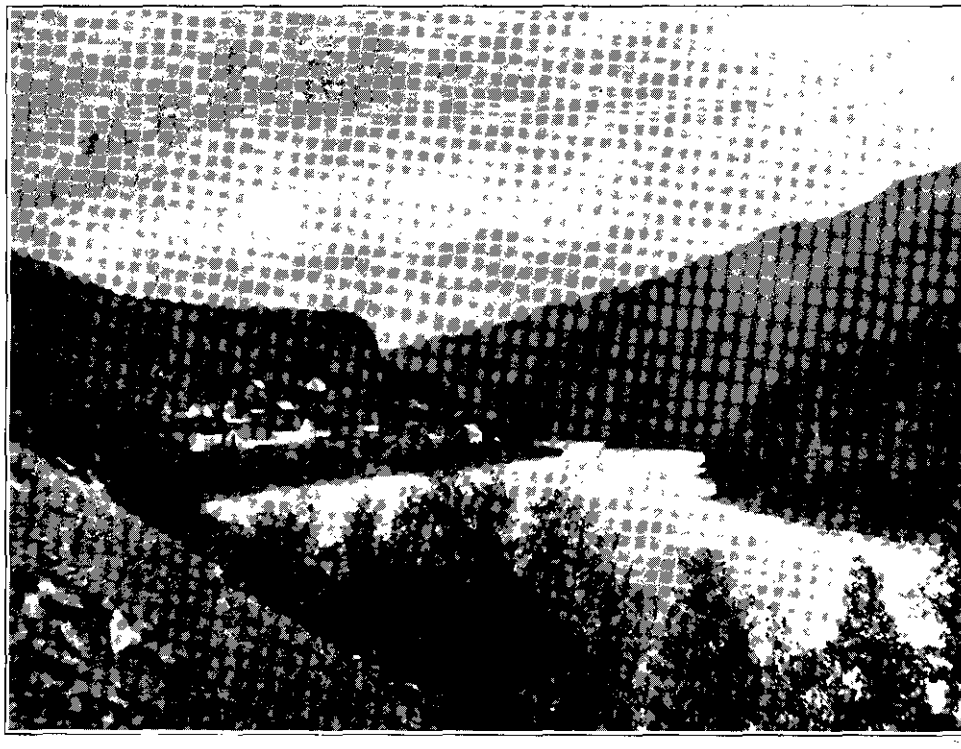
During the year 1924 there were made by the staff in the Government Assay Office 5,069 assays or quantitative determinations; of these the majority were for the Bureau of Mines or for the other departments, for which no fees were received.

The fees collected by the office were as follows:—

Fees for analyses	$ 318 75
Fees for assaying	141 00
Fees for assayers' examinations	30 00
Total cash receipts	$ 489 75
Determinations and examinations made for other Government departments for which no fees were collected—	
Attorney-General's Department	$ 471 00
Agricultural Department	1,590 00
Board of Health	560 00
Treasury Department	13 35
Other departments	133 00
	$2,767 35
Value of work done outside of Mines Department work	$3,257 10



Dease Lake.



Telegraph Creek (Town). Head of Navigation, Stikine River.

The value of gold melted during the year 1924 was $1,073.50 in 8 lots, as against $5,202 in 17 lots in 1923.

Free Determinations.

In addition to the above quantitative work, a large number of qualitative determinations, or tests, were made in connection with the identification and classification of rocks or minerals sent to the Bureau for a report; of these no count was kept, nor were any fees charged, as it is the established custom of the Bureau to examine and test qualitatively, without charge, samples of minerals sent in from any part of the Province, and to give a report on the same. This has been done for the purpose of encouraging the search for new or rare minerals and ores, and to assist prospectors and others in the discovery of new mining districts, by enabling them to have determined, free of cost, the nature and probable value of any rock they may find. In making these free determinations, the Bureau asks that the locality from which the sample was obtained be given by the sender.

EXAMINATIONS FOR ASSAYERS.

REPORT BY D. E. WHITTAKER, SECRETARY OF BOARD OF EXAMINERS.

I have the honour, as Secertary, to submit the Annual Report for the year 1924 of the Board of Examiners for Certificates of Competency and Licence to Practise Assaying in British Columbia, as established under the "Bureau of Mines Act," R.S. 1911.

A meeting of the Board of Examiners was held on May 31st and on December 7th, 1924. One candidate applied for examination on May 31st and passed the examination on that date. The Board recommended that a Certificate be issued to him. No candidate applied for exemption under section 2, subsection (2), of the Act.

In accordance with the recommendation of the Board, a Certificate has been duly issued by the Honourable the Minister of Mines to the candidate.

LIST OF ASSAYERS HOLDING PROVINCIAL CERTIFICATES OF EFFICIENCY UNDER THE "BUREAU OF MINES ACT," R.S. 1911.

(Only the holders of such certificates may practise assaying in British Columbia.)

Under section 2, subsection (1).

Adams, J. B.	Victoria.
Archer, E. G.	Anyox.
Armstrong, N.	Vancouver.
Ayres, D. A.	
Austin, John W.	Vancouver.
Backus, Geo. S.	Britannia Beach.
Baker, C. S. H.	
Bagus, N. J.	Vancouver.
Barke, A. C.	
Beilby, E. B.	Vancouver.
Bernard, Pierre	Monte Christo, Wash.
Bishop, Walter	Grand Forks.
Boulding, J. D.	Vancouver.
Broughton, F. W.	Vancouver.
Buchanan, James	Trail.
Buehman, A. S.	Trail.
Campbell, Colin	New Denver.
Carmichael, Norman	Clifton, Arizona.
Church, George B.	
Clarke, E. R.	Vancouver.
Cobeldick, W. M.	Scotland.
Collison, H.	Cobham, England.
Comrie, George H.	Vancouver.
Cotton, G. W.	Trail.
Craufurd, A. J. F.	Rossland.
Crerar, George	
Crompton, S. V.	Vancouver.
Cruickshank, G.	
Davidson, J. R.	Vancouver.
Day, Athelstan	Dawson.
Dedolph, Ed.	
Dockrill, Walter R.	Chemainus.
Dunn, G. W.	Rossland.
Farquhar, J. B.	Vancouver.
Fingland, John J.	Kaslo.
Gardner, C. S.	Victoria.
Grosvenor, F. E.	Vancouver.
Hamilton, Wm. J.	Anyox.
Hannay, W. H.	Rossland.
Harsant, R. C. C.	Port Essington.
Hart, P. E.	
Hawkins, Francis	Silverton.
Hawes, F. B.	Vancouver.
Hodgson, A. R.	Anyox.
Hook, A. Harry	Greenwood.
Hurter, C. S.	Prince Rupert.
Irwin, George E.	Vancouver.
John, D.	Haileybury, Ont.
Kiddie, Geo. R.	California.
King, R.	
Kitto, Geoffrey B.	Victoria.
Lang, T. F.	Vancouver.
Langley, A. S.	Crofton.
Laucks, I. F.	Seattle.
Lee, Fred E.	Trail.
Lee, Geo. M.	Grand Forks.
Ley, Richard H.	Victoria.
Levy, Frank	
Lindsay, W. W.	Kimberley.
Locke, V. F.	Vancouver.
Longworth, F. J.	Boyds, Wash.
Manning, S. M.	Trail.

Under section 2, subsection (1)—Continued.

Martin, S. J.	
Marsh, Richard	Republic, Wash.
Marshall, H. Jukes	Vancouver.
Marshall, William S.	Ladysmith.
Meale, Eric A.	East Helena, Mont.
Merrifield, T. T.	Trail.
Miles, Arthur D.	
Milne, A. S.	Vancouver.
Mitchell, Charles T.	Copper Cliff, Ont.
McCormick, Alan F.	Ruth, Nevada.
MacDonald, Alec. C.	Vancouver.
MacDonald, J. S.	Vancouver.
McLellan, R. D.	Vancouver.
Morgan, Richard	Trail.
Nicholls, Frank	Norway.
Okell, S. E.	Vancouver.
Parker, Robt. H.	
Parsenow, W. L.	
Perkins, Walter G.	
Pickard, T. D.	Vancouver.
Pirrie, Noble W.	Ottawa, Ont.
Poole, H. W.	Vancouver.
Prior, C. E.	Hedley.
Puder, H. F. H.	Vancouver.
Raht, K.	Trail.
Richmond, Leigh	Duncan.
Robertson, T. R.	Vancouver.
Rodgers, Ch. B.	
Rogers, G. J.	South Vancouver.
Rombauer, A. B.	Butte, Mont.
Schroeder, Curt A.	
Segsworth, Walter	Toronto, Ont.
Shepherd, G. H.	North Vancouver.
Sharpe, Bert N.	
Shore, J. T.	Vancouver.
Sim, Chas. John	Monte Carlo.
Sloan, Wm.	Vancouver.
Snyder, Blanchard M.	
Steven, Wm. Gordon	
Stimmel, B. A.	Trail.
Stockly, Galt	Princeton.
Sundberg, Gustave	Mexico City.
Tally, Robert E.	Spokane, Wash.
Taylor, E. S.	Vancouver.
Taylor, H. L.	Vancouver.
Teed, A. J.	Vancouver.
Thirkell, V. R.	Vancouver.
Thomas, Percival W.	Vancouver.
Tretheway, John H.	
Turner, H. A.	Vancouver.
Vance, John F. C. B.	Vancouver.
Van Agnew, Frank	Siberia.
Vaughan-Williams, V. L.	California.
Wales, Roland T.	
Watson, Wm. J.	Ladysmith.
Watson, Thomas	Vancouver.
Welsh, J. Cuthbert	Butte, Mont.
Wells, Ben T.	
West, Geo. G.	Vancouver.
Wenerstrom, L. H.	Anyox.
Whittaker, Delbert E.	Victoria.
Widdowson, E. Walter	Nelson.
Willemar, Douglas R.	Masset.
Williams, W. A.	Vancouver.
Williams, Eliot H.	
Williams, J. R.	Vancouver.
Wimberley, S. H.	Nevada, U.S.A.
Youngs, T. N.	Victoria.

Under section 2, subsection (2).

Archer, Allan	
Blaylock, Selwyn G.	Trail.
Bissett, D. G.	Trail.
Bolton, George E.	Silverton.
Brennan, Charles Victor	Victoria.
Browne, R. J.	Rossland.
Browne, P. J.	Nelson.
Bryant, Cecil M.	Victoria.
Burwash, N. A.	
Cavers, Thomas W.	
Clothier, George A.	Prince Rupert.
Cole, Arthur A.	Cobalt, Ont.
Cole, G. E.	Rossland.
Cole, L. Heber	Ottawa, Ont.
Conway, E. J.	Vancouver.
Coo, Cecil William	Toronto, Ont.
Coulthard, R. W.	
Cowans, Frederick	
Dawson, V. E.	Trail.
Dempster, R. C.	Rossland.
Dempster, A. S.	Rossland.
Dixon, Howard A.	Toronto, Ont.
Eardley-Wilmot, V. L.	
Eldridge, Gardner S.	Vancouver.
Fotheringham, D. F.	Trail.
Galbraith, M. T.	
Gilman, Ellis P.	Vancouver.
Gray, Stanley	
Green, J. T. Raoul	Blairmore, Alta.
Guess, George A.	Toronto, Ont.
Harding, Wilson M.	
Heal, John H.	
Hearn, Roy D.	Trail.
Hilliary, G. M.	Idaho, U.S.A.
Johnston, William Steele	Lachine, Que.
Kaye, Alexander	Vancouver.
Kendall, George	Vancouver.
Kidd, G. L.	Edmonton, Alta.
Kilbourne, Geo. H.	Vancouver.
Lathe, Frank E.	Grand Forks.
Lay, Douglas	Rossland.
Lewis, Francis B.	South Africa.
Mellish, Albert Henry	Premier.
Merrit, Charles P.	
Murphy, C. J.	St. Catharines, Ont.
Musgrave, W. N.	England.
McArthur, Reginald E.	
McBean, K. D.	Trail.
McDiarmid, S. S.	
McGinnis, Wm. C.	Queen Charlotte Ilds.
McKay, Robt. B.	Vancouver.
McLellan, John	Skidegate.
McMurtry, Gordon O.	
McNab, J. A.	Thompson, Nevada.
McPhee, W. B.	
McVicar, John	Edmonton, Alta.
Maclennan, F. W.	
Moran, P. J.	Vancouver.
Newton, W. E.	Sandon.
Oliver, Chas. E.	Vancouver.
Oughtred, S. W.	Ainsworth.
Outhett, Christopher	Kamloops.
Pemberton, W. P. D.	Victoria.
Reid, J. A.	Cobalt, Ont.
Ritchie, A. B.	Nelson.
Roaf, J. R.	
Roscoe, Harold M.	Anyox.
Rose, J. H.	Thompson, Nevada.

Under section 2, subsection (2)—Continued.

Rutherford, R. C.	Trail.
Sampson, E. H. S.	Riondel.
Scott, John Mitchell	Stewart.
Scott, Oswald Norman	
Shannon, S.	
Sharpe, G. P.	Midland, Ont.
Shorey, P. M.	Trail.
Sloan, David	Three Forks.
Stevens, F. G.	Mexico.
Stewart, A. G.	Vancouver.
Stroud, J. E. C.	Anyox.
Sullivan, Michael H.	Kellogg, Idaho.
Sutherland, T. Fraser	
Sutherland, Wm.	Glasgow, Scotland.
Swinney, Leslie A. E.	
Thompson, W. K.	Trail.
Thomson, H. Nellis	Anaconda, Mont.
Watson, A. A.	
Watson, Henry	
Weir, William	Anyox.
Willis, F. S.	Trail.
Winslow, R. H.	Vancouver.
Wilson, Ridgeway R.	Victoria.
Workman, Ch. W.	
Wright, Richard	Rossland.
Wynne, Llewellyn C.	
Yuill, H. H.	

Under section 2, subsection (3).

Carmichael, Herbert	Victoria.
Galloway, J. D. (Provincial Mineralogist.)	Victoria.
Harris, Henry	Tasmania.
Hedley, Robt. R.	Vancouver.
Kiddie, Thos.	California.
Marshall, Dr. T. R.	London, England.
McKillop, Alexander	Vancouver.
Pellew-Harvey, Wm.	London, England.
Robertson, Wm. Fleet (Provincial Mineralogist. (Retired Feb., 1925.)	Victoria.

PREVIOUSLY ISSUED UNDER THE "BUREAU OF MINES ACT, 1897," SECTION 12.

Pinder, B.	
Thompson, James B.	Vancouver.

NORTH-WESTERN MINERAL SURVEY DISTRICT (No. 1).

REPORT FOR YEAR 1924.

BY GEORGE A. CLOTHIER, RESIDENT MINING ENGINEER.

INTRODUCTORY.

The North-western Mineral Survey District (No. 1) is comprised of the following eight Mining Divisions: Queen Charlotte, Bella Coola, Skeena, Nass River, Portland Canal, Stikine, Atlin, and Liard. The total length, north and south, is about 700 miles, of which the northern portion, of about 400 miles, lies behind or east of the Alaska panhandle, at an average distance of about 30 miles from tide-water and accessible only where navigable waters penetrate the Coast range of mountains. The southern portion of the district, of about 300 miles along the Coast, is a very accessible area, a decided advantage from a prospecting and operating standpoint.

As an aid to the reader to readily grasp the general geological conditions governing the district, I think it justifiable to repeat the brief description given in my previous annual reports. From a mineral-bearing view-point the district divides itself naturally into three belts or zones—namely, the great Central Belt or Coast Range and the two flanking zones, the Eastern Contact Belt on the eastern side and the Western Contact Belt on the western or Coast side of the Coast range.

The Coast Range or Central Belt may be termed the copper-belt as exemplified by the *Outsider* mine on Portland canal, the *Hidden Creek* mine of the Granby Company at Anyox, and *Marble Bay* and *Britannia* farther south. The Western Belt produces mainly copper, but also contains numerous small gold-quartz veins. This is exemplified by the showings on Vancouver island, Queen Charlotte islands, and the outer islands of the Alaska coast. The Eastern Belt is characterized by its gold, silver, and lead deposits and their combinations as shown by the *Engineer* and Atlin silver-lead mines in the Atlin country, the *Premier* and *Dunwell* in the Portland Canal section, the *Dolly Varden* and others in the Alice Arm section, the *Bear* and other properties in the Kitsumgallum Lake area, and the Ootsa Lake and Whitesail Lake areas farther south.

In considering the Coast Range belts, the following extract from the conclusions of F. E. and C. W. Wright, of the United States Geological Survey, in their report on South-eastern Alaska, and which applies directly to this district, states: "Within the granite area itself are occasional belts of sedimentary rocks in a highly metamorphosed condition. They vary from argillites to mica, hornblende, and calcareous schists of various types, even marble, and occur in long bands intensely folded. These included schist-belts are usually not wide and more appear near the mountain-tops than at sea-level. They are usually intensely mineralized with sulphides, especially pyrite, and near the mountain-tops show abundant evidence of the contact metamorphism. They were directly above the intrusive mass and were evidently in the most favourable position to be affected by magmatic waters and heat escaping from the intrusions, so that they are the most heavily mineralized bodies."

The above form of ore-deposits is well illustrated by the *Hidden Creek* and *Outsider* mines of the Granby Consolidated, and exceptionally well in the Ecstall River pyrite-deposits which attain a width of 300 feet or more of solid sulphides, mainly pyrite.

Besides this important type of ore-bodies, there are, within the Coast Range granite-belt, quartz-filled fissures; replacement veins following dykes; quartz-filled shear-zones, etc.; providing a wide range of ore-deposits for the prospector.

The Western Contact Belt includes, for the purposes of this report, the inshore islands along the Coast as well as the Queen Charlotte group.

The reasons for the predominating occurrence of copper on the west side and of gold, silver, and lead on the east side of the Coast granite range has been discussed. In this connection F. E. and C. W. Wright say: "It is probable that at many points along the western flanks of the batholiths the schists now visible were so deeply buried at the time of the intrusion that

the invading granite did not alter them so materially as to produce wide contact change. It is significant that in these deep-seated schists and gneisses near the granite-contact no ore-bodies of consequence have been found, while rocks, farther away from the granite and nearer the surface during the invasion, in many places show contact metamorphism as in spotted schists and contain valuable metalliferous deposits."

S. J. Schofield, in a chapter on "Ore Deposits of British Columbia" in "Geology and Ore Deposits of Salmon River District," Geological Survey of Canada, says: "A fact that may throw some light on the subject is that copper-deposits are not confined to true fissure-veins, but resemble impregnations of the country-rock by minerals such as pyrite, pyrrhotite, chalcopyrite, which indicate conditions of high temperature and pressure, even bordering on those of contact deposits, whereas the gold-silver, silver-lead deposits are usually, though not always, associated with fissure-veins filled under conditions of a moderate temperature and pressure, the gold-silver being characterized by the presence of such minerals as gold, silver, argentite, pyrargyrite, etc., in a quartz gangue, and the silver-lead by galena, zinc-blende, tetrahedrite in a gangue of calcite, siderite, and sometimes quartz."

The Eastern Contact Belt extends, in this district, from Terrace north to the Yukon, a distance of about 450 miles. The general geological characteristics can best be expressed by the following excerpt from the United States Geological Survey Bulletin 347: "The character of the invaded sedimentaries east of the inland border of the granite is noticeably different from the west. The slates and sandstones are less altered and typical schists are rare. Folding and particularly faulting are common and characteristic of the whole complex. The intruded rocks are often indurated (hardened) and heavily mineralized with sulphides near the contact and show evidences of metamorphism by the intrusives. The geological interpretation of those data indicates clearly that the rocks east of the massifs (granite) were less deeply buried at the time of the intrusion than on the coastal side. In other words, the inland rocks were then above the zone of deep-seated metamorphism or rock-flowage, and were therefore profoundly affected by the invading intrusions and accompanying pneumatolytic solutions. Furthermore, the mineral-bearing solutions emanating from the granite encountered new conditions of temperature and pressure on entering the adjacent sedimentary rocks, and deposited as supersaturated solutions in these new environments a portion of their dissolved contents, especially metallic sulphides and silicates."

In discussing this question Schofield says: "It is well known that the roof of a batholith is always intensely metamorphosed by the ascending hot solutions from the underlying molten magma. On the other hand, the deeper and more vertical contacts do not show contact metamorphism to the same degree, not only as regards intensity, but also as regards areal extent. If the batholith and the intruded rocks are exposed in a plane normal to the vertical axial plane of the batholith, the plane would consist of a core of granite surrounded by a contact-zone of approximately the same width. On the other hand, if the batholith and intruded rocks are cut obliquely, the roof-rocks will be preserved higher up on the low side, whereas on the high side the highly metamorphosed roof-rocks will be entirely removed and the contact will be undulating and fairly even. The contact-metamorphic zone will be very narrow on the high side and very wide and irregular on the low side. In addition, the low side will be marked by many roof-pendants of all sizes, whereas the high side will be almost free from them. . . . It follows that, in the wide metamorphic zone on the western flank, ore-deposits of high temperature and pressure would be characteristic, but on the eastern flank a few ore-deposits of high temperature and pressure might occur along the immediate contact of the granite. Owing, however, to the low conductivity of rocks, the zone of these deposits would be very narrow and would rapidly give way to ore-deposits characterized by minerals of medium temperature and pressure. The deposits of the latter variety on the western flank are covered by the waters of the Pacific ocean."

These different mineral-belts are being constantly investigated and reported on by the Geological Survey of Canada. The reader who is interesting himself in the north-western portion of the Province is referred to the following publications for very useful information: "The Atlin District," by D. D. Cairnes, Memoir No. 37, Geological Survey, Canada; "The Unuk River Mining Region," by F. E. Wright, Summary Report, 1905, and U.S. Geological Survey Bulletin 347; "The Portland Canal District," by R. G. McConnell, Memoir 32, Geological Survey, Canada; "Salmon River District," by J. J. O'Neill, Summary Report, G.S.C., 1918; "Salmon River Dis-

trict," by S. J. Schofield and Geo. Hanson, Summary Report, Part A, G.S.C., 1920; "Eutsuk Lake District," by R. W. Brock, Summary Report, 1921, Part A, G.S.C.; "Upper Kitsault Valley, Alice Arm," by Geo. Hanson, Summary Report, 1921, Part A, G.S.C.; "Coast and Islands of British Columbia between Burke and Douglas Channels," by V. Dolmage, Summary Report, 1921, Part A, G.S.C.; "Geology and Ore Deposits of Salmon River District, British Columbia," by S. J. Schofield and Geo. Hanson, Memoir 132, Geological Survey, Canada; "Coast and Islands of British Columbia between Douglas Channel and the Alaskan Boundary," by V. Dolmage, Summary Report, 1922, Part A, G.S.C.; "Reconnaissance between Kitsault River and Skeena River, B.C.," by Geo. Hanson, Summary Report, 1922, Part A, G.S.C.; "Reconnaissance between the Skeena River and Stewart, B.C.," by Geo. Hanson, Summary Report, 1923, Part A, Geological Survey, Canada.

NOTE.—All the Geological Survey of Canada publications are procurable from the Department of Mines, Ottawa, and British Columbia reports from the Vancouver office of the Geological Survey.

PROSPECTING.

The brief geological data given should prove useful to the prospector in giving him an idea as to the conditions governing the deposition of ore-bodies in each of the three mineral-belts of the district.

A short description was given in last year's report of the most favourable and accessible areas for prospecting in the district and how to reach them. This need not be repeated here, but any prospector wanting such information need only write the Resident Mining Engineer at Prince Rupert, B.C.

Prospecting this year has probably been much more active in every part of the district than heretofore. The Portland Canal country, being in the public eye, has no doubt had its most intensive prospecting year; every prospector is combing his ground thoroughly and expending all his energies in developing his findings to the point where he can interest capital. That this system is beneficial is evidenced by the number of companies organized this year to explore these prospects. Office statistics in the Portland Canal Division show an increase of mineral claims recorded, but it is a safe statement that the majority of these are relocations or restakings by individuals who have more claims than they can possibly perform the legal assessment on; this to the exclusion of others who would stake, perform the assessment-work, and thus aid the development of the country. The Portland Canal area has been pretty closely staked up to heads of the main valley, the Salmon and Bear rivers, and probably to the heads of the tributary valleys as well. For new ground the prospector would therefore have to go over the divides, on to the Nass River slope, which of course means, unless something extraordinary was discovered, a wait of an indefinite time for adequate transportation.

The Alice Arm country has had a better than ordinary prospecting season notwithstanding the inactivity in mining in that section. Here there are more opportunities for the prospector, because the country has not been as closely staked, and also many claims have been allowed to lapse on account of the non-interest in mining, due mainly to the closing-down of the *Dolly Varden* mine and railway. Roundy and Lime creeks, the Illiance and Kitsault rivers and tributaries, all offer favourable prospecting areas.

The Kitsumgallum Lake section has had its most active season in prospecting; a great deal of country has been explored and about seventy groups of claims staked on new ground. The advancement of the truck-road from Terrace, on the Canadian National Railway, to Kitsumgallum lake and the optioning of two or three properties to outside mining men have greatly encouraged the prospectors, and I look for an appreciable expansion in mining within the next year or two. There is considerable open prospecting-ground in this section and plenty of opportunity for development-work. Hanson's report in the 1923, Part A, Summary Report of the Geological Survey of Canada, gives important information on the area and between Kitsumgallum lake and Alice Arm.

I had planned a reconnaissance trip from Terrace south to the head of Kitimat arm for this season, but lack of time prevented.

Lack of transportation has prohibited the exploration of the Unuk River area to any exteut. The route up the Unuk river by boat calls for an expensive outfit and experience in fast-water boating, for the river is dangerous at all times. It is hoped that in the near future a trail will

be built from the mouth of the river, at the head of Burroughs bay, following the west bank of the river to the mineral-belt, about 2 miles above the Alaska-British Columbia boundary-line.

Some prospecting has been done this year along the Stikine river, but amounting to nothing when the extent of country and its accessibility are taken into consideration. The granite-contact crosses the Stikine about Clearwater river and from that point east occurs the same mineralized belt that is proving so productive at Stewart, Anyox, Alice Arm, and north at Atlin. There is sufficient area of practically virgin country up the Stikine and Iskut rivers to require hundreds of prospectors to explore.

The conversion of the old pack-trail from Telegraph Creek, at the head of navigation on the Stikine river, to Dease lake into a truck-road is giving that vast area a great mining impetus and makes available an unlimited area for both lode and placer prospecting. Late this fall a report was made of a discovery of placer-ground on Gold Pan creek, a tributary of Eagle river, a distance of 8 to 12 miles east of the centre of Dease lake. While bed-rock was not reached by the discoverers, sufficient coarse gold was obtained from rim-rock to warrant the investigation of this area in the spring. It is authoritatively stated that the country for 40 to 60 miles east of this is favourable for placer prospecting.

The reoperating of the *Engineer* mine and the development of the property of the Atlin Silver-Lead Mines, Limited, will no doubt lead to further prospecting in the Atlin Division, which has everything to recommend it to the prospector for the summer season.

The Queen Charlotte islands and the Coast and offshore islands have had about the usual amount of prospecting this year, but nothing of much importance has been reported.

Altogether about 1,000 claims have been recorded in the district during 1924, practically the same as for the preceding year.

Owing to extent of territory and lack of time I have been unable this year to locate and arrange for "prospecting-trails" into new mineral areas. I believe this scheme of having prospectors themselves cut rough trails into new fields at a small cost per mile to the Government will prove very beneficial in interesting prospectors, extending exploration, and enlarging the field for development companies.

I find that the policy of the Department of Mines of granting assistance for trails under the "Mineral Survey and Development Act" to prospectors, prospect-owners, and small operators is working out to very good advantage. It is without doubt a great incentive to a prospector to open up his property when he realizes that he can obtain assistance for a trail if his showings warrant it, and similarly a small operating or development company feels it is getting somewhere if the money is spent in actual development rather than on trails.

DEVELOPMENT.

This has without doubt been the greatest development year for this North-western District. There have been about twenty-two companies incorporated during the year directly connected with properties in this district. Fourteen of these companies have had properties under development during the year, nine of which are continuing operations through the winter.

Besides these, there are of course the older companies that have been operating for a year or more, making altogether, outside of the three large producing mines, about twenty-five properties under active development in the district and several others which are being developed by individuals.

The number of operating companies is indicative of the progress and growth of the mining industry, for without these smaller stock companies there would be very little development and consequently no producers.

The large operators as a rule prefer a property at least partially developed before they will risk investment. The smaller company, which generally means the public, must therefore assume the risk of trying to make the future mines. The public should therefore use its best judgment in buying mining stock, selecting only the company whose property is endorsed by a qualified mining engineer or by a known, experienced mining man, not one reported on and boosted by the promoter or the owner. Any property worth putting on the market is worth a reliable report.

There are two properties under exploration at the extreme northern end of the Province, in the Atlin Division, that of the Atlin Silver-Lead Mines, Limited, and the *Engineer*. (*See*

report.) Besides these, there are the placer producers and others under development, which give every promise of prolonging the life of placer production for years to come, referring especially to developments on upper Spruce creek.

In the Dease Lake section there is much placer and hydraulicking ground being explored and developed and reported by the operators to be very encouraging. Two or three plants have been taken in and their success would have a far-reaching effect in stimulating prospecting and development in this little-known area.

In the Salmon River (Portland Canal) section the *Premier* mine has been steadily developing ore reserves, which assures the continued output of this property for some time to come. The B.C. Silver Mines, Limited, property has also been continuously developed both by drifting and diamond-drilling with very encouraging results. On the *Indian* deeper development has as yet proven rather discouraging, but diamond-drilling has been started from the recently completed lower tunnel. Other properties on which extensive work is being done include the *Eldorado*, *Silver Crest*, and *Hollywood* (Cronholm-Bartholf Mines, Limited).

In the Bear River (Portland Canal) section development-work has been resumed on the *Silverado*. The Portland Canal Mining Company did some exploration-work this year; the *Dunwell* has had extensive development-work done, including drifting on No. 3 tunnel, cross-cutting in No. 4 tunnel, and drifting on the vein. The *Glacier Creek* group has been considerably developed. The *Lakeview* has been steadily explored; the *L. & L.*, on Glacier creek, has shown encouraging development; the *Star* and *Dandy* (Victoria Mines, Limited); *North* and *South Line* group; the Ruby Silver Mines Company property on Mosquito creek; the *Terminus* on American creek; the *Rufus* and the *George* on upper Bear river; the *Independence;* and the International Petroleum and Developing Company, which has bonded the *United Empire* group, have without exception obtained encouraging results with the year's development.

On the Marmot river the Porter-Idaho property has had much development and substantial shipments made; the *Fraser* group and *Patricia* have also been appreciably explored.

At Anyox the Granby Consolidated Mining, Smelting, and Power Company has had a successful year. Shipments were made from the *Outsider* group at Maple bay, operated by this company. A zinc group at Alice Arm has been bonded and this will be developed as soon as weather permits. The *Golskeish* is being worked again.

At Alice Arm the *Esperanza* has been making small shipments (*see* report) and development-work has been carried on all year; the Consolidated Homestake Mining and Development Company has had the *Toric* group under development since August and recent reports are very optimistic. Considerable exploratory work has been done on the *Keystone*, on Roundy creek.

In the Kitsumgallum Lake section the Chiro Mining Company has been working on the *Bear* group, and the Kalum Lake Mines, Limited, has been developing its property on the west shore of the lake.

On the Queen Charlotte islands the P.B.C. Mines Company (a Philadelphia-British Columbia company) has been engaged in making exhaustive tests on the beach black sands in Masset inlet.

On the Coast and islands the Belmont-Surf Inlet Mining Company has had a profitable year, but it is announced by the president of the company that the mine is practically depleted of ore.

From the foregoing résumé I think I am justified in saying that, so far as this all-important branch of the mining industry is concerned, 1924 has been the most satisfactory year yet and gives a very optimistic outlook for the coming year.

PRODUCTION.

The following is a list of the shipping properties in District No. 1 and their output for 1924:—

Name of Company.	Ore mined.	Gold.	Silver.	Copper.	Lead.
	Tons.	Oz.	Oz.	Lb.	Lb.
Belmont-Surf Inlet Mines	86,500	34,583	15,781	625,238	.....
L. and L., Glacier Creek	1	.....	272	.....	481
Patterson	14	90	.....	.....	.....
Golskeish Mines, Ltd.	537	99	344	.....	.....
Granby Cons. M.S. & P. Co.	1,050,733	6,196	411,341	35,992,726	.....
Esperanza	232	28	17,501	434	334
Porter-Idaho	147	9	33,482	.....	36,501
North Fork Basin claim	8	.....	900	.....	2,000
Premier Gold Mining Co.	159,014	139,288	3,015,382	.....	452,010
B.C. Silver Mines, Ltd.	52	165	3,526	290	.....
Atlin Silver-Lead Mines	30	5	2,250	.....	17,385
Totals for 1924	1,297,268	180,463	3,500,779	36,618,688	508,711
Totals for 1923	1,072,455	155,031	3,209,724	33,408,536	81,486
Increase	224,813	25,432	291,055	3,210,152	427,225

Placer gold for 1924, $150,325.

The above tabulation of the outputs of the individual shipping properties for the year 1924 shows a decided gain not only in tonnage mined, but in the values of the three metals, gold, silver, and copper, produced in this district.

Tonnage.—The total of 1,297,268 tons is the greatest ever mined in this district in one year, showing an increase of 20.8 per cent. over that of last year. It is accounted for in the increased tonnage of the Granby, Belmont-Surf Inlet, and Premier Companies. A greater number of tons have also been shipped by the small producers, but this does not materially affect the total. Granby has mined over 200,000 tons more than last year, due to the shipments from its *Outsider* property at Maple bay and the tonnage from the *Hidden Creek* mines to the new concentrator. *Premier* also shows an increase of nearly 15,000 tons over last year.

Values.—The total values in gold (exclusive of placer), silver, and copper of $10,718,887 is an increase of $718,734 over 1923 and 1924 is the third year that the district's output has been in excess of $10,000,000.

The gold-output shows a net gain of about 25,500 oz. as shown by the table; the *Premier* and *Belmont-Surf Inlet* mines are mainly responsible for this increase. The increase over last year is therefore 16.4 per cent., or 37.1 per cent. of the total increase for the Province.

The placer-gold output for the year is $147,000 from Atlin Division and $3,325 from the Stikine and Liard Divisions, making a total of $150,325 for this district, which is about normal production.

Silver exceeds last year's output by 291,055 oz., a gain of 9.6 per cent., or 12.6 per cent. of the total increase of the Province; Granby dropped off 18,806 oz. and Belmont-Surf Inlet 1,734 oz.; Premier, however, shows a gain of 668,831 oz.; the *Esperanza* at Alice Arm increased by 6,394 oz.; and Porter-Idaho at Stewart helps out with a production of 33,482 oz., B.C. Silver with 3,526 oz., and Atlin Silver-Lead with 2,250 oz.

Copper, depending altogether on Granby and Belmont-Surf Inlet, shows an increase of 3,210,152 lb., about 9.6 per cent. over last year, and 45 per cent. of the total increase for the Province. Belmont-Surf Inlet contributed a gain of 167,716 lb. and Granby about 3,042,414 lb. Granby's output of 35,992,726 lb. is the greatest in its history.

The district therefore produced this year 36 per cent. of the total placer gold of the Province, 73 per cent. of the total lode gold, 42 per cent. of the total silver, and 56 per cent. of the total copper; practically the same percentages as last year, notwithstanding the substantial increase of each of the metals for the whole Province.

Again forecasting future production, it would seem reasonable to expect an even greater output. The Granby Consolidated Mining, Smelting, and Power Company has only had results from the new concentrator for a portion of the year, and under normal conditions, with the maintenance of its present smelter-output, will very probably show a gain next year.

The Premier Gold Mining Company under present operating conditions is probably up to capacity production. The ore reserves are, I judge, greater than proven a year ago and the outlook for some time to come is excellent.

The Belmont-Surf Inlet has not been able to develop any new ore-bodies of consequence and the depletion of its present reserves is a matter of a comparatively short time.

The development of the *Engineer* at Atlin and its equipment to a producing stage gives every reason to expect production in 1925.

The Dunwell Mines, Limited, had announced that shipments would be made during the winter, but lack of power due to the severity of the weather necessitated closing down completely. Whether the property will make immediate shipments depends on the future policy decided upon by the owners. Either shipments of sorted ore may be made or the property may be equipped with a concentrator.

The Porter-Idaho will in all probability be developed during 1925. The *Esperanza* at Alice Arm will no doubt continue to make small shipments of sorted high-grade ore. Continuous shipments to the Granby smelter are expected from the *Golskeish*, near Anyox.

From the B.C. Silver Mines, Limited, adjoining the *Premier*, a few tons was shipped, more as a trial shipment than as an indication of a steady output for the present.

Another small shipment was made during the summer from the Atlin Silver-Lead Mines, Limited, but steady production is not expected until sufficient development-work can be done to properly open up the showings.

Recent developments on the *Torie* at Alice Arm give this property a very promising chance. The *Indian*, which looked so promising in the upper tunnel, is undergoing some very interesting development at depth. Several other properties in different parts of the district have been giving very encouraging results in development.

Placer-mining has been about normal, but is gradually declining in this district. Upper Spruce creek at Atlin will doubtless keep up the present production for some years. The Dease Lake country has good possibilities and considerable development is being done each year. Experiments toward the recovery of gold from the beach black sands on Graham island are being watched with interest, as its success would mean a big industry.

SUMMARY OF THE MINING INDUSTRY.

The prospecting branch of the industry is showing increasing activity from year to year in this district, for two reasons: First, the betterment of transportation by the building of Government trails and roads and the assistance to prospectors by grants from the Mines Department have greatly lessened the hardships of prospecting; and, second, the fact that a prospector is now assured that capital is forthcoming for a meritorious showing.

From the preceding review of development the only conclusion that may be drawn is that it has been very satisfactory this year and gives every indication that next year will see even greater advancement towards greater production.

The standing of the district as the leading producer of gold and copper in the Province is very gratifying, in that it demonstrates that, given capital well spent, the district will give a good account of itself.

Summarizing, the above facts prove the stability of the mining industry for this portion of the Province and that a very optimistic view of the future is warranted.

I take this opportunity to thank the prospectors and operators throughout the district for their assistance and many courtesies.

REVIEW BY MINING DIVISIONS.

The district will be reviewed under the main headings of the Mining Divisions, subdivided into sections as follows:—

Queen Charlotte Mining Division—Graham Island section; Moresby Island section.

Bella Coola Mining Division.

Skeena Mining Division—Coast section; Canadian National Railway section; Kitsumgallum Valley section; Lakelse Valley section.

Nass River Mining Division—Observatory Inlet section; Hastings Arm section; Alice Arm (proper) section; Kitsault River section; Illiance River section.

Portland Canal Mining Division—Portland Canal (proper) section; Marmot River section; Bear River section; Meziadin Lake section; Salmon River section; Unuk River section.

Stikine Mining Division—Stikine River section; Iskut River section.

Liard Mining Division—Dease Lake section.

Atlin Mining Division—Taku Inlet section: Rainy Hollow section; Tagish Lake section; Atlin Lake section.

QUEEN CHARLOTTE MINING DIVISION.

This Division has had more activity in mining this year, due to the experiments in the recovery of gold from the beach black sands of Masset inlet and the east and north coasts of Graham island. Apparently these have been conducted in a thorough and competent manner; the results obtained, therefore, give every reason to believe that this industry will develop into something worth while.

Further oil investigations were made on the west coast and interior fields of Graham island. Shuttle island produces a little gold each year. Altogether the outlook is brighter than usual.

All the properties on the islands have been reported on from year to year, and as no development other than assessment has been done I think it unnecessary to repeat the descriptions.

The following list will show the principal properties and refer to the yearly reports in which they have been reviewed:—

MORESBY ISLAND SECTION.

	Minister of Mines' Reports.
Blue Mule group, west coast, Kootenay harbour	1920, 1922, 1923.
Early Bird group, west coast, Gold harbour	1918.
Homestake group, east coast, Cumshewa inlet	1923.
Iron Duke group, east coast, Louise island	1918–22.
Copper island, east coast, Louise island	1918, 1919.
Alder island, east coast, Louise island	1922.
Campbell island, east coast, Louise island	1922.
Jones group, east coast, Klunkwoi bay	1918.
Swede group, east coast, Lockeport	1918–21.
Shuttle island, east coast	1918, 1919, 1921, 1923.
Copper Queen group, east coast, Jedway	1919.
Producer or *Lucky Seven*, east coast, Jedway	1918–20.
Hope group, east coast, head of Houston inlet	1918.
Ikeda Mines, Ltd., east coast, Ikeda bay	1918–20.
Thunder group, east coast, Collison bay	1918.
Meal Ticket group, east coast, Collison bay	1918.
Wireless, east coast, Collison bay	1918.
Collison Bay Mining Co., east coast, Collison bay	1918.
South Easter Mining Co., Ltd., Skidegate, east coast, Graham island	1918, 1919.

GRAHAM ISLAND SECTION.

There has been great activity this year in staking and investigating the beach sands at Masset and on the north and east coasts. The records show that thirty-nine leases have been granted and six more applied for. These, being 80-acre leases, represent a total of 3,600 acres, apparently an abundance of sands if the gold recovery can be made profitable.

P.B.C. Mines Co. This is a State of Delaware incorporation with an authorized capitalization of $75,000. The head office is at Dover, Delaware. It was registered in British Columbia on March 31st, 1924, as an extra-provincial company, with a paid-up capital of $75,000, with its head office at Victoria. The company's holdings consist of seven hydraulic leases situated on the north-east coast of Graham island; one lease is recorded in the name of the company and six are owned by the three individual stockholders comprising the company.

Operations have been under the supervision of Chas. T. Cabrera, with D. R. Willemar as assayer, starting the latter part of March and continuing up to October 1st. At the time I was

on the ground, May 13th, tests were being made on sands obtained from Masset inlet, but operations were shortly afterwards transferred to Rose spit, where the majority of the experiments and tests were made. The following information was obtained from Chas. T. Cabrera, who, as stated, supervised all the work:—

Preliminary tests consisted of a thorough sampling of the sands at Masset inlet, concentration, and fire assays to determine their average gold content. Experiments in concentration were made by hand-rockers, sluicing, etc., and it was determined that any form of concentrating may be used and that an 8-to-1 concentration carried the most gold in the concentrate and the least in the tailings. Over a ton of concentrates obtained as above were used for fire assays and for cyanide-test runs in a Bracen Laboratory cyanide outfit, having two leaching-tanks holding 50 lb. each, bottom and top feed for solutions, one settling-tank, and one sump-tank. The record of results of both cyanide and fire assays was sufficiently encouraging to warrant going ahead on a producing basis, and in June the erection of a cyanide plant was started on the beach at Masset. The building is 84 by 40 feet, in which have been installed, so far, six 8- by 5-foot leaching-tanks, each with capacity of 8 tons of concentrates; the balance of the equipment will be installed, it is claimed, at an early date. An assay office complete in every detail, a blacksmith-shop, a bunk-house, and a residence have been built on land purchased in the townsite of Masset.

At Rose spit, on the north-east coast of Graham island, tests and experimental work were carried on during July, August, and September. Forty-seven test-holes, varying in depth from 6 to 12 feet, were sunk along the beach. Samples taken up the faces of these pits, cut down and assayed, gave an average gold value of 77 cents per ton.

A bunk-house was put up and an experimental cyanide plant with a capacity of 3 tons a day was installed. The equipment consists of three 5- by 4-foot leaching-tanks; two 4- by 4-foot settling-tanks; one 4- by 4-foot solution-tank; one sump-tank; one 10-compartment zinc box; an ore-car and 400 feet of 12-lb. rails; hand-pumps were used in the plant and water obtained from a well, using gas-engine and rotary pump.

Eighty tons of sands, just as they came from the beach, not screened or concentrated, were treated in this plant as follows: A charge of 3 tons was dumped into the leaching-tank and subjected to a leaching sal-soda solution for one hour; this was drained off at the rate of 6 inches per hour; the charge was then covered with one-quarter of 1 per cent. cyanide solution and treated by percolation for seventy-two hours, the solution draining into a settling-tank where the cyanide content was slightly raised before running over the zinc. Assays were made after each charge was completed of the pregnant solution and precipitates. Mr. Cabrera claims that the results were sufficiently conclusive to justify the erection of a 100-ton daily capacity plant at Rose spit.

Should this plant be successful there is plenty of area of auriferous sands for other similar enterprises.

BELLA COOLA MINING DIVISION.

There is very little information to give on the mining situation in this Division. The trail was repaired up the Saloomt river, but I have no information as to any work done on the *Saloomt* group of mineral claims owned by B. Brynildson.

On the *Concord*, *Nettie L.*, and *Dolly D.* claims on Tesla mountain assessment-work was done by the owner, Percy Godsden, of Bella Coola.

SKEENA MINING DIVISION.

There is nothing of outstanding importance to report on this Division. There appears to have been about the same amount of prospecting and recording as previous years. Government records show that ninety-six claims were staked during the year, the greatest activity being in the Kitsumgallum Lake section. There are two shipping properties in this Division, the Belmont-Surf Inlet Company and the *Patterson* group on Porcher island. There has been considerable prospecting done along the Coast and islands, as shown by the recording of a number of claims. An option was obtained by New York interests on the Martin & Shannon holdings at the head of Kutse inlet, just north of Swanson bay, in the early fall, but nothing was done toward operating it, and I have no information as to whether the option lapsed or not. This has been reported as a big showing and would mean extensive work.

Belmont-Surf Inlet Mines, Ltd.

(*See* previous Annual Reports.) The company's mining holdings are situated 7 miles up from the head of Surf inlet, on the west coast of Princess Royal island. Since opening in the fall of 1916 this property has worked continuously, producing, in a little over eight years, approximately 731,189 tons of ore mined and milled, yielding 276,056 oz. gold, 151,025 oz. silver, and 4,494,468 lb. copper; a total of over $6,500,000.

This year's production amounts to 86,500 tons of ore mined and milled, which yielded 34,583 oz. gold, 15,781 oz. silver, and 625,238 lb. copper; both gold and copper being greater than last year and the gold the greatest since 1920. The enhanced values are doubtless due to the ore obtained from the pillars in the upper levels, which provided about 50 per cent. of the ore mined. The *Pugsley* mine furnished approximately 20 per cent. of the total tonnage mined.

The lower levels have proved so disappointing in developing ore of commercial value that no further sinking was done this year; in fact, comparatively little development-work of any kind was undertaken, the total amounting to 2,724 feet, of which there were 1,263 feet of raises, 1,333 feet of drifts, 113 feet of crosscuts, and 15 feet of winze.

No information is available as to whether a dividend has been declared for the year or not. The property to date has paid $687,500 in dividends.

Unless new ore-bodies are discovered, which does not appear probable after the exhaustive exploration already done, the property will within a comparatively short time have to curtail operations, which have been carried on so efficiently by the staff at the mine, consisting of Fred Penn, general superintendent: P. W. Racey, mine superintendent; and E. Hawkins, auditor.

Millbank Group.

This group is comprised of five mineral claims—*Millbank*, *Pie*, *Summit*, *Claw-hammer*, and *Golden Ore*—formerly the *Plattenberger* group. The claims are situated about 2 miles north of Swanson bay, at an elevation of about 600 feet, and are now owned by E. H. Crawford and associates. This is an old property and considerable work has been done in prospecting, stripping the vein, and a crosscut tunnel driven about 100 feet toward the vein, which is of pyritized quartz from 6 to 12 feet in width in schist formation.

This year the crosscut tunnel was extended to about 400 feet, cutting the vein at a depth of 310 feet from the surface. No further work was done this year, it being the intention to do some drifting both ways on the vein from the crosscut tunnel next season.

This is a big showing, but values on the surface have been too low to make the ore of commercial grade. It is to be hoped that the amount of development-work being done will be rewarded with a shipping or milling-grade ore. Its ideal location would make a comparatively low-grade ore profitable.

Pink Rose Group.

(*See* Report, 1922.) This property was formerly called the *Bolton* group and is situated on the north side of the head of Klekane inlet, about 2 miles from the beach, at an elevation of 2,200 feet. The group is now comprised of seven mineral claims—*Copper Cliff*, *New Crown*, *Bella*, *Key*, *Pink Rose*, *Last Chance*, and *Bonanza*. The work done on the property since last reported on consists of some surface-stripping about 40 feet long above the upper cabin and a small open-cut. This work exposed a quartz vein up to 6 feet in width, carrying a little chalcopyrite. This can be traced on the surface for 500 feet and apparently parallels the old showing above. Also two or three open-cuts were put in on what is supposed to be the downward extension of the old showing on which the work was done at 2,300 feet elevation. The full width of the vein was not definitely determined by these cuts, but there are several feet of mineralized material from which an assay of 32 oz. silver was obtained by Mr. McLeod, one of the owners, who was on the property all summer prospecting and doing the above work.

Martin & Shannon.

These holdings consist of forty-eight Crown-granted mineral claims situated at the head of Khutze inlet, on the mountain on the south side of the Khutze river, and extend from tide-water to about 6 miles back. The original group was staked in June, 1908, by Alexander McLeod, of Vancouver. Considerable development-work was subsequently done and a tram built from the beach to the foot of the hill on which the showings were found, a distance of about 4 miles. Nothing, however, has been done for a number of years.

I expected to examine the property this fall, but the early snows had fallen on the higher ground when I made my yearly trip down the Coast. I intend making the examination in the

spring as soon as weather conditions permit. The property was under option this summer to New York interests, but nothing was done at the mine.

Drum Lummon Mines, Ltd.

(*See* previous reports.) This property has had a rather hard fight for existence. In 1915 the Drum Lummon Copper Mines, Limited, was organized and work started on the property, which consisted of fifteen mineral claims. A small compressor plant was erected and a crosscut tunnel was driven from the surface, cutting the quartz vein, cropping above, at 365 feet from the portal, and continued a further 60 feet toward the No. 2 vein, also cropping on the surface. This work shows a pegmatite vein varying in width from 1 to 15 feet in solid granite country-rock. The mineralization consists of chalcopyrite, bornite, and covellite occurring in part as small masses enclosed in the segregated quartz and feldspar, but mainly along the borders of the vein and interlaminated with the masses of mica. It is therefore difficult, from the nature of the mineralization, to compute definitely any tonnage of fixed values. This was proven by the stoping of over 1,000 tons of ore, which, after the barren quartz had been roughly sorted out, was treated on the ground in a small mill that had been erected, producing 37 tons of concentrates, which yielded $620 gold, $543 silver, and $6,930 in copper; a total of $8,093, about $8 a ton of mine-run ore stoped.

In 1921 the company was reorganized into the Drum Lummon Mines, Limited, under the supervision of Glenville A. Collins, of the Glenville A. Collins Engineers, Limited, a $50,000 incorporation, with head office in Vancouver.

A good piled dock with an approach 1,000 feet long was built; a standard-gauge railway-track 3,600 feet long laid to the foot of the hill and equipped with a 2-ton Ford truck; a jig-back tramway was constructed from the end of the track to the mine; and a 500-cubic-foot compressor driven by a 120-horse-power Diesel Snow engine erected; a commodious, convenient camp was also built; in fact, everything done to put the mine on a shipping basis except developing sufficient ore.

With a very limited available tonnage of shipping-ore and an exhausted treasury, operations ceased in May of last year. The company went into bankruptcy and in November of this year tenders were called for the purchase of the mine and equipment by the Canadian Credit Men's Trust Association, Limited. I understand that arrangements have been made whereby some of the old shareholders will resume operations at the mine.

The property could possibly be made profitable in a small way by stoping out the central, practically barren portion of the vein, and then stoping the richer ore on the walls of the vein for milling, or possibly shipping.

Patterson Group.

The group now consists of five mineral claims—*Trixie*, *Jeanie*, *Western Hope*, *King Bird*, and *Old Kentucky*—owned by Frank Patterson, of Refuge Bay. The workings are situated about a mile from the beach in Welcome harbour, from which there is a good corduroy road, built with the assistance of the Mines Department. Small shipments have been made yearly for several years, this year's being 14 tons, yielding 90 oz. gold, approximately $130 a ton. This was taken from an open-cut about 35 feet long on a vein a short distance to the south-east of and parallel to the vein from which former small shipments were taken.

The veins, which vary in width from a few inches to 2 feet, consist of pyritized quartz in a granite country-rock. The values are in gold, which varies with the pyrite content. I believe that if a number of these small parallel veins were opened up a sufficient tonnage could be developed to feed a small mill and make the property a paying one. The simplest type of mill only would be required, for all the ore needs is crushing and grinding fine enough to free the pyrite, and some scheme to separate the pyrite from the quartz—gravity concentration or flotation.

Very favourable terms could be had from the owner, Frank Patterson, and I consider it well worth investigating for a small profitable undertaking requiring small initial outlay.

Wright Group.

This property includes the four mineral claims—*I.X.L.*, *I.X.L. Fraction*, *Nabob*, and *Klim*—situated south of and adjoining the *Patterson* group. The vein and mineral occurrences are similar to those of the *Patterson*, but sufficient work, which has been limited to assessments, has not yet been done to develop any of the surface showings, from which in places good gold values have been obtained. The two properties could be worked together to good advantage with a small concentrator for both.

Eagle. This claim is owned by Joe Dawson and is situated west of and adjoining the *Trixie* claim of the *Patterson* group. About 180 feet of underground work has been done in yearly assessments. The vein and values so far as exposed are similar to the *Patterson* and *Wright* showings.

Standard Group.—This group of five claims—*Standard Nos. 2, 3, 4,* and *5,* and *Noname*—situated on Gibson island, had some open-cutting and stripping done by the owner, F. St. Amour, of Prince Rupert.

CANADIAN NATIONAL RAILWAY SECTION.

This section includes all the country bordering the railway from Prince Rupert to Terrace, a distance of 95 miles.

During the early days, when transportation was by river-boat up the Skeena as far as Hazelton, a great deal of prospecting was done along the river and many claims staked. The rock formation, consisting of crystalline schists for about 20 miles from Prince Rupert, and for the remaining distance of the main granodiorite of the Coast range, is apparently not a very favourable one for the occurrence of ore-bodies, for nothing of much importance has been found. Interest in prospecting in this section is therefore not very keen. The only property on which any considerable work has been done is the *Autumn* group, near Amsbury, owned by S. Alger, on which about 20 feet additional of tunnel was driven this year.

KITSUMGALLUM VALLEY SECTION.

The area covered by this section extends from Terrace, on the Canadian National Railway, north to the Nass river, a distance of about 54 miles.* On the eastern side of the valley a granite range extends from Terrace to about the centre of Kitsumgallum lake. On the western side is a belt of volcanics traversed by the Zymogatitz river, changing to argillites, quartzites, and tuffs south of Kitsumgallum lake, and extending along the west side of the lake and through to the Nass river, and beyond along the eastern border of the Coast Range granodiorite. The same argillite formation extends north on the east side of Kitsumgallum lake from the granite and east to the Canadian National Railway. There is an area up to 6 to 8 miles wide on either side of the Cedar river of argillites, sandstones, and shales. There is therefore a good prospecting country all the way through from the south end of Kitsumgallum lake to the Nass river and beyond.

The most prospected of this extensive area is in the vicinity of Kitsumgallum lake and some very meritorious prospects have been found. This has been the most active year as yet and it looks as if some real development would result within a year or two. Over seventy claims were staked this year.

Chiro Mining Co., Ltd. This is a Seattle company, registered in the Province of British Columbia, with a paid-up capital of $50,000. Under the supervision of O. P. Brown, the company has had a lease on the *Black Bear* group of mineral claims on Maroon mountain for the past two years, during which time some work has been done in opening up the vein and milling experiments carried on. This year a tunnel about 20 feet in length was driven. In addition to the two claims in the *Black Bear* group, *Black Bear,* and *Cub,* the company has staked the *Hornet, Wasp,* and *O.P.B.* claims.

Apparently little progress has been made toward any definite conclusion as to the working of the property. No equipment has been added to facilitate development, nor has any deep development been done to prove values, tonnage, etc., upon which treatment methods would depend.

Gold Cup.—This claim is owned by James Cauthers and adjoins the *Black Bear* group on the north. The owner did some further stripping and open-cutting this year in tracing the extension of the *Black Bear* vein.

Black Wolf Group. There are five claims in the group—*Black Wolf Nos. 1, 2, 3, 4,* and *5*—owned by Gendron, Couture, Brodin, and Olander. This group is on the southward extension of the *Black Bear* vein. The property was optioned in August to J. M. Hoar and associates, of Seattle, who has incorporated the Black Wolf Mining Company in the State of Washington. The company, I am informed, has made an initial

* G. Hanson: Summary Report, 1923, G.S.C., Part A.

payment to the owners and is proceeding with the development of the property under the management of Mr. Hoar.

Motherlode Group.—(*See* previous reports.) The upper tunnel, 350 feet above the cabin, was continued a further 25 feet this year, making a total of about 100 feet.

Assessment-work was also done on the following:—

Hornet, *Wasp*, *O.P.B.*, and *Cub* claims, east of the *Black Bear* claim, by O. P. Brown for the Chiro Mining Company.

Hawk, owned by Treston. The claim was surveyed this year.

Scenic group and *Gully* mineral claim, on Maroon creek, owned by J. Garland.

Tucy O'Neil, on Maroon creek, by the owner, Chas. Purdy.

Blue Grouse and *Hunter* groups, 8 miles north of Cedar River Crossing.

Jenny Jiggs and *Florance* claims, on east side of Kitsumgallum lake, by G. B. Cobb.

Adair, *Paris*, and *Juneau*, on east side of Kalum lake, by owner, J. Belway.

Marmot group, east side of Goat mountain, by owner, J. Egan.

Marten group, on Little Beaver river, by W. Treston, owner.

Silver Dollar and *Silver Coin*, 3 miles west of Cedar River Crossing, by Oscar Gendron.

D. Shaw completed about 2 miles of trail up Douglas creek to a suitable place for a flume and was hauling in lumber for sluice-boxes. I have not heard what success he had in washing operations.

Kalum Lake Mines, Ltd.

This company was incorporated this year with a capitalization of $75,000, *divided into 75,000 shares, the registered office being Terrace. The company's* holdings consist of the *Portland* group of mineral claims, comprised of *Portland*, *North Portland*, *Portland Heights*, *West Portland*, and *East Portland*, situated on the south-west side of Kitsumgallum lake, and formerly owned by C. A. Smith, who was the original staker.

A shaft has been sunk about 30 feet on a quartz vein averaging a foot or more in width, fairly well mineralized with pyrites, some chalcopyrite, and traces of grey copper. The heavy sulphides assay over $100 a ton in gold, and some fine specimens showing free gold, both in the sulphides and quartz, have been found. Since incorporating the company another shaft has been sunk, farther west on the vein, to a depth of about 50 feet, showing the same conditions as in the No. 1 shaft. I could not get to the bottom on account of the water. A good head-frame has been built and two good cabins on the lake-shore for camp. In all it is an ideal location, and if the vein could be traced into the hill, where a drift-tunnel could be driven instead of sinking, it would greatly reduce operating expenses. C. A. Smith has been in charge of the property and has done a very creditable amount of work for the money expended and the time of operating. With sufficient ore proven to warrant a small mill, I believe this property will give profitable returns on the investment.

LAKELSE VALLEY SECTION.

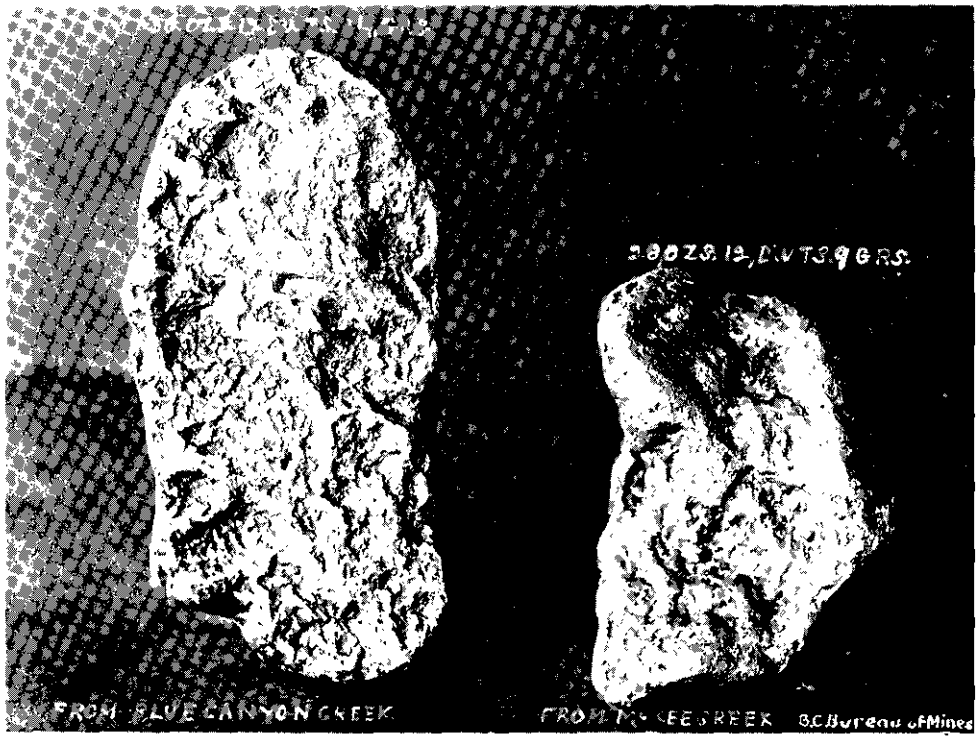
This section embraces both sides of the Lakelse valley, but the only area that has had so far any satisfactory prospecting is Thornhill mountain. This area was reported on in 1918, since which time nothing but yearly assessments by the different owners has been done. This particular section merits more attention and investigation and I will therefore give a short résumé of the more important showings.

The area has been somewhat handicapped heretofore by being on the opposite side of the Skeena river to the railway; however, the Provincial Government has this year completed a fine steel bridge across the river about a mile east of Terrace, thereby placing the properties on Thornhill mountain in a very accessible position.

Ptarmigan Group.

This group includes four mineral claims—*Ptarmigan*, *Sadie*, *St. Paul*, and *Marie*—and is owned by the Michaud Bros., old-time prospectors and trappers, who have also developed a very fine ranch in the Lakelse valley across the Skeena river from Terrace. The claims are situated on the summit and down the east side of Thornhill mountain, to which there is a horse-trail which has been kept in fair repair from year to year by grants from the Mines Department. One showing on the property, at 4,450 feet elevation, consists of a shear-vein in a wider zone of sedimentary rock, which is in turn enclosed in the granite country-rock of the Coast range. The vein shows oxidation across a width of 8 feet, sparsely mineralized with grey copper, chalcopyrite, and galena, giving low

Dunwell Mine, Portland Canal M.D.



Atlin Nuggets.

values in silver. The vein strikes N. 70° E., stands almost perpendicularly, and is a strong showing well worth gaining depth on.

On the *St. Paul* claim of this group there is an outstanding cropping of quartz up to 14 feet in width, showing for a considerable distance on the surface, striking N. 80° E. and dipping 35° N. Some work has been done on this in stripping and open-crosscutting, exposing portions of the vein well mineralized with pyrite, chalcopyrite, galena, and zinc-blende. The heavily pyritized quartz assays up to $80 to the ton in gold and the mixed sulphides as high as $60 a ton in all values. The size of this vein and the indicated mineralization and values have always impressed me very favourably. The best place from which to attack this vein would be from the adjoining group, the *Society Girl*, from which point a considerable depth would be obtained in drifting. The showings are at an elevation of 4,530 feet.

Society Girl Group.

This property consists of three mineral claims—*Society Girl*, *Silver Bell*, and *Don*—and is owned by Dan Mason and W. Bell, of Terrace. The claims lie west of and adjoining the *Ptarmigan* group. The owners have done a considerable amount of prospecting and surface work in the way of stripping and open-cutting. This work has revealed a number of small quartz veins, but of somewhat low grade. The big quartz vein from the *St. Paul* claim of the *Ptarmigan* group extends into this group and is in my opinion the best showing to work on, as it is the most advantageous place from which to open up this vein.

Beaver Group.

This group is comprised of four claims—*Beaver*, *Golden Lady*, *Star*, and *Fisher*—and was formerly called the *Lucky Seven* group. The claims lie on the west slope of Thornhill mountain. O. P. Brown, acting for the Chiro Mining Company, of Seattle, has had a bond on the property for two years. A great deal of prospecting-work has been done on the property, especially by the former owners, Olson & Dahl. A number of small veins have been exploited, but nothing of a permanent character has been exposed. One vein yielded, by mortaring and panning, several hundred dollars in free gold. Some very fine specimens were obtained from this vein, but the gold was pockety and further exploration of it was disappointing.

The showing that gives the best promise of developing into something worth while is on the *Beaver* claim. This is a quartz vein, from 2 to 4 feet wide, exposed along the bed of a creek for several hundred feet. Considerable work in open-cutting has been done on this vein, which shows a fair average gold value. I have no information as to the work being done on this by Mr. Brown.

Assessment-work has been done on the *Copper Queen* group, situated on Williams creek, owned by Jack Bell; *Surprise* group, on Williams creek, by the owner, R. H. Eaton; the *Big Bull* and *Lakelse* claims, owned by T. Turner; and the *Golden Penny* claim, by E. Hoult.

NASS RIVER MINING DIVISION.

This Division extends from the mouth of Portland inlet north to the head of the Kitsault river, a distance of about 70 miles. The two chief mining centres are Anyox and Alice Arm. The Government recording office is at Anyox. The Canadian National Coast-plying boats run to Anyox once a week, and the Union Steamship Company's boat also calls at Alice Arm and Anyox once a week. There is a tri-monthly launch service from Alice Arm to Anyox.

The town of Alice Arm, at the head of the arm of the same name, is the chief distributing centre for the Kitsault valley and tributary creeks, the Illiance river, and down Alice arm proper.

The Dolly Varden Railway extends from tide-water at Alice Arm, 18 miles up the west side of the Kitsault river, to the *Dolly Varden* mine. Though the mine has been closed down for the past two or three years, the Provincial Government maintains the railway for hand-cars and speeders, enabling prospectors and operators to get in supplies quickly and cheaply.

From the end of the railway there is a good pack-trail to the head of the valley, 26 miles from Alice Arm, with branch trails up the main tributary streams. There are six bridges and a cableway across the Kitsault at points most convenient for prospectors.

There is also a first-class pack-trail up the Illiance river for 16 miles, and fair trails up Lime and Roundy creeks, which empty into Alice arm, a couple of miles down from the head.

There is mail launch service once a week up the Nass river to Aiyansh from Mill Bay, a port of call for the Union Steamship Company's boats during the summer months. From Aiyansh roads extend through the Nass valley; there is a trail up the Nass river to Meziadin lake: a

trail across to the Illiance river, and thence to Alice Arm; and a trail south to Kitsumgallum lake, from which there is a motor-road to Terrace, on the Canadian National Railway. The Division is therefore very accessible for prospecting and mining development and the roads and trails are being improved and extended each year by grants from the Mines Department.

The following reports, by Geo. Hanson, of the Canadian Geological Survey, covering the mineral areas of this Mining Division will be found very interesting and useful: "Upper Kitsault Valley," Summary Report, 1921, Part A; "Reconnaissance between Kitsault River and Skeena River," Summary Report, 1922, Part A; and "Reconnaissance between Skeena River and Stewart," Summary Report, 1923, Part A. These may be procured on request from the Department of Mines, Ottawa.

The Division has the distinction of being the second largest producer in the Province, due to the operations of the Granby Company at Anyox. There are two small shippers in the *Golskeish* near Anyox and *Esperanza* at Alice Arm. There are a number of very promising showings in the Kitsault River, Illiance, and Alice Arm (proper) sections. The encouraging results from the development of the *Toric* group on the upper Kitsault river may be an incentive to further exploration-work on other properties. I think if the *Dolly Varden* were forgotten entirely there would be no difficulty in interesting capital in this Mining Division.

Government office statistics show very little difference from last year; the number of claims recorded was a little less and the number of assessments recorded, 366, a few more.

Observatory Inlet Section.

Granby C.M.S. & P. Co., Ltd.

(*See* previous reports.) The company has been operating continuously throughout the year, employing in all operations an average of about 1,000 men. The year's output consists of 6,196 oz. gold, 411,341 oz. silver, and 35,992,726 lb. copper, the greatest yearly production of copper ever attained by the company. These figures bring the total production of the company, since it started ten years ago, to 65,393 oz. gold, 3,452,350 oz. silver, and 292,424,500 lb. copper.

The coke plant this year produced about 57,000 tons coke; 426,000 imperial gallons tar; 1,300,000 lb. ammonium sulphate; 110,000 lb. ammonia liquor; 108,000 imperial gallons motor-fuel; 6,000 imperial gallons tar paint; and 12,000 lb. naphthalene.

The new features in connection with the company's operations this year were the shipping from the *Outsider* group on Maple bay and the starting of the new 1,500-ton capacity concentrator at the Anyox plant. (*See* flow-sheet in 1923 Report.)

The *Rambler* quartz-quarries at Anyox were closed down in September, having furnished 16,400 tons of quartz for fluxing purposes.

The *Outsider* group, starting in February and employing an average of fifty-six men, shipped to the smelter at Anyox, for fluxing uses, 27,940 tons of siliceous copper ore, averaging about 1.35 per cent. copper. Practically all this tonnage was mined between the 900-foot level, working-tunnel, and the 1,070-foot level (above), accounting for the low copper content of the ore.

The only development done during the year was 160 feet of drifting on the 900-foot level, 100 feet on the 1,295-foot level, and about 180 feet of chute raises from the working-level (900 feet), preparatory to shipping from the upper levels where the ore has been proven to be of better grade. New outside work consisted of a warehouse at the beach and a steel house and bunk-house at the mine. The latter is a two-story frame building, 29 by 100 feet, plastered throughout and steam-heated, the upper floor containing sixteen rooms, each 11 by 12 feet, containing two single beds; the lower floor comprises the reading-room, barber-shop, commissary and cook's quarters, laundry, furnace-room, dry-room, wash-room, showers, etc. The mine has been put in charge of two men from Anyox, who are mining the ore under contract for the Granby Company.

The new concentrator was started in April, treating about 500 tons a day and producing a 9.6-per-cent. copper concentrate. The feed was gradually increased until in August it reached between 1,200 and 1,300 tons daily, which has been maintained for the remainder of the year, when a concentrate of 16-per-cent. copper was being produced. It is expected that a 2,000-ton daily capacity will be reached in the near future and that still further improvements will be made in the hydrometallurgy.

The smelting of the concentrates locally was found to be expensive and unsatisfactory and they are now being shipped to Tacoma; in the meantime sintering experiments are being made.

Another innovation is the screening-out of the fines from the ore sent to the smelter and treating them in the concentrator.

The personnel of the Anyox staff is as follows: H. S. Monroe, general manager; J. B. Haffner, general superintendent; G. M. Lee, smelter superintendent; John Swanson, mine superintendent; George Leslie, coke-plant superintendent; W. B. Maxwell, concentrator superintendent; C. M. Bagwill, chief accountant.

HASTINGS ARM SECTION.

This section lies north from Anyox to the head of Hastings arm and also includes the area up the Sutton river. Several groups of mineral claims have been staked above the granite, which extends about 5 miles up from the head of the arm. Improvements are being made on the trail from year to year by the Mines Department, but little more than assessment-work may be reported until the trail is in better condition.

ALICE ARM (PROPER) SECTION.

This includes the country tributary to Alice arm, of which Lime and Roundy creeks, emptying into the north-east side of the arm, are the most important areas.

There is a fair foot-trail up Lime creek to its head and the trail up Roundy creek was improved this year to permit of pack-horses going through to the *Keystone* group. Any extensive development would, however, necessitate the building of good pack-trails. These areas are well mineralized and have had a lot of prospecting, but as yet nothing has been found of much promise.

Keystone Mining Co., Ltd.

This company was incorporated in January, 1923, with a capitalization of 200,000 shares at $1 a share, to take over the *Sunset* group of seven mineral claims staked and owned by G. W. Morley, and seven other mineral claims from O. M. Gray, all situated on Roundy creek. The registered office of the company is stated as 921 Birks Building, Vancouver.

I have always considered the property interesting and worthy of some development on account of the geological features, the showings lying in a broad belt along the contact of the argillites and the Coast Range granite. The operations of the company have been of a very desultory nature. This year a log cabin was being built and it was the intention to continue driving the old tunnel, started by the owners, Morley & Clary. I understand that work was closed down after short operation and that wages are still unpaid.

Such operators and operations are not very nourishing to the local mining situation or to the mining industry in general.

Theda Bara and Bebe Daniels.

These two mineral claims were formerly owned by Frank Jones, but R. Inghram purchased an interest in them this summer and the partners did considerable exploratory work. The claims adjoin the *Sunset* mineral claim of the Keystone Mining Company's ground. The tent camp is at 3,000 feet elevation and the first workings at 3,350 feet, just over the end line of the *Sunset*.

The showing here is a quartz vein mineralized with pyrite, galena, zinc-blende, striking S. 38° E. into the hill and dipping 73° S.W. The country-rock is argillite more or less broken up close to the vein. The main fissure is apparently about 10 inches wide, but the quartz widens out in spots into the hanging-wall, making a vein width up to 4 feet. An open-cut has been run in on the vein at this point, exposing a face about 12 feet high. Along the bottom of the cut there is good-looking ore for the width of the fissure, about 10 inches, but the values are low, a sample across this giving only a trace of gold, 1.5 oz. silver to the ton, and 5 per cent. lead. The cut should be continued into the hill as a tunnel to get a little depth and see if there is any improvement.

Farther up the hill the owners were working on another showing of a different character. Here there is a quartz vein about 5 feet wide lying along a diorite dyke, honeycombed on the surface and very heavily pyritized where broken into. It strikes N. 30° E. and would therefore intersect the galena vein about 300 feet up the hill from the open-cut. The iron-cropping is a strong, well-defined vein and would be well worth developing if the values warranted. I took a sample of heavy sulphides off the surface, but only obtained a trace of gold and 1.5 oz. silver to the ton. I advised them to crosscut it from a convenient point which would give about 10 feet

depth. This was done, but there was no improvement in values. It looks very probable that the galena vein is the extension of the vein on the Keystone Mining Company property.

These are the only two properties on which anything was being done on Roundy creek.

ILLIANCE RIVER SECTION.*

This section had a great deal of prospecting and exploratory work a few years ago, but nothing of any note appears to have developed and interest has therefore lessened, particularly in the upper part of the valley. On McGrath mountain, to which there is a branch trail from the main Illiance River trail, assessment has been maintained on several groups.

The only work being done this year in the upper valley was by W. B. Bower on the *Monarch*, *Silver Star*, and *Silver Leaf* groups, which have been described in previous reports.

Silver Leaf Group.

This group is composed of four mineral claims—*Silver Leaf*, *Silver Leaf No. 1*, *Silver Leaf No. 2*, and *Silver Leaf No. 3*—staked and owned by James Nick, of Alice Arm. The claims are situated about 7 miles from the mouth of the river, just opposite Copper creek, on the south bank of the Illiance. The general rock formation is banded argillite striking N. 50° E. and dipping about 55° E. in this immediate area. Several dykes were noted cutting the bedded formation at different angles, as well as smaller dykes interbedded with the argillite. The showing lies in a deep gulch, up which there is a steep trail from the cabin to the tunnel. The cabin is at 800 feet elevation and the tunnel at 1,200 feet.

The vein is a breccia of quartz and country-rock up to 10 feet in width, striking S. 15° E. into the hill, following the bottom of the gulch, and dipping 55° W., therefore cutting the country-rock bedding in both strike and dip. There has been intense movement since the vein was formed, resulting in another quartz-filled fissure about midway between the foot and hanging walls of the original vein, up to 6 inches in width, and in which fissure is found the values. The quartz is mineralized with pyrite, with which is associated grey copper. A sample gave only a trace of gold and 3.5 oz. silver, showing that the grey copper does not carry high silver values.

A tunnel had been driven on the vein about 20 feet with no apparent improvement. Because of the surface up the gulch showing a well-defined vein from which fair values had been obtained by the owner, I advised a short continuation of the tunnel before abandoning it.

KITSAULT RIVER SECTION.†

This section takes in all the Kitsault valley and tributary valleys, from tide-water at the town of Alice Arm to the head of the river, about 26 miles in length and 4 miles in width.

The mining situation, which has been most discouraging for the past two or three years, due mainly to the non-operation of the *Dolly Varden*, shows some signs of improving. The *Esperanza* mine has been making small shipments all year. The Consolidated Homestake Mining and Development Company secured a bond on the *Toric* group and from late reports the work done is proving very encouraging. (*See* report under *Toric*.) The Kitsault River Mining and Development Company, Limited, has recently been incorporated to develop some claims up the Kitsault. It is reported that the Granby Consolidated has bonded the *Standard* group on McGrath mountain and that the *Silver Band* group, also on McGrath mountain, has been optioned. All indications are that the mining barometer has a tendency to rise.

Too much emphasis cannot be placed on the importance of the work of the Geological Survey, Canada, by Geo. Hanson in this section (and others). Very comprehensive reports and geological maps have been issued in the Summary Reports of the Department. The operator will study them and the prospector should.

The Dolly Varden Railway has been kept in repair for the use of hand-cars and speeders, which is indispensable to the prospectors up the valley.

About the same amount of prospecting and development work is done each year by the resident prospectors, in preparation for the time when the inaction will be removed and the country will get its merited attention.

Minister of Mines' Reports, 1919–20–21. Hanson, Geological Survey, Canada, Summary Reports, 1922, Part A, and 1923, Part A.

† Hanson, Geological Survey, Canada, Summary Reports, 1921, Part A; 1922, Part A; and 1923, Part A. Previous Minister of Mines' Reports.

Esperanza. This property, consisting of three claims situated on the west side of the Kitsault, about a mile from the town of Alice Arm, is owned by Mr. Fraser, in charge at the mine, and six associates at Anyox. R. Armour, of Anyox, is the secretary of the syndicate. It has been a very consistent small shipper for a number of years, though it has never had any plant of any kind on it and never a very large crew. It has shipped probably $100,000 worth of ore altogether. This year the production amounted to 232 tons of ore, yielding 28 oz. gold, 17,501 oz. silver, and a few hundred pounds of lead—a very creditable output. Experiments were made in shipping second-grade ore to Granby.

At the request of the owners I made an examination of the property late this year and had all the ore and dumps sampled. The object of this was to ascertain whether the average ore in the mine would make a profitable milling-ore. Heretofore the vein has all been mined and the high grade sorted out for shipment, the second grade going to the dumps. From my sampling I found that the entire vein in the present working-tunnel, averaging 40 inches in width, would average $12 silver a ton with silver at 67 cents an ounce, which I estimate will yield a profit of at least $4 a ton after the property is equipped with compressor, small concentrator, etc. There are two ore-shoots in this tunnel, aggregating about 80 feet in length, that will average about $25 a ton for a width of 33 inches. These ore-bodies would yield a good profit to mine and mill. The remainder of the ore would not pay to mine and mill, but would pay to mill after being mined to get the high grade.

The dumps will average about 16 oz. silver to the ton as nearly as they could be sampled. These would yield a good profit if concentrated. My conclusion was that a small capacity mill is a necessity and warranted by the present ore on the dumps and in the mine.

Samples of scheelite were picked from the dump and tested, my sample assaying 20 per cent. tungstic acid. This could not be profitably brought up to a marketable grade by hand-sorting, but in the event of a mill being erected on the property might make a very profitable by-product.

The property has not by any means been exhausted so far as development is concerned, and altogether presents an undertaking with very probable chances of success.

Lyon Group. This group consists of six mineral claims—*Lyon, Lyon No. 2, Owl, Owl No. 2, Owl No. 4,* and *U.S.*—situated about 1½ miles straight up the hill above Alice Arm. The owners are Neil Forbes, Hector McColl, Fred Martinson, and Matt Drager. The country-rock is argillite, in which lies a vein-dyke about 8 feet in width of a light-grey rock softer than quartz, in which occur small stringers of quartz mineralized with pyrite, galena, and zinc, assaying as high as 500 to 600 oz. silver to the ton.

At an elevation of 1,565 feet an open-cut and slight incline was driven on the vein-dyke for about 50 feet until the water became unmanageable. Below this cut at an elevation of 1,500 feet a crosscut tunnel was driven 84 feet to cut this vein-dyke and a drift on it for 30 feet, showing the same conditions as above. Further work is being done this winter.

At no place in the vein-dyke were the high-grade quartz stringers numerous enough to make it profitable to sort them out for shipping, nor are they sufficient to raise the whole vein-dyke to a milling-grade ore. Some pieces of ore on the dump show cobalt bloom.

Bunker Hill Group. (*See* 1923 Report.) The seven claims of this group, owned by James Calvin and Jos. Trethewey, are situated on the east side of Haystack mountain on a small fork of Granite creek. The claims have been surveyed this year preparatory to Crown-granting. Further work has been done by the owner, J. Calvin, in tracing the vein farther up the hill. Also, a trail was built from the *LaRose,* to which there is a first-class trail from the railway.

Rex. This claim is owned by Archie McPhail and is situated on the Dolly Varden Railway about Mile 16. The general country-rock consists of the massive volcanic rocks of the Dolly Varden formation, as named by Hanson. The showing on the claim as disclosed by a small open-cut about 250 feet above the railway is a quartz vein of undetermined width, probably 2 or 3 feet, striking N. 60° W. and dipping about 50° S.W. The vein can be traced down the hill to the Kitsault river.

In the quartz are spots of a soft, grey, sericitic-appearing material impregnated with very fine pyrite. A sample was taken of the quartz to check the owner's claim of obtaining $4.80 platinum a ton and $10.80 gold a ton. My sample, however, gave no platinum, $1.60 gold, and 0.6 oz. silver to the ton.

The vein has been broken into only in one or two places and no doubt should be further explored, as the above-claimed platinum and gold values would make a nice mill-feed.

Canyon. This claim, owned by Wm. McFarlane and Geo. Bruggy, of Alice Arm, is situated on the east side of the Kitsault river, north of and adjoining the *Homeguard* or *Central* group and nearly opposite Mile 14 on the Dolly Varden Railway. This year the Government built a bridge across the Kitsault at this point, making properties in this vicinity on the east side of the river very accessible.

The general rock formation on the *Canyon* claim is grey andesite. The showing is a shear-vein up to 6 to 8 feet in width, lying in the deep bed of a creek and striking N. 70° E. and dipping 35° to 40° N.W. It can be traced down the hill along the bluffs for a considerable distance. The shear contains veins of quartz mineralized in places with pyrite, chalcopyrite, and traces of galena, all of average low values, but specimens have been obtained assaying up to 125 oz. silver.

About 500 feet above the cabin at the end of the new bridge and at an elevation of 1,100 feet a tunnel has been driven in on the vein about 20 feet.

Homeguard Group. This was formerly called the *Central* group, for which *see* previous reports. This year the owner, Wm. McFarlane, discovered what appears to be the vein in-place on the crest of the first bench at an elevation of about 1,600 feet. There are a number of immense boulders of ore on this property on the side-hill, on which considerable work was done before it was found out they were only boulders and not the vein in-place. The owners have done a lot of prospecting and exploratory work endeavouring to find the vein in-place from which these great boulders come, as they showed good values and a vein up to 12 to 15 feet in width. The recent discovery mentioned above is supposedly the vein, and it has many of the ear-marks, though it is not so wide, nor is the mineralization as heavy nor the values as high. However, it is something to work from, and the vein may be stripped and followed down the hill to a convenient point from which to start a drift-tunnel.

Basin Group. This property consists of six mineral claims—*Basin* and *Basin Nos. 1, 2, 3, 4,* and *5*—all owned by Angus McLeod, of Alice Arm. They are situated in the basin at the heads of Goat creek, which empties into the Kitsault river above the *Dolly Varden*, just below the new bridge, and East creek, which empties into the Kitsault river about 6 miles below the *Dolly Varden*. The present route follows up Goat creek over the divide at 3,000 feet elevation and down into the basin to the cabin at 3,790 feet, taking about three hours from McLeod's cabin on the east bank of the Kitsault opposite and just below Camp 8. I judge the distance to be about 4 miles. The trail is only a rough one made by Mr. McLeod in going up and down.

The best route to the property and to that area in general would be a trail up East creek from the Kitsault river, with a cable or bridge across the Kitsault from the railway side. Such trail would be probably about 3 miles in length. A trail up East creek will be recommended.

The general rock formation of the basin at the head of the two creeks is grey andesite. The mineral-showings on the group consist of a wide mineralized shear-zone, probably 50 feet wide, striking north and south and showing in the face of the mountain to the north. The shear-filling is a breccia of country-rock, quartz, and calcite, mineralized with disseminated, small bunches and veinlets of chalcopyrite. In places there occurs fairly well-disseminated grey copper, which, however, does not carry any silver values.

The croppings of the vein have been opened up a little by two or three open-cuts, but the country is flat and no great depth could be obtained without sinking unless by a crosscut tunnel from the foot of the bluffs on the south-east side of East creek, which would likewise be an advantageous point from which to diamond-drill the ore-zone.

I took a chip sample around one of the small open-cuts, representing about 5 to 6 feet of the zone, which gave a trace of gold, 4 oz. silver to the ton, and 2.2 per cent. copper.

The mineralization is too large for a prospector to make any appreciable showing on with the limited amount of work he can do under the conditions. I therefore advised Mr. McLeod to select the most favourable place and cut a trench across the full width of the zone; this would enable any one examining it to get some idea as to the mineralization and an average sample across it.

Silver Hoard Group.

This group of four claims, consisting of the *Silver Hoard Nos. 1, 2,* and 3 and *Silver Hoard Fraction,* is owned by A. Davidson, Alice Arm, and partner. The claims are situated north of and adjoining the *Wolf* group of the Dolly Varden Mines, Limited, holdings. The new work done this year on this property consists of two open-cuts, one on the Trout Creek trail and the other some 150 feet higher up on the vein. The lower of these cuts exposes a vein about 12 feet wide, consisting of a breccia of grey andesite country-rock with seams of quartz and calcite, the whole fairly well mineralized, chiefly with pyrite and a little galena, and evidently low grade. A depth of about 12 feet at the face of the cut shows the vein to be standing almost perpendicularly and striking about north and south. A chip sample taken from the small dump of ore gave assay returns of 4.6 oz. silver to the ton and a trace of lead.

The upper cut has a depth of about 10 feet at the face, showing the vein to be about 10 feet in width, with 1 foot of quartz near the foot-wall, well mineralized with galena, and showing traces of chalcopyrite, grey copper, and zinc-blende; the remainder of the vein carries little or no mineralization. A sample taken from the foot of ore gave 47 oz. silver and 17 per cent. lead.

Toric Group.

This property was described in last year's report and therefore need not be detailed again. It consists of four mineral claims—*Toric, Anglo, Moose,* and *Lamb*—situated on the east side of the Kitsault river, opposite the *Dolly Varden* and *North Star* properties. The property was staked and is still owned by the Strombeck Bros., of Alice Arm. In August of this year it was bonded by the Consolidated Homestake Mining and Development Company, Limited, which, under the management of A. C. Gerhardi, had been developing for the past two seasons the *Homestake* group of mineral claims at the head of the Kitsault river.

When I was on the *Toric* in the latter part of August a frame bunk-house had been completed; a tunnel-site cleared, faced up, and the collar sets in; and a compressor was on the ground being erected. Since that time a very creditable amount of work has been done. The tunnel was driven a considerable distance through slide-rock, necessitating careful timbering, and was therefore slow work. At 223 feet from the collar the foot-wall of the vein was encountered and a crosscut of 58 feet continued in it without reaching the hanging-wall. Mr. Gerhardi states that the first 8 feet averages 44 oz. silver and that the whole is milling-grade ore. Chunks of ore from the first 8 feet were brought down, showing native and ruby silver and argentite, indicating similar conditions to those on the surface, 200 feet above on the dip of the vein.

Later work consists of drifting from the tunnel on the foot-wall of the vein to the west, a distance of 90 feet, and at 50 feet crosscutting into the vein for 20 feet. At the time of writing this report the ore-body has been proved to be as good if not better than where first encountered.

From present indications this development looks like a very important strike and one that may have a far-reaching effect on the whole section. Mr. Gerhardi is to be recommended for his energy in pushing this work through under difficult conditions, which unfortunately are not always appreciated by the man behind the money. The further development of this property will be of great interest.

Second Thought Group.—(*See* Minister of Mines' Reports, 1918, 1921.) This year some drifting was done on the vein, both ways from the tunnel, and I am informed the work exposed some promising-looking ore.

There are a number of properties in the Alice Arm country that have been reported on from time to time, but as only assessment-work has been done on them each year for the past two or three years, very little change has been made in them. I therefore think it unnecessary to repeat descriptions of these properties and will refer the reader to the following list of the more promising properties, giving their location and years in which each has been reported in the Annual Report:—

	Minister of Mines' Reports.
Independent group, Alice Arm	1918, 1919.
Lone Maid group, above Esperanza	1922, 1923.
Alice group, above Esperanza	1922, 1923.
Alice Arm LaRose Mining Co., Paul Kladuck creek	1918–20.
Wild Cat group, Homestake creek	1918, 1921.
Copper Cliff group, opposite Trout creek	1918.
David Copperfield group, adjoins *Dolly Varden*	1919.

	Minister of Mines' Reports.
Dolly Varden Mining Co., Ltd., 18 miles up from Alice Arm	1918–22.
North Star, adjoins *Dolly Varden* on north	1918–22.
Vanguard group, 4 miles north of *Dolly Varden*	1918, 1919, 1922.
Lucky Strike group, north of *Vanguard*	1922.
Matilda, above *Homestake*	1918, 1921.
Tip Top, adjoins *Homestake*	1918.
Fox, adjoins *Tip Top*	1918.
Blue Ribbon group, adjoins *Homestake* on the north	1921.
Homestake group, 26 miles up Kitsault	1918, 1919, 1921, 1923.
Columbia group, Clearwater creek	1918–22.
Black Diamond group, Clearwater creek	1922.
Summit group, head of Clearwater creek	1921, 1923.
Last Chance group, Trout creek	1918–20, 1923.
Climax group, Trout creek	1919, 1922.
Moose group, adjoins *Climax* and *Silver Horde*	1918–21.
Second Thought group, south of Clearwater creek	1918, 1921.
Wolf group, north of *Musketeer*	1918–20.
Musketeer group, north of *Tiger*	1918–20, 1922.
Tiger group, adjoins *Toric* on north	1918, 1919.
Ruby group, adjoins *Toric* on south	1919, 1921.
War Dance group, N.E. fork of Kitsault	1919.
Silver Band group, McGrath mountain	1918.
Standard group, McGrath mountain	1918.
Red Bluff group, Illiance river	1922.
Copper Creek group, Illiance river	1921.
Bellevue group, Illiance river	1920, 1921.
United Metals Mining Co., Ltd., Illiance river	1918.
Silver Bell group, Illiance river	1918, 1921.
Monarch group, Illiance river	1918, 1921.
Silver Star group, Illiance river	1918, 1921.
Silver Cliff group, Illiance river	1918.

PORTLAND CANAL MINING DIVISION.

The following publications dealing with this Division will prove invaluable to any one interested in the geological features and ore-deposits of this portion of the Province:—

Minister of Mines' Reports, 1918 to date.

Portions of Portland Canal and Skeena Mining Divisions, Skeena District, B.C., by R. G. McConnell, Geol. Survey, Canada, Memoir 32, 1913.

Geology and Ore Deposits of Salmon River District, B.C., by S. J. Schofield and Geo. Hanson, Geol. Survey, Canada, Memoir 132, 1922.

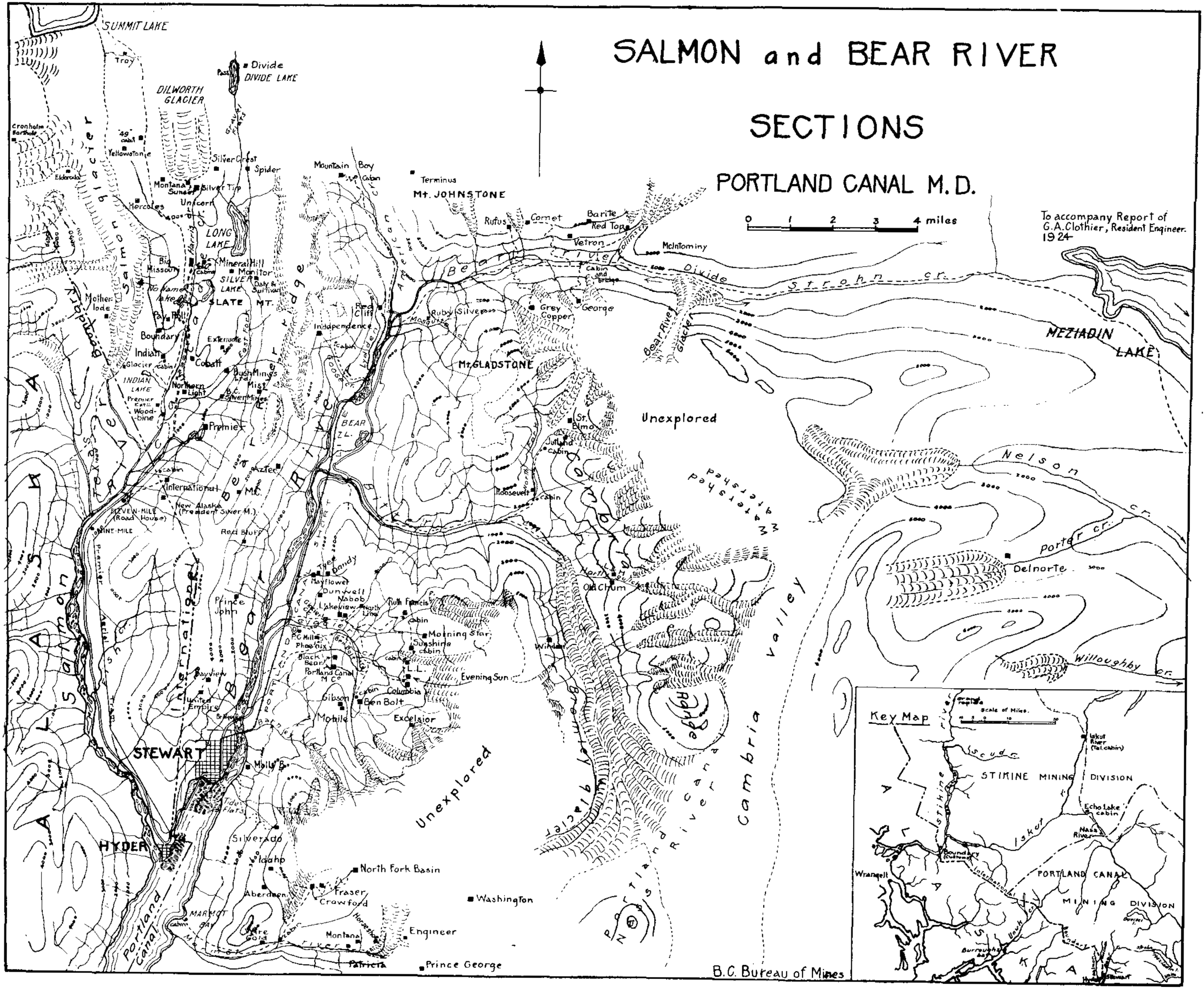
The Geology of the Portland Canal District, by Victor H. Wilhelm, Mining and Scientific Press, Vol. 119, pp. 95, 96, 1921.

Notes on the Salmon-Unuk River Region, by J. B. Mertie, Jr., U.S. Geol. Survey, Bulletin 714, pp. 129–142, 1921.

Ore Deposits of the Salmon River District, Portland Canal Region, Alaska, by Lewis G. Wistgate, U.S. Geol. Survey, Bulletin 722-C, 1921.

Coast and Islands of British Columbia between Douglas Channel and the Alaska Boundary, by V. Dolmage, Geol. Survey, Canada, Summary Report, 1922, Part A.

The Division includes the region north of Pearce island, in Portland inlet, on the east side of Portland canal (the west side is Alaska), to the summit of the range between Portland canal and Observatory inlet, and north to Mount Brown, from which point northwards it includes the whole drainage area of the Nass river. This northern portion, though over the Bear River divide, is included in the Division for the reason that it is reached by way of Stewart, where the Government office is located, and therefore the most convenient for recording and obtaining information from Government records.


SALMON and BEAR RIVER
SECTIONS
PORTLAND CANAL M.D.
0 1 2 3 4 miles
To accompany Report of
G.A. Clothier, Resident Engineer.
1924
SUMMIT LAKE
Troy
Divide
DIVIDE LAKE
Pass
DILWORTH
GLACIER
Gravel Flats
Cronholm
'49'
Yellowstone
Silver Crest
Spider
Eldorado
Montana
Sunset
Silver Tip
Hercules
Unicorn
Mountain Boy
Terminus
Mt. JOHNSTONE
LONG
LAKE
Big
Missouri
Mineral Hill
Monitor
SILVER
LAKE
Daly & Sullivan
No Name lake
Pay Roll
SLATE MT.
Mother-lode
Boundary
Extenuate
Indian
Glacier
Cobalt
Bush Mines
INDIAN
LAKE
Northern
Light
Mist
B.C. Silver Mines
Premier
Wood-bine
Premier
Boundary
Salmon
glacier
Bear
River
Ridge
Red
Cliff
Independence
cabin
American cr.
Rufus
Comet
Barite
Red Top
Vetron
McIntominy
Bear River
Cabin and bridge
Divide
Strohn cr.
Ruby Silver
Grey
Copper
George
Bear River
Glacier
MEZIADIN
LAKE
Mt GLADSTONE
Unexplored
BEAR
R.L.
St.
Elmo
Jutland
cabin
Watershed
Aztec
M.C.
International
cabin
ELEVEN-MILE
(Road House)
NINE-MILE
New Alaska
(President Silver M.)
Red Bluff
Roosevelt
cabin
Nelson cr.
Porter cr.
Delnorte
Tyee
Dandy
Mayflower
Dunwell
Nabob
Lakeview
Ruth Francis
cabin
Old Chum
Prince
John
Morning Star
Sunshine
cabin
Windsor
Willoughby cr.
Phoenix
Black
Bear
Portland Canal
M Co
L.L.
Evening Sun
Columbia
Bayview
United
Empire
Gibson
Ben Bolt
Mobile
Excelsior
Cambria valley
Cambria Ridge
International
Boundary
Salmon
ALASKA
STEWART
Molly B.
Tide Flats
Unexplored
HYDER
Silverado
Idaho
North Fork Basin
Aberdeen
Fraser
Crawford
Washington
MARMOT
BAY
Gold
Montana
Engineer
Patricia
Prince George
Portland
Canal
Portland
Canal
River
Texas cr.
Marmot
Portland
Glacier
Key Map
Scale of Miles.
Iskut River (Tel. cabin)
STIKINE MINING DIVISION
Echo Lake cabin
Nass River
Boundary (Customs)
Wrangell
Iskut
Stikine
PORTLAND CANAL
MINING DIVISION
International
ALASKA
B.C. Bureau of Mines

The town of Stewart, at the head of Portland canal, is the distributing centre of the Division. It is the most northerly seaport in the Province and therefore the natural outlet for all the great interior country east of the Coast range. Stewart has a weekly service by both the Canadian National and Union steamships from Vancouver and Prince Rupert; a Dominion telegraph service and a radio office at Hyder, Alaska, 2 miles from Stewart.

Salmon river has a good auto-road from Stewart to the *Premier* mine, a distance of about 17 miles, from which branch trails serve all portions of the upper Salmon valley, being extended each year as necessity demands. Bear River valley is also made accessible by auto-road as far as Bitter creek, 8 miles from Stewart, at present. The Government this year completed a bridge across the Bear river above Stewart at a total cost of over $50,000. The old wagon-road extends through to the *Red Cliff* mine, 14 miles from Stewart, but a portion of it at Muddy gulch is impassable and pack-horses must be used beyond this point. This part of the road should, and no doubt will, be rebuilt the coming year and the upper end improved so that trucks may get through to American creek. The main trail extends from the end of the wagon-road up Bear river and over the divide down to Meziadin lake, 32 miles from Stewart. Branch trails up all the tributary creeks make this whole region very accessible for handling mining supplies.

The Government office statistics for the year show 361 miners' certificates issued; company licences, 11; mineral claims recorded, 536; assessments done, 811; bills of sale recorded, 252; and certificates of improvement or applications for Crown grant, 70; as a whole showing the continued activity for the year.

During the year there were twenty companies incorporated which are directly interested in mining in the Portland Canal Mining Division. Of these, ten actively operated during the summer season, six of which continued work throughout the winter. Altogether there are fifteen companies operating this winter in the Division, making this year easily the most active and progressive one the Division has ever had. The total production of the Division for the year was $4,952,955, due of course to the large output of the *Premier* mine, which again disbursed $1,715,000, or 34 per cent., in dividends, making a total of $6,649,625 dividends in a little over three years' operations.

The B.C. Silver Mines made a small shipment this year and late development-work has given the management great encouragement.

The Indian Mines Corporation has not had very encouraging results from the deeper development, but exploration is now being pushed by diamond-drilling.

Other groups of claims in the upper Salmon valley that are developing favourably are the *Eldorado, Troy, Silver Crest*, etc.

Altogether there has not been a widespread development on the Salmon river this year; the Bear River valley seems to have monopolized attention.

The *Outsider* group of claims at Maple bay, on Portland canal, has been brought to the producing stage by the Granby Consolidated at Anyox. This year the property shipped 27,940 tons of siliceous copper ore to the company smelter at Anyox.

The *Dunwell* has been successful in cutting the vein with the No. 4 tunnel, showing conditions identical with the upper levels.

Other properties under development are: *Lakeview, North Line* and *South Line, Dandy*, by the Victoria Mines Company, Limited; *Glacier Creek;* L. & L. Glacier Creek; Ruby Silver Mines, *Terminus, Independence, Rufus, United Empire, Silverado, Porter-Idaho*, and others. Besides which, a great deal of prospecting has been done as evidenced by the fact that assessments were performed on 811 properties during the year.

Everything considered, I think this year has been a most progressive one in this Division and the number of companies operating will make 1925 a greater one.

Timely assistance in the matter of trails, etc., has been rendered the prospectors and small operators by the Mines Department. The Bear River road, as stated before, will no doubt be put in order to the *Red Cliff* this year. A start should then be made on the continuation of this road up the Bear river towards the divide, with the idea of ultimately extending it to Meziadin lake, and beyond, to furnish an outlet for the "inland empire" until such time as that country justifies a railway. The route should be carefully selected and surveyed and with an expenditure each year it could be gradually advanced.

PORTLAND CANAL (PROPER) SECTION.

This section consists of the country bordering the eastern side of Portland canal from Pearce island north to its head at Stewart. It should not be confused with the entire Portland Canal Mining Division.

Outsider Group.—(*See* last year's report.) For this year's operations the reader is referred to this property under the heading of the Granby Consolidated Mining, Smelting, and Power Company, Limited.

Maple Bay Group. Further diamond-drilling was done on these claims during the summer. Three holes were drilled on the *Eagle* claim and one on the *Princess May*, but the values were considered too low to justify the large outlay required to put the property on a paying basis, and the option was therefore thrown up.

Georgia River Mining Co. This company's holdings of two claims on the Georgia river, I am informed, are still under option to the American Mining and Milling Company. The latter company has also a number of other claims in that immediate vicinity, but nothing very much has been actually done on the property toward developing it.

Gloria Group. This group, consisting of twelve claims, *Gloria Nos. 1* to *12*, inclusive, was first taken over by the Gloria Mining Company, but last year the North Country Mining Company, Limited, was incorporated, with a capitalization of $200,000 of an equal number of shares, to take over, apparently, the same property. The claims are situated at the head of Bulldog creek, a small stream emptying into the east side of Portland canal about a mile below the mouth of the Marmot river.

I did not get up to the property this year because of the snow, but Mr. Linke, the original staker of the claims, who had been working on the property all summer, surface prospecting, etc., informed me that it would require considerable exploratory work to try out some of the surface exposures.

MARMOT RIVER SECTION.

This is the drainage area of the North and South forks of the Marmot river, which latter empties into the east side of Portland canal about 4 miles below Stewart, from which point it is reached by boat, there being no trail down the east side of the canal.

There was a good pack-trail from the beach at Marmot bay to the forks, about 2½ miles, but the incessant rains and the daily traffic of from thirty to forty pack-horses bringing ore from the *Porter-Idaho* property transformed it into a trench of mud until it finally became impassable in the fall. Emergency work was done with grants from the Mines Department, but to meet the requirements the whole should be corduroyed of wagon-road width from the beach to the forks at least. A small floating dock was put in this year to facilitate loading ore. This will also require to be enlarged and improved.

The eastern contact of the Coast range crosses just about the forks, and above that is therefore very favourable formation for the deposition of ore. The area has been pretty fully staked and the development of the *Porter-Idaho* property to the shipping stage has induced a great deal of prospecting and developing.

A small shipment of high-grade ore was also made from the *Fraser* group on the North fork. It is very probable that several small shippers will develop, and I believe that extensive exploratory work would prove very substantial bodies of at least milling-grade ore.

Porter-Idaho Mines, Ltd. (*See* 1922 and 1923 Reports.) The *Idaho* group consists of the eight mineral claims—*Gem of the Mountain*, *Sunday*, *Never Sweat*, *Lucille*, *Prickley Heat*, *Nettie L.*, *Protector*, and *Slide*. In the fall of 1923 the Porter-Idaho Syndicate was formed to acquire this property. The syndicate issued 15,000 units of par value of $10 each, of which 6,600 were placed in the treasury to be used for the development of the mine and 8,400 units issued as purchase price of the property.

Work was started on the property early in the year under the management of Clay Porter, one of the original owners. A trail was built from the west side of the glacier up to the camp, buildings were erected for camp, and improvements made on the Government trail from the forks up. A contract was let to W. Harner for packing ore to the beach. During the summer over 200 feet of tunnels were driven and 147 tons of ore was sorted out and shipped, yielding 9 oz. gold, 33,482 oz. silver, and 36,501 lb. lead. This is indeed a very creditable showing for the

first year's operations, with all the attendant difficulties of situation, camp and trail construction, starting of mining, etc., and Clay Porter is to be commended.

Owing to the pressure of supplying sufficient ore to keep the pack-train going and other work, very little advance development was accomplished during the season. The property therefore now needs extensive underground and surface work preparatory to the economical mining and handling of ore for further shipments.

A new company, the Porter-Idaho Mines Company, Limited, has recently been incorporated, under the laws of British Columbia, with a capitalization of $2,000,000 in 4,000,000 shares, to take over the holdings of the Porter-Idaho Syndicate. The registered office of the company is at Stewart.

The company is in good shape financially to proceed with the opening-up of the property and a portion of the new stock will be sold to provide further funds. A crosscut tunnel will be driven, as soon as work can be commenced in the spring, at a point where the two veins should intersect, which should be a very favourable point for an ore-body and will obtain good depth. Mr. Porter will continue supervising the work at the mine.

North Fork Basin.

This claim is owned by William Fraser, of Stewart, and associates, and is situated at an elevation of 4,300 feet in the North Fork basin of the Marmot river. Considerable work was done on the claim some years ago, consisting of surface cuts and a 42-foot shaft which followed the vein down a portion of its way, but eventually cut into the foot-wall, necessitating a crosscut of 17 feet from the bottom of the shaft to the vein. The vein is quartz, 8 to 12 inches in width, carrying high silver values where mineralized with galena, zinc-blende, and grey copper. Two tons were sorted from the shaft and cuts on the surface several years ago and shipped, returning 22 per cent. lead, 22 per cent. zinc, and 200 oz. silver to the ton.

The wall of the vein was traced from the shaft down the hill and a drift-tunnel driven on it to a point underneath, and about 30 feet lower than, the bottom of the shaft without locating the vein.

This year an option was taken on the property by W. Harner, who put up a temporary camp and drove a crosscut a distance of 92 feet to the right, cutting 30 feet of vein-matter but not to the hanging-wall, the work having to be stopped on account of the coming of the snow. While this work was being prosecuted 8 tons of ore was taken from a small open-cut above the collar of the tunnel and shipped, returning 900 oz. silver and 2,000 lb. lead, and assaying 13.7 per cent. zinc.

Other groups and claims on the North fork are:—

	Minister of Mines' Reports.
Fraser group	1919, 1923.
Aberdeen group, adjoining *Porter-Idaho* on the south and west	.....
Crawford, below *Fraser* group	.....
Brown's claims, east side of Glacier, opposite *Porter-Idaho*	.....

Groups and claims on the South fork are:—

Patricia group	1921–23.
Montana group	1919, 1921, 1923.
Engineer group	1921, 1923.
Prince George group	1921.
Washington group	1921, 1923.
Horseshoe claim	1919, 1923.

Wire Gold Group.

This group, consisting of four mineral claims—*Wire Gold*, *Wire Gold Nos. 2*, *3*, and *4*—is owned by John Ryan and partners, of Stewart. The claims are situated just off the main trail up the Marmot river on the north side, at an elevation of about 200 feet and about 2 miles from the beach. Two years ago the owners put up a fine log house on the beach along the river just below the showings.

The general rock formation here is the granodiorite of the Coast range, which extends about half a mile farther up the valley to the forks of the Marmot river. The showing is a pyritized quartz vein striking N. 25° E. and dipping 65° W. A drift-tunnel has been driven 40 feet on the vein, starting on about 2 feet of ore at the collar of the tunnel and showing about a foot in the face, all carrying low values in gold. The vein is very clean cut, with free walls. It can be seen cropping in oxidized spots in the perpendicular bluffs above.

It is claimed that free gold has been found in the quartz, but I was unable to find any. The property is ideally located and a comparatively low-grade ore would pay. On account of the precipitous bluffs, drifting on the vein is apparently the only way to explore it.

BEAR RIVER SECTION.

This section includes all the Bear River valley and tributaries thereto from Stewart north. It has a great revival of mining this year, due to the very gratifying results obtained in the development of the *Dunwell* mine on Glacier creek. During the summer there were at least fifteen companies carrying on development-work, of which nine are continuing work throughout the winter, the greatest activity yet seen in the Bear River section. The symptoms of real mining development are becoming more pronounced each year, and the "wild-catter" is at least in some instances changed to a "tame-catter."

Some worthy development-work has been done by the small operators this year, and, while all cannot be successful, many of the properties are showing considerable merit.

The Dunwell Mines, Limited, has demonstrated the continuation of its ore-bodies to the fourth level and is now in an excellent position for serious development. The Glacier Creek Mining Company has done a lot of underground work and will now further explore its ground by diamond-drilling. The Lakeview Mines, Limited, has very successfully opened up its property, above the *Dunwell*, this year. The *North Line* and *South Line* group of claims also has demonstrated that extensive development is justified. The Victoria Mines, Limited, has, I judge, a good chance on its ground adjoining the *Dunwell* on the north. The L. & L. (Glacier Creek) Mines, Limited, has proven a considerable tonnage of high-grade ore, warranting further expenditure. The Silverado Mining Company, Limited, is exposing good-grade ore in the present tunnel being driven to cut known veins on the surface. The Terminus Mines, Limited, will prove the vein at depth when the present crosscut tunnel reaches it. The Independence Gold Mining Company, Limited, has very promising ground to explore. The Rufus Silver-Lead Mines, Limited, made a good start in the right direction in the prospecting and mapping of the surface. The International Petroleum and Development Company is doing some deep crosscutting to get under any favourable outcrops on the *Inland Empire* group. The Ruby Silver Mines, Limited, is prospecting a promising-looking vein.

In addition to these companies there is a very appreciable amount of individual prospecting and development being done in all parts of this section. This region has been pretty well staked, especially close in, but exploration-trails are being extended yearly as an aid and inducement for wider prospecting.

Silverado Group. This group consists of four claims and a fractional claim, owned by John Haahti, J. W. Stewart, of Stewart, and associates. The property is situated on the east side of the head of Portland canal, above the town of Stewart, and at an elevation of about 4,000 feet. It has been reported in the Minister of Mines' Reports of 1921, 1922, 1923, to which the reader is referred.

Subsequent work consists of the driving of the old tunnel 122 feet, making it a total length of 385 feet from the portal. A short tunnel 12 feet long was driven on the vein 100 feet south of the main tunnel. Forty feet of drifting was done on what is known as the gold vein, at 3,200 feet elevation. Several open-cuts have been put in near the lower camp.

The main tunnel is being extended for the purpose of cutting two other parallel veins which outcrop above, and in which good average silver values are obtained on the surface. Should these veins prove equal to expectations from the surface showings, this property can no doubt be developed into a paying undertaking. Its situation is ideal for transportation. The present aerial tram can be extended from the mine to tide-water. Under present conditions it is not particularly pleasant for winter work, but these could be readily improved if extensive work were planned.

There is a small bunk-house at the tunnel, telephone connection to the office in Stewart, and a cache and barn at the lower camp.

Phoenix Silver Mines, Ltd. (Portland Canal Tunnels Company.) This company was incorporated this year with a capitalization of $500,000, divided into 2,000,000 shares, with its registered office at Victoria. Its holdings consist of ten Crown-granted mineral claims formerly owned by the Portland Canal Tunnels Company, which some years ago drove a crosscut tunnel 3,500 feet into the hill, from which about 1,600 feet of drifting

was done on four veins intersected by the main tunnel. None of the drifts exposed commercial ore of any importance.

The first two veins, the *Lucky Boy* and *Melba*, and probably the third, the *Richard*, would if extended to the south be in the Phoenix Silver Mines, Limited, ground. The *Lucky Boy* and *Melba* would rise into the Portland Canal Mining Company's ground within a comparatively short distance. All on the premise, of course, that they maintain their strikes and dips as indicated on the surface and in the long tunnel.

The *Melba* vein in the long tunnel is presumably the Portland Canal Mines Company vein on which the work was done by that company at the head of the tramway. If the drift were extended from the long tunnel to underneath the Portland Canal workings, a distance of about 6,000 feet, it would gain a depth of about 2,200 feet. The *Melba* vein has been drifted on a distance of approximately 500 feet, of which approximately 300 feet is in the Phoenix Company ground, without finding commercial ore of importance. The face of this drift is now very probably in Portland Canal Mines, Limited, ground and would have to be driven 700 feet to 800 feet farther before entering the company ground again on the *Olga* claim.

The General Mining and Finance Company of London did not take an option on the Portland Canal Mining Company holdings as intimated in the prospectus of this company, the Phoenix Silver Mines, Limited. It is very improbable that the Portland Canal Mining Company would do any development or exploratory work from this tunnel, since the tunnel starts on a claim owned by the Glacier Creek Mining Company. The information given in the prospectus of the Phoenix Silver Mines, Limited, is very limited and vague.

Portland Canal Mining Co., Ltd.

The holdings of this company, consisting of eleven claims and fractions, are situated on the east side of Bear river, about 4 miles up from Stewart. It is one of the oldest properties in this section and the company was one of the first to operate in the Portland Canal country. The property was closed down in the fall of 1911 and nothing has since been done on it until this year. The reader is referred for a full description of the property to the Minister of Mines' Report of 1910, and "Portions of Portland Canal and Skeena Mining Divisions, Skeena District, B.C.," by R. G. McConnell, Memoir 32 of the Geological Survey of Canada.

The successful development of the *Dunwell* mine in this immediate area during the past year or two revived interest in this property, and I therefore made an examination of it early in the summer.

The old underground workings were thoroughly sampled and all open-cuts and exposures of the vein on the surface for a distance of over 1,000 feet were also sampled. I found that there is no available tonnage of ore exposed in the mine; that there are several places underground that warrant further exploration; that at no place sampled on the vein down the hill were the values sufficient to expect an ore-body with development. My conclusion is that the deposition of commercial ore in this vein depends upon the influence of intersecting cross-fractures, and particularly intersecting mineralized cross-veins, as in the case of the *Dunwell*.

Very thorough surface prospecting should therefore be done along the vein to find out if possible the point of intersection of other veins which have been discovered on adjoining claims and properties. In this connection the *Gypsy* vein should be investigated. Some work along these lines was done this summer without, I understand, very encouraging results.

Black Bear.

This claim is owned by George Matheson, of Stewart, and partners, and is situated east of and adjoining the *Gypsy* claim of the Portland Canal Mining Company's holdings. At an elevation of 1,500 feet there are two outcrops showing a brecciated vein of quartz and argillite country-rock over 10 feet in width, apparently striking N. 50° W. and dipping about 50° S. (about paralleling the *Dunwell* vein on the opposite side of Glacier creek). A little work has been done on the lower of these showings, but not sufficient to get through the oxidized, broken-up surface material. The vein-filling is mineralized with pyrite, galena, and a little zinc-blende, the typical ore of this locality. Picked samples of the best galena and zinc ore have given assays up to 60 oz. in silver. The vein is well worth doing some work on and would be worth the attention of the Portland Canal Mining Company to trace it through if possible to its intersection with the main north-south zone with the hope of obtaining *Dunwell* conditions.

Glacier Creek Mining Co., Ltd.

This company was incorporated in October, 1909, with a capitalization of $500,000, divided into 1,000,000 shares. Its registered office is at Victoria. At that time the company holdings consisted of the five mineral claims—*Riverside, Nellie V., Last Chance, Lucky Boy,* and *Lulu*—to which has recently been added the *Victory* claim. Up to 1912 a crosscut tunnel 264 feet long had been driven from the gulch-bed towards cutting the two east veins—the "Central" and "Green" veins—of the vein series exposed on the *George E.* claim of the Stewart Mining and Development Company, adjoining the *Lulu* on the north. This work brought the face of the tunnel up to 175 feet from the eastern boundary of the *Lulu* claim and to the limit of the company ground.

This year work was resumed; the old camp was re-established, a branch air-line 1,600 feet of 2-inch pipe connected with the main line to the *Dunwell,* blacksmith-shop and snow-shed built, and the mine equipped with a heavy drifter-machine, track, cars, etc. The old drivage was continued 376 feet, about 200 feet on the *Victory* claim, making the total length of the tunnel 640 feet. The "Central" vein, which was encountered at about 325 feet in from the mouth of the tunnel, was drifted on a distance of 84 feet, disclosing a well-defined vein but finding no commercial ore.

At 455 feet from the portal the "Green" vein was cut and drifted on for 90 feet, showing the same strong, well-defined vein as opened up on the *George E.* claim, north of and adjoining the *Lulu* and *Victory* claims. No ore of importance was found in the vein in that distance, but there is over 200 feet remaining to the north line of the *Victory* claim.

I am informed by the management that diamond-drilling will be done this winter.

Dunwell Mines, Ltd.

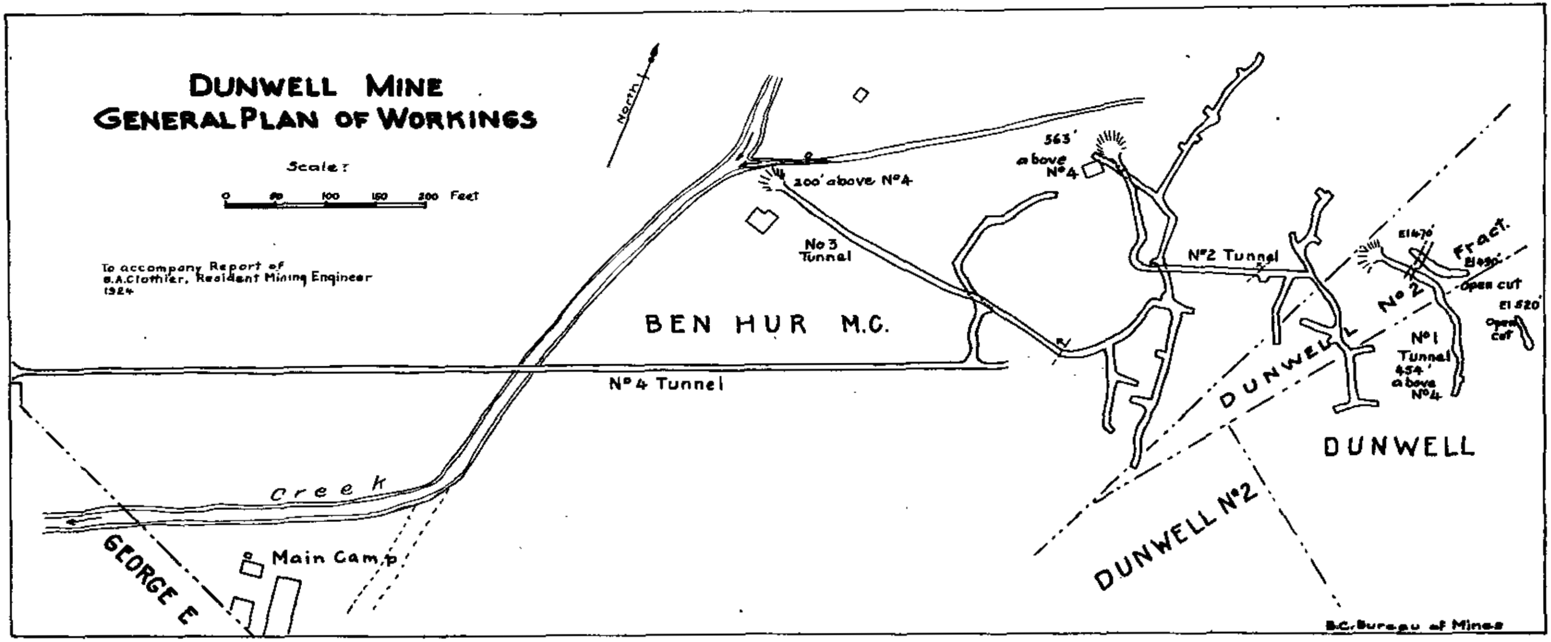
(*See* Minister of Mines' Reports, 1922 and 1923.) The company was incorporated in 1922 and is a specially limited reorganization of the Nass River Lands, Limited, which was incorporated in 1913. The capitalization of the present company is $350,000, of $1 per share. The registered office is at Victoria, in the office of the Stewart Land Company, Limited, Pemberton Block. The holdings of the company consist of some twenty-four claims and fractions ideally situated for mining and transportation on the north side of Glacier creek and extending from the railway-track up the hill. The camp is at an elevation of 1,200 feet.

This year a road was built, by means of grants from the Department of Mines, from the main Bear River wagon-road at the mouth of Glacier creek to the Glacier Creek Mining Company camp, the company finishing it for a snow-road for this winter to its own camp.

At the camp a new two-story bunk-house 16 by 36 feet and office 16 by 24 feet were built this year, making accommodations for thirty to forty men. At the No. 4 tunnel a branch road was built from the main road to the new ore-bunkers, holding 50 tons. On the ore-bunkers a sorting-house 14 by 40 feet was built. There were also constructed a blacksmith-shop 24 by 24 feet; a building 12 by 30 feet, divided into an assay office and electric-light plant, the latter equipped with a 3-kw. Westinghouse A.C. generator; a fuse and powder house and a snow-shed. The old flume of the Portland Canal Mining Company power plant being used by the *Dunwell* was also rebuilt at considerable expense this year.

Up to the first of 1924 the No. 3 tunnel had been driven 340 feet, just reaching the hanging-wall of the north-south vein. During 1924 it was extended 145 feet, making a total crosscut of 485 feet, crossing the foot-wall of the north-south vein at 375 feet and cutting the *Dunwell* vein at 465 feet from the portal. The foot-wall of the north-south vein was drifted on for 90 feet south and the *Dunwell* vein for 165 feet south from the main tunnel. The *Dunwell* vein was also drifted on north 110 feet to its intersection with the north-south vein and a further 175 feet from there to the present face. About 175 feet of short crosscuts were driven from the different drifts, making a total of approximately 1,200 feet of work on this level. This work exposed ore practically from the point at which the *Dunwell* vein was cut north to the face, the main ore-shoot, however, being from the intersection of the *Dunwell* vein with the north-south vein, a distance of 175 feet to the face, the ore apparently becoming better grade going north. The No. 3 tunnel ore-body is therefore apparently identical with the ore-exposures and conditions in No. 2 tunnel, 163 feet above.

No. 4 tunnel, 200 feet below No. 3, was driven as a crosscut a total distance of 995 feet, encountering at 855 feet from the portal what corresponds to the hanging-wall of the north-south vein on the No. 3 level and at 955 feet the foot-wall of the same vein or vein series. The tunnel has apparently not been continued far enough to cut the *Dunwell* vein. From the 955-foot point


DUNWELL MINE
GENERAL PLAN OF WORKINGS
Scale:
0 50 100 150 200 Feet
To accompany Report of
G.A.Clothier, Resident Mining Engineer
1924
North
200' above N°4
No 3 Tunnel
563' above N°4
N°2 Tunnel
BEN HUR M.C.
N°4 Tunnel
Creek
Main Camp
GEORGE E
DUNWELL
DUNWELL N°2
N°1 Tunnel 454' above N°4
Open cut
Fract.
B.C. Bureau of Mines

a drift was driven north on the foot-wall vein a distance of 150 feet, encountering patches of ore, but nothing of importance. A crosscut had been driven 90 feet east when the work closed down without encountering the *Dunwell* vein, though it must be very close to it.

It is very apparent from this work that conditions on this level are very similar to the two levels above. If the No. 4 tunnel had been 150 feet farther north it would have cut the north-south vein probably about the point of intersection of the *Dunwell* and north-south veins, thereby saving the present drifting on the vein, proven above to be poorly mineralized.

The company had a very interesting and important programme planned for the winter, but unfortunately the flume froze up hopelessly in December, necessitating closing down.

Plans for reorganizing the company are under way and no doubt work will be resumed as early as permissible. In the meantime the mine is undergoing a much-needed, thorough sampling.

The property is at a rather critical stage right now, the future depending largely on the findings on the No. 4 level and the results of the sampling of the upper levels.

Victoria Mines, Ltd.

The *Dandy* group consists of four claims—*Dandy No. 1*, *Dandy No. 2*, *Star No. 1*, and *Star No. 2*—situated north of and adjoining the *Dunwell* group and east of the *Mayflower* group. Early in the spring this property was acquired by R. W. Martin and Eastern associates and some work done in the bed of a deep creek cutting across the claims. The work consisted of open-cutting and a crosscut tunnel about 70 feet in length, showing some small mineralized quartz veins and silicified bands bedded with the slate formation.

Later a company was organized called the Victoria Mines, Limited, with a capitalization of $500,000, divided into 500,000 shares, with the registered office at Victoria. This company started work late in the fall and up to the end of the year a crosscut tunnel had been driven 90 feet with the object of cutting any or all of the north-south series of veins prominent on the *Dunwell*, and which, according to the prospectus issued by the company, must necessarily extend into the company's ground.

Emperor Mines, Ltd.

The *North Line* group includes three mineral claims and two fractions—*North Line*, *North Line Fraction*, *South Line*, *South Line Extension*, and *Flat Fraction*—owned by James McKay, of Stewart, and situated north of the *Lakeview* group. Last year the claims were bonded to Gus Seiffert, who organized the North and South Line Syndicate in Vancouver on a basis of 300 units of a par value of $200 a unit. To provide working funds 75 units were disposed of and work was started as early this spring as snow and trail conditions would permit. Under the supervision of Mr. Seiffert a very creditable amount and quality of work has been done this season, making a good start on a promising property.

The trail was put in passable condition from the *Lakeview* to the camp. Preliminary to starting development-work two log cabins were built, one 14 by 44 feet and the other 18 by 34 feet, for mess and bunk houses.

A great deal of surface work was done first in stripping and open-cutting at intervals of from 50 to 100 feet, this indicating a vein of from 7 to 14 feet in width. The vein has a quartz gangue mineralized with galena, zinc-blende, and pyrite.

A crosscut tunnel was driven 120 feet, striking the hanging-wall of the vein at a depth of about 85 feet. A cut of 13 feet in length was then driven across the vein without reaching the foot-wall. A drift was driven north 40 feet and another 25 feet south, both in the hanging-wall of the vein. Both faces were in good ore when work was stopped early in the winter. While the ore on the average is not high grade, it will at least make good milling-ore, with the probabilities that there will be shoots of shipping-grade ore in it.

Mr. Seiffert has now incorporated the Emperor Mines, Limited, with a capitalization of 1,500,000 shares at $1 each par value, with registered office in Vancouver, to take over the property. It is expected there will be no difficulty in proving necessary funds to proceed in the spring on a comprehensive plan of development. A trail will be recommended to the property from the *Lakeview* or whatever point is most advantageous.

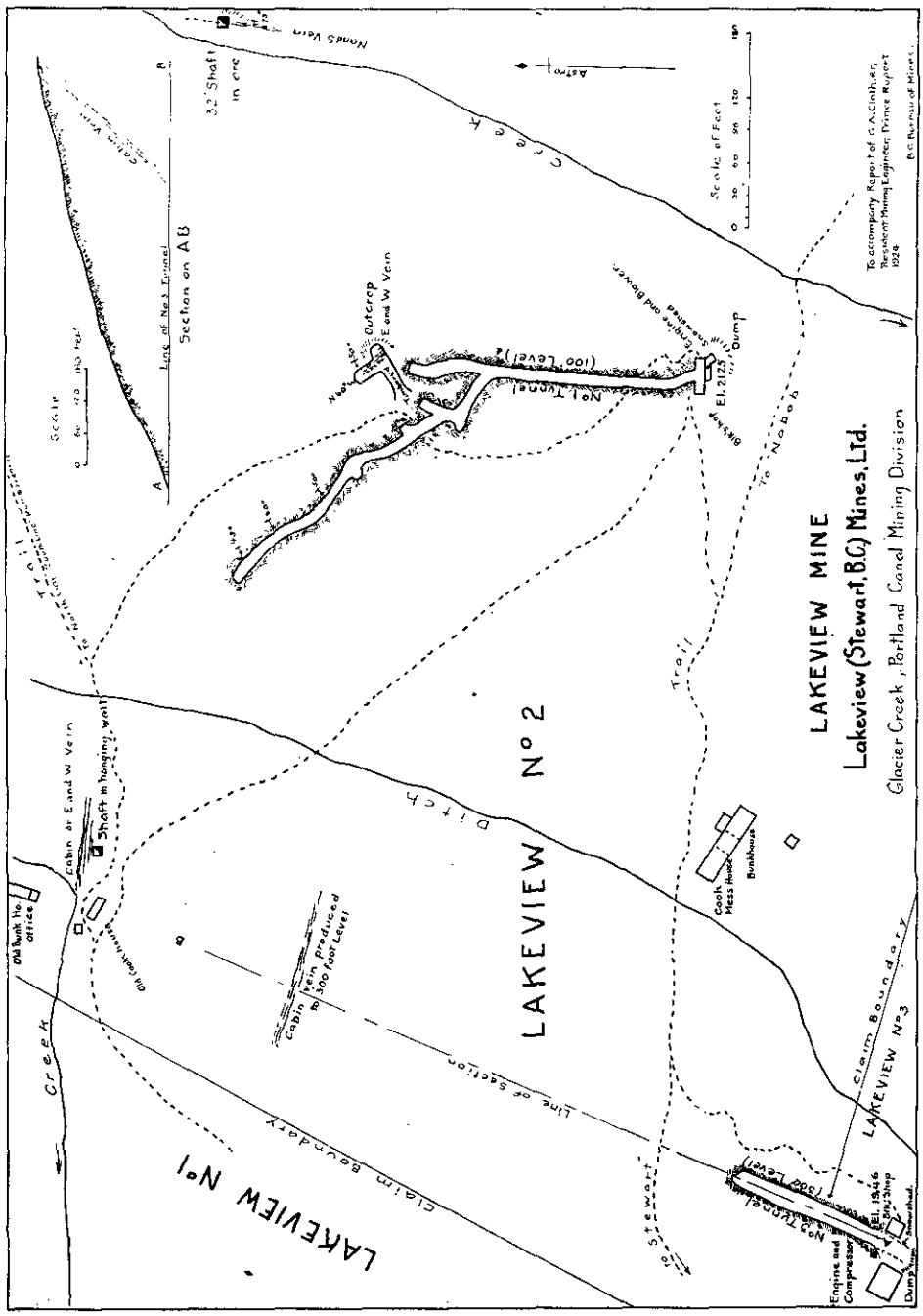
Lakeview Mines, Ltd.

This company was incorporated in April of this year, with a capitalization of $500,000, divided into 500,000 shares, with its head office at Victoria. Its holdings consist of the *Lakeview* group of mineral claims—*Lakeview No. 1*, *Lakeview No. 2*, *Lakeview No. 3*, and the *Silver Bell Fraction*, staked and owned by James McKay and Chas. Bibeau, of Stewart; the *Lakeview Fraction* and an interest in the *Riverside No. 1*, *Riverside No. 2*, and *Riverside No. 3 Fraction*.

George Mountains, Bear River, Portland Canal M.D.

Rufus and Comet Mountains, Portland Canal M.D.

The *Lakeview* group lies east of and adjoining the Dunwell Mines, Limited, ground, and the other claims between the *Lakeview* group and Glacier creek. Altogether it is ideal ground for



operating and shipping, being only about 2 miles from the main wagon-road and 5 miles from tide-water. The country-rock is the Bitter Creek formation, composed of chiefly argillites, tufaceous rocks, and bands of limestone.

The *Lakeview* claims have had an extensive amount of prospecting and development-work by the original owners, who did a lot of surface cutting in tracing and exposing the two veins, and also by two different parties who have had it under bond. The latter work consists of a tunnel driven to cut the vein at a depth of 100 feet and is now called the 100-foot level. The first bonders failed to find the vein, and the second operators, after finding it and doing considerable exploratory work, abandoned it on account of the low values obtained, contrary to surface indications at this point.

In June of this year R. F. Hill was appointed mine manager by the company and took charge of operations. After examining and surveying the showings and workings he decided to extend the workings in the old 100-foot level, which, as stated, were abandoned in 1920. Accordingly the north-west drift was started and within 10 feet the walls of the vein became well defined and the vein-filling up to 6 feet in width well mineralized with pyrite, galena, and zinc-blende, showing in places native silver and argentite, significant in being the first found on this level.

This shoot of ore proved to be 65 feet long, from which assays ranging up to 0.72 oz. gold and 393.6 oz. silver to the ton were obtained. The 2 feet of ore on the hanging-wall could be broken to average $40 a ton and could be hand-sorted to a much higher grade; the 3 or 4 feet of the balance of the vein is of good milling grade. At 75 feet from the starting-point the vein-filling was replaced by two small porphyry dykes for about 45 feet, from which point the vein was again drifted on to the face 50 feet, showing maximum values of 2.45 oz. gold and 96.9 oz. silver to the ton.

This work proved the maintenance to this level of the high values shown in the surface exposures. As no further depth was obtainable in this drift it was decided to transfer work to a lower crosscut tunnel until a power plant had been installed.

Extensive surface work was also done on the extension of this vein, 300 feet west from the face of the drift. Here the vein was stripped and open-cut for a distance of 400 feet farther west, showing its width to be from 6 to 8 feet. Three samples along the vein gave assay returns as follows: 30 inches wide, 0.115 oz. gold and 60.4 oz. silver to the ton; 48 inches wide, 0.04 oz. gold and 10 oz. silver to the ton; 12 inches wide, 0.04 oz. gold and 91.4 oz. silver to the ton; the three samples averaging over 25 per cent. lead.

In the light of the information gained from this surface and underground work, a crosscut tunnel, 300-foot level, was started in October. By the middle of November the collar sets were in; a blacksmith-shop, powder-house, and snowshed had been built; and ore-car, rails, mining supplies, and four months' grub on the ground. A new camp to accommodate fifteen to twenty men, convenient to both the 100-foot and 300-foot levels, was built. A contract for the driving of the tunnel was let, employing six men, and at the end of January, 1925, 140 feet had been driven. It is estimated that the vein will be cut at a distance of 580 feet from the portal and a depth of 330 feet obtained on the dip of the vein.

A power plant is now being taken up on the snow and erected (February, 1925), consisting of a 355-cubic-foot (2-drill) Canadian Ingersoll-Rand compressor; 55–60 horse-power semi-Diesel, Vickers-Petter engine; receiver, drills, air-pipe, rails, fuel-oil, etc. The management expects to have it operating early in April. In the meantime the tunnel is being continued by hand and its objective should be reached early in May.

No work has yet been done on the north-south vein. A shaft was sunk 32 feet in ore all the way by former operators. It is the intention of the management to explore this at a later date by driving a crosscut from the north end of the 100-foot level, a distance of 350 feet, which will obtain a vertical depth of 175 feet below the collar of the shaft. This is a very promising vein, showing a splendid grade of ore.

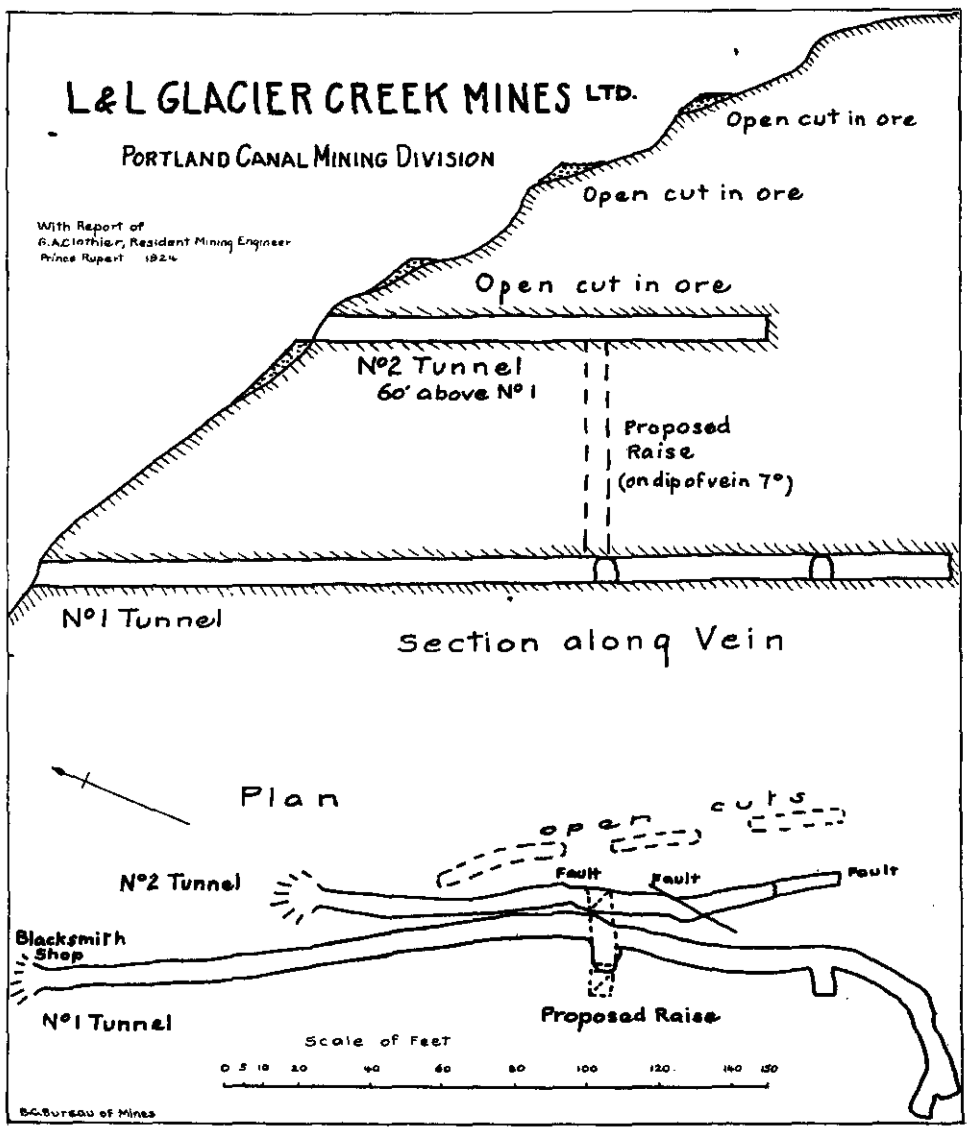
Altogether this property is opening up fine, giving every indication of making a mine. Credit is due Mr. Hill for his efficient handling of the company's operations.

L. & L. Glacier Creek Mines, Ltd.

(*See* Minister of Mines' Reports, 1922 and 1923.) This company was incorporated in May, 1924, with a capitalization of $250,000, divided into 1,000,000 shares. The registered office is at Victoria. The *L. & L.* group consists of three claims—*L. & L. No. 1*, *L. & L. No. 2*, and *L. & L. Fraction*—situated on the North fork of the Middle fork of Glacier creek. The claims have been surveyed this year and application made for Crown grants.

The work done on the property up to the first of the year consisted of four open-cuts, tracing the vein a distance of over 300 feet. Each cut exposed an ore-body varying in width from a few inches up to 3 feet of heavy sulphide ore of zinc-blende and arsenical iron in about equal proportions, with some galena and grey copper, the latter no doubt carrying the high silver values obtained.

Under these surface exposures a tunnel had been driven on the vein a distance of 225 feet, extending under the first two surface cuts and about up to the third one without disclosing



any appreciable amount of ore such as exposed on the surface, though some good-grade ore was encountered at about 150 feet from the portal.

This year, under the supervision of J. F. Breeze, the tunnel was continued 60 feet, bearing to the right and thus crosscutting the formation for about 30 feet, but without encouraging results.

An upper tunnel was then started at the lowest open-cut, about 70 feet vertically above the main tunnel, and driven about 120 feet by the end of 1924. This tunnel has been in high-

grade ore varying from 8 to 30 inches in width from the collar to the face. A sample taken at the mouth of the tunnel of 1 ton was shipped to Trail, from which returns were received of 0.10 oz. gold, 273.6 oz. silver to the ton, 24.1 per cent. lead, and 14 per cent. zinc. Later another ton taken from 50 feet in the tunnel was shipped to Selby, California, giving assays of 0.10 oz. gold, 293.4 oz. silver to the ton, 16.5 per cent. lead, and 12.2 per cent. zinc.

At the time of writing (February) the face is at 140 feet, still in high-grade ore, obtaining a depth of about 90 feet. This upper tunnel shows the vein to have faulted in two or three places, the lateral displacement being up to 5 or 6 feet.

A raise is now being driven from the lower tunnel, starting about 120 feet in from the portal, just north of a short crosscut. In cutting out for this raise high-grade ore was struck and has continued continuously for the 40 feet raised to date. The vein in the raise is from 12 to 30 inches wide.

Altogether this property is showing up well and has all the earmarks at present of being a very profitable investment. A comfortable log cabin was built this year, but another will be added early in the spring in anticipation of the employment of more men in stoping and sorting out. Recommendations will be made for the reconstruction of a portion of the trail to improve shipping facilities.

Ruth and Francis Group.

(*See* 1922 Report.) This group of four claims, situated on the North fork of Glacier creek, is owned by James Nesbitt and Andy Archie, of Stewart. This season, while prospecting the ground, Mr. Nesbitt discovered a small vein in a high bank just across the creek from the cabin, carrying high silver values in grey copper and silver sulphides. I understand that, so far as it could be explored this year, the showing was very satisfactory.

Other properties in the Glacier Creek area which have been reported on previously are:—

	Minister of Mines' Reports.
Mobile Mines, Ltd. (*Mobile* group)	1921–23.
Mimico group	1922, 1923.
Evening Sun and *Columbia*	1919, 1922.
Excelsior and *Eagle*	1919, 1922.
Sunshine group	1919, 1923.
Morning Star group	1923.
Mayflower group	1918, 1922.
Tyee	1921.

Windsor Group.

This group consists of four mineral claims—*Windsor*, *Windsor No. 1*, *Laura*, and *Laura No. 1*—owned by Ben Lawrence, of Stewart, and associates. The claims are situated at a general elevation of about 3,700 feet on the south side of Bitter Creek glacier and about 9 miles up Bitter creek from the bridge on the main Bear River wagon-road. There is a fair horse-trail up Bitter creek to the foot of the glacier, which is then diagonally crossed up to the foot of the hill on which the claims lie. Shipping transportation would be obtained by means of a tramway from the property to the foot of the glacier along its south side.

The general rock formation is the Bitter Creek formation, consisting largely of slates and argillites, extending south to the *Dunwell*, *Lakeview*, *Portland Canal*, and other properties.

The showings on the property consist of two veins. The upper one I did not see, but is described by the owner as being a narrow, oxidized vein up to 8 or 10 inches in width, in which occur patches and small lenses of galena-zinc-blende ore carrying high values in silver. Some work was done this summer on this vein and the owners consider the showing very promising.

The lower or main vein consists of a belt, up to 18 feet in width, in which there is from 1 to 5 feet of heavily pyritized quartz, the remainder being slate intersected with quartz-seams mineralized with pyrite. It strikes N. 30° W., paralleling the glacier, and dips about 40° W. into the hill.

The work on this vein consists of several open-cuts and a crosscut tunnel, 76 feet long, cutting the vein, which is about 12 feet in width as nearly as could be ascertained through a heavy, soft oxidation, due to seepage through the pyrite.

The heavy iron sulphide is comparatively low grade, but fair gold values are obtained where the ore shows galena and zinc-blende. One cut gave $12 a ton gold values across 5 feet.

The vein is strong, well defined, and, as stated, shows fair values at several places along the surface. I think the possibility of developing a tonnage of milling grade is sufficient to justify considerable development-work.

Other properties in the Bitter Creek area are:—

	Minister of Mines' Reports.
L.L. & H. group	1920.
Jutland group	1919.
St. Elmo group	1919.

Ruby Silver Mines, Ltd.

The *Ruby Silver* group is comprised of the six mineral claims—*Ruby*, *Ruby No. 1*, *Stirling*, *Pershing*, *Pershing No. 1*, and *Star*—owned by A. W. P. LeSueur. The *Ruby Silver Extension* group is comprised of four mineral claims—*Ruby No. 2*, *Ruby No. 3*, *Ruby No. 4*, and *Ruby No. 5*—owned by A. W. P. LeSueur and associates. The claims are situated on Mosquito creek, a short distance up the hill from the main wagon-road. A good trail has been made, branching from the Bear–Nass trail about 200 feet from the wagon-road. A commodious log cabin was built this year at 1,125 feet elevation, about 600 feet above the wagon-road. The property is therefore very conveniently located for getting in supplies or equipment of any kind.

The general rock formation is argillite of the Bitter Creek formation. The showing is a quartz-calcite vein, about 5 feet wide on the surface, mineralized with pyrite in spots. No ruby silver was seen as the name implies. It strikes S. 70° E. into the hill and dips 68° S.W. At 1,250 feet elevation a tunnel has been driven 150 feet, following the foot-wall of the vein nearly all the way. The vein appears to follow a light-grey porphyritic dyke to within about 40 feet of the face of the tunnel, at which point the dyke pinches out.

At 24 feet in from the collar of the tunnel a short crosscut of 5 feet was driven to the right; another at 51 feet from the collar, 12 feet long, shows about 2 feet of mixed vein-matter; a third, at 54 feet back from the face, 15 feet long, shows only a seam of a vein on the dyke, the balance being across the dyke. Beyond the dyke the vein seam continues on through the argillite to the face, where there is only a few inches of quartz.

I am informed that the drivage will be extended next year. The property was closed down during the winter. The Ruby Silver Mines, Limited, was incorporated this year, with a capitalization of 350,000 shares at $1 per share par value, with the registered office at Victoria.

Rufus Silver-Lead Mines, Ltd.

The *Rufus* group is composed of seven mineral claims—*Rufus*, *Rufus Nos. 1* to *6*, inclusive—situated on the north side of Bear river, about 4 miles up from the end of the wagon-road. They were staked and owned by Ben Erickson, one of the pioneer prospectors of this district. This year the Rufus Silver-Lead Mines, Limited, was incorporated and took over the property. The company is capitalized at 1,000,000 shares at $1 a share par value, with its registered office at Victoria.

The property was briefly reported on in 1922, since when nothing of importance has been done until this year. Two good log buildings were built, one just above the Bear river and the other on the upper claims. An assaying outfit was installed at the lower camp. The season's work consisted of surface prospecting, assaying, and the plotting of the geological features, under the supervision of Mr. Whiteworth. Definite information has thereby been gained from which can be decided the most advantageous point at which to start permanent workings. Work will be resumed next spring.

George Copper Mines.

This property, on the south side of Bear river near Bear River pass, owned by W. B. George, has been previously reported on in the Minister of Mines' Reports of 1918, 1919, 1922, and 1923. The inaccessibility of this property has been its chief handicap, but a good pack-trail has now been completed from the main Bear–Nass trail up to the camp at the showings. A saddle-horse can be ridden from Stewart to the showings.

The owner has certainly done a great deal of prospecting and development-work. Every engineer who has examined the property has been favourably impressed with the showings and possibilities, but its situation means not only a heavy outlay to put it on a producing basis, but a still heavier expenditure to provide adequate transportation, which would necessitate a tramway to the present end of the railway at the *Red Cliff* or the extension of the railway 6 miles up Bear river to the property.

Other properties in this upper Bear River valley which have been reported on are:—

	Minister of Mines' Reports.
Red Top group	1919, 1920, 1923.
Comet group	1920.
Vetron group	1920.
Delnorte group	1922.

Barite Gold Mines, Ltd.

The *Barite* group includes three claims—*Barite*, *Barite No. 1*, and *Hub*—situated on the north side of Bear river above the *Red Top* and east of the *Comet* group, and at an elevation of 4,000 feet. The Barite Gold Mines, Limited, was incorporated this year, with a capitalization of 250,000 shares of $1 par value each, and took over the property from H. Quickstad, of Seattle, Wash. The registered office of the company is at Victoria. I have not as yet examined this property. I understand that about 30 feet of tunnel was driven this year on one of three veins exposed on the surface. The work was under the supervision of Mr. Quickstad, president of the company, and Chas. Dowling, a director.

Terminus Mines, Ltd.

The *Terminus* group is composed of the following mineral claims: *Glenora*, *Edith M.*, *Oneida*, *Evans*, *Ayrshire*, and *Cobalt Fraction*. These claims are Crown-granted and situated on the east side of American creek, about 5 miles from the end of the wagon-road and railway at the *Red Cliff*, at a general elevation of about 3,400 feet. The Terminus Mines, Limited, was incorporated early this year and acquired the above group from Harry Heywood, the original staker. The capitalization of the company is $1,000,000, divided into 1,000,000 shares, with its registered office in Victoria.

The general rock formation in the vicinity is the greenstone of the Bear River formation (McConnell). The workings at the time the present company took over the property consisted mainly of a shaft 35 feet deep. This work exposes a 2-foot dyke, dipping easterly at about 65°, on the hanging-wall of which is a small vein 8 to 12 inches and on the foot-wall one of about 6 inches of high-grade silver ore.

Since starting work under the supervision of Harry Heywood the shaft has been sunk to 51 feet, from the bottom of which a drift was driven north on the vein for 42 feet and south for 34 feet, exposing, I understand, the same ore throughout.

A crosscut tunnel was then started, which it was estimated, with a drivage of 286 feet, would encounter the vein and obtain a depth of 100 feet on it. At the end of the year the tunnel had been advanced to about 270 feet.

Later information is that the vein had been encountered, though (at the time of writing) not entirely crossed, showing in the foot-wall streaks of sulphides in the vein-matter, consisting of galena, zinc-blende, and grey copper, carrying high silver values, the vein-matter itself carrying good milling values. This certainly sounds encouraging.

Should the development warrant, and there seems small doubt of it now, recommendations will be made to the Mines Department for assistance in building a pack-trail over a suitable route to the main wagon-road. The present trail is impossible. Commendation is due Mr. Heywood for his tenacity under tough conditions.

Mountain Bay Group.—(*See* Minister of Mines' Report for 1919.)

Independence Gold Mining Co., Ltd.

This company was incorporated early this year, with a capitalization of 1,500,000 shares at $1 a share par value. Its registered office is at Stewart. The holdings of the company consist of the *Independence* group of six claims on Goose creek owned by the Fitzgerald Bros., of Stewart. (*See* Minister of Mines' Reports, 1919, 1921, and 1923.) Last winter the main tunnel was extended to about 270 feet, exposing some ore, and it was therefore decided to erect a small compressor. Several log buildings were erected, including a bunk-house, cook-house, store-room, blacksmith-shop, and compressor building, altogether making a very substantial equipment.

Work was started on the No. 3 vein, on which there is a very promising exposure of ore. I understand a cut was put across this with good results. The compressor was started in June and work was resumed on No. 1 or the main tunnel in driving ahead. At a point about 300 feet from the portal a crosscut was started towards cutting the No. 2 vein, on which some work was done on the surface at 1,750 feet elevation. I have not been on the property since June and have no information as to the results of this work.

The main tunnel was then continued and is reported by J. Fitzgerald as being in ore practically continuously to the face, at 400 feet from the portal, where a crosscut is being driven across the vein. Altogether there has been about 650 feet of underground work done, besides extensive surface work.

Considering snow conditions in the spring and trail conditions during the summer, the property has had a very creditable amount of work done on it this year, with, it is reported, very satisfactory results. Though the Mines Department expended a considerable sum on the trail this year, it will require further improvement next spring.

Pacific Mines, Petroleum, and Development Co., Ltd.

The *United Empire* group of mineral claims includes a number of claims formerly in the *Bayview* property, and the *Gold Cliff* group, owned by Dann & Douville, of Stewart, about twenty claims in all. The claims are situated on the west side of Bear river, just north of the town of Stewart and adjoining the *Bayview* group, an ideal location for tramway transportation to tide-water in the event of becoming producers. The combined properties were taken under bond in October by A. B. Trites, or the Pacific Mines, Petroleum, and Development Company, Limited, a limited company incorporated for 2,100,000 shares at $1 a share par value, in December, 1922.

Work was rushed in getting a trail built, a camp put up, and supplies in for winter work before the snow came. A contract was let to drive a crosscut tunnel during the winter.

The country-rock in which the veins occur is a band of metamorphosed rock lying along the border of the granite intrusion, on its contact with the old sedimentaries. This belt or zone is in places intensely pyritized, as seen in the big bluffs. The veins are quartz-filled fissures, striking almost at right angles to the line of contact, mineralized with pyrite, chalcopyrite, galena, and zinc-blende. Assays from the surface exposures vary up to 250 oz. silver to the ton.

There are, so far as known, three veins on the property. No. 1 vein has been traced for over 1,000 feet, No. 2 about 500 feet, and No. 3 about 300 feet, all mineral-bearing. It is expected that, by spring, sufficient information will have been gained to decide the future of the property. A. St. Clair Brindle is in charge at the property for Mr. Trites.

Other properties in the Bear River valley previously described in these reports are:—

	Minister of Mines' Reports.
Bayview group	1920, 1922.
Prince John group	1918, 1919, 1922, 1923.
M.C. group	1922, 1923.
Aztec group	1920.
Red Bluff group (*Prince John*)	1923.
Royal Irish group	1920.
Mayflower group	1918, 1922.

SALMON RIVER SECTION.*

This section, with an area of about 60 square miles, lies up the Salmon River valley above the Alaska-British Columbia boundary-line at about 13-Mile. It is reached by auto-road from Stewart to the *Premier* and trails branching from the main road in all directions. The new bridge across Cascade creek, built by the Mines Department, at the *Premier* power plant was necessary for the area on the west side of Cascade. A portion of the road was built this year on the west bank, but as yet it starts and ends nowhere.

About the usual amount of prospecting has been done in the valley this year, as shown by Government office statistics. Development, however, has not been nearly so active as in previous years, the epidemic of incorporations apparently having shifted to the Bear River section on account of the success of the *Dunwell*.

Several properties have, however, been under development in the upper valley—the *Silver Crest*, *Eldorado*, *Cronholm-Bartholf*, *Troy*, and several others; while the *Indian*, B.C. Silver Company, and of course the Premier have operated continuously. The *Indian* deeper development so far has proven disappointing, but the B.C. Silver Company results are most encouraging.

* Geology and Ore Deposits of Salmon River District, British Columbia, Memoir 132, by Geo. Hanson and S. J. Schofield.

The *Premier* disbursed $1,700,000 in dividends again this year, bringing its total dividends to $6,550,000.

On the Alaska side of the boundary-line several properties are developing well; the *Riverside* at 7-Mile has been equipped with a concentrator and is now on the shipping-list. Good reports are also heard of the *Daly Alaska* property at 11-Mile and others.

Premier Gold Mining Co., Ltd.

This company was incorporated in 1919, with a capitalization of $5,000,000 at $1 a share par value. It is a reorganization of the old Salmon-Bear River Mining Company, Limited, organized by O. B. Bush in the early days of Stewart. It was in the fall of 1919 that the American Smelting and Refining Company acquired the controlling interest in the company from Trites, Wilson, Neill, and Wood, who had purchased the property from the Salmon-Bear River Company and brought it into prominence. The first dividend, $400,000, was paid in 1921 and up to the end of 1924 $6,649,625 has been paid. Over $15,000,000 worth of ore has been produced in that time.

This year (1924) 159,014 tons of ore was mined, of which 75,917 tons of first-class ore was shipped to Tacoma smelter, 21,132 tons of second-class ore was shipped to Granby smelter at Anyox, and the remainder, 61,965 tons, was milled, producing 8,524 tons of concentrates shipped to Tacoma and Selby plants and 13 tons of precipitates shipped to the Selby smelter.

The total tonnage shipped was 105,586 tons, having a gross content of 139,288 oz. gold, 3,015,382 oz. silver, and 452,010 lb. lead, a total value of approximately $4,898,927, figuring silver and lead at their average prices for the year, showing an increase of nearly $700,000 over last year. A slight increase of the average values in both gold and silver is noted in the ore mined.

The increase in tonnage milled and shipped is due to improved mechanical efficiency; six Wilfley tables were added to the mill for cleaning concentrates and the driving mechanism of the aerial tramway was improved, resulting in speeding it up. Operations were somewhat slowed up for a month or so during the winter owing to lack of water-power, due to the abnormal cold weather before the protective, heavy snowfall.

A vigorous development campaign has been carried on throughout the year, consisting of 3,600 feet of drifts, raises, etc., and 14,830 feet of diamond-drilling. This work has been especially gratifying in that it has developed more ore than has been mined during the year, therefore increasing the known ore reserves.

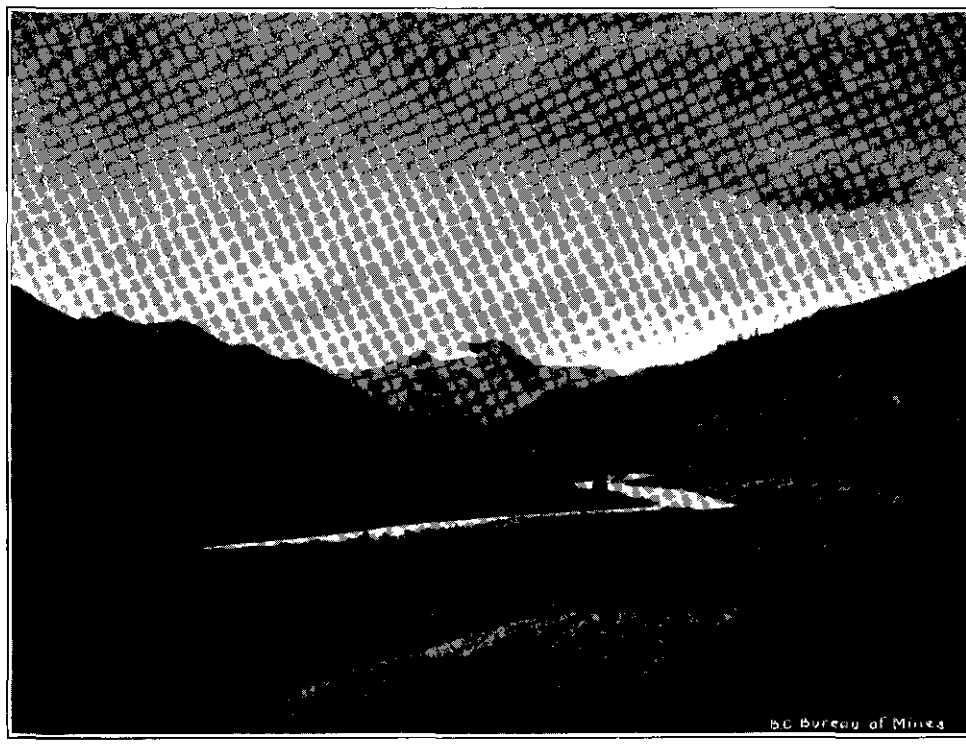
A new stope was opened up on No. 1 level, another on No. 2, two on No. 3, and two on No. 4. No. 3 level, as indicated last year, has proven particularly productive and the ore-body has in places shown exceptional width. All the new stopes as well as the old ones have been worked for the tonnage mined.

The No. 6 tunnel was advanced 1,100 feet, practically in a straight line, to a point 2,500 feet from the portal, where a 3-compartment raise was started and driven 500 feet during the year to connect with the No. 4 level. The raise has about 50 feet yet to go before reaching No. 4. Intermediate levels will be opened from it for exploratory purposes. All the other levels have been extended along the ore-zones.

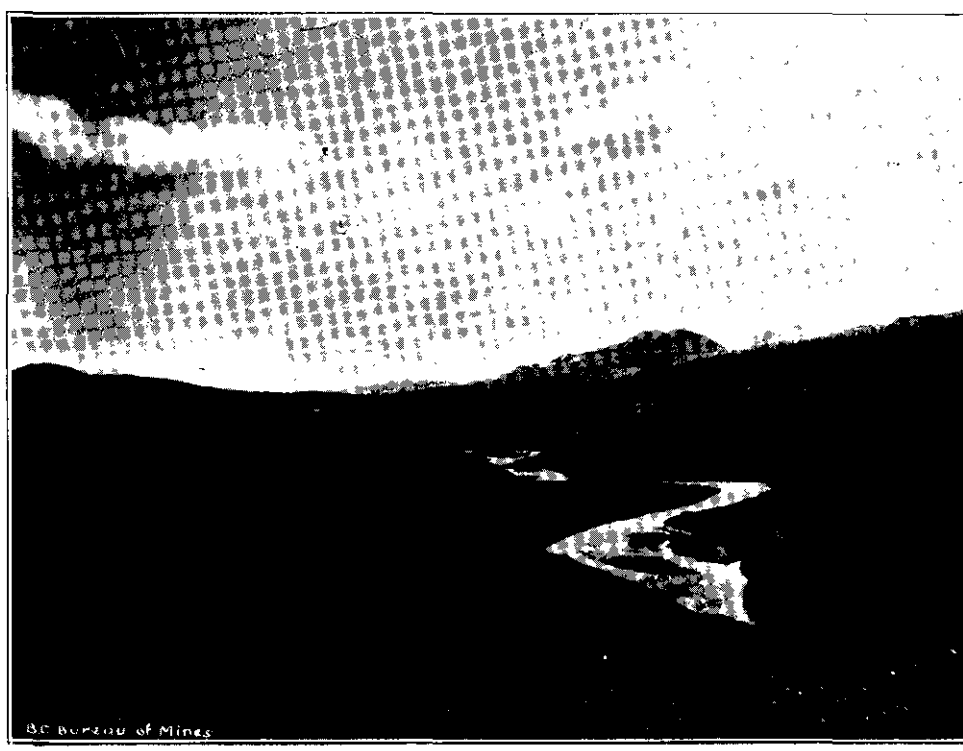
Surface improvements and changes during the year consisted of the erection of a steel tank, 5,000-barrel capacity, at the mine for storage of Diesel-engine oil. Oil can now be brought up over the tramway during the summer months, when actual consumption of oil is lowest, and stored for winter use. All the men have been removed from Camp 1 down to Camp 4, except the main office and staff. Several of the buildings at Camp 1 have been remodelled into three-room-and-bath suites for married couples. These suites are steam-heated, electric-lighted, have hot and cold water, etc. A new dry-house 40 by 40 feet, with up-to-date equipment, has been erected at Camp 4 to accommodate the underground men.

Not the least important item of the year's progress, and one tending towards a fine camp spirit and resultant general efficiency, has been the organization of a Community Club, of which every employee is a member. A hall has been fitted up where local talent entertainments, dances, and smokers are given at short intervals, and a reading-room arranged containing late papers, magazines, and a library of books. Basket-ball is the popular winter sport and a fine tennis-court has been built.

The personnel of the staff is: Dale L. Pitt, manager; Bert F. Smith, assistant manager; Hector McDonald, mine superintendent; W. Asseltine, concentrator superintendent; and Harry Jackson, chief accountant.



Spatsizi River.



Klappan River.

B.C. Silver Mines, Ltd.

(*See* Minister of Mines' Reports, 1922 and 1923.) This company, organized in 1919, with a capitalization of $1,500,000, divided into 1,500,000 shares, owns a group of eleven mineral claims north of and adjoining the holdings of the Premier Gold Mining Company. During the last three years the company has done over a mile of underground work and several thousand feet of diamond-drilling. Two tunnels have been driven. The lower one was started on the *Oakville Fraction* and driven 1,050 feet to intersect a continuation of the *Premier* ore-zone to the north. About 1,000 feet of drifting was then done on this zone without satisfactory results. Last year an upper tunnel, 270 feet vertically higher than the No. 1, was driven 720 feet, from which two crosscuts were run south and one to the north.

This year the work has been confined to the upper tunnel, which has been extended 1,425 feet, making the total drivage of nearly 2,200 feet; 5,400 feet of diamond-drilling was also done this year from this level. Two holes show very favourable indications of commercial ore and a third hole will be bored for further information.

The property is well equipped with camps, assay office, power plant, etc.

LATER.—It has been announced by the manager, C. A. Banks (in February, 1925), that the diamond-drill hole on No. 3 level has just intersected a very important ore-body. The drill passed through 58 feet of ore, which, allowing for the dip of the vein, indicates an ore-body of 45 feet in width. Ten feet of the drill-core averaged $22.80, 13 feet averaged $30, and 9 feet averaged $40 to the ton. The whole ore-body is of commercial grade. Further drilling is being pushed ahead to determine the extent of this ore-body.

C. A. Banks is manager and C. B. North in charge of the work at the mine.

Silver Crest Mines, Ltd.

(*See* Minister of Mines' Report, 1920.) This company was incorporated in October, 1919, with a capitalization of $500,000, divided into 2,000,000 shares, and took over the *Silver Hill* group of eleven Crown-granted mineral claims. They are situated on the south-east side of Mount Dilworth at the head of the Salmon River valley. In 1920 some twenty-four open-cuts were put in under the supervision of P. W. Racey, M.E., and described in my 1920 report. No work has been done on the claims since then until this year, when several open-cuts were made and two tunnels driven, with Seymour Campbell, the original staker of some of the claims in 1919, in charge of the work.

The country-rock is mainly slates overlying volcanic tuffs and quartz porphyries. The slates have been laid down since the mineralization of the underlying formation, as there is no fracturing or mineralization in the slates. In places the slates have been eroded, exposing the mineralized "greenstones" underlying them.

The work this year was done on the *September Fraction* claim, on which, in fact, practically all the work to date has been done. Seven open-cuts were put in west of the middle bunch of open-cuts referred to in the old work to trace the mineralization through. At No. 3 of these cuts a tunnel was started to cut the ore exposed above in cuts 1 and 2. This (No. 1) tunnel was driven a distance of 107 feet. Near the portal a vein of good ore was crossed which does not crop on the surface. About 30 feet back from the face of the tunnel a crosscut was driven west, cutting 10 feet of vein without reaching the hanging-wall. The last 3 feet is reported to be very good ore.

No. 2 tunnel was started 300 feet horizontally and 125 feet vertically below No. 1; the first 15 feet is open-cut and from there to the face is 44 feet, but a further 30 or 40 feet will be required to get under the ore-exposure in cut No. 7 above. So far only small stringers of ore have been found.

Some very high silver assays were obtained from the surface cuts and altogether the results of the year's work have been very satisfactory and encouraging to the company.

Northland Mining Co., Ltd.

This company was incorporated early in January, 1925, with a capitalization of $1,500,000, divided into 1,500,000 shares, to take over the *Troy* group of mineral claims, situated at the head of the Salmon River valley, about a mile south of Summit lake. The group consists of nine mineral claims—*Troy*, *Troy No. 2*, *Troy No. 3*, *Butte*, *Welcome*, *Deadwood*, *L.X.*, *Reward*, and *Terry*—owned by Neil McDonald and C. H. Lake, of Stewart, who bonded them this fall to E. O. Weston, of Victoria. I have been over the ground, going through to Tide lake, but at the time nothing had been done on the claims and I have therefore not made an examination of them.

The country-rock in that vicinity is the Bear River formation, or locally called greenstones, overlain in places by the uneroded slates that predominate on the east of Mount Dilworth.

Considerable work has been done by Neil McDonald in tracing the veins by stripping and open-cutting, and I am reliably informed that some very fine showings have thus been exposed. On the *Troy No. 3* claim an open-cut shows the mineralization to be 15 feet in width, of which 5 feet in width is said to assay 255.6 oz. silver to the ton and 5.6 per cent. lead. Another cut on the same vein gave assays of 35.6 oz. silver to the ton and 43.5 per cent. lead across 2½ feet. On the *Troy No. 2* claim a cut 6 feet deep shows a width of 6 feet of ore assaying 10.7 oz. silver to the ton and 34.2 per cent. lead. All this indicates that the property merits development.

Camps will be put up and work started as early as permissible in the spring.

Eldorado Gold Mining Co., Ltd.—The property of this company was reported on in the 1923 Minister of Mines' Report. I was unable to again see the property this year, but work was continued under the supervision of T. V. Wilson.

Cronholm-Bartholf Mines, Ltd. This company was incorporated in 1922, with a capitalization of $250,000, divided into 250,000 shares. The holdings consist of the *Hollywood* group of eight mineral claims of that name, situated on the north side of the West arm of Salmon River glacier. Mr. Cronholm has been in charge of what work has been done on the property during the last two summers. I have not had an opportunity of examining the showings and have no authentic information to offer.

Indian Mines Corporation, Ltd. (*See* 1922, 1923, and previous Minister of Mines' Reports.) The present corporation is a reorganization of the Indian Mines, Limited, whose original capitalization was 1,000,000 shares of $1 each par value; later, in 1922, increased to 1,600,000 shares of $1 each par value. In July of 1923 the Indian Mines Corporation, Limited, was formed, with a capitalization of $3,000,000, divided into 3,000,000 shares, with its registered office in Prince Rupert.

Up to the first of 1924 some 4,000 feet of underground work had been done and 2,000 feet of diamond-drilling. The principal development had been done in the upper or No. 1 tunnel, which had at that time been driven 1,050 feet. In that distance six ore-bodies, aggregating 630 feet, had been drifted through, showing, so far as had been demonstrated, a width of from the width of the drift up to 20 feet as shown in a crosscut through No. 6 ore-body. The mine assay records were taken, giving an average of $15.20 to the ton in gold, silver, and lead values and 8.5 per cent. zinc. My conclusions at that time were: "Everything considered, the development to date has been very satisfactory and the mine is in good shape. The amount of ore cut in one tunnel would seem to leave no doubt as to the ample tonnage available for milling purposes. Apparently the only question to be answered is whether a $15 (plus probably recoverable zinc values) milling-ore of this character can be made profitable. Thorough milling tests are being made of the ore and plans being formulated for the erection of a concentrator, power plant, etc."

Late last year (1923) diamond-drilling was started from the No. 1 tunnel and continued into the present year, a total of 4,100 feet being drilled. This work, although no great depth was attained, did not give very reassuring results as to the downward extension of the No. 1 tunnel ore-bodies. The summer of 1924 645 feet of diamond-drilling was done from the surface without results.

The No. 1 tunnel was extended 300 feet, making this a total of approximately 1,350 feet from the portal to the face; also 208 feet of crosscutting was done. No further ore was disclosed in any of this year's work.

The No. 3 tunnel, 200 feet vertically lower than No. 1, had been driven about 650 feet altogether, and it was decided to continue this drivage on a bearing to get under Nos. 5 and 6 ore-bodies drifted through in No. 1. Accordingly this year this tunnel was extended 715 feet, making a total of 1,365 feet in length, and 360 feet of crosscutting done. This work was completed by contract early in January, 1925, without finding any ore.

This year's work consists of 124 feet raising, 569 feet crosscutting, 1,017 feet of drifting, and 4,760 feet diamond-drilling. At the time of writing this a contract has been let for a minimum of 2,000 feet of diamond-drilling from the No. 3 tunnel, which is a very advantageous point from which to prove the ground, both laterally and to greater depth.

Other properties in the Salmon River section that have been reported on are as follows:—

	Minister of Mines' Reports.
International group	1918, 1919.
Bush Mines, Ltd.	1918, 1919.
Mineral Hill Mines, Ltd.	1918, 1919.
Unicorn group	1919.
Silver Tip	1920.
Salmon River Silver Mines, Ltd.	1920.
Silver Crest Mines, Ltd. (*Silver Hill* group)	1920.
Spider group	1919, 1920, 1922.
Mahood Mines, Ltd. (*Divide*, *Sunrise*, and *Mahood* groups)	1920.
American Mining & Milling Co., Ltd. (reorganization of Mahood Mines, Ltd.)	1922.
Forty-nine Mining Co., Ltd.	1918–20.
Yellowstone group	1918, 1919.
Hercules Mines, Ltd.	1920, 1923.
Big Missouri group	1918–20, 1922, 1923.
Salmon River Mother Lode Mining Co., Ltd.	1920.
Munro group	1922.
Outland-Silver Bar group	1922.
Cronholm-Bartholf Mines	1923.
Eldorado Gold Mining Co., Ltd.	1923.
Pay Roll group	1918.
Boundary group	1919.
Glacier group	1920.
Premier Extension Gold Mining Co., Ltd.	1923.

STIKINE AND LIARD MINING DIVISIONS.

These two Divisions comprise all the northern portion of the Province except the Atlin Division. The Stikine Division is the drainage area of the Stikine river, which flows into the Pacific ocean at Wrangell, Alaska; the first 30 miles from the mouth up of the river is in Alaskan territory. The Liard Division is likewise the drainage area of the Liard river and therefore on the Arctic slope, as the Liard river flows into the Mackenzie river at Fort Simpson.

These Divisions are the greatest unexplored area in the Province and will so remain unless hydroplanes are utilized for exploratory work. The innumerable lakes and waterways should make very favourable routes and landings for hydroplane-work.

So far the easiest means of getting into the country is by way of the Stikine river and east from Atlin. The main route is from Wrangell up the Stikine river by river-boat to Telegraph Creek, at the head of navigation. The river-boats normally start about May 15th. From Telegraph Creek to Dease lake is 72 miles over a road finished last year by the Mines Department, so that motor-trucks can make the trip through to the lake in a day. The old pack-train time was six days in, loaded, and four days out, light.

From the head of Dease lake there is a waterway to the Arctic ocean via Dease lake, Dease river, Liard river, and Mackenzie river. The whole country is a moose pasture. Prospecting and development are slowly increasing with the improvements in transportation and there is a field for thousands of prospectors.

The taking-out of a few ounces of gold on Gold Pan creek, a small tributary of Eagle river, though not a new discovery, may be an incentive for prospectors to explore the rest of the country.

STIKINE RIVER SECTION.

There has been no activity up the Iskut river this year at all. Acreage-tax was paid on Crown-granted claims.

On the Clearwater river, a tributary of the Stikine river emptying into it about 70 miles above the boundary-line, considerable interest has been shown in placer-mining; some prospecting was done and about 30 oz. gold taken out in sluicing. Also some lode prospecting was done and I am informed that some promising-looking quartz was brought out. As this area lies right along the eastern contact of the Coast Range granites I have always recommended it as a very

promising prospecting region. Transportation is not nearly as badly handicapped as other sections, for the Clearwater is navigable for several miles for light boats. Several men are wintering in the Clearwater country.

The total placer-gold production for the year is approximately $3,325.

DEASE LAKE SECTION.

At the old placer camp of Laketon on Dease creek, which flows into Dease lake from the west, about half-way down the lake, an appreciable amount of work has been done this year.

Dickinson Mining Co. This company was organized in the State of Washington and registered as an extra-provincial company in British Columbia in December, 1923, with its head office at Telegraph Creek. Its authorized capitalization is $25,000; the paid-up capital is $2,500. The company has a number of leases at the mouth of Dease creek and this fall took in a portable sawmill. There are six men working this winter preparatory for next spring's sluicing.

Dease Creek Mining Co., Ltd. This company was incorporated in the State of Washington and registered in October, 1923, as an extra-provincial company in British Columbia, with its head office in Telegraph Creek. Its authorized capitalization is $50,000, of which $15,000 is the paid-up capital. Its holdings consist of seven leases at the head of Dease creek, on which it intends installing an hydraulic equipment.

Sunrise Lease.—Tom Bryan and Geo. Johnson took out about 30 oz. gold for the season from this lease on Dease creek. They are putting in a ditch and pipe-line to obtain water from the head of Lyons gulch, a distance of about 2 miles.

Dease Syndicate. This syndicate holds thirteen leases on Thibert creek, which empties into the foot of Dease lake from the west. The ground was worked a couple of years ago by George Adams, of Atlin, unprofitably because of the lack of water, but successfully in demonstrating the values and extent of pay-gravel and the proper system for handling the whole undertaking.

The present equipment on the ground is adequate for the available water, but the whole plant is not big enough to handle the excessive overburden. Ample water can be obtained about 4 miles up Thibert creek from the lower end of the leases, where it is proposed to start operations. It is estimated that a 30-inch pipe-line would meet all the requirements, which with necessary additional hydraulicking equipment would cost about $160,000 in place.

I have been over the ground several times and am greatly impressed with the possibilities of the property. I would strongly recommend its investigation by any one interested in hydraulicking.

Lease 143.—This is situated across Thibert creek from Boulder creek. The owners, L. W. Hohensee and partner, are driving in with fair success. They took out about 30 oz. this season.

Lease 144.—The owner, Thos. Hobson, is making extensive preparations for spring work.

Mosquito Creek.—George Adsit took out about 10 oz. placer gold. I am informed that Seattle interests are negotiating for the whole creek.

Cassiar Dredging Co., Ltd.—This company holds some dredging leases at the mouth of Thibert creek. Arrangements are being made in Seattle for machinery to be sent in by tractor in the spring.

On McDame creek, which flows into Dease river about 45 miles down from the foot of Dease lake, more progress has been made this season than for many years.

Pendleton Gold Mining Co., Ltd. This is a State of Washington company registered in British Columbia in February, 1920, with its head office at Victoria. It is capitalized for $500,000, divided into 500,000 shares. This year, under the efficient supervision of H. A. Kuehl, of Seattle, a road was built from the mouth of McDame creek to the company's lease No. 69, at China bar, about 11 miles up the creek. Forty-five tons of machinery was then taken in and erected, but unfortunately too late for operations this fall. A crew of six men are on the ground this winter preparing everything to take advantage of the early spring water.

Gold Pan Creek.—(*See* sketch.) This is a small creek flowing into Little Eagle river from the east, about 4 miles from the head of the river. This fall, about September 1st, two prospectors, Grady and Ford, arrived in Telegraph Creek with 2½ oz. of fairly coarse gold which

they stated was found on rim-rock at the mouth of Gold Pan creek. They recorded "discovery," but were not particularly excited about the find, admitting that bed-rock had not been reached at any place, but considered it well worth further investigation next season. However, some local people got the fever, and together with the captain, crew, and cook of the river-boat from Wrangell headed for the new "diggings." When they returned and the boat got back to Wrangell the 2½ oz. of gold had grown, broadcasting commenced, and the "stampede" was on. By October 1st about 100 claims had been staked, although there was 3 feet of snow on the creek. Government office records show that up to the end of the year 165 claims had been staked on Gold Pan and tributary creeks. No conclusive work has been done and no more is known of the country than when Grady and Ford came out, but the power of the press has again been demonstrated.

However, gold has without doubt been found; there is a big country similar to the area already staked, and therefore there are the probabilities of other finds.

The most feasible route into the country is by way of Wrangell; thence by river-boat to Telegraph Creek; thence by pack-train or motor-truck to the head of Dease lake, 72 miles. From there it is about 25 miles east from the head of the lake and north to Gold Pan creek. My information regarding the trail from the head of the lake is that it is mostly a jack-pine country and horses can be taken anywhere.

The river-boats of the Barrington Transportation Company running from Wrangell will start as early as possible, probably about May 1st. Outfit and supplies may be obtained at Telegraph Creek, doing away with Customs regulations at the boundary-line.

The accompanying sketch-map will give some idea of the situation. Dome creek runs into Gold Pan at three above, Grady creek at nine above, and Little Jimmie at twenty-seven claims above discovery.

ATLIN MINING DIVISION.

This Division, which comprises the north-western corner of the Province to the British Columbia-Yukon boundary, is showing a considerable renewal of activity and interest in mining. The placer-output of $147,000 is about normal. No new placer-ground has been discovered, with the exception that upper Spruce creek is proving rich where bed-rock can be gained.

The outstanding feature of the Division this year is the resumption of operations at the *Engineer* mine, which has been idle and in litigation since the owner, Captain James Alexander, was drowned on the "Sophia" in 1918.

Adjoining properties will doubtless become active and prospecting in general will be revived. The Atlin Silver-Lead Mines operated for a short time during the spring and summer.

Since R. W. Wiley stopped work on the *Maid of Erin* property in the Rainy Hollow section nothing further has been done. The Alaska Road Commission has put the road from Haines to the boundary in good repair at a large expense.

Some prospecting was done in the Taku Inlet section, but nothing of importance has been reported. This section is easily accessible by small power-boat and offers a field for prospecting similar to the Stewart and Alice Arm areas.

ATLIN LAKE SECTION.

Engineering Gold Mines, Ltd.

(*See* Minister of Mines' Reports, 1904, 1914, and 1918, and Dom. Geol. Survey, Memoir 37, by D. D. Cairnes.) The *Engineer* group consists of eleven Crown-granted mineral claims—*Northern Partnership Nos. 1, 2, 3, 4, 5, Engineer No. 1, Mickey, Plato, Philadelphia Fraction, Mill Brook,* and *Daisy*—situated on the east side of Taku arm, 10 miles south of Golden Gate, 65 miles from Carcross on the White Pass Railway, and 25 miles from Atlin. Its location on the edge of the lake is ideal for operating in the summer months, but the long winter is a serious handicap. In summer it is without doubt one of the beauty-spots of the North country. The White Pass Railway lake-boat plying between Carcross and Atlin calls at the mine each way. An overland winter trail from the property to Atlin was built this fall by the Mines Department to serve as a means of communication for mails and emergencies. The lake-travel is dangerous at all times during the six months that navigation is closed.

The general country-rock formation consists of shales and fine-grained greywackes that vary from dark greenish to almost black. These have been cut, faulted, and folded by intrusions of andesite, granite porphyry, etc. The quartz veins range from a few inches to great masses

of quartz 200 feet in width, locally called "hubs." The mineralization is mainly pyrite, though some native antimony and arsenic also occur, and the chief metallic mineral native gold.

During the regime of the late Captain Alexander a great deal of prospecting and development-work was done; the former consisting in the main of innumerable open-cuts which exposed some twenty-five small quartz veins showing free gold in many of the exposures. The underground development was practically confined to the "E vein," on which a shaft had been sunk 275 feet, from which four levels had been run both ways. From this work, both surface and underground, considerable ore had been extracted and treated in, formerly, a 2-stamp Joshua Hendy mill and latterly in a small ball-mill. The record run of the ball-mill is said to have produced 24 lb. 8 oz. of gold from 160 lb. of ore. A comprehensive plan of development had been planned and gotten under way to the extent of driving what is known as the "mill tunnel" about 300 feet.

Late last fall the property was examined and bonded by Andrew Sostad for New York interests. A lot of work was done during last winter and continued throughout 1924. The Engineer Gold Mines, Limited, was incorporated in May of this year and took over the bond. This company was organized in the State of Delaware, with a capitalization authorized at $1,000,000 and a paid-up capital of $1,000,000. The head office in the Province is in Vancouver.

Since the company took over the property extensive work has been carried on with a crew of from thirty to sixty men. Camp buildings have been erected, a power plant and transmission-line installed, a concentrator built, diamond-drilling done, and the driving of the "mill tunnel" continued.

A commodious frame mess-house, consisting of a 16- by 24-foot kitchen and 18- by 30-foot dining-room; a two-story bunk-house, 24 by 48 feet, containing fifteen bedrooms, change and wash room, bath, toilet, and laundry rooms, electric-heated throughout, hot and cold water—in fact, a modern building in every way that will accommodate thirty men—have been built; also several new residences; an office, 24 by 40 feet, floated from the old camp of Conrad, a distance of about 50 miles, and a new wharf have been added to the camp.

The concentrator, having a capacity of 50 tons in twenty-four hours, is located on the edge of the lake below the mouth of the "mill tunnel," the site of the old stamp-mill. It is a frame building of very substantial construction. The equipment consists of a 50-ton ore-bin at the head of the mill, to which ore is dumped from the mine. From the bin the ore goes to a 7- by 10-inch Dodge crusher, reducing ore to ¾-inch size; then by automatic feed to a 4- by 4-foot ball-mill, which grinds to 120 mesh. From the ball-mill the pulp goes over three amalgamating-plates, 48 by 168 inches, fitted with amalgam-traps; thence to elevator to Aikens classifier, from which the oversize is returned to the ball-mill and the slimes run over three amalgamating-plates, 48 by 168 inches. From these slime-plates the ore goes to an hydraulic classifier, from which the coarse material is fed to a Wilfley table and the fine material to a dewatering-cone; thence to a Deister slime-table.

All the tailings are elevated by centrifugal pump and impounded for future treatment. The table concentrates will consist of pyrite, chalcopyrite, and gold compounds, and probably a good grade of ore. The mill is driven by a 75-horse-power motor.

At the mouth of the working-tunnel a compressor building 14 by 28 feet houses a 600-cubic-foot Ingersoll-Rand machine driven by a 75-horse-power motor; and a large blacksmith-shop is equipped with a steel sharpener, lathe, etc.

The power plant has been installed on the Wann river, which flows into the lake about 3 miles below the mine. The building is of frame construction, 20 by 40 feet; the equipment comprising a 6-foot Pelton wheel driven by two 3-inch nozzles, and a 200-kw. generator, making about 150 horse-power. A 180-foot head of water is obtained by 500 feet of 16-inch steel pipe from the wheel; then 1,700 feet of wood-stave pipe to flume, which is 250 feet to intake on the river. The plant is arranged to admit of enlargement at any time.

From the power-house a 3-wire transmission-line of No. 2 hard-drawn wire runs to the compressor plant at the mouth of the tunnel. A wagon-road has been built along the transmission-line.

About 2,000 feet of diamond-drilling was done from the surface in three holes. One hole, 930 feet deep, was run across the upper series of veins up the hill from the "E vein" shaft. This proved the downward extension of these veins and justifies the driving of a crosscut tunnel from the surface on a level with the No. 1 level of the shaft. Another hole was run 520 feet,

cutting "hub B," one of the large masses of quartz-croppings, at a depth of 360 feet, thereby showing the necessity of driving a tunnel into it from the surface for its exploration. A third hole, 500 feet deep, was being drilled under "hub A" for the same purpose.

Underground work in the driving of the main tunnel was pushed ahead, reaching its objective, under the E vein shaft, in December, at about 1,200 feet. This obtains a depth of 50 feet below the 40-foot sump or 90 feet below the No. 4 level of the shaft. My information is that the same width and rich quality of ore was encountered as occurs in the shaft levels above. A raise is being put up to the bottom of the shaft and drifts run both ways on the vein from the tunnel, thus making this ore-body available for milling right away. Four or five small veins were crossed in the driving of the main tunnel, one of which shows fine ore. All of these will ultimately be developed. With a crosscut tunnel driven under the upper series of veins and connected with the shaft and working-tunnel, the property will be in excellent condition to maintain an ample, rich feed for the mill and a resultant steady output of gold.

Andrew Sostad has had the general management of operations since the start. This summer Fred Collins, formerly mine superintendent at the *Belmont-Surf Inlet* mine, was installed in the capacity of general superintendent. H. Giegrich is the engineer.

Other properties in the vicinity of the *Engineer* mine that were reported on in the Minister of Mines' Report, 1918, since which time no extensive work has been done, are as follows:—

Venus group and *Venus Extension* group on Windy arm of Tagish lake; the *Gleaner*, *Kirtland*, and *Sweepstake* groups adjoining the *Engineer* group; *Happy Sullivan* group on Sheep creek north of the *Engineer*, and about 1½ miles from the lake; *Brown* group, about half a mile up the Wann river; *White Moose* group, across the lake and a little south of the *Engineer*; *Rupert* group, above the *White Moose* group; *Laverdiere* group on West bay at the south end of West channel, an arm of Atlin lake; *Callaghan* group adjoining the *Laverdiere* group; *Copper Island*, at the south end of Atlin lake; *Big Horn* and *Spokane* groups on Big Horn creek, 10 miles up the creek from the west side of Taku arm, just opposite Golden Gate. (*See* Report, 1921.)

Atlin Silver-Lead Mines.

(*See* 1921 Report under *Big Canyon* and *Ruffner* groups, and 1922 and 1923 Reports.) This property is comprised of fifteen mineral claims situated on Vaughan mountain, about 10 miles up Fourth of July creek from Atlin lake and 14 miles by wagon-road from Atlin. The first 6 miles of this road from Atlin is in fair condition, but the balance, up Fourth of July creek, is at best only a temporary road. Should the property develop into a shipper, which seems very probable, a road has been cruised up the west side of the creek on a good grade that could be built comparatively cheaply. The property is owned and under the supervision of J. M. Ruffner, of Atlin.

By referring to former reports it will be seen that up to the end of 1923 the property has had a considerable amount of exploratory and development work by way of open-cutting, short tunnels, and a shaft sunk to 50 feet and drifting therefrom.

The surface work has disclosed in the prevailing country-rock of massive granite a number of well-defined fissure-veins up to 14 feet in width, much oxidized on the surface and, as subsequent work has shown, to a very considerable depth. In the oxidized material is found lumps and ribs of ore consisting of quartz mineralized with galena, zinc-blende, and pyrite, carrying good values in gold, silver, and lead, the silver being the important value.

This year the compressor, put on the ground the previous winter, was erected on the *Cherokee Fraction;* the drift east on the vein into the hill was extended 80 feet, making a total distance of 120 feet from the shaft. As noted in the 1923 Annual Report, there was a decided improvement in the ore as depth was attained in the shaft, due to the lessening of the oxidation and the increase of sulphide contents. The drift east, however, went through the ore-shoot and at the face the vein-width is 4 feet, assaying (manager's sampling): Gold, 40 cents; silver, 2.3 oz. to the ton; and lead, 3 per cent. A shipment of 30 tons sent to the Trail smelter, which was sorted from the drift and the dump at the collar of the shaft, assayed: Gold, 0.16 oz.; silver, 75.7 oz. to the ton; lead, 29.25 per cent.; and zinc, 12.4 per cent.

The shaft was sunk 25 feet deeper in the vein, showing mixed ore, assaying across 3½ feet at the bottom: Gold, $2.80; silver, 14.2 oz. to the ton; and lead, 12 per cent.

Work was then started on a drift-tunnel 185 feet below the collar of the shaft, which was driven 190 feet through a heavily oxidized vein-filling about 4 feet in width, the face assaying: Gold, 60 cents; silver, 5.55 oz. to the ton; and lead, 5.4 per cent.

Later in the season, what may be the extension westward of the No. 2 vein was picked up at an elevation of 300 or 400 feet above the valley-level. A grab sample from it assayed: Gold, $19.60; silver, 68.1 oz. to the ton; and lead, 18.8 per cent. This discovery is important, as it would be a suitable point from which to start a prospecting-tunnel that would obtain sufficient depth on the vein to prove conclusively conditions below the oxidized horizon. Another cropping was found, high up on the mountain, that may be the extension eastward of the No. 4 vein. Gold values up to $73 to the ton were obtained at this point and further work will be done to open the vein next season.

It has apparently been demonstrated by the amount of surface work done, and in the depth attained in the shaft and drift and drift-tunnels from the surface, that a considerably greater depth is necessary to prove the property, and that such work is fully warranted by the findings already made.

Mr. Ruffner expects to get an early start next season on a comprehensive scale of development.

Cornerstone Group.

This group, consisting of the *Cornerstone*, *Prince Eddie*, *Melbourne Cup*, and *Golden Link* mineral claims, is owned by J. Reid, of Atlin. The claims are situated on the west end of Munroe mountain. The general rock formation is massive granite, within which is a belt of coarse, loose-grained, more or less decomposed granite, in which occur pegmatite veins. Some work was done on the face of a bluff on the north side of the mountain in one of these pegmatite veins. It shows it to be about 4 feet wide, mineralized with a little disseminated pyrite and claimed by the owner to carry values in gold, silver, tin, and tungsten. A sample across 4 feet failed to show any values other than a trace of gold and a trace of silver.

Imperial Group.—This group, owned by James Stokes, of Atlin, is situated on the south side of Munroe mountain, and was reported on in 1918, to which report the reader is referred, as since then nothing of importance has been done.

Lakeview Group.—This group of six claims is situated on Star mountain between Birch and Boulder creeks, and was also reported on in 1918.

PLACER-MINING.

The only locality in the Atlin Mining Division that placer-mining is being carried on is in the immediate vicinity of Atlin. Production is confined to Spruce, Pine, Ruby, Otter, Boulder, and McKee creeks, the first mentioned being by long odds the most important. Altogether the season was a very favourable one; water conditions were fine throughout, though labour was none too plentiful. I am indebted to C. L. Munroe, Gold Commissioner, for the production figures.

Spruce Creek.—There were a number of operators on the creek this year, especially on the upper claims. The lower ground is about exhausted and there are comparatively few "lay" men left. Isaac Matthews was probably the largest producer this year. As has been pointed out every year, the upper creek, where good "pay" is being found, on which depends the maintenance of the placer industry and the camp of Atlin, is rendered practically useless by the lack of proper drainage. The lower ground is owned by people who have no need of a drain through it at present and consequently the upper ground is unworkable on bed-rock.

Some method should be adopted by the Government whereby the situation would be relieved by the construction of a Government-owned (or otherwise) drainage-tunnel, maintained and eventually paid for by a levy on each and every operation in proportion to the benefit derived from it.

Pine Creek.—The output from this once famous creek was very small this year. A small hydraulic outfit operated by Mr. Hill and associates and a few individual miners was the extent of activities. The Discovery Mining and Power Company did not work any of its ground this summer. The town of Discovery is the latest addition to the list of "ghost mining camps."

Ruby Creek.—The Placer Gold Mines Company, which has been hydraulicking on Ruby creek very successfully for several years, finished its ground this year, moving about 54,000 yards of gravel that yielded 2,600 oz. gold. This fall the necessary part of the equipment was moved down the creek to the lower end of the company's ground. This, from previous testing, is known to be rich and drifting will be carried on next year. The company's affairs are under the management of C. E. Leonard and C. H. Titus.

SKETCH MAP

DEASE LAKE AREA, LIARD MINING DIVISION

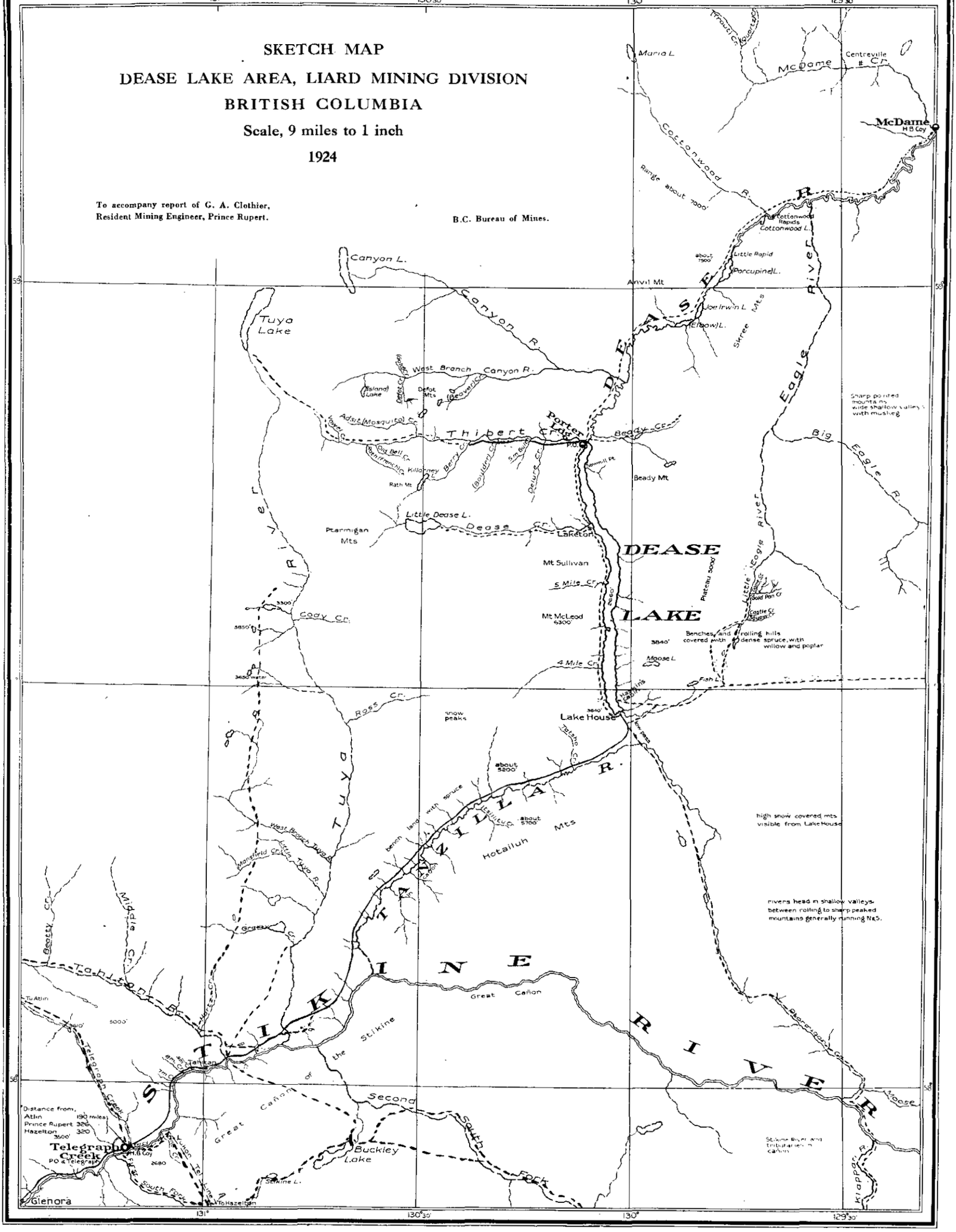
BRITISH COLUMBIA

Scale, 9 miles to 1 inch

1924

To accompany report of G. A. Clothier,
Resident Mining Engineer, Prince Rupert.

B.C. Bureau of Mines.



Above the company ground the former creek-bed has been covered by a lava-flow under which it would be impossible to hydraulic. Attempts have been made by owners above to penetrate this lava-bed and get to bed-rock below, but have so far been unsuccessful.

Ruby creek was one of the last creeks to be hydraulicked, but has proven a very profitable undertaking.

Boulder Creek.—I am informed that only one small crew was working, with fair success.

Otter Creek.—The Mines d'Otter, under the supervision of Henri Maluin, had a profitable season, though operating under a heavy handicap in the early part of the season, due to the working-ground being buried under a slide of gravel. About July 1st hydraulicking was started on a higher bench which proved to be good "pay" and enabled the company to meet the abnormally heavy expense.

McKee Creek.—The Delta Gold Mining Company's holdings were operated this year by Geo. Adams and associates. A large yardage of gravel was moved in working out two pits and over 6,000 square yards of bed-rock were claimed; the results, though fairly satisfactory, did not come up to expectations. An average of twelve men was working throughout the season.

CASSIAR DISTRICT.

ATLIN MINING DIVISION.

REPORT OF C. L. MONROE, GOLD COMMISSIONER, ATLIN.

I have the honour to submit the office statistics of the Atlin Mining Division for the year ended December 31st, 1924.

Free miners' certificates (individual)	229
Free miners' certificates (company)	3
Placer records	3
Placer rerecords	14
Leases applied for	19
Certificates of work (leases)	74
Leaves of absence (representing 65 claims)	21
Bills of sale, etc. (placer)	6
Bills of sale, etc. (hydraulic)	7
Bills of sale, etc. (mineral)	4
Mineral records	27
Certificates of work (mineral)	79
Certificates of improvements	2
Filings (mineral)	8
Crown grants issued	1
Gold reported or estimated	~~$147,000~~

Revenue.

Free miners' certificates	$1,370 75
Mining receipts, general	7,114 50
Total	$8,485 25

STIKINE AND LIARD MINING DIVISIONS.

REPORT BY H. W. DODD, GOLD COMMISSIONER, TELEGRAPH CREEK.

I have the honour to submit the office statistics of the Stikine and Liard Mining Divisions for the year ended December 31st, 1924.

Free miners' certificates (individual)	221
Free miners' certificates (company)	2
Placer claims recorded	165
Placer claims rerecorded	8
Placer leases issued	27
Mineral claims recorded	6
Certificates of work (placer)	33
Certificates of work (mineral)	13
Leaves of absence (placer)	68
Bills of sale, assignments, etc., recorded	166
Filings	2

Revenue.

Free miners' certificates	$1,064 25
Mining receipts	4,690 80
Total	$5,755 05

SKEENA DISTRICT.

SKEENA AND BELLA COOLA MINING DIVISIONS.

REPORT BY NORMAN A. WATT, GOLD COMMISSIONER, PRINCE RUPERT.

I have the honour to submit the office statistics of the Skeena and Bella Coola Mining Divisions for the year ended December 31st, 1924.

Free Miners' certificates issued	312
Mining receipts issued	42
Mineral claims recorded	96
Certificates of work issued	128
Filings	20

Revenue.

Free miners' certificates	$1,629 25
Mining receipts	1,390 60
Total	$3,019 85

NASS RIVER MINING DIVISION.

REPORT BY JOHN CONWAY, MINING RECORDER, ANYOX.

I have the honour to submit the office statistics of the Nass River Mining Division for the year ended December 31st, 1924.

Free miners' certificates (individual)	213
Free miners' certificates (company)	3
Free miners' certificates (special)	3
Mineral claims recorded	102
Certificates of work issued	366
Bills of sale, etc., recorded	42
Filings	18

Revenue.

Free miners' certificates	$1,335 50
Mining receipts, general	1,961 70
Total	$3,297 20

PORTLAND CANAL MINING DIVISION.

REPORT BY J. P. SCARLETT, MINING RECORDER, STEWART.

I have the honour to submit the office statistics of the Portland Canal Mining Division for the year ended December 31st, 1924.

Free miners' certificates (individual)	381
Free miners' certificates (company)	11
Mineral claims recorded	536
Certificates of work issued	811
Bills of sale, etc., recorded	252
Certificates of improvements recorded	70
Filings	95
Abandonments	7

Revenue.

Free miners' certificates	$ 3,005 50
Mining receipts	7,761 25
Total	$10,766 75

QUEEN CHARLOTTE MINING DIVISION.

REPORT BY J. L. BARGE, MINING RECORDER, QUEEN CHARLOTTE.

I have the honour to submit the office statistics of the Queen Charlotte Mining Division for the year ended December 31st, 1924.

Free miners' certificates	97
Mineral claims recorded (quartz)	17
Placer claims recorded	12
Placer leases recorded	22
Placer leases applied for	16
Certificates of work issued (quartz)	24
Certificates of work issued (placer)	2
Records entered	58
Records filed	2

Revenue.

Free miners' certificates	$ 462 00
Mining receipts	1,189 25
Total	$1,651 25

NORTH-EASTERN MINERAL SURVEY DISTRICT (No. 2).

REPORT FOR YEAR 1924.

BY JOHN D. GALLOWAY, RESIDENT MINING ENGINEER.

INTRODUCTORY.

The North-eastern Mineral Survey District consists of Omineca, Cariboo, Quesnel, and Peace River Mining Divisions, and occupies a large portion of Northern British Columbia, having an area of nearly 100,000 square miles. The northern, western, and southern boundaries of this district are the arbitrary boundary-lines of the Mining Divisions, but these, where practicable, always follow the watersheds of the country. The eastern boundary is the British Columbia-Alberta boundary-line. The western boundary is roughly 100 miles from the Coast, while the northern and southern boundaries are about 200 miles from the respective Provincial boundaries.

For descriptive purposes in this report the district is reviewed under the main headings of the Mining Divisions, subdivided into sections as follows:—

Omineca Division—Skeena section; Hazelton section; Telkwa section; Burns Lake section; Sibola section; Manson section.

Cariboo Division—Barkerville section; Fort George section.

Quesnel Division—Quesnel section; Quesnel Lake section; Horsefly section; Keithley section.

Peace River Division.

A general description of the geographic, geologic, and topographic features of the district was given in the Annual Report of the Minister of Mines for 1917. In the following table is given a list of the more important reports on this district, in addition to which numerous references can be found in the Summary Reports of the Geological Survey and the Annual Reports of the British Columbia Department of Mines:—

LIST OF REPORTS ON DISTRICT.

Name of Author.	Publication.	Year.	Page.
Dr. Geo. Dawson	Geological Survey of Canada	1875	233
Dr. Geo. Dawson	Geological Survey of Canada	1876	17
Dr. Geo. Dawson	Geological Survey of Canada	1879	Pt. B
Dr. Geo. Dawson	Geological Survey of Canada	1888	73R
Amos Bowman	Geological Survey of Canada	1887–8	Pt. C
R. G. McConnell	Geological Survey of Canada	1894	5c
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GENERAL SUMMARY.

The lode-mining industry in the North-eastern District started well in the early part of the year 1924, but later on some disappointments and set-backs occurred. These must be expected, however, in a district where mining conditions are difficult and many obstacles must be overcome in the development of properties to the productive stage.

At the beginning of the year the Federal Mining and Smelting Company had commenced an active campaign of development of several properties; in August all work was discontinued and the company retired from the field. It is unfortunate that the Federal Company was not apparently successful in its operations, but the history of mining shows that many successful mines have been taken up and abandoned several times before success was attained.

With the exception of the stopping of work by the Federal Company, all other mining development for the year was satisfactory. Work was carried on at the *Fiddler* group at Dorreen, on the *Sunrise* near Hazelton, and much small-scale individual work at numerous properties throughout the district.

Owing to the steady operation of the Duthie Mines during the first half of the year, the production of the district shows the important increase of 72.5 per cent. as compared with 1923.

At the present time there is a keen demand for properties containing silver, lead, and zinc ores. In this district there are many properties containing such ores and undoubtedly some of them are worthy of serious investigation. The Silver Basin properties described in the 1923 Annual Report have been taken up under option and will be developed in 1925. Similar showings occur on Legate creek and should receive attention. In the Babine range the distance of many of the properties from the railway has been a deterring influence on their development, but with lead at 9 cents a pound some of them present favourable opportunities for the investment of mining capital.

The North-eastern District has made but slow progress in mining development in recent years, but the vast extent of the known mineralized area indicates that before long it should take an important place as a productive mining district of the Province.

In placer-mining the year was a most satisfactory one. The production shows a small increase as compared with 1923, and the prospects for a largely increased output in the future are excellent. The outstanding feature was the construction by the Kafue Copper Development Company of a standard modern type bucket-dredge on Antler creek, near Barkerville. The successful operation of this dredge will direct attention to the large areas of low-grade placer-gravels occurring in the Cariboo District and the possibilities of successful mining of them by dredging methods.

The construction of a dredge was also started in the fall of the year on the Swift river, near Cottonwood; it is expected that it will be completed in the spring of 1925. This dredge is of a new type and its operation will be of interest. Some testing of placer-ground by Keystone-drilling was carried out, but much more is planned for 1925.

The hydraulic mines of the Cariboo and Quesnel Divisions had a satisfactory year and a larger output from them accounts for the increased production of the North-eastern District. Cedar Creek camp was active until the winter freeze-up, but a slightly lower production was made than in 1923.

During the year a trip was made by the Resident Engineer into the old Manson Creek placer camp. This area is considered to be excellent ground for the placer prospector and also for dredging-ground. Development of the Telkwa Collieries property was carried on during the year, and in the late fall shipments of coal to Prince Rupert and the local market were resumed.

An important geologic examination of the Driftwood Creek area in the Babine range was made in 1924 by Dr. Geo. Hanson, of the Geological Survey of Canada. The mineral properties within the area geologically mapped were examined in detail.

The writer wishes to thank the prospectors, operators, and mining men of the district for many courtesies extended.

ROAD AND TRAIL CONSTRUCTION.

As usual, substantial aid to the mining industry was given by the Mines Department by means of grants from the Mines Development Fund to build, or partially assist in building, various roads and trails to mining camps and properties in various parts of the district. Numerous small grants were made to improve roads and trails in many places, particularly in the Cariboo and Quesnel Divisions, and while no expensive individual pieces of road were constructed, nevertheless, in the aggregate, a substantial amount of money was expended.

In the Hazelton-Telkwa-Skeena sections development of mineral properties is still considerably handicapped by lack of adequate transportation. The work done each year by grants from the Mines Development Fund is steadily making the country more accessible and in time the benefits of the policy will become apparent.

PRODUCTION.

The lode-mineral production of the district was 1,709 tons, containing 329 oz. gold, 262,759 oz. silver, 754,559 lb. lead, and 11,162 lb. copper. The placer production was $250,000, the bulk of which comes from the Cariboo and Quesnel Divisions. The Telkwa Collieries shipped 1,228 tons of coal.

PROSPECTING.

In the 1917 Annual Report an outline of the physiographic and geologic features of the district was given. Under the subheading of "Prospecting Possibilities" in the 1921 Annual Report, a description is given of what are considered to be promising areas for prospecting in the North-eastern District. Again, in the 1923 Annual Report, under "Opportunities for Prospecting," likely areas for the prospector are designated. It is unnecessary to repeat at length these descriptions, but it is desirable to point out that there are still any number of places in the district which have not been carefully prospected.

In the Bulkley, Babine, and Cariboo mountains opportunities for prospecting for lode minerals are good and many suitable areas occur. The North-eastern District also contains large areas of more or less virgin ground for the placer prospector. In the Cariboo and Quesnel Divisions opportunities still occur, and much new territory remains to be explored in the eastern portion of the Omineca Division, north of the Canadian National Railway. The country surrounding the old placer camps of Manson creek and the Ingenika river have been dormant for years, but much promising ground remains to be investigated.

The North-eastern District also offers opportunities for those desirous of acquiring and developing prospects. Showings containing gold, silver, lead, zinc, and copper ores occur widely, and while, as is usual in all mineralized zones, many of the claims are not of importance, there are numbers that have merit and are worth at least preliminary development. There are also deposits containing tungsten, arsenic and molybdenite, and some good mica occurrences.

Good-quality coal occurs in several places throughout the district, and with the exception of a small production from the Telkwa River field, no serious effort has been made at development

and output. There are also abundant opportunities for large-scale operation of low-grade placer-gravels in the Cariboo, Quesnel, and Omineca Divisions.

OMINECA DIVISION.

SKEENA SECTION.

Usk.

Small-scale work was carried out during the year on a number of properties in the vicinity of Usk. The usual number of prospectors were out in the hills, but, for the most part, they were engaged in doing assessment-work and but little new prospecting or exploration was done.

There are a large number of claims in this area and nice specimens of gold, silver, copper, and lead ore can be obtained from many of them. As a general rule the types of ore-bodies are irregular, consisting of sheared and sheeted zones in which the valuable minerals are intermittently deposited, and considerable development is required to test the showings. Many of the properties are practically undeveloped, as the total amount of work done in annual assessments, in the aggregate, amounts to but little. It would seem that a number of the properties have sufficient evidence of mineralization to warrant extended development by companies with the necessary capital. The actual minerals in the ore-bodies are as a rule high grade, and therefore, if appreciable ore-shoots occur, they would be most valuable. All the more important claims in this area have been described in previous Annual Reports.

Lucky Jim. This property, owned by Fred Forrest and situated on Kleanza creek, 13½ miles from Usk, was described in detail in the 1923 Annual Report. Briefly, the showing consists of disseminated bornite, chalcopyrite, and copper carbonates occurring in a zone from 5 to 10 feet wide; average samples show from 3.5 to 8 per cent. copper and from 2 to 5 oz. silver.

The property was bonded by the Federal Mining and Smelting Company and work commenced in July, 1924. A drift-tunnel was started and driven 10 or 15 feet, when all work was stopped in accordance with the general policy of the company of closing down in the district. Since this work was done the property has not been examined by the writer.

This property is nicely situated for economical mining and it is to be regretted that it was not given a more extensive testing.

Lucky Luke. This group, situated 1½ miles from Usk and owned by L. E. Moodie and Richard Lowrie, was fully described in the 1923 Annual Report. During 1923 and 1924 it was under bond to S. A. D. Davis and partners, who carried on intermittent development with two men. A shipment of 25 tons of hand-sorted ore was made from the property in the fall of 1924; this gave returns of 18 oz. gold, 316 oz. silver, and 11,162 lb. copper.

The vein occurs in schistose rock and is well defined, being from 1 to 2 feet wide. The gangue is quartz and altered schist carrying bornite, chalcopyrite, and a little pyrite and chalcocite. The ore occurs in short irregular shoots and the problem seems to be to discover ore-shoots of appreciable length.

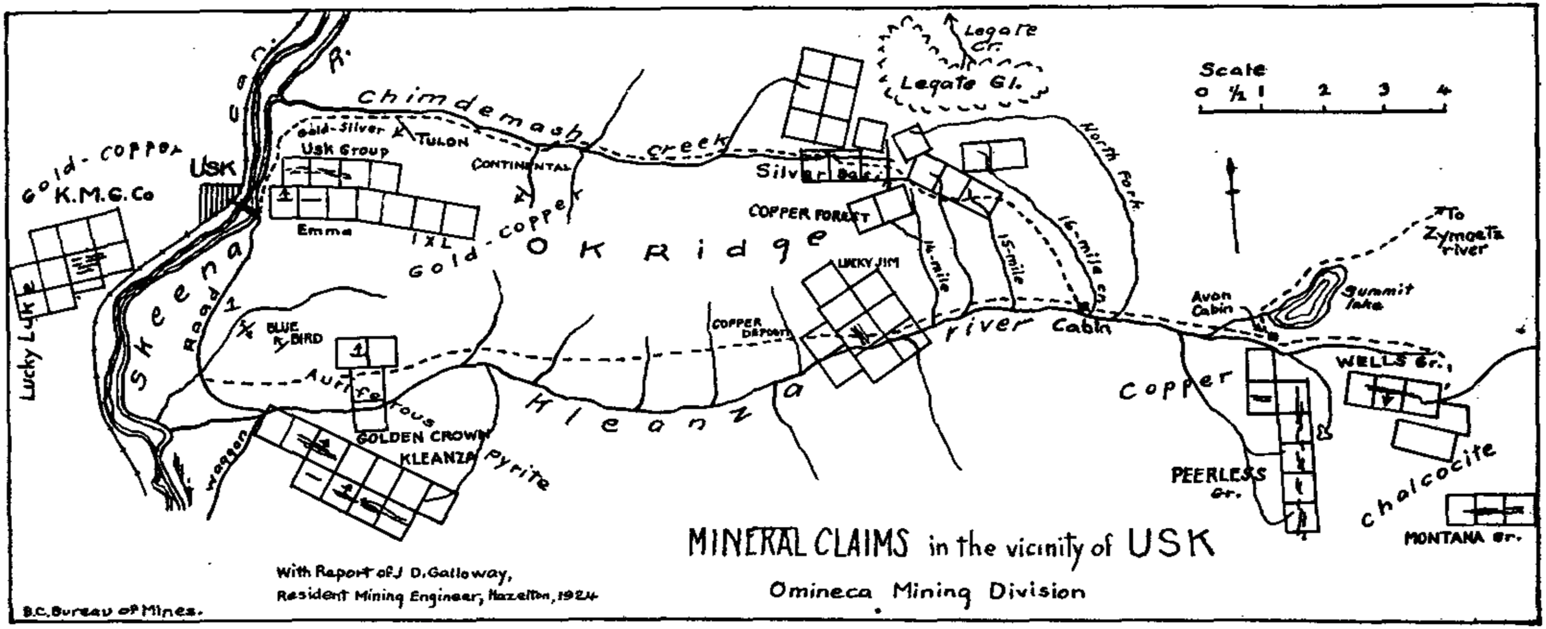
Silver Basin.

The properties situated in Silver basin at the head of Chimdemash creek were examined in 1923 and reported on in the Annual Report for that year.

In 1924 the more important claims were secured under option by John Willman. During the summer the properties were examined by W. J. Elmendorff, of Seattle, and as a result an arrangement was made whereby Mr. Elmendorff has secured the necessary capital to carry out preliminary development of the properties, in return for an interest in Mr. Willman's option. This work, which to begin with will consist mainly of surface work, will be started in the spring of 1925.

The following extracts are taken from Mr. Elmendorff's report on the Silver Basin properties:—

"*Silver Basin.*—A glacial cirque of horseshoe form and about 2 miles diameter, lying above the head of Chimdemash creek, has been appropriately named Silver basin. The inclined floor of the basin rises from an altitude of 4,000 feet above sea-level to 4,500 feet. The surrounding peaks of the Bornite range rise more than 2,000 feet higher. The scene is one of simple grandeur not easily forgotten.


Legate Cr.
Legate Gl.
Scale
0 ½ 1 2 3 4
Chimdemash creek
Gold-Silver
TULON
Usk Group
CONTINENTAL
USK
Gold-copper
K.M.C. Co
Emma
IXL
Gold-copper
OK Ridge
Silver Bar
COPPER FOREST
North Fork
16-mile cr.
15-mile
14-mile
LUCKY JIM
To Zymoetz river
Summit lake
Avon Cabin
Cabin
river
Skeena
Road
BLUE BIRD
COPPER DEPOSIT
Lucky Luke
Auriferous
Kleanza
GOLDEN CROWN
KLEANZA
Pyrite
Waggon
Copper
WELLS Gr.
PEERLESS Gr.
chalcocite
MONTANA Gr.
With Report of J. D. Galloway, Resident Mining Engineer, Hazelton, 1924
B.C. Bureau of Mines.

MINERAL CLAIMS in the vicinity of USK

Omineca Mining Division

"*Location.*—Chimdemash creek empties into the Skeena river about 1 mile above—north-east from—the town of Usk, a station on the line of the Canadian National Railway and about 100 miles east from Prince Rupert, British Columbia, Canada. Silver basin is in the Omineca Mining Division, in the North-eastern Mineral Survey District.

"*Geology.*—The rocks of Silver basin are all igneous, so far as observed, but of great variety and difficult of classification owing to their altered condition. Flows of rhyolite and trachyte have been cut by later intrusions which form dykes; these are usually very siliceous, but some alteration products of basic intrusives are also present. Many of the rocks are so altered that their original character is obscured. The area deserves careful study by a competent geologist who can give the needed time for a careful classification and correlation of the rock formations.

"The Silver Basin area is in many ways similar to the San Juan Mining District of Colorado, where the writer did his first mining and with which he is quite familiar.

"*Accessibility.*—A trail from Usk extends 7 miles up Chimdemash creek. About 5 miles more would complete this trail to the Wells cabin in Silver basin and give easy access to the properties there. The British Columbia Government each year appropriates a liberal sum for trail-building in the districts where promising mining prospects seem to justify an attempt to render them more accessible. This work is done upon the recommendation of the Resident Engineer and the completion of this Silver Basin trail is contemplated in 1925. An excellent trail can be made of this at comparatively little expense, as the grade is generally regular and deep canyons on the main creek and laterals are absent.

"At the time of the writer's visit the basin was reached from the 16½-Mile cabin on Kleanza creek by a barely passable trail about 6 miles in length which crosses a pass and enters the basin from the south, a circuitous and difficult route.

"*Silver Basin Group.*—The *Silver Basin*, *Argentite*, *Silver Barrier*, and *Silverton* mineral claims form the *Silver Basin* group. They are all full claims, 1,500 feet square. The first three named claims extend up Chimdemash creek in a general easterly direction and from an altitude of 3,600 to 4,500 feet above sea-level. The *Silverton* claim, which lies north-east of the others, extends up the steep slope of the cirque from an altitude of 4,800 to 5,500 feet.

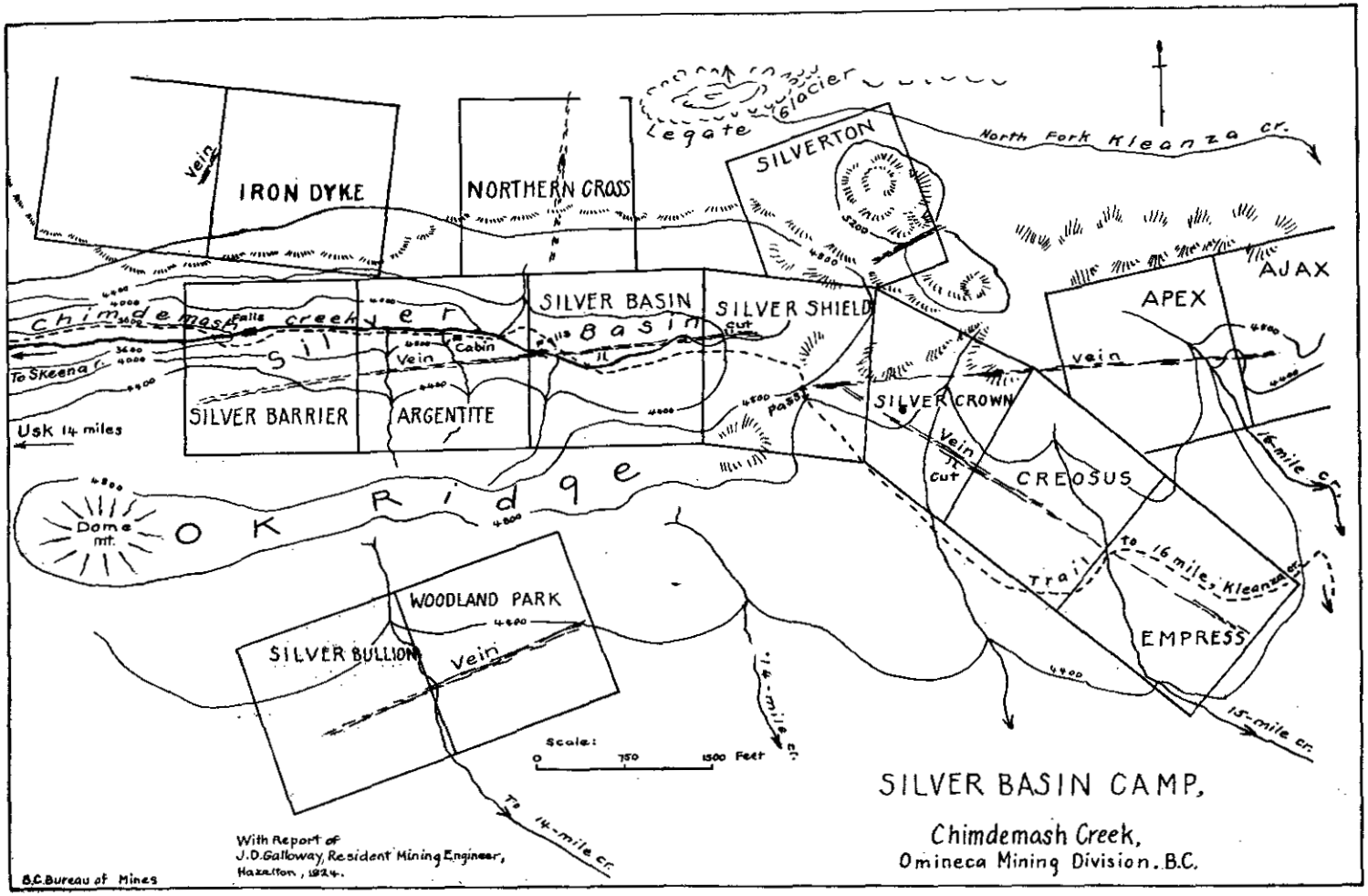
"*Silver Crown Group.*—This group, which was formerly called the *Silver Horde*, includes the *Silver Shield*, *Silver Crown*, *Croesus*, and *Empress* claims. This group adjoins the *Silver Basin* group on the west and extends in a south-easterly direction from an altitude of 4,500 feet across the divide, where the highest showing is about 5,000 feet above sea-level.

"Both these groups of claims are held by location and have not yet been surveyed. All the property except the two lowest claims is above the timber-line.

"*Veins.*—The ore-bearing veins in Silver basin follow fissures in the volcanic flows of rhyolite and trachyte. The ore-seams themselves, where exposed, are narrow, but the width of the accompanying fissuring is considerable, possibly 5 to 6 feet. The veins are well defined and persist for considerable length, the *Silver Basin* vein having been traced through at least three claims. In fact, the vein exposed on the *Silverton* claim, another claim-length away, may well be its extension. The strike of the veins is from north-west to south-east and they dip to the south. Within the width of the veins, which show a banded structure, mineralized seams or veinlets with quartz and calcite gangue alternate with bands of altered country-rock, also somewhat mineralized.

"*Ores.*—The prevailing ore is grey copper of high silver content. The gold value in the ore is low but by no means negligible. Other high-grade silver-bearing minerals are doubtless present and native silver is to be seen in fine flakes in many of the better pieces of ore. This native silver is of secondary origin and too much importance must not be attached to its presence. However, it usually takes high-grade primary silver ores to produce any considerable quantity of native. The associated minerals are galena, pyrite, chalcopyrite, bornite, and, possibly, chalcocite. Many of these minerals are silver-bearing and their presence is important, not for the sake of the base metal content itself, but for the silver that they contain. It is most probable that the deposits will develop into silver-mines if the development is satisfactory.

"*Development.*—On the *Silver Basin* claim, about 600 feet up the creek from the Wells cabin, a cut has been made into the wall of the little canyon through which Chimdemash creek flows at this point. Just above the cut is a little waterfall. Here the vein shows about 5 feet in width, with mineralized bands of ore forming, perhaps, one-third of its width. From this point this vein has been traced, and opened at several points, down the creek through the


IRON DYKE
NORTHERN CROSS
Legate
glacier
SILVERTON
North Fork Kleanza cr.
AJAX
APEX
vein
SILVER BASIN
SILVER SHIELD
Chimdemash Creek
Falls
Basin
Silver
Cabin
Vein
cut
To Skeena r.
Usk 14 miles
SILVER BARRIER
ARGENTITE
pass
SILVER CROWN
Vein
cut
CREOSUS
16-mile cr.
Dome mt.
O K Ridge
Trail
to 16 mile, Kleanza cr.
EMPRESS
WOODLAND PARK
SILVER BULLION
vein
14-mile cr.
15-mile cr.
Scale:
0 750 1500 Feet
To 14-mile cr.
With Report of
J.D. Galloway, Resident Mining Engineer,
Hazelton, 1924.
B.C. Bureau of Mines
SILVER BASIN CAMP,
Chimdemash Creek,
Omineca Mining Division. B.C.

Argentite and *Silver Barrier* claims, a distance of 3,000 feet, and up the creek into the *Silver Shield* claim, a further distance of 1,500 feet. A vein has been opened on the *Silverton* claim beyond this point and up the steep side of the cirque which shows similar mineralization and may well be the further extension of this vein. What appears to be a second and roughly parallel vein shows on the south side of the pass on the *Silver Shield* and *Silver Crown* claims. Finally, what appears to be still another vein has been opened still farther to the south-east on the *Croesus* and *Empress* claims. Along all these outcrops there are numerous open-cuts, but no serious underground work has yet been attempted. This is as it should be. As most of the outcrops are above timber-line and the rocks are bare, the tracing of the veins is not a difficult matter. It is important that the most likely point for underground development should be determined before such work is initiated, and this can only be done by careful exploration, sampling and assaying of the surface showings. As development, and with it exploration, proceeds, it is probable that other veins will be exposed. The area gives promise of extensive mineralization.

"*Ore Values.*—Three samples were taken by the writer from the showings described above. Two other samples from the ground were later sent to him and assayed. In none of these samples was any attempt made to obtain the best of the ore. Rough hand-sorting would raise, perhaps double, the grade of any of these. The descriptions and results of assays on these follow:—

"Silver basin, sample No. 1, *Silver Basin* claim, average of 10-inch streak in vein in cut below falls: Gold, 0.02 oz.; silver, 161.6 oz. to the ton; value, $117.12.

"Silver basin, sample No. 2, *Silver Shield* claim, average 10-inch streak in vein in creek-bed: Gold, 0.06 oz.; silver, 50.1 oz. to the ton; value, $36.27.

"Silver basin, sample No. 3, *Silver Shield* claim, average 6-inch streak in cut at elevation of pass: Gold, 0.01 oz.; silver, 54.2 oz. to the ton; value, $39.94. This sample was also assayed for copper and carried 26.66 per cent.

"*Silver Crown* claim, sample from vein: Gold, 0.20 oz.; silver, 151 oz. to the ton; value, $109.70.

"*Croesus* claim, sample from vein: Gold, 0.08 oz.; silver, 68 oz. to the ton; value, $49.20.

"The results of many assays on the Silver Basin ores have been submitted to me and two sets are worth recording here as confirming the values obtained from my own sampling.

"On June 6th, 1923, Mr. Galloway reports the results of three samples taken by J. D. Wells and assayed in the Government Assay Office. The average of these three is: Gold, 0.59 oz.; silver, 250.2 oz. to the ton; copper, 2.8 per cent. The highest of these ran: Gold, 1.36 oz.; silver, 597 oz. to the ton; copper, 5 per cent.

"It would be interesting to know what character of mineralization carried the high gold value.

"On August 13th, 1923, Mr. Galloway reports the results of what is supposed to be a more general and average sampling by Mr. Wells, as follows:—The average of eight samples: Gold, 0.03 oz.; silver, 58.9 oz. to the ton; copper, 2.2 per cent. The highest of these ran: Gold, 0.04 oz.; silver, 142 oz. to the ton; copper, 5.6 per cent.

"*Opinion.*—The *Silver Basin* and *Silver Crown* groups of mining claims are in the initial stages of their development. They are 'prospects' in every sense of the word. But they are very promising prospects and I believe will make 'pay' mines if properly handled. The veins, so far as seen, are not wide and only a portion of their width is ore. This ore, however, is of excellent grade and may be easily mined and easily sorted. The properties should be developed with the idea of obtaining quality grade—rather than quantity—tonnage. Located as they are, a comparatively small expenditure should accomplish much in the way of stripping and open-cutting. When good showings of ore are opened by these means—and there are several such already exposed—drifting and, if necessary, sinking will be the logical further means of development.

"The installation of power or extensive and expensive improvements in the means of transportation need not be considered now. The trail up Chimdemash creek must be completed; that is of prime importance and the first thing to be done. This trail should be so built that pack-animals can carry good loads over it in both directions. This should not be difficult as the nature of the topography is favourable to this end.

"Hand-mining, sorting, sacking, and packing ore out to the railway are not the general idea of what constitutes up-to-date mining methods. They are, however, just the methods by which many small profitable mines—and some of the large ones too—have operated ever since mining was first known. And they will always be the methods of operation indicated under certain conditions. If large enough and rich enough ore-bodies are opened later—and this is entirely possible—then will be the time for improvement in transportation facilities and power installations.

"I heartily recommend the Silver basin to prospective investors as an area of great promise where heavy expenditure is not needed to accomplish results."

Legate Creek.

The usual amount of work by prospectors was done on a number of claims at the head of Legate creek. Further development was carried out on the *Independence* and *M. and K.* properties, but the details are not known.

One of the forks of Legate creek leads into the Silver Basin divide. This section of country is apparently well mineralized with high-grade silver minerals and warrants close attention from prospectors. It is only 10 to 12 miles back from the railway-line and, if promising showings are developed, good transportation could be provided.

Fiddler Creek.

Fiddler Group. This property, which is situated on Fiddler creek, 4½ miles from Dorreen, a station on the Canadian National Railway 125 miles east of Prince Rupert, has been described in detail in previous Annual Reports, particularly that of 1916. In 1923 the property was secured under option by J. F. Duthie and some development was done that year. During the season of 1924 operations were resumed; the tunnel was advanced 50 feet and a raise put up 25 feet; a stope was started and 80 tons of ore taken out and hauled to the railway; improvements and repairs were made to the road and camp. The ore at the railway was not shipped by the end of the year, as it was held pending negotiations regarding freight and treatment rates. Work at the property was discontinued for the winter months, but it is expected that more extensive development will be carried out in 1925.

The property has a well-defined quartz vein averaging about 2½ feet in width and mineralized with pyrite, arsenopyrite, galena, chalcopyrite, and zinc-blende—a complex ore. The principal value in the ore is gold, but with the silver, lead, and copper content of some importance. The vein has been traced for 1,000 feet and is well mineralized throughout. Gold values run from $15 to $20 a ton. The 80-ton ore shipment was made for the purpose of getting a comprehensive sampling of the high-grade ore in the vein. An average of all samples taken during the sacking of this ore gave: Gold, 1.67 oz.; silver, 6 oz. to the ton; lead, 6.2 per cent.; copper, 1.3 per cent.; zinc, 5.8 per cent.

Eventually successful operation of the property will depend on milling the ore rather than making shipments of hand-sorted ore. From the present showings it seems probable that further development will show a sufficient tonnage of concentrating-ore to warrant the erection of a concentrator.

HAZELTON SECTION.

There was but little activity in the Hazelton section during 1924. The *Silver Standard* mine remained closed down for the year; with the present high prices for silver, lead, and zinc and slightly reduced freight and smelter-treatment rates, it seems strange that this property is not being operated.

On Rocher Déboulé mountain the properties of the Rocher Déboulé Copper Company and the Delta Copper Company remained inactive. A material improvement in the copper market would be an incentive to renewed operation of these properties. The usual assessment-work was done on a number of prospects on the mountain.

Nine-mile Mountain.

On Nine-mile mountain further development of the *Sunrise* was carried out. Frequent references to the properties on this mountain can be found in previous Annual Reports and also in Memoir No. 110 of the Geological Survey of Canada, by J. J. O'Neill.

Sunrise. This property is owned by the Sunrise Mining Company. During the last two years small-scale development has been done on the property by Trethewey Bros., the work being under the supervision of W. S. Harris. The results of the development having been considered satisfactory, Trethewey Bros. exercised the options then held on different blocks of stock in the company, so that now they own the major portion of the stock issued and have control of the company.

It is their intention to carry out the plans made for 1924 which were not at that time put into effect—namely, to erect a compressor plant and drive a long crosscut tunnel. This tunnel will cut a number of veins and should effectually prove the possibilities of the property. This plant will be taken in as soon as is practicable in the spring of 1925.

No detail description will be given of the actual workings, as this can be found in previous Annual Reports, particularly that for 1920. The development done during 1924 consisted of advancing some of the tunnels, open-cutting, and extensive sampling. From two to four men were engaged until the winter weather set in, when operations were discontinued.

The two main veins on the property, occurring in granodiorite, are replacement sheared zones and vary in width from 2 to 10 feet. Mineralization is with galena, jamesonite, stibnite, zinc-blende, and small amounts of pyrite and grey copper. The principal value is in silver, with subsidiary values in lead and zinc. The gangue is mainly sheared and silicified granodiorite, together with some quartz and calcite. The actual mineral is high grade, running from 1 to 3 oz. silver to the unit of lead. The grey copper is rich in silver and a little of this intimately associated with the galena and zinc-blende causes wide variations in the ratio of silver to lead in an assay. The valuable minerals are irregularly scattered throughout the veins, but more or less definite ore-shoots occur where fracturing and shearing of the granodiorite has been most intense.

The possibility for the property is that development will show a sufficient tonnage of ore to warrant the erection of a mill. The work and results of sampling done by Trethewey Bros. in the last two years would seem to show that the upper portions of these veins carry a fair grade of milling-ore; if the lower development shows the veins to be as well mineralized at depth, then successful operation of the property will be assured. There are a number of claims on Nine-mile mountain which have showings similar to those of the *Sunrise*, and with present metal prices they would seem to be well worth development. Scouting engineers looking for silver-lead properties would do well to examine this camp.

Nine-mile Mountain camp is situated from 12 to 14 miles from Hazelton, to which it is connected by a road for half the distance and the remainder by trail. All the properties are at or above timber-line, but are not inaccessibly located. A good water-power is available on the Shegunia river, a few miles away. It is expected that during 1925 the Government will complete the wagon-road to the camp.

TELKWA SECTION.

The name "Telkwa section" is used to embrace a large area of country from Moricetown to Telkwa and includes Hudson Bay mountain, the Telkwa river, Dome mountain, Driftwood creek, and other camps in the Babine range. All these different mineral camps are tributary to the towns of Smithers and Telkwa, both of which are situated on the railway-line in the Bulkley valley. Smithers is a divisional point on the railway and is the starting-point for Hudson Bay mountain and the properties on Driftwood creek. Telkwa is situated 10 miles up the railway from Smithers and is the centre for Dome mountain and properties up the Telkwa river. Coal properties on the Telkwa river use the town of Telkwa as the shipping-point.

Hudson Bay Mountain.

Duthie Mines, Ltd. The Duthie Mines, Limited, holdings consist of the *Henderson* property and options on the *Mamie* and *White Swan* groups. The original group taken up by J. F. Duthie was the *Mamie* and later the others were secured. The various claims adjoin one another and are situated on the southern slope of Hudson Bay mountain and distant about 14 miles from Smithers. A good motor-road connects the mine with the town, which is the shipping and supply point.

In August, 1923, a 55-per-cent. interest in the Duthie holdings was acquired by the Federal Mining and Smelting Company. Operations were carried on by this company until about

August, 1924, when all work was stopped. No information is forthcoming as to future plans for the property, although it is known that negotiations have been proceeding between J. F. Duthie and the Federal Company with the expectation that one or other will resume operation.

The important claim of those so far developed is the *Henderson*, from which substantial shipments of silver-lead ore were made in 1923 and 1924. Payment for this property to the original owner was completed about the time the Federal Company acquired control. The other properties were held on option and whether or not these options are still in force is not known. Full descriptions of the property and showings are given in the 1922 and 1923 Annual Reports, so that repetition in this report is unnecessary.

The operations of the Federal Company in 1924 on the *Henderson* consisted of ore-extraction and development by driving ahead the Compressor, McPherson, and Intermediate levels. The McPherson level, which is now in 900 feet, is the farthest in the hill, and is now nearly under the highest surface outcropping of the vein. The Intermediate and Compressor levels were also driven several hundred feet during the year. A crosscut was also driven from the McPherson level to the *Ashman* vein, which is a parallel vein outcropping about 125 feet north-west of the *Henderson* vein.

The development carried out by the Federal Company was not particularly encouraging. The occurrence of ore-shoots in the *Henderson* vein is apparently related in some way to the contour of the hill as shown by a longitudinal section and vertical projection showing the tunnel levels and stopes. The three main levels that have been driven into the hill contained good ore-shoots for the first 200 to 400 feet, but, as greater depth was gained by driving, the vein is but sparingly mineralized.

It has been suggested that such a condition, wherein the ore-shoots roughly parallel the contour of the surface down to depths of 150 to 200 feet, indicates that the rich ore-shoots in the vein have been formed by secondary enrichment. This is not believed to be the case, as most of the ore, consisting of galena, zinc-blende, and grey copper, does not appear to be of secondary origin. In places, in the ore a little native silver occurs along fracture-planes, which is undoubtedly of secondary origin. Ruby silver also occurs in places, but whether it is of secondary origin or not is difficult to tell.

The *Henderson* vein is a fairly well-defined fracture, but in places splits up so as to give it somewhat the appearance of a sheeted zone. It has been suggested that in driving the lowest or Compressor level the main fracture has been left in the hanging-wall and a subsidiary fracture followed. A short crosscut was driven into the hanging-wall from near the end of the level, but no ore was disclosed. While hardly probable that the main portion of the vein has been missed in this way, further crosscutting to make certain would seem to be justified.

An explanation of the occurrence of the ore-shoots may be that they occur where small cross-fractures intersect the vein; and another one is that the ore-shoots are localized and controlled by the physical character of the wall-rock through which the vein-fracture passes. The rock formation at this point consists of highly altered flows of rhyolite, andesite, and other volcanic rocks. Some of these rocks are dense, tough, fine-grained, and impermeable, so that they would be relatively unaffected by shearing forces and the action of mineralizing solutions. Other parts of the formation consist of rocks more coarsely crystalline and less dense and tough, which would be more easily affected by mineralizing agencies. It seems probable that the character of the wall-rock is the determining factor in the occurrence of the ore-shoots. Therefore a careful study of the different types of wall-rock might be of considerable value in planning the development to find ore-shoots.

The development of the *Ashman* vein from the McPherson level has failed to disclose important ore-bodies. It is reported that the decision by the Federal Company to close down operations was in part due to the unsuccessful development of the property and in part to a desire to arrange different terms with J. F. Duthie for continued operation. In other words, under more favourable terms further development of the *Henderson* would be considered as justified.

During the year some improvements and additions were made to the mine equipment, but the general scheme of operations was carried on as outlined in the 1923 Annual Report. A hand-jig was erected in the ore-sorting house and proved very effective in making a high-grade concentrate from the fines, which previously had to be rejected or shipped as a low-grade product.

Development of the *Mamie* was also carried on by the Federal Company. This property has a sheared-zone vein 4 to 8 feet wide, carrying zinc-blende, arsenopyrite, and pyrrhotite, which had been developed by a drift-tunnel (No. 1) and two winzes. No. 2 tunnel was started by the Federal Company 125 feet below the upper tunnel and on the general line of strike of the vein. This was driven in about 600 feet to a point nearly below the first winze in the drift on No. 1 tunnel.

Some mineralization is showing in this tunnel and a fairly wide zone is exposed in crosscuts at the face of the tunnel. The mineralization is, however, much too slight to admit of classifying the rock as ore. It is possible that the valuable ore-shoots on the *Mamie* vein lie up the hill from the mouth of No. 1 tunnel, so that further drifting and crosscutting in the No. 2 tunnel would be justified.

Other Properties.—Further work was done by Donald Simpson on his *Victory* group, situated a mile to the west of the *Mamie* group.

Development of the *King Tut* property, situated three-quarters of a mile nearer Smithers than the *Henderson*, was started by the Milligan Bros. A shaft was sunk 50 feet and numerous open-cuts put in on the vein. Some very high-grade silver ore occurs in the vein, but substantial ore-shoots have not yet been discovered. The mineralization is of a similar type to that of the *Henderson*.

Considerable work was done under the supervision of A. C. Garde on a group of claims on the north-eastern slope of Hudson Bay mountain. This consists of the *Silver Peak* group and adjoining claims. An examination of the property was made in the fall by an engineer for the Nipissing Mining Company. It is understood that this company has been financing Mr. Garde's work, and that, as the results of the season's development were satisfactory, operations will be resumed in the spring.

Further development of the *Cascade* group, *Empire* group, and other properties was carried out by the respective owners.

Dome Mountain.

The properties in Dome Mountain camp which had been acquired in 1923 by the Federal Mining and Smelting Company were continuously developed until about June, 1924. The results of this development were not considered satisfactory and all work was stopped. The steam plant, consisting of boilers, compressor, hoist and incidental machinery, was dismantled and hauled out to Telkwa. All camp equipment was taken out and apparently no further work will be done.

Full descriptions of the property are given in the 1922 and 1923 Annual Reports. The Federal Company formed the Dome Mountain Gold Mining Company to operate the property and over twenty claims were acquired outright by purchase. A number of the claims have been Crown-granted by the company.

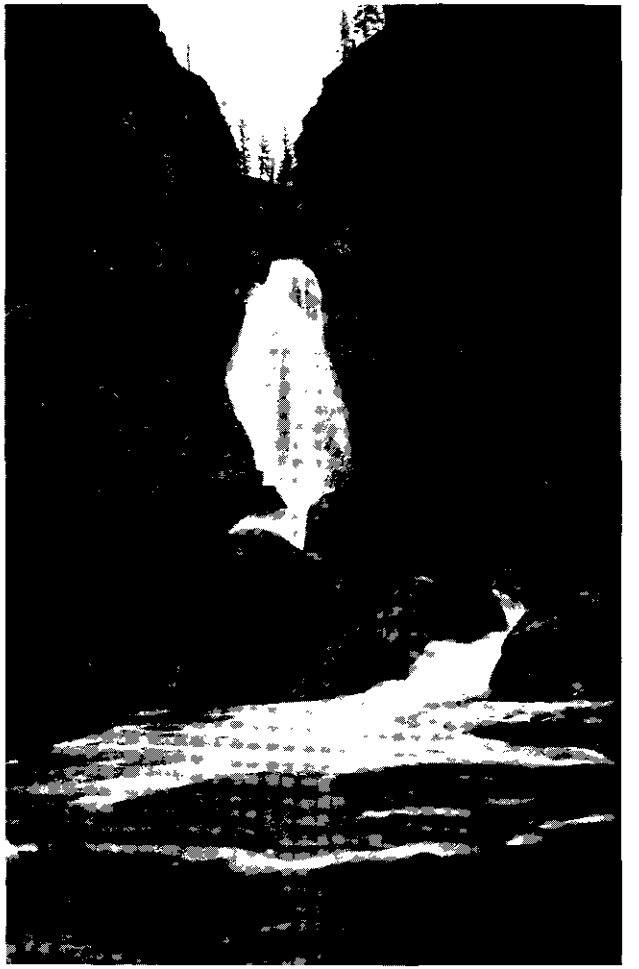
The principal development carried out was the exploration of the "Forks" vein by a drift sunk to the 100-foot level, with crosscuts and drifts, and drifts on the *Cabin*, *Ptarmigan*, and *Jane* veins.

From the information supplied by the company it would appear that the ore-shoots in the several veins were lenticular, having but little length or depth. In places the "Forks" vein widened out to make a fine showing of high-grade gold ore, but no continuity of ore occurred at any of the places developed. It is believed that the company very thoroughly tested the different veins developed and that further work is not justified.

In addition to several hundred feet of drifting on the "Forks" vein at the 100-foot level, much surface-stripping of the vein was done. It is apparent that there are two veins at this point and that at intersections ore-shoots occur, which, however, are not of any considerable size. When the property was examined in April the shaft-work on the "Forks" showing had been stopped for some time and owing to water in the workings they could not be examined. In addition to the shaft-work, the old "Hazelton" tunnel was cleaned out and considerable surface-stripping of the vein was done. In all this work only comparatively small lenses of ore were discovered.

On the *Cabin* vein a crosscut tunnel was driven 352 feet to cut the vein. Drifting was in progress on the vein at the time of visiting the property, but was stopped soon after. At that time the face showed 20 inches of low-grade ore consisting of iron sulphides in a siliceous gangue. Adjoining this ore on the hanging-wall was a considerable "showing" of pyritized

Taltapin Mine, Omineca M.D.



Hixon Creek, Cariboo M.D.

andesite, which, however, carried little or no values. The ore occurs generally in association with green andesite and is noticeably greater in amount where the andesitic wall-rock is highly schistose. At about the point of crosscutting the vein it was cut by a fault, but was easily picked up beyond the fault.

The *Snowdrop* vein was developed by a tunnel 246 feet in length. Only a few short ore-shoots were disclosed in this drift on the vein and the gold values were low. At the face there is a width of 5 inches of ore and some pyritized silicified andesite; this latter never carries appreciable values.

On the *Ptarmigan* vein a drift-tunnel had been driven 380 feet at the time of examination and later on was driven a little farther. This working shows a little ore in short lenses of galena, pyrite, and zinc-blende. The values throughout are low. The association of the ore with pronounced schistosity of the andesite is again apparent. In places fingering stringers of quartz occur in green andesite. The small lenses of ore are generally lying quite flat and in an irregular manner.

The closing-down of the Dome Mountain Company's properties is a big disappointment, and it is most regrettable that the favourable surface showings that occurred did not prove to be continuous in length and depth. The incentive to development of other claims on the mountain was stopped and during the last half of the year the camp was dormant. These ups and downs must, however, be expected and too much importance must not be attached to the apparent failure of one property in the district.

Driftwood Creek.

During 1924 small-scale work was done on several of the numerous properties in the Driftwood Creek area of the Babine range.

P. J. Higgins put in a long and busy season on the *Silver King* and *Victoria* groups. He reports very satisfactory results on the *Silver King* in disclosing nice showings of silver-lead ore.

The Babine-Bonanza Company's property (Cronin's mine) was not worked during the year, but was examined by two engineers for possible purchasers.

The *Driftwood* claim was further developed and some work was done on the Harvey property.

Hyland Basin Group. This property was bonded in 1923 by J. F. Duthie, of Seattle. After preliminary surface work a 300-foot tunnel was driven during the winter of 1923–24. This tunnel was driven in schist approximately parallel to the line of strike of the vein, which lies more or less in the contact between schist and rhyolite. In order to prospect the vein one or more crosscuts from the tunnel to the schist-rhyolite contact would be required. After the contract to drive the tunnel had been completed no further work was done, the necessary crosscuts not being driven.

The surface work shows a well-defined vein carrying in places ore-shoots of galena, grey copper, pyrite, and zinc-blende, with high values in gold and silver. It is believed that Mr. Duthie still holds his option on the property and that further development will be carried out in 1925. Crosscutting of the vein from the tunnel should certainly be done.

Little Joe. This property, which was described in the 1923 Annual Report, is owned by Martin Cane and Tommy King. It has a small vein principally mineralized with grey copper, carrying high silver values. The work during the year consisted in driving ahead the drift-tunnel on the vein for an additional 75 feet. An option on the property was given in the fall of the year to a Spokane syndicate, but no appreciable development was carried out by the syndicate.

Telkwa River.

Several properties on the headwaters of the Telkwa river were slightly developed during the year. Most of the work consisted of cleaning out old surface cuts in order to get the properties in better condition for examination by scouting engineers.

The mineralization in this area consists of galena, pyrite, zinc-blende, and grey copper, with values in silver, lead, and zinc.

Grouse Mountain.

Grouse mountain is one of the lower elevations of the Babine range flanking the Bulkley valley about 16 miles east of the town of Telkwa. Some years ago a number of claims were

staked on the mountain. After preliminary development the *Copper Crown* group was acquired by a Spokane syndicate and the Cassiar Crown Copper Company organized to operate the property. This company did extensive development-work, including a long crosscut tunnel, with many short drives and crosscuts from it. The lower development-work was not particularly satisfactory, but it would seem that insufficient surface work was done before driving the long crosscut tunnel.

Claims on Grouse mountain are described in the 1914, 1916, and 1923 Annual Reports and an excellent report on the camp was made by the late J. D. MacKenzie in the Summary Report of the Geological Survey of Canada for 1915.

During the last two years there has been some revival of interest in the Grouse Mountain camp. Individual work has been done by Louis Schorn on his *Lakeview* claim and he now has a nice showing. This property was described in the 1923 Annual Report, since which time further surface cuts and stripping exposing the vein have been done. The type of ore is similar to that of the *Copper Crown*—namely, chalcopyrite and pyrite carrying low values in gold and silver in addition to the copper content. The veins consist of sheared and sheeted zones with somewhat irregular mineralization.

In 1924 a new discovery on the mountain was made by Walter Skelhorne and some development-work was done on it with, is said, satisfactory results. This property was not examined, but there is said to be a well-defined vein up to 6 feet in width and mineralized with galena, chalcopyrite, and pyrite and carrying values in gold, silver, lead, and copper.

Other claims on the mountain were prospected to some extent during the season, and generally this is a well-mineralized area and would seem to be worth investigation and development.

Venus Group. This group consists of eight claims situated on what is known as Mineral hill on the south end of Grouse mountain. It is owned by Bussinger, Miller, and LeBlanc. There are several veins on the property from 1 to 4 feet wide carrying small pay-streaks of galena, zinc-blende, and grey copper. Development is by means of surface cuts and shallow shafts. Nothing had been done on the property for some years until the fall of 1924, when work was resumed by the owners. It is intended to get out during the winter a car-load or more of high-grade hand-sorted ore. The showings are described in the 1914 Annual Report.

Topley.

Cup Group. This group of three claims is situated 6 miles from Topley, 3 miles out on the Babine Lake sleigh-road, and from this point 3 miles of trail. It is owned by Matthew Sam and is now under option to Frank Chettleburgh, of Telkwa, who commenced development this summer. The formation is andesite, grey and green in colour, and in places porphyritic. The vein is exposed for several hundred feet along the enclosing valley rim of a small unnamed creek. The strike is north-westerly with a north-easterly dip of 20° to 25°. By its flat dip and the contour of the hill the vein goes nearly horizontally into the hill. The vein is from 3 to 6 feet wide and is mineralized with galena, zinc-blende, and pyrite in a siliceous gangue. In most places the outcrop is very considerably oxidized and partially leached, with a development of limonite and copper and lead carbonates.

At the time of examination of the property a drift-tunnel on the vein had been started; this was later on driven in to about 100 feet. Samples taken gave the following results:—

Description.	Gold.	Silver.	Lead.	Zinc.
	Oz.	Oz.	Per Cent.	Per Cent.
Across 2 feet 8 inches of vein at face of tunnel	0.02	3.2	8.0	4.0
Across 3 feet of vein at face and adjoining first sample	0.02	18.5	30.0	8.0
Selected high-grade ore	0.02	20.0	60.0	6.0

The property is nicely situated for economical mining. Being only 6 miles from the railway and at an elevation of 3,100 feet, there would be no difficulty in building a good road for transporting ore. Although the silver values are low, the present price of lead makes the ore of fair grade.

Owen Lake.

Silver Queen Group.

This group, owned by H. C. Wrinch, was taken up under option in 1923 by the Federal Mining and Smelting Company. Development was carried on with a crew of about nine men until August, 1924, when operations were discontinued and the option relinquished. The property is fully described in the 1916 and 1923 Annual Reports. Attached to this report is a plan showing the workings made by the Federal Company, permission to print it having been given by the company. The principal development was a tunnel driven to prospect the No. 4 vein, which was considered to be the most promising one on the property. The information obtained by driving this tunnel is clearly indicated on the plan by means of the figures showing average widths and values along the length of the vein exposed.

A brief examination of the property was made after the Federal Company had stopped work. The No. 4 vein is somewhat of the nature of a sheeted zone, with parallel stringers outside the main fracture. For this reason further crosscutting from this tunnel might be considered as development that would possibly show up greater widths of ore.

In the short tunnel on No. 3 vein the ore is apparently cut off by a rhyolite sill which, dipping at a low angle, gradually rises from the floor of the tunnel. The Nos. 1 and 2 veins were not developed by the Federal Company, the reason apparently being that these veins carried a higher percentage of zinc-blende and less chalcopyrite than Nos. 3 and 4 veins.

Owing to the activity of the Federal Company a number of claims were located in the Owen Lake area, but no appreciable work was done on any of these.

SIBOLA SECTION.

There was not much work done in this section during the year. The important properties are the *Emerald* and surrounding groups on Sweeney mountain and the Harrison property on Whitesail lake. The *Emerald* has been described in the 1916 and 1920 Annual Reports and the Harrison property in the 1920 Report.

During the year the Tahtsa River trail, which serves the Sweeney Mountain area, was completed. This should help prospectors to get in with horses to carry on more extensive exploration.

In February, 1925, the *Emerald* property was bonded by A. B. Trites and a vigorous development plan has been outlined for the season of 1925. The property has an excellent showing of silver-lead ore and has been favourably reported on by several engineers. The transportation problem for this property is a somewhat difficult one, but may be solved by getting a route out to tide-water by means of Tahtsa lake and a pass through the Coast range to Gardner canal. The distance of the property from the railway has been the main factor in preventing its development in recent years.

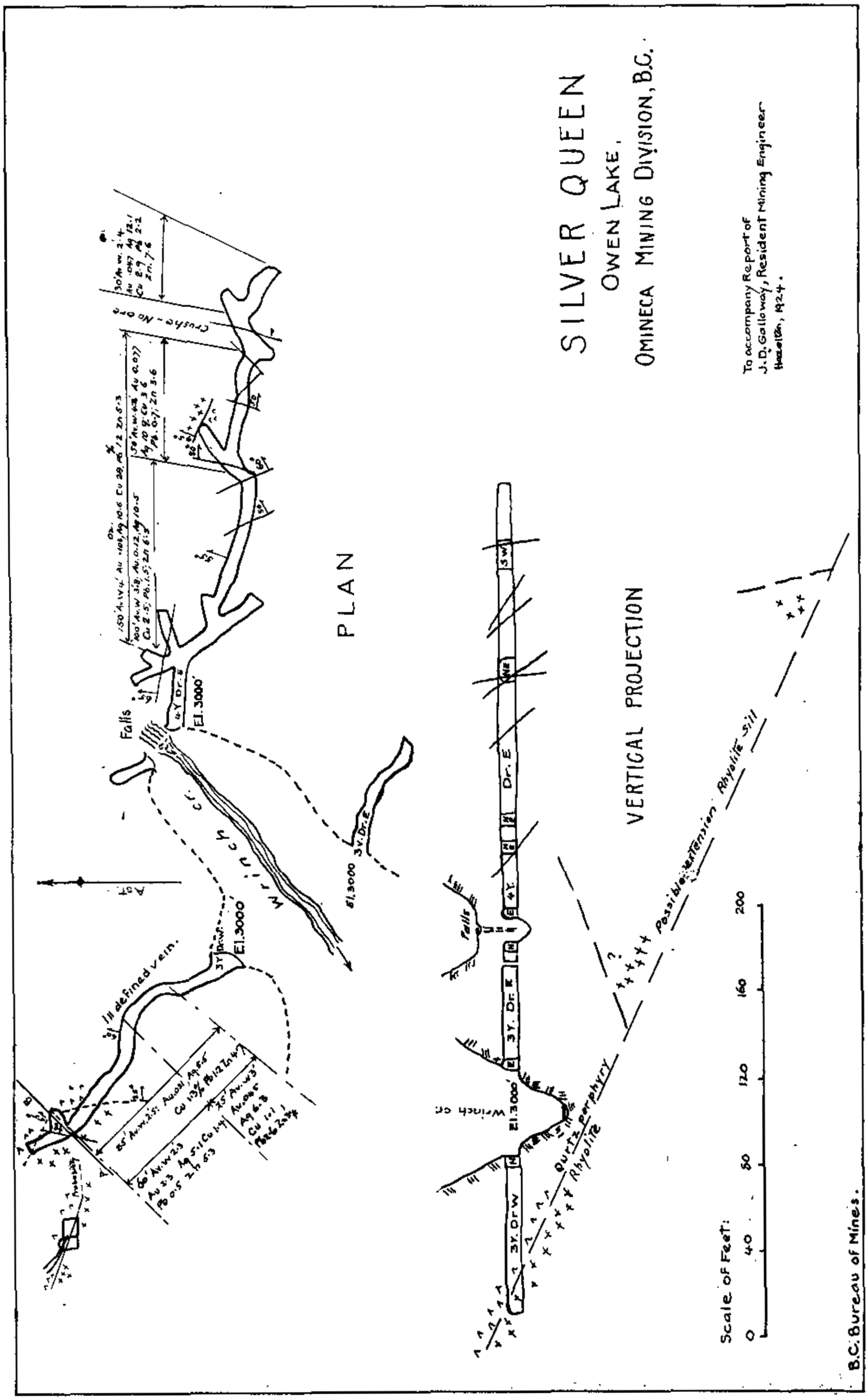
COAL.

The property of the Telkwa Collieries Company, which is now being operated by J. McNeil, of Telkwa, was operated during the year and a production of 1,928 tons of coal was made.

Development-work was satisfactory and plenty of coal is available for mining and shipment.

The following analyses of samples sent in by Mr. McNeil show the quality of this coal:—

No.	Moisture.	Vol. Com. Matter.	Fixed Carbon.	Ash.	Coking.	B.T.U.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
1	1.1	27.8	60.7	10.4	Good	12,850
2	1.1	28.1	60.8	10.0	Good	12,865
3	1.2	30.1	58.7	10.0	Good	12,860
4	1.3	31.7	58.7	8.3	Good	13,230
5	1.1	33.0	54.2	11.7	Good	12,810


SILVER QUEEN
OWEN LAKE,
OMINECA MINING DIVISION, B.C.
To accompany Report of J.D. Galloway, Resident Mining Engineer
Hazelton, 1924.
PLAN
VERTICAL PROJECTION
Falls
Wrinch cr.
El. 3000
Possible extension · Rhyolite sill
Quartz porphyry
Rhyolite
Scale of Feet
0 40 80 120 160 200
B.C. Bureau of Mines.

There has recently been some interest in the coal areas of this district, and, as they have all been described in previous Annual Reports, it is considered advisable to here give references to the different reports. They are as follows:—

Name.	Annual Report.
Groundhog coalfield	1911, 1912.
Bowron River coal area	1914.
Copper River Coal Co.	1914, 1922.
Prince Rupert Coalfields Co.	1917.
Lake Kathlyn coal property	1917.
Wright Coal Co. (Seaton)	1916.
Aveling coal property	1921.
Fraser Lake coal	1921.
Cedar Creek coal property	1922.
Telkwa Collieries Co.	1920, 1923.
Peace River coalfield	1923.
Quesnel-Alexandria coalfield	1923.

The coalfields of the Skeena, Bulkley, and Telkwa rivers were examined and mapped by W. W. Leach, of the Geological Survey, during the years 1904 to 1910. Much information about them is contained in his report entitled "The Telkwa River and Vicinity," 1907.

The Groundhog coalfield is described in a lengthy report by G. S. Malloch in the 1912 Summary Report of the Geological Survey of Canada.

BURNS LAKE SECTION.

Asphaltum Occurrence.

General Statement.—In the Annual Report for 1923 there is a description by the writer of the occurrence of asphaltum on the Collier ranch, near Francois lake. In that report it is pointed out that this deposit of asphaltum is in itself of no commercial value, as it only occurs in small quantity, but that its importance lies in the fact that it may possibly be an indication of the occurrence of petroleum in some of the rock formations of the district. A further examination of the area was therefore made in the summer of 1924. In September a further short reconnaissance was made accompanied by Dr. George Hanson, of the Geological Survey, to whom the writer is indebted for valuable assistance in correlating the rock formations and other information.

A considerable number of oil leases have been staked in the area. F. M. Dotson has examined the country carefully and has information regarding sedimentary outcrops and evidences of asphaltum. He has also done some further work on the original asphaltum-outcrop. This shows that a narrow but irregular band of it extends downward on a slight incline into the andesitic rock.

This report should be read in conjunction with the one in the 1923 Annual Report, as certain information and details given there are not repeated here.

Summary and Conclusions.—(1.) The occurrence of asphaltum near Francois lake has been considered an indication of the possibility of petroleum in the rock formations of the section.

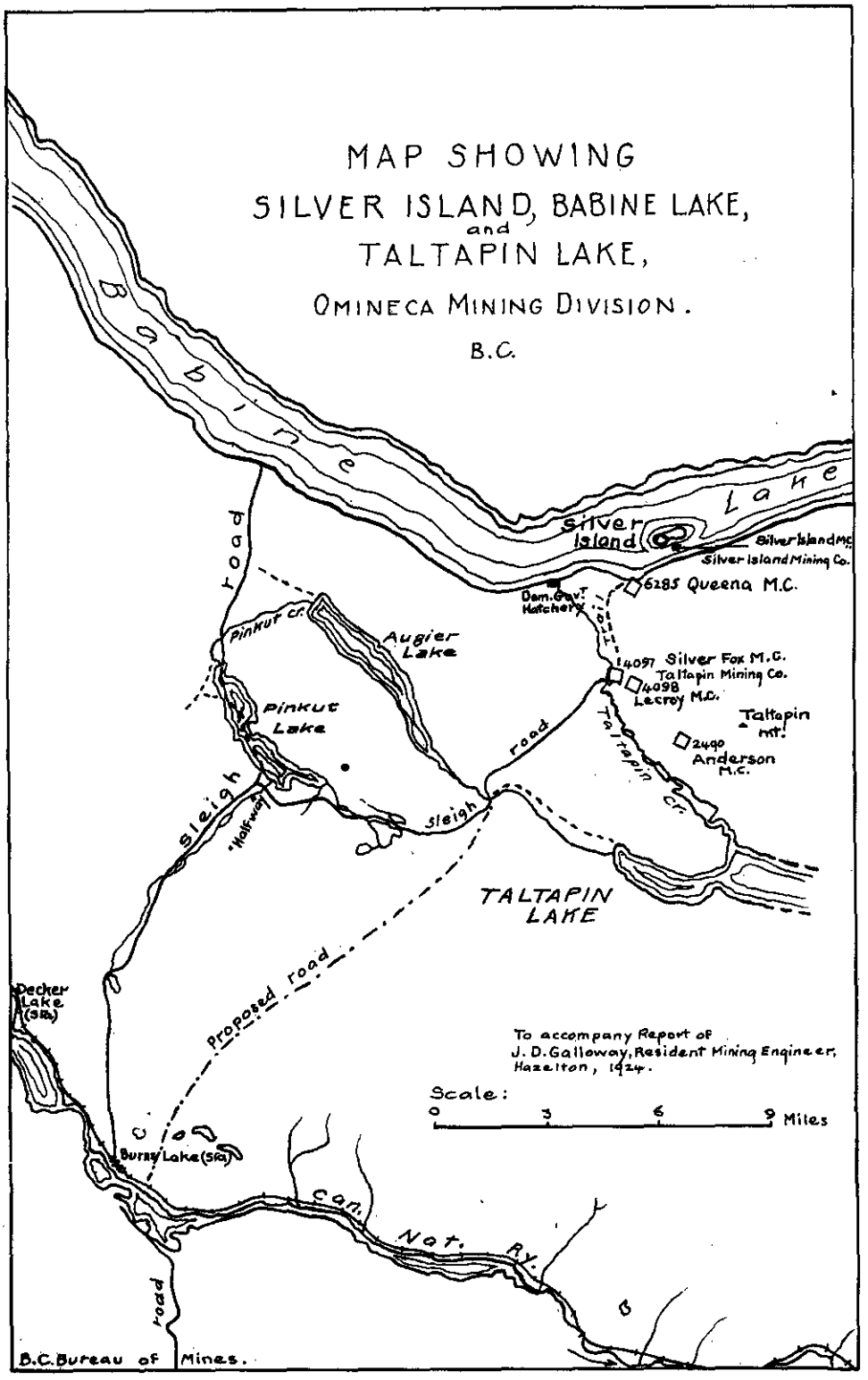
(2.) The greater part of the area examined is underlain by igneous rocks, consisting of dykes, stocks, and lava-flows.

(3.) Sedimentary rocks, sandstones, shales, and conglomerates occur in small basins in the area; in places these rocks are intruded by igneous rocks and in others are overlain by lava rocks.

(4.) The whole formation is believed to be of Tertiary age, the sedimentary measures representing periods of quiescence and sedimentation and the igneous rocks periods of volcanic activity.

(5.) The sediments generally show but little evidence of metamorphism and are not appreciably folded; dips as a rule are slight. Near intrusive dykes some disturbance of the strata has taken place.

(6.) The main occurrence of asphaltum is in andesitic rock, evidently a flow-rock. One other occurrence of it was noted in small specks in a conglomerate.


MAP SHOWING
SILVER ISLAND, BABINE LAKE,
and
TALTAPIN LAKE,
OMINECA MINING DIVISION.
B.C.
Babine Lake
Silver Island
Silver Island Mg
Silver Island Mining Co.
6285 Queena M.C.
Dom. Gov't Hatchery
Pinkut Cr.
Augier Lake
Pinkut Lake
14097 Silver Fox M.C.
Taltapin Mining Co.
4098 Lecroy M.C.
Taltapin mt.
2490 Anderson M.C.
Taltapin Cr.
road
sleigh
Halfway
TALTAPIN LAKE
Decker Lake (Sta.)
proposed road
To accompany Report of
J. D. Galloway, Resident Mining Engineer,
Hazelton, 1924.
Scale:
0 3 6 9 Miles
Burns Lake (Sta.)
Can. Nor. Ry.
B.C. Bureau of Mines.

(7.) Field evidence throws no light on the origin of this asphaltum, other than the purely hypothetical one that it may be derived from carbonaceous bands of the sediments by some process of distillation by the intrusive molten rocks.

(8.) The character of the Tertiary sediments and lack of marine formations cannot be considered encouraging for the occurrence of oil in these rocks.

(9.) Older and underlying formations, not visible at the surface, may be the source of the asphaltum originally, but no proof of this is available.

(10.) The chemical evidence from analysis (given in 1923 Report) that this asphaltum has been derived by the metamorphosis of petroleum is interesting, but until further proof is found in the field drilling for oil could not be advised.

Topographic Features.—The Burns Lake section, including the Francois Lake area, is a portion of the Nechako plateau of Northern Interior British Columbia. It is an irregular elevated plateau in which the stream-valleys and lake-basins are not cut deeply into the surrounding country. The occurrence of numerous hills and small mountain ranges rising considerably above the general plateau-level gives the section a mountainous appearance.

Burns, Francois, and other lakes are major depressions, troughs, or valleys, with lengths in a general east-and-west direction of 50 to 80 miles and widths of from 1 to 4 miles.

The area examined in this report on the north shore of Francois lake is rolling country. The greater part of it is farming country and only slightly timbered with poplar and small brush. Most of it is covered with a comparatively thin layer of gravel, clay, and soil. Rock-outcrops occur near the lake and along the banks of a number of small creeks which flow into Francois lake. The higher elevations are almost invariably volcanic rocks, while the lower areas show sedimentary measures. Colley mountain is a prominent feature, rising well above the surrounding country; it is entirely volcanic rock.

The occurrence of sediments at the lower elevations is partly due to erosion having removed overlying volcanic rocks and partly due to the sediments having been laid down in small basins in enclosing igneous rocks.

Geological Features.—The area examined was a strip of country along the north shore of Francois lake extending from 2 miles west of the ferry-landing to 1 mile west of Colleymount—a distance of about 17 miles—and from the lake-shore northerly from 1 to 3 miles. Along the lake-shore rock-outcrops are fairly frequent and this gives a good section of the country. A large part of the area is farming country and, as might be expected, rock-outcrops are infrequent owing to the covering of soil. No detail mapping was done, but a fair idea of the distribution of rock formations was obtained.

The greater part of the area is underlain by igneous rocks. These are prevailingly basic in composition and generally fine-grained. Andesite and diabase are of frequent occurrence, with some very basic dark-coloured rocks. In places lava rocks can be seen directly overlying shales and dykes cutting the sediments also occur. Some of the volcanic rocks are probably older than the sediments.

Several small basins of sedimentary rocks occur in the area; these consist of sandstones, shales, and conglomerates. Calcareous sandstone and marl were seen as float, but not in-place. Fossils occurring in this float have been identified as of Eocene age. The whole sedimentary series is believed to be of Tertiary age. Proof of this is found in the unaltered character of the rocks and the lack of much folding or faulting, together with the fossil evidence. These rocks lie horizontally or with slight dips. They resemble closely, lithologically, other known Tertiary sediments in the district and markedly different from the Jura-Cretaceous sediments of the district—namely, Hazelton and Skeena formations.

These Tertiary sediments are largely rocks of fresh-water origin, no marine limestones having been found in the series. As such they are not particularly promising as a source of petroleum. Some bands of the sediments are carbonaceous and in places impure seams of lignite occur.

Asphaltum Occurrences.—The small vein-like deposit of asphaltum occurring in andesitic lava on a small knoll on the Collier farm has been fully described in the 1923 Annual Report of the Minister of Mines. An analysis of the material by the Ottawa Geological Survey and a discussion of its possible origin are also given in that report.

Asphaltum also occurs in small specks in conglomerate outcropping on Lot 5332, about 5 miles east of the ferry-landing. The rock is well exposed along the main Colleymount road a short

distance from the lake-shore. No other occurrences of asphaltum were observed. Carbonaceous coaly material in several places has been reported as asphaltum, but incorrectly.

As has been previously pointed out, this asphaltum is of no commercial value; the interest in it lies in whether or not it is an indication of petroleum. Chemical evidence seems to indicate that it has been derived from the metamorphosis of petroleum. On the other hand, field evidence for this conclusion is entirely lacking. Distillation of carbonaceous bands in the sediments by intrusive igneous rocks may possibly have been the cause of the distribution of this asphaltum in the rocks of the area. But for the present the writer can only say that there is no positive evidence indicating the origin of this mineral.

MANSON SECTION.

The term "Manson section" is used to designate that portion of the Omineca Mining Division which in former years had some importance as a placer camp and which centred about the old town of Manson Creek. In recent years this section has been dormant, but signs of returning activity are apparent.

In September a trip was made into this section by the Resident Engineer and information obtained regarding the placer and lode-mineral possibilities. The time spent on the trip—one month—was insufficient to make as thorough a survey of the area as would have been desirable.

In Dawson's "Mineral Wealth of British Columbia," published in the Geological Survey of Canada Report for 1888, mention is made of the Omineca placer-field and some information given in regard to the early mining operations.

In 1894 McConnell made a trip up the Finlay and Omineca rivers and examined the Omineca placer-diggings. His report is Part C of Vol. VII. (1894) of the Geological Survey of Canada.

A month's trip was made into this area by Camsell in 1915. His report, entitled "Explorations in the Northern Interior of B.C.," is contained in the 1915 Summary Report of the Geological Survey of Canada.

Routes.

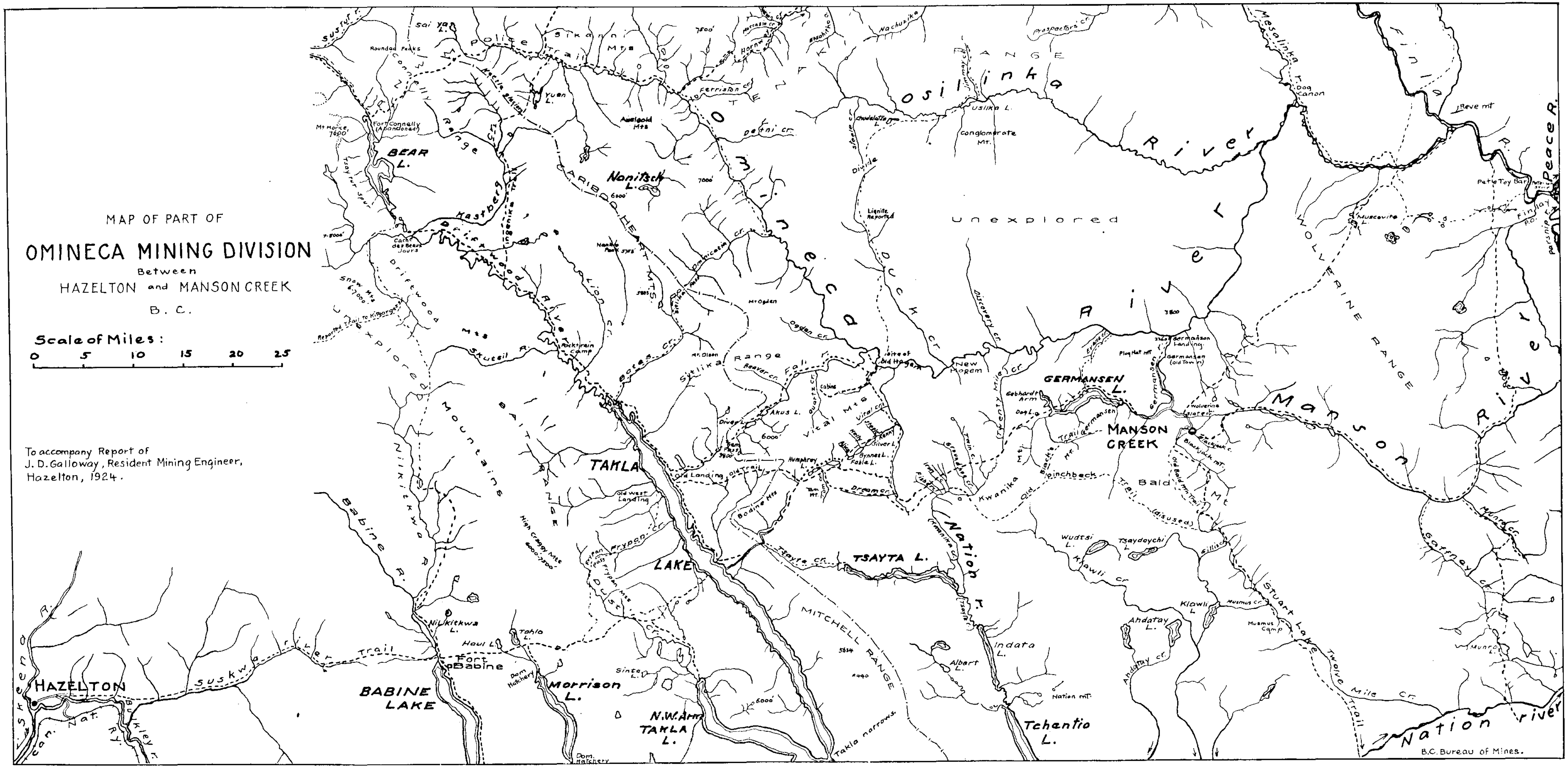
The route used was by means of pack-trail from Hazelton. The trail leaves the wagon-road at 6 miles from Hazelton and follows up Suskwa river to its head and then down to Babine lake. The elevation of the summit on this Suskwa River pass is about 3,900 feet, while Hazelton is 800 feet and Babine lake 2,222 feet above sea-level; the descent to Babine lake from the summit is fairly abrupt, most of the drop coming in 6 miles. The trail to Babine is in fair condition and is much used by trappers and Indians. It crosses the Babine river on a bridge at its outlet from Babine lake. Directly on the opposite side is the Indian village of Babine, where there is a Hudson's Bay post, numerous Indian houses, and a very highly decorated (by the natives) Roman Catholic Church. A Forest Ranger is stationed at this point with a gas-boat for patrolling Babine lake.

From Babine lake the trail continues almost due easterly to Takla lake, a distance of 34 miles. Between Babine and Takla lakes the trail rises to an elevation of 3,600 feet and then gradually descends to Takla lake, which is 2,268 feet above sea-level.

The trail strikes the westerly side of Takla lake at about its central point and it is necessary to ferry across the lake. An Indian—Bear Lake Tom—is engaged by the Government to maintain a ferry service during the season, which he does in a rather intermittent and unsatisfactory manner. There is a large scow capable of carrying a dozen horses and the usual equipment, which is propelled by a small boat fitted with an Evinrude engine. Crossings can only be negotiated when the lake is nearly calm.

On the eastern shore of Takla lake a trading-post is kept by R. C. McCorkell. During the hunting season Mr. McCorkell supplies horses and guides for parties going northerly to hunt for sheep, grizzly, and other big game.

From Takla lake the trail goes easterly in a more or less direct line to Manson Creek, a distance of 65 miles. A summit is climbed on leaving Takla lake to an elevation of 3,400 feet. The trail follows down Kenny creek to Tom creek; it then crosses over a low summit to Silver creek. From this point the trail goes over rolling country to the flat divide separating the headwaters of the Nation river from those of the Omineca. This Arctic-Pacific divide at this point can hardly be detected. The trail continues to the western end of Germansen lake and


MAP OF PART OF
OMINECA MINING DIVISION
Between
HAZELTON and MANSON CREEK
B. C.
Scale of Miles :
0 5 10 15 20 25
To accompany Report of
J. D. Galloway, Resident Mining Engineer,
Hazelton, 1924.
B.C. Bureau of Mines.
HAZELTON
BABINE LAKE
Babine R.
Fort Babine
Morrison L.
TAKLA LAKE
N.W. Arm TAKLA L.
Takla narrows
MITCHELL RANGE
Tchentio L.
Indata L.
Albert L.
Nation mt.
TSAYTA L.
Tsayta cr.
Nation R.
Nation river
MANSON CREEK
GERMANSEN L.
Germansen Landing
Manson River
Omineca River
Osilinka River
Unexplored
WOLVERINE RANGE
Peace R.
Finlay R.
Bear L.
Driftwood River
Nilkitkwa R.
Suskwa river Trail
Skeena R.
Bulkley R.
Can. Nat. Ry.
Sikanni Mts
Police Trail
Nonitsch L.
Cariboo Heart Mts
Vital Mts
Old Landing
Old Hogem
New Hogem
Kwanika cr.
Bald Mt
Stuart Lake Trail
Twelve Mile cr.
Klawli L.
Ahdatay L.
Wudtsi L.
Tsaydoychi L.
Sinta L.
Tahlo L.
Haul L.
Nilkitkwa L.
Frypan Mts
Bodine Mts
Humphrey L.
Dreamer cr.
Conglomerate Mt.
Uslika L.
Fort Connelly (Abandoned)
Mt Morice 7600
Roundod Peaks
Yuen L.
Ferriston cr.
Discovery cr.
Duck cr.
Lion cr.
Stuteil R.
Bates cr.
Sitlika Range
Mt. Ogden
Ogden cr.
Snow Mts 6-7000
Reported Trail to Kitsargas
Dog Canon
Mesalinka R.
Pete Toy Bar
Muscovite L.
Munro cr.
Saffney cr.

along the north shore of the lake; then crosses over to Slate creek and thence to Manson. The total distance from Hazelton to Manson by this trail is approximately 150 miles.

Another route which is now much used to get into this section is from Vanderhoof, on the Canadian National Railway, to Fort St. James, 40 miles by motor-road; then by boat or canoe to Takla Landing. This water route is via Stuart lake, Tachie river, Trembleur lake, and Middle river to Takla lake. Twenty-ton scows can be taken in this way and it is a feasible route for transporting heavy machinery. From Takla Landing the Hazelton–Manson trail is used to Manson. The construction of a sleigh-road from Takla Landing to Manson would in connection with this water route make a fair transportation system for mining in the Manson section.

There is also a pack-trail which goes directly from Fort St. James to Manson, a distance of about 125 miles. As the water route to Takla Landing is quicker, this old trail is not now much used. One distinct advantage of using the Hazelton route is that pack and saddle horses can always be obtained there, whereas it is difficult to get them at Takla Landing unless advance arrangements have been made with Mr. McCorkell.

Topography and Physiography.

The trail from Hazelton to Babine cuts directly through the heart of the Babine range by way of the Suskwa River pass. This range is a part of the Cassiar system of the Central Belt and is bounded on the west by the Bulkley valley and on the east by the elongated valley occupied by Takla and other lakes. The range trends north-westerly and has a length of about 120 miles and a width of from 20 to 40 miles. Babine lake is 105 miles long and from 2 to 6 miles wide. It is bountifully stocked with fish and is a natural spawning-ground for the Skeena River salmon. Netting of salmon on the Babine river at the mouth of the lake is an important business for the Indians, and Babine smoked salmon are packed for long distances to many parts of the district.

Babine range is a well-defined range unit; it is rugged and picturesque. Numerous peaks rise to elevations of 7,000 to 9,000 feet and small glaciers are of frequent occurrence. Some of the higher peaks are above the line of glaciation and show the characteristic pinnated structure and lack of glacial rounding.

The creeks and rivers rising in the range have as a rule steep gradients, so that low-level passes through the range are conspicuous by their absence. The best passes are found near the southern extremity of the range, where it flattens off and merges into the plateau country of the Central Belt.

Glaciation is well pronounced, the river and creek valleys being deepened and rounded by ice-action. In the Babine range the layer of glacial drift is thin, as subsequent erosion has removed much of it, except in the terraces of the deeper valleys. In the less mountainous plateau area to the east much of the country, except at the higher elevations, is covered with glacial clays and gravels. Outcrops of bed-rock, however, are easily obtained, except in the deeper valleys.

From Babine lake to Takla lake the trail traverses a fairly mountainous portion of the Nechako plateau of the Central Belt. The low range of mountains bounding the eastern shores of Babine lake at its northern end is not well defined and is named the Frypan range. This area may be considered as a part of the plateau area extending from Takla lake to Manson. The apparent mountainous nature of this area is in part due to Babine and Takla lakes occupying valleys which have been maturely eroded into the general uplifted Nechako plateau.

The area lying between Takla lake and Manson is also more mountainous than the typical Nechako plateau lying to the south. Physiographically this portion of the country is part of the Nechako plateau, but forms a transitional stage to the mountainous country bordering the plateau to the north. The area is rolling and broken by short isolated hills rising 1,000 to 2,000 feet above the valley-levels. To the north and west this broken country merges into more prominent mountains on the headwaters of the Omineca and Nation rivers and the Babine range to the west.

Drainage from the Babine range and Babine lake is all to the Skeena river and thence to the Pacific ocean. The waters of Takla lake flow southward and eventually reach the Pacific ocean by the Nechako and Fraser rivers.

The area between Takla lake and Manson Creek is on the Pacific-Arctic divide, as the waters of the Omineca, Manson, and Nation rivers flow into the Finlay and Parsnip rivers, and by means of the Peace and Mackenzie rivers flow northerly into the Arctic, while the Takla Lake waters and tributaries flow southerly to join the Fraser system going into the Pacific. For a mountain region the gradients of the streams are not steep, except in the Babine range and on Babine river, which flows out of Babine lake.

The great waterway formed by Stuart, Trembleur, and Takla lakes and connecting streams has a very slight fall to the south-east, which permits of easy navigation by boats and scows from Fort St. James to the Driftwood river. The streams draining to the Arctic have steeper slopes and navigation by canoe from the Peace river up the Nation, Omineca, and Manson rivers, although attempted, is somewhat hazardous.

The following is a quotation from Camsell's report in the Summary Report for 1915 of the Geological Survey of Canada:—

"The predominant physiographic feature is the great master valley which extends in a north-westerly direction from Stuart river to Bear lake for at least 160 miles and possibly for about 80 miles farther to the headwaters of the Skeena river. It has a width ranging from 2 to 6 miles and a depth which increases northward until it reaches a maximum of about 5,000 feet. It is occupied successively by Stuart lake, Tachie river, Trembleur lake, Middle river, *Takla lake, Driftwood river, Bear lake and river, and the headwaters of Skeena river, the last* three draining out of the valley westward. It is an ancient structural valley coinciding in direction with the general trend of the rocks and lying parallel to the other great longitudinal valleys of the Cordillera.

"The region east of the great valley exhibits physiographic features of much greater maturity than those which characterize the region to the west. The summits are all well rounded and the valleys broad and flaring. There is no evidence of recent general elevation of the region of such strength as to permit the trenching of the valleys deeper than the mantle of surface material. Glacial drift is very deep and widespread and this adds to the appearance of maturity of relief. Lakes are very numerous and, in most cases, they have resulted from the disorganization of the drainage by the damming of the valleys by glacially transported drift."

Good timber, consisting mainly of cedar, hemlock, and spruce, occurs on the Babine range on both the slopes to the Bulkley valley and to Babine lake. East of Babine lake for a few miles there is also a good stand of timber. Easterly from this point the country has been largely burned over many years ago; it is now covered with a scrub growth of jack-pine, willows, and alders, with occasional patches of good timber.

It is not considered that much of the country traversed by the Hazelton–Manson trail is suitable for agriculture.

Geologic Features.

The Babine range consists dominantly of considerably metamorphosed volcanic and sedimentary rocks, which are as a rule closely interbedded and intercalated. Wherever the range has been closely examined these rocks are found to be members of the Hazelton formation of Jura-Cretaceous age, and it is believed the whole range is largely made up of rocks of this formation.

Intrusive into these older rocks are small bodies—dykes, sills, and small batholiths—of granitic rocks; basic, lamprophyric, dykes also occur. Igneous intrusions in the range have not been on nearly as large a scale as in the Coast range and its subsidiary mountains, but are more comparable with those of the Bulkley mountains directly to the west.

The geologic conditions are excellent for the occurrence of mineral, and in many parts of the range mineralized areas have been discovered. Descriptions of the character of the Hazelton formation and intrusive granitic rocks as exposed along the Bulkley, Skeena, and tributary valleys can be found in several reports of the Geological Survey of Canada and in previous Annual Reports of the British Columbia Department of Mines.

Between Babine lake and Takla lake the rock formations have not been studied in detail. It is probable that the Hazelton formation continues easterly for some distance. On Takla lake there is a series of sedimentary rocks, consisting of conglomerate, sandstone, shale, and some coal, which has been classified by Camsell as being of Cretaceous age. These rocks are very similar to the Skeena formation, which overlies the Hazelton formation in the Hazelton-Telkwa sections. So far as is known, Hazelton formation rocks are continuous from Babine lake until

within a few miles of Takla lake, where the Cretaceous sediments come in. Associated with these sediments are some beds of volcanic rocks.

East of Takla lake the Cretaceous sediments continue for about 5 miles. At this point the schistose series of rocks, which have a widespread distribution in the Manson section, commence. These rocks, which are tentatively classed by Camsell as being of Carboniferous age, consist of a schistose complex, including limestone, argillite, chert, slate, quartzite, and some highly altered volcanic rocks. Intrusive into this series are small bodies of granite. One of these crops out on the trail beyond Silver creek and another a short distance south of Manson Creek.

Quartz veins are of common occurrence in this formation and it is believed that gold from these veins is the source of the placer gold in the different creeks in the area.

Economic Geology.

The important mineral-deposits of the Manson section so far known are the gravel-deposits in which placer gold occurs. Prospecting for gold in "The Omineca," as the section was known in the early days, commenced in 1864, but very little production was made until 1869. The area within which the greater part of the mining has taken place is scarcely more than 50 miles in its greatest diameter, and includes the upper portions of the Germansen, Omineca, and Manson rivers and their tributaries.

After a few years of mining the area was practically abandoned owing to the placer discoveries in the Cassiar District. In 1879 the Omineca again attracted attention, but in 1887 was once more nearly abandoned, and since that time has only been worked more or less intermittently for placer.

The following table shows the placer returns for this district from 1874 to 1924:—

Year.	Amount.	Year.	Amount.
1874	$38,000	1906	$10,000
1875	32,040	1907	10,000
1876–78	*	1908	20,000
1879	36,000	1909	15,000
1880	45,800	1910	15,000
1881	39,300	1911	10,000
1882	25,330	1912	8,000
1883	21,000	1913	6,000
1884	12,000	1914	6,000
1885	16,500	1915	12,000
1886	17,600	1916	17,000
1887	13,000	1917	12,000
1888–97	*	1918	8,000
1898	15,000	1919	8,000
1899	8,600	1920	3,000
1900	12,527	1921	3,000
1901	19,100	1922	5,000
1902	40,000	1923	4,000
1903	28,000	1924	4,000
1904	11,600		
1905	10,000	Total	$517,397

* No returns.

The important streams that have been worked for placer are Germansen and Manson rivers, Tom, Vital, Slate, Blackjack, and Lost creeks. Much coarse gold was obtained, but generally the diggings were said to be "spotted" or irregular. Some work was also done on the Nation river and tributaries, and in recent years a few prospectors have been at work there.

In addition to placer gold in the gravels, small quantities of arquerite, a native amalgam of silver, and native copper have been recovered in the sluice-boxes. These minerals occur in greatest abundance in the Vital Creek gravels, but are of scientific interest only, as the total amount is too small to have commercial value. They are, however, valuable indicators of the possibility of lode deposits of these minerals occurring in the district, and as such they should be noted by prospectors. Platinum has been reported as occurring in the black-sand concentrates

from the gravels, but this cannot be definitely verified. In any case the platinum content is not of commercial importance.

The placer-gravels of this section do not carry much black sand; in fact, the percentage of black-sand concentrate to the gravel washed is very much lower than in many placer camps. A number of samples of black sand were taken from different creeks and assayed; these were obtained by panning and by taking samples from the discarded black sand from previous sluicing operations. The assays of these samples show that the actual black sand does not contain appreciable gold or platinum values. The black sands from sluicing operations return on assay varying amounts of gold, but careful examination shows that the gold occurs as fine gold associated with the black sand. Thorough cleaning of the concentrate by amalgamation will recover practically all this gold content. It is therefore considered that the black-sand content of the placer-gravels of this district is not of much commercial importance.

So far as can now be observed, the placer-gold concentrations occur principally in the present stream-gravels. This concentration is from the reworking by stream-action of glacial gravels, which were slightly auriferous. It is possible that some of the rich ground mined by the old-timers consisted of remnants of Tertiary gravels, but no evidence to support this idea is obtainable.

The beds of the streams have in part been worked, but very little prospecting of benches has been done. There is a noticeable absence of old channels having been worked. In the Cariboo the phenomenally rich concentrations of placer gold that were mined on Williams, Lightning, Keithley, and other creeks were in large part contained in old channels or present stream-beds below a point where an old channel had been robbed by the modern stream. These places represent remnants of Tertiary channels containing Tertiary gravels which were not eroded by glaciation; in most instances, however, glaciation had concealed the Tertiary gravels under a thick mantle of glacial clays and gravels.

It is quite possible that in the Manson section similar remnants of Tertiary channels will be found to exist, and this fact should be kept in mind by prospectors. The discovery of rich ground in the Cedar Creek camp shows that placer gold may be found in what has been considered an unlikely place and at a considerable elevation above the modern stream-valleys.

It is also believed that the Manson section provides good opportunities for gold-dredging. The beds of the streams that have been worked have only been mined at what are relatively rich places and low-grade ground has been left. This ground is too low grade to be worked at a profit by small-scale individual mining, but will make good "pay" for dredging. Besides the stream-beds, the benches in places are believed to carry low values. Streams that were not worked by the old-timers carry more or less values and are worth investigation with a view to outlining dredging areas.

Streams such as Kenny, Silver, Upper Manson, and others have wide flat valleys, with, in places, small lake expansions, which have never been tested for placer gold. In many places there is undoubtedly a very considerable thickness of glacial clays and gravels, which are practically barren of values. But where stream-action has to some extent concentrated these glacial gravels low-grade auriferous gravel has been formed.

The average depths of gravels along the creeks are in many instances not great and well within the dredging limit. The gravels generally do not contain large boulders and the schistose bed-rock is very suitable for dredging. Although at some distance from the railway, good enough transportation could easily be provided for taking in dredging machinery.

Summing up, it may be said that the Manson section presents favourable opportunities for investigating the placer-gravels with a view to proving suitable dredging areas.

Vital Creek.—The first real gold strike in the area was on Vital creek in 1869 and the creek was worked for some years by the old-timers, first as drift-diggings and then by ground-sluicing and hydraulicking. Good pay-ground was found and the results of the early work were quite satisfactory. During the last three seasons a party of six Hazelton Chinamen have been working the creek on a continuation up-stream of the old workings. There is a heavy overburden of clay and gravel on this part of the creek which probably accounts for the abandonment of the work by the old-timers.

Where the creek is now being worked it is a narrow steep-sided gulch with banks of clay and gravel from 100 to 200 feet high. The Chinamen are working it by open-cut methods; in the spring of the year, when water is plentiful, fair progress is made with ground-sluicing and

hydraulicking with a canvas hose. The values occur practically on and in the bed-rock; about 4 feet in depth of the soft, shattered, schistose bed-rock is picked out and most of the gold is obtained from the crevices. The overlying gravels and clays do not carry appreciable values. Thick strata of boulder-clay occur and it is evident that most of the material is of glacial origin.

It is probable that the creek would pay much better as a drift-digging, as by the present methods a large yardage of barren gravel and clay has to be handled to get at a pay-streak only a few feet wide. The gold recovered is coarse, pieces up to $2 being found; practically no fine gold is obtained. It is worth about $17 an ounce.

Tom Creek.—Tom creek is a small stream which joins Kenny creek at a point 18 miles east of Takla lake. The Manson trail crosses it a mile above the mouth. From the trail-crossing up-stream for about 1½ miles the creek has been pretty well worked. The creek was not struck until 1889, twenty years after Vital creek was found. It was intensively worked for a few years and good returns were obtained. The creek-bed was practically mined out for at least a mile and some work done farther up-stream. Prospecting up-stream may show an extension of the pay-streak.

During the season of 1924 about eight men were working on the creek. G. M. McMullin, on a record claim, was running an open-cut and shovelling into a flume. Gus Palm, on a record claim, had a shaft down about 11 feet, going through gravel, 3 feet of blue clay, and then gravel, but had not reached bed-rock. Haskell and Clark, on a record claim, were sinking a shaft in the rim and intend to drift out under the stream-bed; they expected to work all winter.

McCormack, at the lower end of the worked ground and close to where the trail crosses, has been engaged for several seasons in driving a rock tunnel to prospect a supposed old channel of the creek. At this point the present creek turns abruptly, nearly at right angles, and cuts through a rock-rim forming a V-shaped box canyon. An apparent continuation of the stream-valley to the right of the canyon can be seen and it is to prospect this that the tunnel is being driven. The creek was mined down to the commencement of the canyon. If an old channel occurs at this point, it is evidently filled with a considerable thickness of glacial material, but may have a pay-streak underneath.

The ground on the creek that was mined ranged from 10 to 20 feet in depth, and while boulders are fairly numerous there are not many large ones. The bed-rock is a soft schist.

Silver Creek.—Silver creek was never mined to any great extent, but in 1912 and subsequent years some testing of the gravels was done by G. H. Knowlton and associates. In this work an Empire hand-drill was used. No exact information is available as to the results obtained.

Silver creek has a fairly wide valley, with high banks of gravel on either side. The creek has cut down through thick strata of glacial clays and gravels to form the present valley. Somewhere there may be sufficiently concentrated gravels to pay to work.

Slate Creek.—Slate creek is a small stream that flows into Manson river about 2½ miles below the old town of Manson Creek. The creek was first worked by individuals in the early days. These workings were not in the bed of the stream, but on the rims, and fairly good "pay" was obtained. The deep ground could not be worked by small-scale methods.

Later on a group of leases on the creek were taken up by the 43rd Mining Company with the object of working the deep ground; later this company was organized into the Kildare Mines, Limited. The title to the leases lapsed in 1922 and in the spring of 1923 the ground was restaked by H. Beach, who had previously been interested in the Kildare Mines, Limited.

The property was worked by both the 43rd Company and the Kildare Mines, Limited. It had been equipped with a water system by means of a 4½-mile ditch and flume from Manson creek. Two pits have been opened up. Owing to the flat nature of the creek it was necessary to work these by hydraulic elevators. It is reported that $120,000 was spent on the property by the Kildare Mines, Limited, and a considerable sum by the 43rd Company. The main workings are at a point about 3 miles up-stream from the mouth of the creek.

From the information now obtainable it would seem that good values occur at and near bed-rock, but that under the system of working the operations did not pay. The presence of numerous boulders made the operation of the hydraulic elevator unsatisfactory and costly. The ground is said to be from 30 to 60 feet deep. Information is not available as to average values of the gravels in the pits that were opened up. There seems to be no reason why the ground

could not be dredged, except that the large boulders would add somewhat to the cost of handling the gravel. The bed-rock is schist and clay-bands in the gravels are not frequent or of much thickness.

In the summer of 1923 Mr. Beach interested P. O. Bangert aand associates, of Philadelphia, in the property. C. T. Cabrera was engaged by Mr. Bangert to make an examination of the property and he was accompanied on the trip by Messrs. Beach and Bangert. About two months were spent by the party (in 1923) in testing the property by panning and shovelling into a small flume. In practically all this work only surface gravels were tested. Mr. Cabrera's report on the property was most favourable, but no new work has yet been started. The property is apparently controlled by Mr. Beach and it is expected that he will be successful in interesting capital in it for the season of 1925.

Twelve leases are held on Slate creek and two on Manson river, at the mouth of Slate creek. About 4 miles of the creek are held by these leases, containing a large yardage of gravel, which has practically been unworked. The evidence of values from the scanty information now obtainable is sufficient to warrant a thorough testing of the property. This could be most effectively and economically done by drilling, and it is quite probable that much of the ground would be found to carry sufficient values to make a profitable dredging proposition.

Manson River.—The upper part of Manson river, which was extensively mined for gold, has in the past been generally referred to as "Manson creek," because the stream at this point is quite small. Gold was first discovered in 1871 and for two or three years the bars and stream-bed gravels proved extremely productive. In later years only "sniping" operations have been done and very little production has been made. Gold was found mainly along 2 miles of the stream, but to some extent along several miles from the Manson lakes to above the town of Manson Creek. This old town, which is situated about 10 miles above Manson lake, is now obliterated, only one house being left; this is the old Government office and is now the post-office occupied by Archie King. A still older town known as "Manson" or "Old Town" was situated near the confluence of Lost creek with Manson river, but this has long since disappeared.

The bars and stream-bed gravels of Manson river were in part worked, but much of the productive 2 miles of the stream has never been mined. In addition, the benches or rim-gravels have not been worked. The bench-gravels are thick and would seem to be mainly roughly resorted glacial material and therefore low grade or barren.

In 1924 leases were located on 10 miles of Manson river from Manson lake up-stream by R. H. Fleming, who intends to take in a hand-drill and test the ground in 1925. It is believed there is considerable yardage which would pay to dredge and it is with this in view that the drilling is planned. Much of the ground is shallow, from 5 to 20 feet, and probably very little exceeds the dredging limit. Physically, the material is excellent for dredging, with an absence of large boulders and no clay; also the bed-rock is soft. From the information as to values obtained in the old workings, it seems quite possible that there may be a considerable yardage at this point containing sufficient gold content to pay to work by dredging methods.

W. B. Steele, an old-timer in the district and Deputy Mining Recorder, was engaged during the season of 1924 in mining just above the town of Manson Creek. With two partners he was stripping gravels from bed-rock and wheeling to a dump-box. Fair "pay" was being taken out. For winter work he intended to drive a tunnel into the bench to prospect the continuation of the pay-streak. A little gold was also taken out in 1924 by A. King by sluicing the stream-gravels close to his house. A few other individuals were prospecting at different points on Manson river.

In the winter this area always has a few trappers and in the spring some of these men do a little small-scale placer-mining.

Lost Creek.—Lost creek is a small tributary of Manson river, coming in about 5 miles below Manson creek. In recent years considerable mining was done on this creek by Steele and McMullen, but these operations have now been discontinued. According to Steele, there are a number of places left where good enough "pay" can be obtained to make wages on small-scale work.

Mr. Steele's cabin on Lost creek is his headquarters camp, but he has another place at the old Kildare Mines camp on Slate creek, as he is agent for H. Beach, who now controls this property.

Blackjack Gulch.—Blackjack gulch is a small creek entering Manson just below the town of Manson Creek. It has been mined considerably, the last work being hydraulicking. Not much information is available as to the results of the hydraulicking, which was continued for several reasons. It is probable that fair "pay" was obtained from the actual stream-bed gravels, but that the inclusion of a large yardage of bench-gravels in the hydraulic pit made quite low-grade ground.

Germansen River.—Germansen river drains the lake of the same name and flows into Omineca river, a distance of about 16 miles. It is a fair-sized stream and has a rapid descent. The valley is cut deeply into the plateau country and the rims of the streams are in most places bounded by thick masses of glacial clays and gravels. Gold on Germansen river has been obtained principally from the river-flats and bars and, according to McConnell, to some extent "from gravels underlying the boulder-clay and referred to the early part of the glacial period."

It would appear that the valley of Germansen river had been filled with glacial clays and gravels and that subsequent stream-action has cut deeply into these glacial deposits and effected a concentration of this material to form payable placer deposits in the bed of the stream. It is believed that the stream-bed gravels have been pretty well worked out by the old-timers from a mile above Omineca river nearly to Germansen lake. The last mile of the river is part of the broad valley of the Omineca and the ground is quite deep.

Some possibilities still exist on this stream to test bench-gravels where some concentration has been effected by small creeks coming in and to investigate the auriferous gravels underlying the glacial valley deposits.

Omineca River.—An excellent description of the Omineca river is given in McConnell's report, from which it is apparent that the ascent of the river by canoe from its mouth at the Finlay is extremely difficult. He says: "From the mouth of the Omineca to the head of the swift portion of the river is a distance of about 35 miles. The difference in elevation of the two points is approximately 425 feet, giving the river an inclination in this reach of about 12 feet to the mile, an exceptionally high grade for a stream of this size.

"From the head of the rapid water of Germansen Landing at the mouth of Germansen creek, a distance of 12 miles, with the exception of a few small riffles the current is easy, from 2 to 3 miles an hour. The river has a width of about 100 yards and for part of the way becomes very tortuous, winding from side to side of the wide flats which now border it. Before reaching Germansen creek the Omineca turns almost due west and continues in this direction for many miles.

"Germansen Landing in the old days was a place of considerable importance, as most of the supplies for the Germansen and Manson Creek camps were brought from Takla lake across to the Omineca, floated down the stream in boats, and landed here for distribution. In recent years this route has been abandoned and such supplies as are needed for the few remaining miners are brought in by pack-train."

The Omineca river has not been mined for placer gold to any extent, the only work being small-scale operations on a few bars.

Some testing of the gravels between the mouth of Germansen river and Old Hogem, a distance of about 40 miles, was done in 1914 by H. B. Perks. The testing was by means of pits, which could only be put down to water-level and bed-rock was not reached in them. The results therefore gave no information as to average values of the gravels from surface to bed-rock or as to the depth of gravel.

It would seem probable that much of the ground along this river is deep and only low-grade gravels on the average could be expected.

Other Creeks.—There are many small creeks in this section in which little or no prospecting has been done, except panning of surface or rim gravels. Small tributaries of Silver, 20-Mile, Kenny, and Dream creeks and Manson, Germansen, and Nation rivers are all worth more prospecting than they have yet received.

The whole area from Takla lake to Manson river is a promising field for the placer prospector. In many places "sniping" operations will give a grub-stake, and starting in this way experience of the character of the deposits can be gained, which will be useful in further prospecting of unexplored creeks.

Lode Minerals.—The Babine range is known to be well mineralized at numerous places where it has been prospected. Where it is crossed by the Hazelton–Babine trail a certain amount of prospecting was done many years ago. After some work was done most of the claims were abandoned and the section has been dormant ever since. Most of the known showings are from 20 to 30 miles from Hazelton and were given up because of the distance from the railway. Silver-lead-zinc ores are known to occur and with the improved prices now prevailing for these metals the area should be a favourable one for intensive prospecting. Valuable ore-bodies have been developed on Glen and 9-Mile mountains, both of which are in the Babine range, so that the whole area from Hazelton to Babine lake warrants thorough prospecting. A description of a few of the old claims can be found in the 1920 Annual Report. The trail from Hazelton to Babine provides fair transportation for prospecting and preliminary development. If any showings were sufficiently developed to warrant it, a road could be built up the Suskwa River pass.

Comparatively little prospecting for lode minerals has been done in the country between Babine lake and Manson. The Frypan mountains, lying between Babine lake and Takla lake, and to the north of both lakes, are reported to contain deposits of copper ore. This copper ore consists principally of bornite and chalcocite occurring in small stringers in an irregular manner over a considerable area. From the descriptions the occurrence would seem to be in the nature of sheeted zones. So far as is known, no report has been made by any one on these deposits and they were not examined by the writer. Access to them is by the Babine and Driftwood rivers, which connect with Babine and Takla lakes respectively.

None of the coal-seams occurring in the Cretaceous sediments around Takla lake were examined. Coal in this area, situated so far from transportation and market, has no present value. The known seams are small and not particularly high-grade coal. Practically no prospecting of the area has been done and it is quite possible that in this sedimentary formation there are good-sized seams.

From Takla lake to Manson the country is largely underlain by the Carboniferous series of schistose rocks. These schists, slates, and associated rocks are intruded by bodies of igneous rocks and are geologically a favourable formation in which to expect to find ore-deposits.

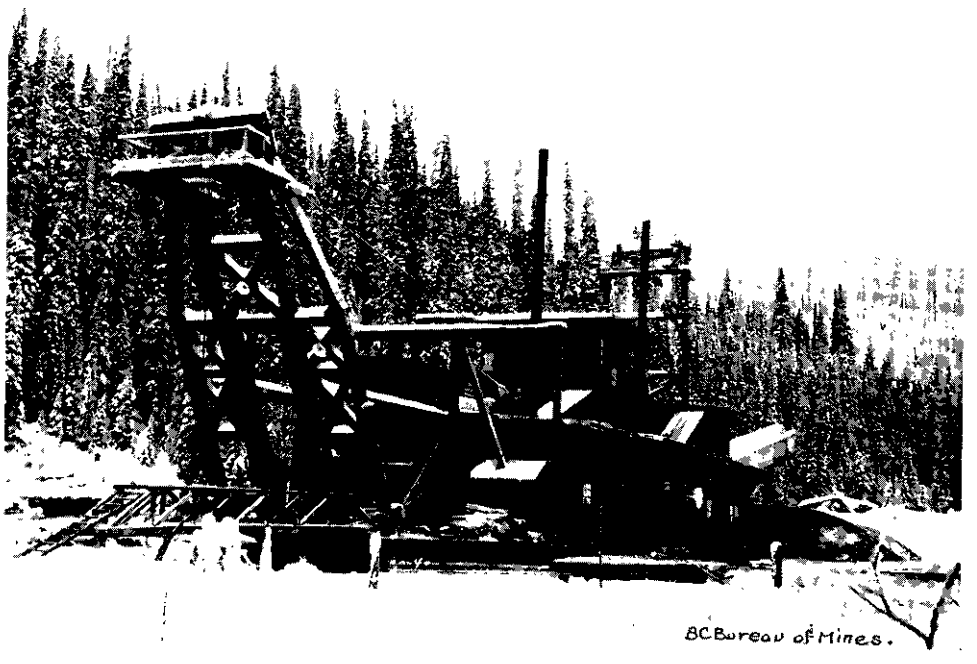
Quartz veins occur in abundance in the more schistose bands or parts of this formation and in places these veins are mineralized with pyrite, arsenopyrite, and galena. The appearance and characteristics of these veins in schists and slates are very similar to the quartz veins of the Cariboo Division occurring in the Cariboo schist formation. In the Cariboo it has been noted that those veins which cut the formation, and are relatively small and inconspicuous as to outcrop, are more heavily mineralized and carry much better gold values than the wide veins with prominent outcrops that strike with the formation. For lode prospectors in the Manson section this consideration should be kept in mind.

It is apparent that the placer gold of the Manson section has had its origin from the zones of mineralization occurring in these schistose rocks, but it is also quite apparent that many of the outcropping quartz veins are practically devoid of values. It would seem, however, that prospecting may reveal veins that carry shoots of gold-bearing sulphides.

The galena content of any of the veins examined is very slight. Fairly large specimens of nearly pure galena can be obtained, but these represent "kidneys" of galena which are irregularly disseminated through the quartz. Reports of important galena veins in this section have been bought out by prospectors, so that it is possible that better showings of galena occur than any that were examined.

At the present time and until a very considerable improvement in the transportation is effected into this section, lode prospecting will be mainly confined to searching for deposits carrying minerals containing gold.

Kafue Dredge, transporting Machinery.



Kafue Dredge, Antler Creek, Cariboo M.D.

The following table shows the results of assays on samples taken from different veins:—

Description.	Gold.	Silver.	Lead.
	Oz.	Oz.	Per Cent.
12-inch quartz vein, Tom creek	Trace	Trace	.....
20-foot quartz vein, Lost creek	*Nil*	*Nil*	.....
20-foot quartz vein, Lost creek	*Nil*	*Nil*	.....
20-foot quartz vein, Lost creek	Trace	Trace	.....
Stanwood, Lost creek, selected ore	Trace	17.0	34.0
Long, Discovery bar, quartz vein	Trace	1.0	.....
Selected galena, Lost creek	0.04	15.0	22.0
Sullivan, Manson creek	Trace	0.6	.....
Sullivan, Manson creek, across 2½ feet quartz	Trace	0.6	.....
Sullivan, selected pyrrhotite	Trace	19.0	.....
Sullivan, selected quartz with pyrite and galena	0.02	32.0	4.0
Sullivan, across 2½ feet quartz	Trace	1.0	.....
Selected quartz with pyrite	Trace	Trace	.....

In addition to the above samples, a number of others were taken at various places of oxidized rock-matter, but nothing better than traces of gold and silver were obtained on assaying.

The widths of the quartz veins examined varied from 1 to 20 feet. As a rule they strike with the formation and have been involved in the shearing forces which have induced schistosity in the country-rock.

The above assay results are not particularly favourable, but it must be remembered that no intensive prospecting for lode minerals has been done in the Manson section. There is a large area in which geologic conditions for the occurrence of ore-deposits are favourable. When better transportation is provided this should be a good field for the prospector.

A number of claims have in past years been staked in the area, particularly within a radius of a few miles of Manson Creek. Most of these have lapsed, but a group, the claims of which are Crown-granted, is still held by the Goffatt Company, of Toronto. The Sullivan property, which is situated about a mile from Manson Creek, was partially developed by some short tunnels and open-cuts; it was abandoned many years ago.

CARIBOO MINING DIVISION.

It is satisfactory to be able to report a most satisfactory year in placer-mining in the Cariboo District, which includes both the Cariboo and Quesnel Mining Divisions. The actual production of $250,000 shows an increase of $20,000 as compared with 1923, but the most encouraging feature is the promise of a considerable increase in output in the future.

The construction, by the Kafue Copper Development Company, of a modern type bucket dredge for digging gold-bearing placer-gravels was the most important development of the year. The successful operation of the dredge may well prove a turning-point in the placer history of the Cariboo, as there are many deposits of low-grade placer-gravel that it may be possible to work at a profit by dredging.

The hydraulic mines had a successful year with water conditions better than in 1923. The paving of the long flume on the *Lowhee* hydraulic mine with steel plates was an important piece of work that was carried out during the year. The erection of a dredge of a new type was commenced on the Swift river and it is expected that construction will be completed in the spring of 1925. This dredge is known as the "Rowe Circulating Dredge" and its operation will be watched with interest.

BARKERVILLE SECTION.

Hopp Mines.

Two properties, *Lowhee* and *Mosquito Creek*, were operated by John Hopp during the season. The water-supply was good throughout most of the season and better results were obtained than in 1923. During the season the *Lowhee* tailings-flume, which is nearly a mile in length, was paved with steel plates. These plates are specially made high-carbon-manganese steel plates supplied by the Bethlehem Steel Company and by their use several advantages are gained as compared with the ordinary wooden-block paving heretofore in use. It is practicable to set the flume at a lower grade and as much

or more gravel can be handled with the same amount of water. By lowering the grade of the flume at *Lowhee* it was possible to get down to bed-rock in the pit, which had not been possible in the last two seasons. About 300 feet of the pit-bottom was cleaned up this year when the flume was lowered and this ground carried good "pay." Much expense and time lost during the hydraulic season in renewing the block paving will be obviated now that the flume is lined with the plates. If sufficiently hard, these plates should last for years without renewal. It is expected that the flume will carry larger boulders now than before, as the irregularities of the block paving made greater friction than the smooth surface of the plates. Recovery of gold from the material washed can be effected as efficiently with steel plates as with block paving.

A new reservoir dam for flushing water was also constructed at some distance ahead of the pit; this was necessary as the pit had been advanced nearly to the old dam. It is believed that the pit is now at about the end of the old drift-workings and consequently a higher gold content in the gravel handled is to be expected from future operations. With the flume down to bed-rock at the head of the pit and all arrangements completed, a large yardage of gravel should be handled in 1925, and it is expected that a better clean-up than in recent years will be obtained.

On *Mosquito Creek* operations were conducted as usual. This property is apparently nearly worked out.

Trehouse Syndicate.

This property is a small hydraulic claim on Cunningham creek, where a bench of the stream is being worked. Results for the season were satisfactory. An insufficient supply of water handicaps the operation of this property, but it is considered that the expense of laying on additional water would be justified. The owners are F. J. Tregillus and J. House, of Barkerville, and F. de Witt Reed. The ground worked varies from 5 to 25 feet deep on bed-rock and the "pay" has a width of 140 feet.

Other Placer Properties.—Hydraulic operations were carried on at the *Point* mine on Slough creek, Perkins gulch, near Stanley, Devil's canyon, and 8-Mile lake. Some small-scale drift-workings were also operated by individuals.

Antler Creek Dredge.

In the summer of 1923 C. A. Banks secured options for the Kafue Copper Development Company on ground situated on Antler creek, and the adjoining Cunningham Pass creek, about 8 miles south-east of Barkerville. This company is a subsidiary of the Selukwe Corporation, of London, which latter company also controls the B.C. Silver Mines, Limited, in Portland Canal Division; Mr. Banks is in charge of the interests of the Selukwe Corporation in British Columbia.

The ground on Antler creek consists of the Nason, Lothair, and MacDonald leases and is owned by C. W. Moore and J. G. McLaren. About ten years ago this ground was Keystone-drilled by the Yukon Gold Company. The drilling results were satisfactory, but it was not considered that a sufficient yardage had been proven to warrant the erection of a dredge, so nothing further was done at that time. It was considered by Mr. Banks that the Moore-McLaren holdings, together with ground on Cunningham Pass creek, might, however, prove an attractive dredging proposition. After acquiring the options the ground was tested by Keystone-drilling; this work was done by W. E. Thorne, an experienced drilling and dredging engineer.

Sufficient drilling was done on the Antler Creek ground to check the previous drilling done by the owners and the Yukon Gold Company. More drilling was done on the Cunningham Pass ground, where no previous testing of any kind had been carried out.

This drilling was carried on during the winter of 1923–24 and the results were satisfactory. The figures given out by the company show 1,500,000 cubic yards on Antler creek averaging 50 cents a yard and 3,000,000 cubic yards on Cunningham Pass creek averaging 25 cents a yard. Further drilling may show extensions of this yardage.

The option on the Antler Creek ground is on a royalty basis and the Kafue Company is to be reimbursed to the extent of $180,000 for the construction of the dredge out of the first profits before the owners receive any royalty. By making such a deal the owners plainly show their confidence that the ground will produce substantial profits. The ground on Cunningham Pass creek is being acquired on an option for cash payable over a number of years.

As a result of the testing, the Kafue Company decided to erect a 4-cubic-foot bucket capacity dredge, capable of digging 60,000 cubic yards of gravel a month. As there was an abundance of suitable timber growing close to the point at which the dredge was to be constructed, it was

decided that the hull of the dredge should be constructed of wood and that the dredge would be steam-driven with wood as fuel.

In the early spring of 1924 the Kafue Company erected a sawmill on the ground and all lumber for the dredge-construction and the building of a permanent camp was sawn and dressed. The construction of the hull and construction and equipment of the remainder of the dredge was let on contract to the Union Construction Company, of San Francisco. C. W. Moore was in charge of the work for this company.

The following description of the dredge equipment is quoted from an article by E. A. Haggen: "The dredge was completed in November and a trial run was made. Owing to a severe cold snap and a heavy snowfall, but little was accomplished before it was necessary to stop operations. It is expected that the dredge will commence digging some time in March, 1925. Operation of the dredge during nine or ten months of the year is believed to be possible, but the time of closing down for winter weather can only be determined by actual operation.

"The dredge was built at the mouth of China gulch, where it enters Antler creek, and will be worked into the main channel from that point. It is of bucket-elevator type. The buckets weigh half a ton apiece and are connected in endless chain. They have a capacity of 4 cubic feet each, giving the dredge a capacity range of 2,000 cubic yards a day of three shifts. The plant is equipped to dig gravel to a depth of 50 feet, with provision for future extension of the ladder and additional buckets to enable it to go to a depth of 60 feet.

"The buckets discharge into a hopper, which delivers the gravel into a revolving screen 26½ feet long. This screen is 5 feet in diameter and is perforated with holes to ⅝ inch diameter, through which the fine gravel and gold pass to the gold-saving tables, where the gold is collected. There are two sets of tables, each consisting of two bays 12 feet long by 2½ feet wide. These discharge into a 56-inch steel sluice on each side of the dredge. The coarse gravel and rejects are carried by an endless conveyor-belt to the dumps astern of the dredge.

"The hull of the dredge is 104 feet long by 38 feet wide and has a depth of 7½ feet. The main deck-house is 72 feet long. The winch-room is 10 feet square and is located on the starboard bow. The winch has seven cast-steel drums, each equipped with a steel brake-band lined with hardwood blocks. The winch has two forward and one reverse speeds.

"The tailings-stacker is 100 feet long and is of lattice-girder construction. It can be extended to a greater length as required. The spuds have a length of 55 feet. Water for washing the gravel will be supplied by a 10-inch high-pressure centrifugal pump capable of delivering 3,000 gallons a minute. A second centrifugal pump supplies water for cleaning-up and fire-protection. The dredge is electrically lighted from a 3-kw. generator driven by a gasolene-engine.

"Power is supplied by two Lanz compound condensing locomobile boilers of 90 horse-power each. One boiler is used for operating the bucket-line and winch. The other drives the pumps, screen, and stacker. The boilers are equipped with superheaters, feed-water heater, and condenser.

"Gold recovered is in a cleaning-box with cast-iron riffles. A swing-crane is provided for handling the heavy parts of the plant in making repairs, and steel ropes are used for guys, as well as for controlling the position of the dredge, raising the buckets and stacker, etc.

"The cost of the dredge was about $200,000. It is constructed of the best material and is of the most up-to-date design. C. W. Moore, under whose supervision the machinery was assembled and the dredge constructed, has had extensive experience in similar work in the Yukon and Alaska. He will also be in charge as dredgemaster of the operation of the dredge."

So far as can be foreseen, successful results should be obtained from the operation of this dredge. The ground has been fairly well tested by drilling, so that average values have been closely estimated; the gravel is free from large boulders; practically no clay strata occur in the gravels, and the schist bed-rock is soft and suitable for recovering gold by dredging.

Peters Creek.

Peters creek is a tributary of Lightning creek coming in at Beaver pass. Claims and leases were worked on it many years ago by drifting methods.

In 1921 options on a number of leases were secured by the Northern Construction Syndicate and some testing of the ground was done by sinking pits and drilling (*see* Annual Report for 1921). Afterwards the leases reverted to the original owners.

Options on the more important leases were taken by C. A. Banks in 1924. Under the supervision of W. E. Thorne drilling of the ground was carried on for a few months. In this drilling an Empire hand-drill and a Keystone drill were used and the creek-valley was cross-sectioned with holes at several places over a distance of 2 miles. No exact information has been given out regarding the drilling results, but the options to purchase the leases were relinquished.

It is known that in places there are good values in the gravels, but the question of how to mine the ground presents some difficulties. The grade is insufficient to admit of hydraulicking unless by the use of an hydraulic elevator at the lower end of the creek. The occurrence of strata of clay is somewhat of a hindrance to dredging, which, however, can be overcome if the values are high enough.

A report on the property by E. S. Hogg, made after he had spent some time testing it at the time the Northern Construction Syndicate had an option on it, is most favourable. At that time the proposed plan of operation was to be by hydraulicking with the aid of an hydraulic elevator. J. Gardner, of Beaver Pass, owns some of the leases on the creek and has much information regarding the property.

Lightning Creek Gold Company.

A résumé of the operations of the Lightning Creek Gold Gravels and Drainage Company during the last twenty-six years was given in the 1923 Annual Report. No actual mining was done in 1924, but a few men were on the ground at different times during the year.

The affairs of this company and its various subsidiaries would seem to be rather involved, and during 1924 much litigation was in progress between the contending factions. New arrangements and new plans for operation are announced from time to time, but little is actually accomplished.

Gold Dredging Syndicate, Limited.

A group of leases on the Swift river, about 5 miles above Cottonwood Post-office, has been secured by the Gold Dredging Syndicate, Limited. The capitalization of the company is $50,000, with the head office in Vancouver. M. M. Kerr is secretary-treasurer of the company and manager in charge of the work.

The ground was drilled in 1922 by G. A. Dunlop, and according to Mr. Kerr the results showed 5,000,000 cubic yards proven with an average value of 40 cents a yard. Most of this pay-gravel is contained in a surface run of gravel from 10 to 20 feet thick, lying on clay. Most of the drilling did not go to bed-rock, as but little values occur in gravel under the clay.

After the drilling was done Mr. Kerr promoted and organized the company. An arrangement was entered into with F. A. Rowe, the inventor of the "Rowe Circulating Dredge," whereby the property would be equipped with a dredge of this design. Late in the fall of 1924 most of the machinery was shipped in to the property and assembling of the dredge commenced. Owing to severe winter weather, construction was stopped before completion of the dredge, but it is expected operations will be resumed in the spring of 1925.

The principle of the dredge is that by suction and force pumps the gravel is forced up a 6-inch pipe to the washing-sluice. The 6-inch pipe is inside another pipe of larger diameter—8 or 9 inches; water is forced down the annular space between the two pipes and emerges from the end in four small jets; this is expected to cut the gravel, which is then drawn by suction up the inner pipe. The pressure-pump delivers 900 gallons a minute and the suction-pump 1,200 gallons a minute. The concentric pipes stand vertically and are expected to sink into the gravel-deposit as the digging proceeds. After the pipe has mined out the gravel around it the pipe is withdrawn by a winch and started in a new place. No boulders are mined, but it is claimed that the water-suction will draw into the discharge-pipe all fine gravel, sand, and gold, leaving the boulders behind—an ideal system if it works.

The whole plant, including boilers, pumps, etc., is to be mounted on a log raft 60 by 22 feet, which can be moved and moored by cables as necessary. The raft has been constructed right in the Swift river, but will be carried ahead in a pond as desired. It is claimed that the dredge will mine 3,000 yards a day of the gravel-deposit, but by leaving behind the boulders, only a portion of this yardage is actually handled. The ordinary sluice-boxes and riffled tables will be used for washing the gravel.

It is to be hoped that the claims of the inventor are substantiated when the dredge is in operation.

QUARTZ-MINING.

Further progress was made in quartz-mining, particularly in the Barkerville section, during 1924. More attention is now being paid to the small veins with inconspicuous outcrops than the large prominent showings of more or less unmineralized quartz. These small veins require intensive prospecting methods, but the results may compensate the work.

Myrtle Group. This group is situated on the south-west slope of Barkerville mountain, 1½ miles from Barkerville. An option was taken on the property in the spring of 1924 by J. Clark Johnstone, acting as agent and manager of the El Oro Mining Company. Some development-work was done, a road built, and a Ross mill bought and taken to Barkerville, when the company's funds were exhausted.

The property reverted to the original owner, E. E. Armstrong, and later he secured the Ross mill. In the fall of the year the mill had been erected at a point in Stouts gulch where water could be obtained and 20 tons of ore was hauled to it from the property and some of it milled. Only a short run could be obtained before the winter freeze-up arrived and milling had to be stopped.

It is reported that about $50 a ton was recovered from the ore milled. About 1½ tons of ore can be put through the mill in one shift. The ore so far milled has been more or less selected ore, so that it is better than the average of the veins.

The showing on the property consists of two narrow quartz veins, 500 feet apart and striking N. 15° E. (mag.) and standing nearly vertical. These veins occur in schist and vary in width from 2 inches up to 2 feet. They are considerably oxidized at the surface and for a few feet down. The original iron sulphides which occurred in the quartz gangue are nearly all changed to iron oxides at and near the surface; small amounts of galena occur in places, but are not important. Specimens showing free gold are frequently obtained. Development consists of open-cuts, stripping, and shallow shafts from 10 to 12 feet deep. Other parallel veins or stringers have been found, but practically no development has been done on them.

The following table shows the results of assays of samples taken:—

Description.	Gold.	Silver.
	Oz.	Oz.
Across 15 inches	Trace	0.2
Grab sample from oxidized rich portion of vein	2.80	1.2
Across 8 inches	1.44	0.2
Grab sample from dump, 11-foot shaft	0.72	0.2

The Ross mill and small jaw-crusher are operated by an 8-horse-power Petter engine, type "S," using coal-oil as fuel. It was erected about a mile from the workings, as a suitable supply of water was not available closer. By equipping the mill with amalgamating-plates a good recovery of the gold was obtained. The oxidized ore on the surface is practically free-milling, so that amalgamation is suitable for it.

The owner had planned steady development and ore-extraction for the winter months and he expects to have a good supply of ore at the mill for grinding in the spring of 1925. This operation is only small-scale work, but it is interesting as showing the possibilities for the development of the small quartz veins of this section.

Rainbow. This property, which is owned by A. Sanders, is situated a short distance up the hill from the lower end of the *Louhee* hydraulic mine. A number of small veins and stringers on the property have been developed by the owner in the last three years; this work consists of stripping, open-cuts, and short tunnels. Some useful work was also done by ground-sluicing, exposing a zone in the schist in which a network of stringers and cross-fractures occur, carrying in places values. That the different veins carry gold is well shown by the fact that each season the owner takes out several hundred dollars by panning the oxidized quartz.

The best defined vein is known as the "Iron vein"; it is exposed by stripping and some open-cuts. In the table showing all assay results from this property Nos. 2733 and 2735 are from this vein.

The lowest working is a short tunnel below an old ditch. The face shows a 6-inch and an 8-inch band of quartz separated by 15 inches of schist. No. 2734 is a sample from the 6-inch band.

The upper showings near the cabin are developed by two short tunnels which show a crushed zone carrying quartz stringers. Nos. 2736 and 2737 are samples taken across this zone, excluding 2 feet of schist; the first sample is across 2 feet and the other across 6 feet.

The assays of samples taken are as follows:—

No.	Description.	Gold.	Silver.
		Oz.	Oz.
2733	Iron vein, grab sample of dump	1.16	0.14
2734	Lowest vein, across 6 inches	0.26	0.14
2735	Iron vein, across 15 inches	0.70	0.10
2736	Upper workings, across 2 feet	0.30	0.20
2737	Upper workings, across 6 feet	0.18	.....
2618	Upper workings, across 6 feet	1.26	0.20
2619	Upper workings; grab sample, oxidized quartz	3.06	0.40

Other Properties.—Assessment-work was done during the year on a number of claims on Proserpine and Cunningham mountains. These properties have been described in previous Annual Reports.

QUESNEL MINING DIVISION.

The only important mining in the Quesnel Division is placer-mining, although prospecting for lode minerals is intermittently carried on. Coal-deposits are known, but as yet very little development has been done on them. Owing to the production of the Cedar Creek camp the placer-gold output of this Division for the last three years has shown a large increase over previous years, and the interest aroused by the rich ground at Cedar creek has had a very beneficial result on prospecting.

During the year grants were made from the Mines Development Fund for the purpose of improving the transportation in the Likely and the Keithley sections. Substantial grants were also made by the Public Works Department for repairing the main trunk road serving these sections, so that this part of the Division is now well served by fairly good motor-roads throughout.

QUESNEL SECTION.

In 1923 an examination was made of the diatomaceous earth deposits of British Columbia by V. I. Eardley-Wilmot, of the Mines Branch of Canada. His report is in the recently issued bulletin entitled "Investigations of Mineral Resources and the Mining Industry, 1923," by the Mines Branch.

The following is a quotation from his report: "The largest as well as the purest deposit so far found in the Dominion occurs in the immediate vicinity of Quesnel, the present terminus of the Pacific Great Eastern Railway. At least a dozen different showings are exposed over an area of 30 square miles within the Fraser and Quesnel River valleys. These horizontal and inclined beds are exposed on the faces of steep bluffs caused by slides and the cutting-away of the river-valleys. The deposits occur from 100 to 800 feet above the present rivers, but were probably originally formed at the higher levels, where the beds are more uniform and attain a thickness in some places of 40 feet, whereas the exposures just above the present river are much broken up, twisted, and faulted. This movement is well illustrated at the big bend, 10 miles north of Quesnel, where the diatomaceous earth, together with highly coloured clays, are exposed at various elevations for three-fourths of a mile along the west bank. The earth is in most cases overlain by a bed of porous basalt. All these deposits occur as an almost pure white, dry, compact material, and in many places can be cut into blocks up to 3 feet in diameter, the size varying according to the thickness of the bedding-planes. Microscopic examination of samples taken from six of these different exposures show each of them to be almost entirely composed of the same species of diatoms, which are in the form of curved porous cylinders. No work has yet been done, but several places were tested by auger a few hundred feet from the exposures,

and the material was found under a few feet of soil, so that these beds must cover large areas and contain very considerable tonnages of diatomaceous earth."

LIKELY SECTION.

The name "Likely section" is used to designate the country adjacent to Quesnel lake and the two forks of the Quesnel river and their tributaries; it includes the Cedar Creek camp. The town of Likely, formerly known as Quesnel Dam and given its present name in honour of John Likely, one of the old-timers of the district, is the supply-point for this section.

During the season of 1924 many prospectors were at work in many parts of this section and a good deal of individual drifting-work is being steadily carried on. The important productive property at present is that of the Cedar Creek Mining Company.

Ennis Gold Mining Company.

At the request of the directors of the company a special report was made on the property of the Ennis Gold Mining Company. As there are a number of placer properties in the Likely section which have some characteristics in common with this one, the report is published nearly in full. It is considered that a detail description of this particular property will be of general interest to owners and operators in this section.

General Statement.—The Ennis Gold Mining Company was organized and incorporated for the purpose of acquiring and operating certain placer leases on Spanish creek, Quesnel Mining Division. The head office of the company is at Kelowna and D. Ennis is manager in charge of operations at the property. An option to purchase is held on eight placer leases, which are owned by Messrs. MacDonald, Burns, Lynes, Harris, Henderson, and Robins.

Spanish creek flows into the North fork of Quesnel river and is distant 8 miles from the town of Likely, with which it is connected by an auto-road. Four of the placer leases held by the company extend from the mouth of Spanish creek up-stream, taking in the valley of the creek; the other four leases are on the left bank of the North fork, one above Spanish creek and the other three below, and all adjoining. The important ground for the present to be worked lies on the leases on Spanish creek.

Spanish creek was worked many years ago, the bed of the present creek having been pretty well worked by the old-timers. Later on deeper ground lying on the right bank of the creek was worked by the Moore Mining Company (now commonly referred to as the McGregor workings) by means of a drift-tunnel and incline shafts. The Moore Mining Company holdings were sold to John Hobson and the property was equipped as an hydraulic mine. A pit was started near the mouth of the creek and piping was carried on for one or two seasons and then stopped. In 1912 the property was acquired by John Hopp and another hydraulic pit started on the right bank of the creek, near the mouth (opposite Hobson's pit), and piping was carried on for one season. After this the ground apparently became vacant until taken up by the present owners and now under option to the Ennis Mining Company.

When the property was acquired by the Ennis Mining Company nearly all the necessary equipment for running an hydraulic mine was on the ground; this equipment was owned or controlled by the Hobson Estate. By arrangement with the Hobson Estate this equipment has now been secured by the Ennis Mining Company. In addition, the company has a small sawmill for cutting lumber and timbers.

The water records held by the company consist of 5,000 acre-feet storage on Spanish lake and 33 cubic feet a second water rights on Spanish and Black Bear creeks. Arrangements have also been made whereby the company has the use of the dams on Spanish lake and Spanish creek, originally constructed by John Hobson.

Geologic Features.—Spanish creek is a fair-sized stream flowing from Spanish lake into the North fork of the Quesnel river. About a mile up Spanish creek from its mouth (following the windings of the stream) Black Bear creek joins it from the east. Immediately below the mouth of Black Bear creek Spanish creek flows through a canyon with a rapid descent of about 250 feet in about 800 feet. Below the canyon to its mouth Spanish creek has a fairly regular grade of about 4 per cent.

The canyon of Spanish creek is a recent gorge cut through bed-rock; below the canyon the creek flows over gravel that is not very deep to bed-rock. It would seem that this part of the creek follows more or less the rim of a deep channel which lies to the east, or on the right

bank of the creek. Evidence for the existence of the channel is as follows: The surface topography suggests a channel going through east of the canyon of Spanish creek to Black Bear creek, the outcropping of what appear to be rims on the left bank of the North fork (which stream would cut at right angles the old channel) and the drift-workings of the Moore Mining Company.

So far as can be gathered from the available evidence, Spanish creek yielded but little gold above the confluence of Black Bear creek. After the bed of the stream had been mined the Moore Company commenced work on the assumption that there was deeper ground on the right bank of the creek. By means of a drift-tunnel 1,500 feet long and three incline shafts this company found bed-rock deeper than the present creek-bed and carried on mining operations for some time. Gold was obtained, but in what amount cannot be exactly determined. In the Annual Report for 1902 it is reported that this drifted ground went 2 oz. to the set; other reports give higher values. An excessive flow of water in these drift-workings made operation difficult, but it is claimed that the work paid. This company sold out to John Hobson, who opened up the property as an hydraulic mine.

In connection with his work Hobson made an excellent plan of Spanish creek, showing the Moore Company workings and a number of vertical sections at different points along the creek.

As this plan was made at a time when the Moore Company workings could be entered and mapped, it must be assumed that it is substantially correct. From the sections on the plan it is apparent that the Moore Company drift followed along the rim of the presumed deep channel and much deeper ground is shown to the east. The actual depth of the deepest part of this channel and position of the other rim (which are shown in the sections) must be considered as assumed and not exact, as no workings reached the centre of the channel and no drifts were driven to the opposite rim. The important information from this plan for the Ennis Mining Company is the depths shown to bed-rock at different points in the Moore Company workings.

The gravels exposed in the bed and banks of Spanish creek are ordinary glacial and post-glacial gravels. They are in large part post-glacial gravels consisting of glacial gravels resorted by stream-action. As shown by the Ennis pit, the gravels are well stratified and there is an entire absence of slum. Near the top of the right bank of the pit there is a well-defined stratum of boulder-clay which carries many boulders, but very few of large size. No cemented gravel occurs.

The bed-rock gravels as exposed in the Moore Company workings (cannot be seen now) are described in the 1902 Annual Report as follows: "The gravel in this old channel is well water-worn and flattened, carries masses of iron pyrites, white iron, pyrrhotite, and galena, and seems to be an important and valuable deposit."

Rim-rock shows in the Ennis pit on the left-hand side and this probably corresponds with the shallow ground worked in the bed of Spanish creek, and it may be the highest point of the rim of the deep channel to the east. The sections on the Hobson plan show the Moore Company workings to be on the rim of this deep channel, but it is quite possible that these workings are not far from the deepest ground of this channel. No bed-rock is exposed in the bottom of the Ennis pit and it will be necessary to get down to approximately the level of the Moore workings before bed-rock is reached.

On the east side the Ennis pit has a high bank of gravel up to 150 feet in height, with from 50 to 60 feet on the other side. Ahead of the pit there is less overburden until past the McGregor wheel-house, where the ground rises steeply. It is quite possible from the topography of the country that the bed-rock at this point has a similar sharp rise.

No panning or testing of any kind was done by the writer. The gold from the clean-up was not seen, but is said to have been comparatively fine, as would be expected, occurring as it does in gravels lying well above bed-rock.

Operations.—Work was commenced by the Ennis Gold Mining Company in the late summer of 1923. To begin with, much preparatory work was necessary, laying pipe-line, repairing the flume, and generally getting in shape for piping. Only a short run of two or three weeks' piping was obtained before the winter freeze-up. A full season's piping was carried out in 1924, the freeze-up coming early in November.

In commencing work on the property Mr. Ennis decided to open up an hydraulic pit at a point about half a mile up the creek from its mouth. As previously stated, both hydraulic pits previously commenced on the property were within a short distance of the mouth. Mr. Ennis

did not expect to be able to get down to the bed-rock of the Moore Company's workings with this pit, but intended to take off a large part of the overburden by hydraulicking and then use a drag-line scraper to dig the remaining gravel down to bed-rock. The Ennis pit is situated nearly over the Moore Company's drift-tunnel and just below the McGregor wheel-house—the last incline shaft of the Moore Mining Company. At this point Spanish creek has a semicircular bend in it, with a high bank of gravel projecting out from the general contour of the valley and forming a ridge. This high ridge of gravel was attacked from both the up-stream and down-stream sides of the semicircle with monitors and a large cut made right through it. The gravel was carried off by two short sets of sluice-boxes, which carried the gravel into Spanish creek. By confining the stream to one channel by means of logs and brush the creek carried away the tailings to the river.

The water plant on the property is an excellent one. The water from Spanish lake is regulated by a dam at the outset; then it flows 5 miles down Spanish creek to a small dam at the head of the canyon, which diverts the water into a flume, approximately 1,000 feet in length. From the penstock at the end of the flume 1,000 feet of pipe delivers the water to the monitors at the pit. From 150 to 180 feet of head is obtained and during most of the season there is enough water to run two monitors with 8-inch nozzles. The hydraulic work was quite successful from the point of view that a large yardage was moved at a low cost. About 800,000 cubic yards of material has been moved at a cost for actual piping operations, according to the manager, of about 1½ cents a yard. The piping, however, has left a large accumulation of boulders in the bottom of the pit and at the head of the sluice-boxes. This condition is largely caused by reason of the pit not being down to bed-rock. A donkey-engine, tackle, and stone-boat was rigged up at the lower end of the pit in the fall of 1924 to stack boulders.

In addition to the hydraulic work, a small amount of testing of the ground was being commenced by the management. In 1923 a shaft was sunk in gravel to a distance of 18 or 20 feet; on account of water it could not be sunk any deeper. Bed-rock was not struck and it is understood that no exact testing was made for values, the main information desired being the depth to bed-rock.

After the close of the hydraulic season in 1924 a shaft was started a short distance below the end of the hydraulic pit and to the east of the old Moore Company tunnel. At the time of visiting the property in November this shaft was down 18 feet 6 inches and sinking was being continued. A considerable flow of water had been struck and without a power-pump not much headway could be made. A tunnel was also driven from a point on the North fork, just above the water-level, in a distance of 50 feet. From the end of this tunnel sinking had just been started and it was intended if possible to put this shaft down to bed-rock.

Elevations.—The following figures of elevations are taken from the survey made by Messrs. Ennis and Sexsmith, supplemented by bed-rock depths as given on Hobson's plan:—

Hopp sluice, 8 feet above river (high water, North fork).
McGregor wheel-house, 114 feet 6 inches above river.
Bed-rock, McGregor wheel-house, 75 feet below surface.
Bed-rock, McGregor wheel-house, 39 feet 6 inches above river.
Ennis sluice, 55 feet 8 inches below McGregor wheel-house, surface.
Ennis sluice, 19 feet 4 inches above McGregor wheel-house, bed-rock.
Ennis pit-bottom (elevations irregular), 25 to 50 feet above bed-rock.
Distance river to McGregor wheel-house, 2,626 feet.
Average grade of flume required, starting at river, to get bed-rock at McGregor wheel-house, 1.5 per cent.
Average grade of flume required to get bed-rock at Ennis pit cannot be exactly calculated as pitch of bed-rock unknown, but would have to be less than 1.5 per cent., probably a maximum of 1 per cent.

The above figures may be assumed to be substantially correct, quite sufficiently so for the purpose of estimating what grade of flume would be required to reach bed-rock. A grade of 1 to 1.5 per cent. for a flume to carry off hydraulic tailings is extremely low and it would be quite impossible unless with a flume lined with steel plates. Such a grade would carry water and gravel, but a large percentage of the boulders would probably have to be handled by mechanical methods so as not to block the sluice. Before putting in such a flume, if possible, information should be obtained if such a low grade has proved practicable anywhere. The required quality of high-carbon steel plates for paving a flume, or sluice-box, cannot be easily obtained from the

usual sources supplying steel plates. As a rule it is necessary to get these plates by a special order from a steel-rolling mill.

Values.—Not much information is available regarding the average values in the gravel-deposits being worked by this company. This question is of course a most important one.

It is known that the drift-workings of the Moore Mining Company proved that there was a bed-rock concentration of gold in the deep ground which was rich enough to pay to work as drift-diggings. Overlying this bed-rock concentration there is a thickness of gravels varying from 60 to 200 feet. Assuming that it may be possible to hydraulic off these gravels down to the Moore Company workings—that is, to bed-rock—then it is obvious that if the only gold content is the concentration on bed-rock, then this streak would have to be very rich to make the proposition pay. Various figures are reported as to the richness of the bed-rock ground, running from 2 to 17 oz. to the set; but much richer ground than this would be necessary to pay to hydraulic off the whole mass of gravels.

There is, however, some evidence to show that the upper gravels do carry a small gold content, distributed somewhat irregularly through them. A report by John Hobson gives an estimate of 70,000,000 cubic yards of gravel lying above the present bed of Spanish creek, with an average gold content of 23 cents a yard. This figure was obtained by means of a limited amount of testing by small pits and therefore cannot be accepted as being very accurate. According to Mr. Ennis, about 800,000 yards of the upper gravels have been removed in the pit he has operated, and from this ground approximately $2,000 has been recovered in the sluice-boxes. This gives an average value for the gravel handled of one-fourth to one-fifth of a cent per cubic yard.

The amount of gold recovered from the Ennis pit is, however, only considered to be a small proportion of the total gold contained in the gravels hydraulicked off. As has been pointed out, the sluices and pit-bottom were not down to bed-rock and a large accumulation of boulders is piled up ahead of the sluices; under these conditions it would be practically impossible for much gold to get into the boxes. The boulders in the pit-bottom form a natural riffle which would collect most of the gold contained in the gravel piped over them. Any estimate of what percentage the gold recovered in the boxes is to the total gold in the gravels cannot be considered as other than a "guess." Under ordinary conditions the piping-off of nearly a million yards of gravel would have given a most excellent test of the gold content of this gravel-deposit, but for the above reasons the test is of no value and is uncompleted until such time as the pit-bottom is cleaned up to bed-rock.

The shaft and tunnel work which was done by Mr. Ennis this fall may have given some information regarding values in the upper gravels, but the results are not known to the writer.

Future Operations.—In any hydraulic mine the three essentials are: (1) Sufficient gold in the gravel to pay for operation; (2) sufficient dump to handle tailings; (3) ample water-supply under a good pressure-head.

A consideration of the property of the Ennis Gold Mining Company from the standpoint of the above factors shows:—

(1.) No exact information is available as to the average gold content of the gravels, and all reports, estimates, etc., of such values must be classed as guesses based on entirely insufficient data. There is, however, enough preliminary information to make it quite warranted to thoroughly test the gravels, with the reasonable expectation that pay values will be found.

(2.) The dump is unsatisfactory. By bringing in a sluice from the river on a 1 to 1½ per cent. grade it may be possible to successfully hydraulic down to bed-rock. From the surface topography it would appear that up-stream from the McGregor wheel-house the bed-rock should rise rapidly and therefore hydraulicking of the gravels above this point may be quite practicable. More information as to the depth of bed-rock is necessary before this could be assumed. If hydraulicking is attempted on a low-grade the costs of operation will be higher, so that higher-grade gravel is required than with a sluice on a normal grade of 4 to 6 per cent.

(3.) The property has an excellent water-supply, with sufficient pressure-head for hydraulicking. This is a very favourable feature of this property, which ensures low-cost operation provided that a suitable dump can be provided. The North fork is a large stream which will take away all tailings when delivered at or near the mouth of Spanish creek. The costs of hydraulicking, as given by Mr. Ennis, of 1½ cents a yard are very low. With a flume running right to the river and handling of all boulders the costs would necessarily be higher. Also something addi-

tional must be allowed for overhead, interest, depreciation, etc. Under these conditions a cost of from 3 to 5 cents a yard might be anticipated, but even this is quite low and would admit of low-grade gravel being handled at a profit.

It is apparent that there is no use in continuing hydraulicking next season as was done this year (1924). The operations were unsuccessful financially and there is no reason to suppose that handling more gravel under the same conditions would produce any better results. The shaft-work for testing was also unsatisfactory, as owing to water it was impossible to make much headway by hand-work and the footage cost must necessarily have been high.

The company has spent a considerable sum on the property and has not yet definite information as to the value of the property and how it can be operated at a profit. The season of 1925 should therefore be used to determine by testing the value of the property, in order to decide whether the option to purchase should be exercised and the property bought.

By far the most economical and accurate method of testing the property would be by drilling, preferably with a standard Keystone drill. This drilling would give information as to average values throughout the gravels, as well as the bed-rock concentration, and would also give the depths to bed-rock at different points. Drilling would show whether the ground up-stream from the McGregor wheel-house could be successfully worked even though the ground below the wheel-house is too deep to be hydraulicked.

Testing of the ground could be done by shaft-sinking with the aid of a power-pump to handle the water. This would be much more costly than Keystone-drilling and no greater accuracy of results is obtainable by it.

The writer has no hesitation in recommending this property as being one with considerable possibilities. The first-class water system is a decided asset; the difficulties as to dump can possibly be overcome and the evidence of values, both in the surface gravels and in the bed-rock concentration, is good enough to warrant careful testing. A large yardage of gravel, running into the millions, is available for hydraulicking, provided the average values are high enough.

Notwithstanding these favourable features, it would be most inadvisable to assume that the property is sufficiently proven and to go ahead with the plan to bring in a long sluice from the river paved with steel plates; more information as to depth of bed-rock and values should be obtained before this expenditure is incurred.

The cost of adequately testing the ground by drilling can only be roughly estimated, as the total amount of drilling to be done would be determined to a large extent from the results obtained from the holes drilled in the progress of the work. From $5,000 to $10,000, exclusive of the cost of the drill, would probably be required. Drilling costs would run from $3 to $5 a foot.

Conclusions.—(1.) The Ennis Gold Mining Company's placer property on Spanish creek consists of a number of placer leases which have been partly, but only slightly, worked in former years.

(2.) The property is well equipped with a good water system which gives ample water for a long hydraulic season. The annual expense for the upkeep of this water system will be extremely low.

(3.) There is a large yardage of gravels on the creek in which the percentage of large boulders is not high. Strata of cemented gravel are practically absent.

(4.) The dump is unsatisfactory, as up to the present it has not been possible to get the hydraulic pit down to bed-rock.

(5.) A few weeks' hydraulicking was done by the company in 1923 and a full season's run obtained in 1924. In this time about 800,000 cubic yards of gravel was moved and a gold return of about $2,000 recovered from the sluice-boxes. The manager considers that most of the gold in the gravel piped off is still in the bottom of the pit, held in the accumulation of boulders lying in the pit. The economical recovery of the total gold in the gravels is not practically feasible without getting a sluice-box down low enough to reach bed-rock.

(6.) No appreciable testing of the gravels for average values has been done by the company and the records available from previous work on the creek are too indefinite to be relied upon.

(7.) It is possible that the ground can be effectively worked by hydraulic methods by bringing in a line of sluice-boxes from the North fork of the Quesnel river on a low grade up Spanish creek.

Recommendations.—(1.) Inasmuch as hydraulic operations have so far been a complete failure financially, it is useless to carry on hydraulic work along the same lines during the season of 1925.

(2.) The first requirement for the property is thorough testing to determine average values in the gravels; this testing will also give information regarding the bed-rock levels on the property, which is essential knowledge for successful operation. Testing of the property is essential before any further operating plans are decided upon.

(3.) Testing can most economically and efficiently be done by drilling, and for this character of ground and the depths to be drilled a standard Keystone drill should be used. Such drilling if carefully done will give definite information regarding the depths to bed-rock at different points, character of the gravels, and average values.

(4.) The plan of bringing in a sluice from the North fork on a low grade should not be carried out until adequate drilling has been done.

Black Bear Creek.

Black Bear is a small creek entering Spanish creek about 1 mile above the mouth of the latter, which flows into the North fork of the Quesnel river. Some good "pay" was taken out of this creek many years ago, after which it was practically abandoned. During the last two years a number of prospectors have been working on the creek, this renewed activity being due to the incentive supplied by the discovery of rich ground in the Cedar Creek camp. This work has been mainly directed to finding one or more old channels, which are believed to exist in the rims of the present creek-valley. Some encouraging results have been obtained, but the areas of pay-ground discovered have not been extensive and no substantial pay-streak has rewarded the considerable efforts that have been made.

Work is being done on the creek by Alex. Sutherland and partners under the name of the "Wolverine Mining Syndicate," Jack Johnson and partner, H. McGregor, Robert Owen, C. MacDonald, C. Burns, and others. Nearly all are continuing drifting operations during the winter.

Wolverine Syndicate. Four leases on Black Bear creek, about 2 miles above the mouth, and owned by A. Sutherland, A. Hanson, A. Morrison, and P. Murr, have been grouped as the Wolverine Mining Syndicate. The owners have done a lot of work in the last two years and are steadily prospecting the ground. After some tunnel-work a pit was opened up by ground-sluicing. Not much success was attained with this, as the material handled was mainly slum lying on a rim of the present channel. Drifting is now being done in the rim-gravels to prospect for another channel which is believed to lie beyond the present rim. Encouragement in this work was obtained by the finding of some "pay" in the rim on the adjoining lease.

Johnson. This lease, owned by Jack Johnson, adjoins the Wolverine Syndicate holdings down-stream on Black Bear creek. A tunnel driven in the rim struck a patch of gravel carrying coarse gold, but the work was stopped before much prospecting was done. In November Johnson and his partner had built a cabin and were taking in supplies preparatory to working all winter.

Other Leases.—The Burns Bros., McGregor, and MacDonald are engaged in prospecting leases on the lower end of Black Bear creek. The ground in the stream-bed is deep and unsuccessful attempts were made many years ago to reach bed-rock. The rim-gravels carry a little gold in places, possibly enough to make hydraulic ground.

Robert Owens has been prospecting a lease adjoining on the up-stream side of the ground of the Wolverine Syndicate. A long tunnel has been driven through the rim-rock and into slum, the total length being 225 feet.

North Fork of Quesnel River.

Harvey Group. A group of eight leases have been taken up on the North fork by Charles Harvey and partners. The leases are on the east side of the river and commencing about half a mile above Spanish creek; they were taken up in August, 1923, and in 1924 some prospecting was done. The ground consists of bench-gravels on the North fork and much work will be required to find the average values contained in parts of the gravel. From the preliminary work done it is considered that there may be a large yardage of gravels carrying sufficient value to pay to work by hydraulicking on a large scale.

Collins Group. One mile and a half above the Harvey ground on the North fork four leases are held by J. Collins and partners. The ground has been prospected by open-cuts and a tunnel. No one was on the property when it was examined, but it is reported that good "pay" was obtained in places. The owners planned to carry on drifting operations during the winter of 1924–25. The tunnel could not be examined, but some nice-looking reddish gravel with an abundance of quartz in it was seen in one cut.

Murder Gulch Group. This group of five leases is situated on the North fork about 3 miles below the mouth of Spanish creek; the owners are A. Rafferty, R. Tilton, J. S. McDonald, T. Comer, J. McAllister, and J. S. Day. The ground being worked lies about 50 feet above the river-level and would seem to represent a former channel of the stream. By means of a splash or "shooter" dam a small pit has been opened up; the tailings are run off through a bed-rock flume cut through rim-rock between the pit and the river. A section at the face of the pit shows soft schistose bed-rock, 2 feet of gravel, 2 to 4 feet of material containing large angular boulders (slide-rock), and 8 to 10 feet of fine silt. Buried deeply in this silt are remnants of old logs which are reduced to the condition of punk. It is apparent from this evidence that at least the silt-filling in the channel is of modern origin.

Some gold has been recovered from the ground-sluicing, but average values are low. Ahead of the workings along the line of strike of the present channel there are some old workings that were made many years ago and it is reported that some good "pay" was taken out. The property warrants investigation to see if it would pay to work by hydraulic methods. Water can be secured from Poquette lake and there is a good dump into the North fork.

Farrel. Between the *Murder Gulch* group and the mouth of Spanish creek there are several leases. The owner of one of these, Wm. Farrell, has done some prospecting by means of ground-sluicing and cuts. He reports getting a little coarse gold in places in a high run of gravel above bed-rock.

Quesnel Gold Mining Co. This company holds eight leases on the North fork of the Quesnel river, extending down-stream from the mouth of Spanish creek and on the west side of the river. The company is capitalized at $80,000, with the head office in Bellingham. H. Fuller was the promoter of the company and is manager. The ground that it is proposed to work consists of the thick deposits of bench-gravels and clays lining the North fork of the Quesnel. From the nature of the material it is apparent that only low values could be expected. Some testing of the gravels by pits was done, but not sufficient to accurately determine average values.

Equipping of the property for hydraulic operations was in progress when it was examined. A flume and ditch-line was being constructed to bring water from 5-Mile and 6-Mile creeks to where hydraulicking was to be started on the high bank directly opposite the mouth of Spanish creek. Penstock, pipe-line, and tailings-flume were being laid out. This tailings-flume was started about 15 feet above the level of the North fork and was not down to bed-rock. By advancing the flume as hydraulicking proceeds, eventually rim-rock of the river-channel will probably be reached. But until this is done the saving of any values contained in the gravel handled will be difficult.

In the fall of the year a short run of the plant was obtained, but owing to an insufficient supply of water not much was accomplished.

Spanish Creek to Spanish Mountain.

A considerable number of prospectors were at work during the season in the area of country lying between Spanish creek and Spanish mountain. This is a part of the high plateau area from 4 to 8 miles from the town of Likely and served by the Spanish Lake and Spanish Creek roads and trails therefrom.

The country is heavily timbered and is of a rolling nature, with many small creeks which do not cut deeply into the plateau-level. A layer of glacial drift of varying thickness covers the country. The discovery of rich ground on the high plateau at Cedar Creek camp makes the prospecting of this area worth while. Some gold has been found, but no great success has been yet attained.

There is but little in the surface topography to aid the search and about the only way information is obtained is by digging and panning. The small creeks probably have in places

slight concentrations of original glacial gravels, but nothing better than hydraulic ground would, as a rule, be formed in this way.

Work was carried on during the season by J. Lynes, Oliver and McDiarmid, Weltman Bros., Sinclair, Black, Hamilton, and others.

Weltman. Weltman Bros. and partners have been working a group of four leases on Hepburn creek, close to Summit lake. Ground-sluicing was done by taking water from the creek in a small ditch and using a splash-dam. The creek runs on bed-rock, making a small canyon. The ground-sluice is on the south side of the creek and prospects what is supposed to be an older channel of the stream. In places a reddish gravel occurs and some "pay" was obtained in this. In what appears to be the centre of the channel as shown by the ground-sluice the reddish gravel is underlain by grey gravel, but bed-rock was not reached. As some coarse gold was obtained in grey gravel on bed-rock near the creek, it would be advisable to sink to bed-rock in the central part of the ground-sluice.

The bed-rock is soft schist and in places it is directly overlain by a blue gumbo, consisting of macerated schist, containing pyrite crystals, evidently a glacial deposit.

Oliver & McDiarmid. T. Oliver and N. McDiarmid have a lease half a mile by trail from the Spanish Lake road and 5½ miles from Likely. This is heavily timbered country and on the lower slopes of Spanish mountain. The work done consists of a long ground-sluice in a flat draw in which there is a very small stream of water. There is 4 feet of surface grey gravel overlying 4 to 8 feet of yellow, rusty gravel containing considerable clay. This yellow gravel looks promising and on bed-rock, which has not been reached, may carry values. Some values occur in the surface grey gravel and it is claimed that all the material taken out of the ground-sluice is good hydraulic ground; that is, running 40 to 50 cents a yard. A limited supply of water could be obtained for hydraulicking by short ditches from three small creeks and a storage-dam.

J. Lyne. The lease owned by J. Lyne is on the small creek directly below and adjoining the Oliver & McDiarmid lease, the workings being 700 feet below the others. A long cut exposes grey and yellow gravel mixed with large boulders and pieces of slide-rock. Bed-rock is not definitely exposed, but on one side some soft schistose material may be rim-rock. It is reported that the ground would pay for hydraulicking, but is too low-grade for small-scale methods.

Cedar Creek Camp.

The production of the Cedar Creek camp for the year was approximately $100,000, the greater part of this being made by the Cedar Creek Mining Company. This amount is slightly less than the production for 1923.

Detail descriptions were given in the 1922 and 1923 Annual Reports of this camp, so that repetition in this report is unnecessary.

Cedar Creek Mining Co. The Cedar Creek Mining Company was operated until October by the receiver, with Geo. C. Bagley in charge of the work on the property. By order of the Court the receivership was then discharged and control of the company passed to the Murray-McGregor Mining Company, this company having completed purchase of the 27,000 shares of the Cedar Creek Company optioned in 1923; all debts were paid up and generally the financial affairs of the old company were straightened out in a satisfactory manner.

During the year a deal was made with B. Boe, whereby the property was equipped with a "pump hydraulic" plant. The contract called for Mr. Boe putting this plant on at his own expense in return for the privilege of mining the ground on a royalty basis, 30 per cent. of the gross returns to go to Mr. Boe and 70 per cent. to the Cedar Creek Mining Company; all expenses of operating and mining are to be paid by the operator. The deal would seem to be a most excellent one for the Cedar Creek Mining Company. It is probable that the cost of mining under any system will exceed 30 per cent. of the gross gold content recovered, so the contract may not last long.

In the design and construction of the plant Mr. Boe was advised by P. Louat, an Australian engineer, who claimed that similar plants had been successful in Australia in working placer deposits where only a small supply of water was available. Scarcity of water for sluicing has been a handicap to the economical mining of the Cedar Creek Company's property.

The principle of the plant is as follows: All available seepage-water on the property is impounded by dams and reservoirs and pumped to one reservoir; a pit is excavated to bed-rock and then the gravels are hydraulicked into the bottom of this pit by a monitor supplied with a head of water by pumping; a suction-pump then elevates the gravel and water from the pit to a line of sluice-boxes carried overhead on a trestle and giving height for a dump; the water from the dump drains back to the main reservoir, where it is impounded to be returned again to the hydraulic and suction pumps.

A brief consideration will show that, as all power for pumping is generated by steam in boilers burning wood for fuel, the cost of handling gravel in this way is bound to be relatively high as compared with ordinary hydraulicking or steam-shovel methods. Mechanically, the use of steam-power to pump water to lift gravel is an indirect method and therefore an inefficient system.

The plant consists of two wood-fired 60-horse-power boilers and two upright compound engines; two main pumps and auxiliary gas- and steam-driven pumps for the return-water system. One engine drives the force-pump supplying water to the monitor with a head of 45 lb. pressure. The other engine drives the 8-inch gravel-pump, which acts as a suction for 10 feet and then as a force-pump for 30 feet, the total lift to the sluice-boxes being approximately 40 feet. The estimated capacity of the plant is 60 cubic yards an hour. A 3-inch monitor is used. The boiler-water is obtained from old tunnel-workings, which were dammed up to give a supply of clean water uncontaminated by the sluicing-water.

The plant was completed in September and a trial run of about five weeks was obtained. The breaking of a shaft on one of the engines necessitated stopping the plant, and before repairs could be made an early cold snap rendered the further operation of the plant in 1924 impracticable.

Some difficulty was found in breaking down the gravel by means of the hydraulic monitor; at the place where the pit was started the gravels are firm and compact and slightly cemented. The suction-pump to elevate and force the gravel to the sluice-boxes 40 feet overhead did not work very satisfactorily and delays were caused by the blocking of the pipe-line. The closed circuit water system results in the water used becoming saturated with mud in a short time and causes further difficulties. In the spring of the year, when the water-supply is relatively abundant, much better success will be obtained Mechanical difficulties generally occur in commencing a new plant, but these can be adjusted. This plant is an improvement on hand methods, but on this particular gravel-deposit a better system would probably be to mine the gravel by steam-shovel and tram it down to Cedar creek, where sufficient water is available for sluicing. The pump hydraulic plant is said to have cost about $50,000.

During the year sluicing operations with hand-mining were carried on as in 1923. Both the Stevens and Sheridan leases were worked and the production of gold for the year was obtained mainly from these operations. This work was stopped when the Boe plant was started. No work is being carried on during the winter.

It is reported that there is still considerable pay-ground on the property to mine. Only a limited amount of testing has yet been done to find continuations of the known pay-ground, and generally the property is far from being exhausted.

McGaskill & Wright.

Some further testing of the Platt lease was carried on by McGaskill & Wright. This work, which was done by Mr. McGaskill with the assistance of one or two men, has for its object the determination of the yardage available and average values, so that plans can be made for equipping the property with a suitable plant. The results show so far a gross value in the ground of $150,000 to $200,000, with the "pay" mainly confined to 5 feet of gravel lying on bed-rock. The overburden above the pay-gravel is from 5 to 15 feet thick.

KEITHLEY CREEK SECTION.

This section was not visited by the Resident Engineer in 1924, but descriptions of it can be found in previous Annual Reports.

The important operating property is the *Kitchener* mine, owned by J. H. Scattergood, of Philadelphia. Small-scale work by a few individuals is carried on each season on Keithley, Snowshoe, Little Snowshoe, Harvey, and other creeks.

Some quartz prospecting was also done during the year in the Snowshoe Creek area. It is reported that some of the showings of gold-bearing quartz veins are promising.

Kitchener. This is a well-equipped hydraulic mine, owned by J. H. Scattergood and operated under the management of K. C. Laylander. The season of 1924 was the most satisfactory one since operations were started in 1921 and a substantial operating profit was made. The property was operated in 1924 by Mr. Laylander on a "lay" or royalty basis from Mr. Scattergood, and a number of the men also worked on a royalty basis with the manager. An old high-level channel of Keithley creek is being worked. The accompanying plans show the lay-out of the pits and flumes. Descriptions of the property can be found in the Annual Reports for 1921 and 1922. Water conditions were nearly normal for the year and the yardage handled was 1,076,376 cubic yards.

An interesting feature of the year's operations was the magnetometric surveying of the property carried out by Mr. Laylander. Besides trying the method on the *Kitchener*, Mr. Laylander also surveyed with his instrument several leases in the Cedar Creek camp.

This method of locating ore-deposits has been perfected and used for many years in Sweden, but it is a comparatively recent innovation on the American continent. In Sweden important successes have been obtained with the use of the magnetometer as an aid to prospecting for ore-bodies, and some important mines have been developed as the result of the information so obtained.

The principle of the instrument is that by measuring changes in the normal magnetic field of the earth, caused by the presence of ore-deposits, the location and extent of these deposits are determined. In the hands of an *expert* this instrument yields data from which ore-bodies may be located, and in many cases their strike, direction of dip, and depth below the surface determined. It should be carefully noted that the instrument only assists in the location of ore-bodies and gives no information as to whether or not the mineralized body indicated carries valuable minerals or metals. Magnetic disturbances of the earth's field, however great, do not thereby justify the conclusion that they are caused by workable mineral-deposits.

All ore-deposits contain minerals which affect and change the normal magnetic field of the earth. This is also true of placer deposits where the contained minerals, such as magnetite, pyrite, arsenopyrite, and galena, occurring in small grains through the deposit or concentrated in certain strata, affect the normal magnetic field.

In any given area which is to be magnetometrically surveyed the normal field of magnetic intensity of the earth's crust at that point is determined by the average of all instrumental observations. The area of possible mineralization is surveyed, and by laying off the area to be examined in suitable-sized squares and taking readings at the intersecting corners a magnetic-intensity map can be prepared on which differences of vertical magnetic intensities are platted, in exactly the same manner as differences of elevation are platted on a contour map. This will show relatively areas of mineralization as indicated by differences of vertical magnetic intensity.

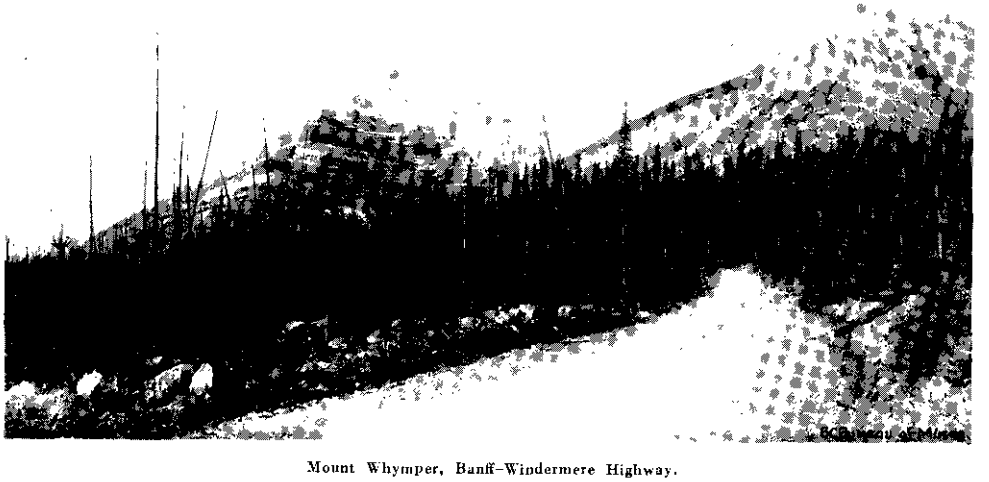
The magnetometer readings are affected by the temperature and barometric pressure, so that these must be noted when instrumental readings are taken and compensating corrections made. Careful work is needed in order to get dependable results.

When a magnetometric survey of an area indicates the existence of a mineral-deposit the judgment of the engineer must be used to determine if this deposit is of probable value as a source of workable minerals. In a mineralized zone in which there are developed mines or partially developed prospects much information can be readily secured, which can be applied to interpreting the results obtained by magnetometric surveying of unproven ground in that vicinity. This is equally true of either lode or placer deposits. In an entirely new and unproven district geologic information and observation of surface conditions will assist in interpreting the magnetometric results.

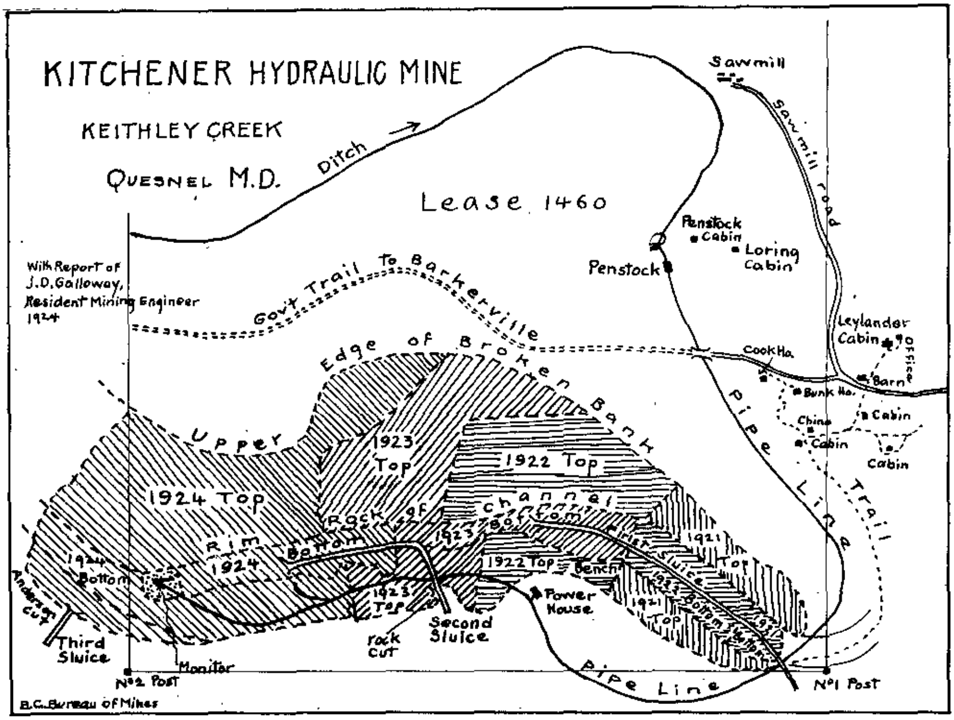
In all cases magnetometric surveying must be considered as preliminary development or prospecting, which by showing zones of mineral concentration eliminates much dead-work. It must, of course, be supplemented by the usual development of drilling, sinking, or drifting as a means of determining the economic value of the ore-body or channel; but such contingent prospecting is more in the nature of development-work than prospecting.

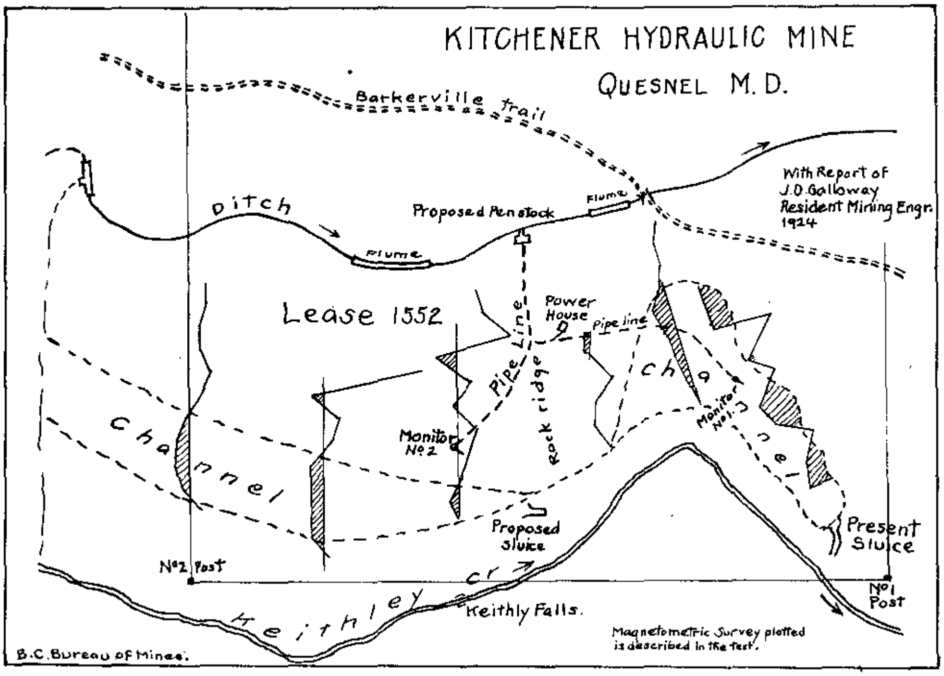
In placer-mining the method has been successfully used in California in tracing the continuations of placer pay-streaks which had been lost in ordinary mining methods. In the Cariboo District magnetometric surveying should prove of great value in prospecting operations. In a general way the placer-gravels of the Cariboo are concealed by overlying glacial gravels and clays of variable thickness; much fruitless work is done in prospecting this practically barren

Mount Robson, 13,068 feet, Cariboo M.D.



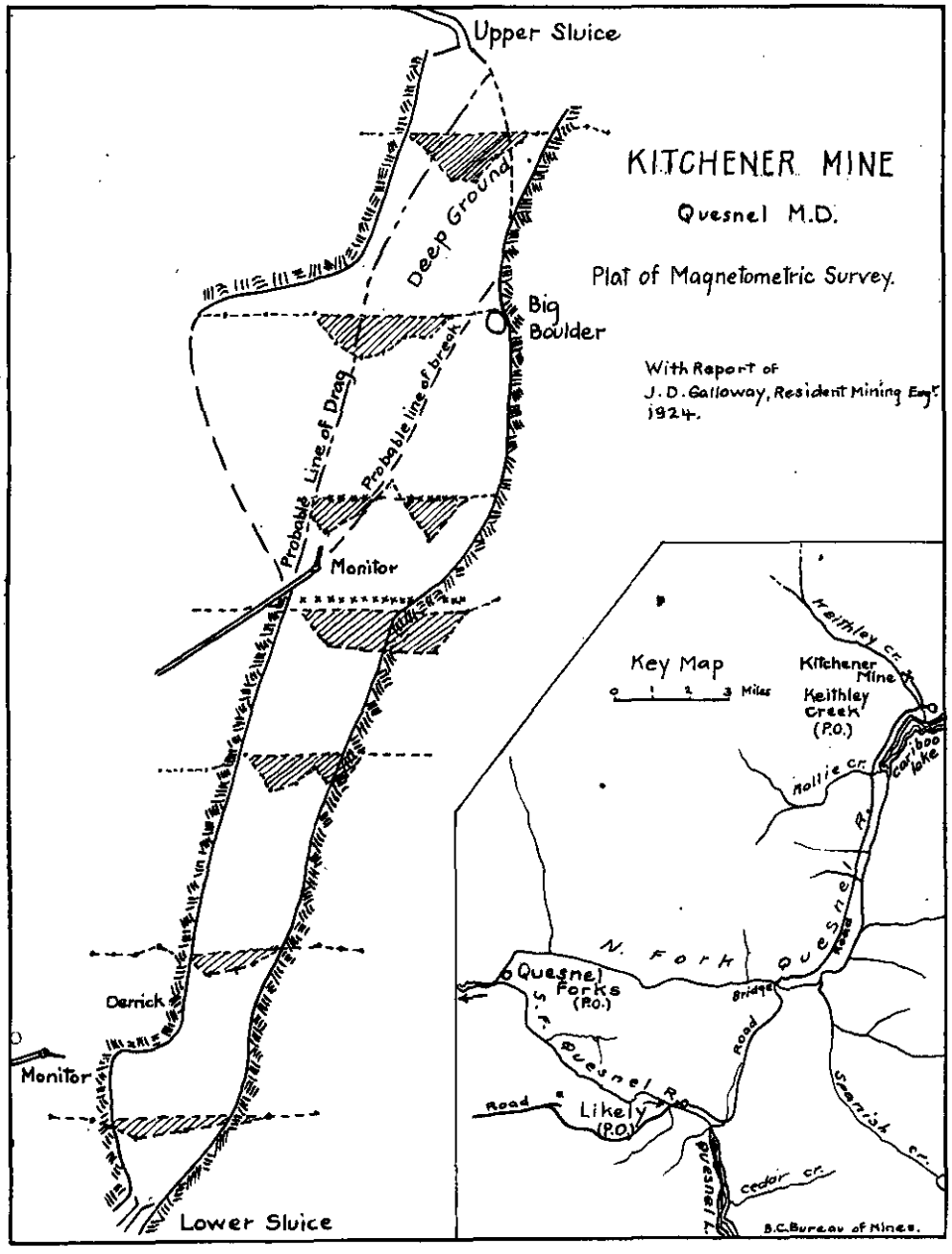
Mount Whymper, Banff–Windermere Highway.


KITCHENER HYDRAULIC MINE
KEITHLEY CREEK
QUESNEL M.D.
With Report of J.D. Galloway, Resident Mining Engineer 1924
Ditch
Lease 1460
Sawmill
Sawmill road
Penstock Cabin
Loring Cabin
Penstock
Gov't Trail to Barkerville
Leylander Cabin
Office
Cook Ho.
Barn
Bunk Ho.
China Cabin
Cabin
Cabin
Edge of Broken Bank
Upper
1923 Top
1922 Top
1924 Top
Pipe Line
Trail
Channel
Rim Rock of
Bottom
1923 Bottom
1924
1922 Top
Bench
1921 Top
1924 Bottom
1923 Top
Power House
Second Sluice
rock cut
Anderson cut
Third Sluice
Monitor
1921 Top
Pipe Line
No. 2 Post
No. 1 Post
B.C. Bureau of Mines


KITCHENER HYDRAULIC MINE
QUESNEL M.D.
Barkerville trail
With Report of J.D. Galloway Resident Mining Engr. 1924
Ditch
Flume
Proposed Penstock
Flume
Lease 1552
Power House
Pipe line
Pipe Line
Rock ridge
Channel
Channel
Monitor No. 2
Monitor No. 1
Proposed Sluice
Present Sluice
No. 2 Post
No. 1 Post
Keithley Cr.
Keithly Falls
Magnetometric Survey plotted is described in the text.
B.C. Bureau of Mines.

glacial material for possible underlying auriferous gravels. Undoubtedly magnetometric surveying would eliminate much useless development and would indicate virgin areas for prospecting.

It has been pretty well proven by geologic evidence that many of the rich placer deposits of the Cariboo are remnants of Tertiary gravels and the tracing of these old channels has been very difficult. The use of the magnetometer would assist in this work.



It should be emphasized that this instrument is in no sense a divining-rod and must not be confused with the numerous fake instruments now being advertised as certain finders or indicators of gold and other metals.

Several different instruments have been designed for magnetometric surveying. The changes in the normal magnetic field may be measured either in the horizontal or vertical field by noting

changes in the magnetic declination or inclination; different instruments use either one method or the other and in some cases indirect methods based on these principles. In 1904 an excellent report was issued, entitled "On the location and examination of magnetic ore-bodies by magnetometric surveying," by Eugene Haanel, of the Mines Department, Ottawa; copies of this report can still be secured.

The instrument used by Mr. Laylander is the "Combined Magnetometer," with which measurements can be made in both the horizontal and vertical plane; it is manufactured by F. J. Berg, Stockholm, Sweden. The Thomson-Thalen instrument—a part of the combined instrument—which measures very slight changes in the vertical field, was found to be most useful and was used throughout the work.

The *Kitchener* mine was not examined in 1924, so that a detail description of the magnetometric surveying carried on cannot be given. It is understood, though, that this work assisted materially the finding of the rich ground which was worked late in the season. Through the courtesy of Mr. Laylander three plans are printed with this report, showing the general lay-out of the workings and the condensed platted results of the magnetometric surveying.

The shaded areas at the cross-section lines on the plans show the relative intensity of the magnetic field at these points and consequently the line of the pay-streak in the gravel deposit.

CARIBOO DISTRICT.

CARIBOO MINING DIVISION.

REPORT BY H. BEECH, GOLD COMMISSIONER, BARKERVILLE.

I have the honour to submit the office statistics of the Cariboo Mining Division for the year ended December 31st, 1924.

Free miners' certificates issued	178
Mineral claims recorded	90
Placer claims recorded	4
Placer claims rerecorded	16
Placer leases issued	95
Certificates of work issued (leases)	117
Certificates of work issued (mineral)	121
Powers of attorney recorded	63
Conveyances and options recorded (leases)	90
Conveyances and options recorded (mineral)	15
Conveyances and options recorded (placer)	10

Revenue

Mining receipts	$15,202 42
Free miners' certificates	1,504 75
Total	$17,307 17

QUESNEL MINING DIVISION.

REPORT BY H. B. CAMPBELL, GOLD COMMISSIONER, WILLIAMS LAKE.

I have the honour to submit the office statistics of the Quesnel Mining Division for the year ended December 31st, 1924.

Free miners' certificates issued (individual)	454
Free miners' certificates issued (special)	6
Mineral claims recorded	60
Certificates of work issued (mineral)	46
Placer claims recorded and rerecorded	17
Applications for placer-mining leases	110
Placer-mining leases issued	103
Placer-mining leases in force	270
Certificates of work (placer)	145
Powers of attorney recorded	92
Conveyances and agreements recorded	69

Revenue.

Free miners' certificates	$2,492 25
Mining receipts, general	10,907 50
Total	$13,399 75

OMINECA MINING DIVISION.

REPORT BY S. H. HOSKINS, GOLD COMMISSIONER, SMITHERS.

I have the honour to submit the office statistics of the Omineca and Peace River Mining Divisions for the year ended December 31st, 1924.

Free miners' certificates issued (ordinary)	659
Free miners' certificates issued (company)	12
Free miners' certificates issued (special)	11
Mineral claims recorded	275
Placer claims recorded	11
Certificates of work recorded	728
Bills of sale and mining agreements	219
Powers of attorney recorded	55
Mining documents filed	53
Certificates of improvements recorded	40
Crown grants issued	4
Applications for placer-mining leases (Omineca)	29
Placer-mining leases issued (Omineca)	27
Applications for placer-mining leases (Peace River)	32
Placer-mining leases issued (Peace River)	18

Revenue.

Free miners' certificates	$ 4,135 50
Mining receipts	8,722 65
Total	$12,858 15

CENTRAL MINERAL SURVEY DISTRICT (No. 3).

REPORT FOR YEAR 1924.

REPORT OF A. W. DAVIS, RESIDENT MINING ENGINEER.

INTRODUCTORY.

The No. 3 or Central Mineral Survey District comprises the seven Mining Divisions of Clinton, Lillooet, Kamloops, Ashcroft, Nicola, Vernon, and Yale. The Resident Engineer's headquarters office is at Kamloops, from which point most parts of the district can be reached by a few hours' journey by rail or by motor over good roads.

While Central Mineral Survey District No. 3 is still almost, but not quite, in the non-producing class, the impression should not be gained that mining and prospecting are in consequence in a semi-moribund condition.

The following list gives certificates of work granted and new claims recorded in the district during 1924:—

Mining Division.	Certificates of Work.	Claims recorded.
Ashcroft	86	74
Kamloops	262	213
Clinton	229	184
Yale	160	152
Lillooet	101	70
Nicola	57	46
Vernon	45	123
Totals	940	862

While there are, it must be admitted, some rather sketchily performed assessments, in which it is somewhat of a strain on the imagination to conceive of their having cost $100, there are, on the other hand, many instances where the prospector, in the endeavour to prove up his property, does a great deal more work than is necessary to hold his claims. Calculating the 940 assessments, therefore, at $100 each, it will be seen that the substantial sum of $94,000 has been expended during the year in this preliminary mining development. This amount does not, of course, include the comparatively large sum spent in development by the various mining companies operating in the area.

That an effort such as this should go unrewarded it is hard to believe. In the main our prospectors and operators are not deliberately throwing away their time and money, and the incentive that keeps them active must surely exist in the district.

Reference was made in last year's introductory remarks to the gypsum-deposits located at Falkland, on the graded line of the Canadian National Railway. This railway is now being completed, when a permanent industry in connection with the mining of this mineral will be at once inaugurated.

As will be noted in the non-metallic section of this report, the shipments of soda from the soda-lakes near Clinton, on the Pacific Great Eastern Railway, are becoming of some importance. As a producer of tonnage for this railway this is an event of considerable importance.

Some activity is to be noted in the gold properties on Cadwallader creek, in the Bridge River country. Up the North Thompson river near Barriere, Chu Chua, Birch island, and elsewhere mining operations are on the increase.

The *White Elephant*, a gold property near Okanagan lake, is at least receiving the development it deserves.

A large number of inquiries were received this year at this office relative to certain areas in the district and to various properties contained therein.

NICOLA MINING DIVISION.

There is not much active mining going on in this Division, although, as usual, a rumour has been going the rounds of late of operations again starting up in the Stump Lake section. This particular section was visited during the summer, and while all the shafts were full of water and therefore inaccessible, enough was seen, combined with considerable data which were obtained concerning the camp, to render the possible revival of the camp a matter of some interest.

STUMP LAKE SECTION.

A brief history of the Stump Lake section is justifiable and is given below.

The camp was discovered in the eighties of the last century and in the years 1886 to 1889 nearly all of the development-work now in existence was done. During that period half a dozen properties were in full swing and hopes were high as to the future of the district. Ore that would stand shipping being scarce and adequate milling facilities not being available, the camp, at about the end of the years specified above, was shut down, and but for one spasmodic attempt to open up the *Donohue* mine in 1915, when not much development-work was attempted, has remained idle ever since.

The situation therefore is practically as it was in the eighties, and below is a quotation from Dr. G. M. Dawson, who examined the district at that time (*see* Canadian Geological Survey, 1887-88 Annual Report, Volume III., page 63A) :—

"In the vicinity of Stump lake the principal mining developments are comprised within an area about 5 miles in length, with a variable breadth, running nearly north and south on the east side of the lake. A large number of mining claims have been taken up in this vicinity and numerous prospect-holes and small trial shafts have been sunk. The greatest amount of work has so far been accomplished on the property of the Nicola Mining Company, under the superintendence of W. Craib, and on the adjoining property of the Star Mining Company, under G. Henderson. A considerable amount of work has also been done on the *Hepburn* group of claims on the opposite side of the valley and farther south than those first mentioned. Operations were temporarily suspended on the last-mentioned claims at the time of my visit, but some of the richest ore, of which very satisfactory trial shipments have been made, has been obtained at this place.

"The metalliferous veins which have been found within the limited district above defined are very numerous. They vary from about 10 inches to 5 or 6 feet in width, and some of them have been traced for a length of several hundred feet. Though it is probable from the great number of veins which exist that no single one will be found to be continuous for a very great distance, a large supply of ore is already assured. Most of the veins run with very considerable uniformity in bearings a few degrees west of true north, or from N. 10° W. to N. 30° W. (mag.). There are, however, a few which diverge widely from this direction and two or three which run nearly at right angles to it. The gangue is generally white quartz and the principal metalliferous minerals present include iron and copper pyrites, galena, blende, and tetrahedrite. Assays made by Mr. Hoffmann in the laboratory of the Survey run from 15 to 406.5 oz. of silver, with 0 to 6 oz. of gold per ton of 2,000 lb., according to the relative amounts of the various mineral constituents. The country-rock consists of altered volcanic materials, probably of Palæozoic age, and may be generally characterized as a diabase porphyrite, the most characteristic material in this place being a rock of green and green-grey colour with coarse porphyritic crystals of plagioclase and pyroxene.

"On the whole, the prospects for the immediate development of an important mining district are here most encouraging."

Other engineers' reports to hand would also indicate that the ore of the Stump Lake section carries good gold and silver values.

The properties on which most of the work has been done are the *Joshua* mine (now called the *Donohue*), the *Star*, the *King William*, and the *Tubal Cain*. These all adjoin each other and a working-tunnel about 1,500 feet long, driven from Stump lake, would tap them all.

No mill worthy of the name has ever been erected in the district. A high ratio of concentration is to be expected, and, considering the use of fuel-oil and Deisel engines, flotation and hammer-drills, all non-existent at the time this camp was active, much better results are to be expected now than then, even considering the present higher costs of labour and material.

It is the old story of the beneficial effects of centralization and of making one mine out of the group of properties mentioned above, with one mill and one overhead, which should be considered, and on this score alone the camp is well worth a thorough overhauling and sampling.

The samples taken by me when on the ground were as follows:—

Donohue ore-dump (all the high-grade ore from here had been sorted out and shipped): 0.10 oz. gold and 8.50 oz. silver to the ton; lead, 1 per cent.

Outcrop on *Donohue* (200 yards west from *Donohue* shaft and dump): 0.16 oz. gold and 21 oz. silver to the ton.

Star (ore at bin, taking poorer-looking material): 0.20 oz. gold and 11 oz. silver to the ton; lead, 2.7 per cent.

Referring to the *Star* claim, the following assays are chosen from many more included in a report on hand, written by Redman & Outheet, as being fairly representative of the lot:—

	Gold.	Silver.	Copper.	Lead.
(*a.*) From shaft near surface	$ 7 20	$16 38	$1 62	$2 26
(*b.*) From 65-foot level	7 20	3 64	2 05	4 16
(*c.*) From 65-foot level	57 30	2 76	3 52	3 52
(*d.*) From 65-foot level	7 50	3 18	1 60	3 87
(*e.*) From bottom of shaft	7 20	1 92	1 62	3 12

These results are indefinite, as all values are given in dollars and cents, but they nevertheless give some idea as to the values in the ore.

The *Vimy Ridge* group on Guichon creek, and referred to in the Minister of Mines' Report, 1923 (page 161), was visited during the summer. The open-cut where 14.7 per cent. copper was obtained was looked at again with the snow off the ground and the other side of it sampled across 5 feet where accessible. The following assay was obtained: Trace of gold and 0.8 oz. silver to the ton; copper, 3.6 per cent. A sample of bornite from the dump of the tunnel (not in much quantity) assayed: Trace of gold and 6 oz. silver to the ton; copper, 21.6 per cent.

The *Aberdeen* mine, also referred to in the 1923 Report, was visited. Most of the workings are off a winze and owing to the water are at present inaccessible. Some high-grade copper-carbonate ore is to be seen near the mouth of the short tunnel leading to the winze, from which all the high-grade ore shipped from the property was obtained. On the main dump a lot of irony-looking material is to be seen (hæmatite is a prominent mineral). This is no doubt the gangue-matter in the vein. A sample taken assayed: Trace of gold and trace of silver to the ton; copper, 0.3 per cent.

The *Lucky Mike* property, located 12 miles north of the town of Nicola and at an elevation of about 5,000 feet, received some development-work this year. The owners are Oscar A. Schmidt and F. F. Ragsdale, both of Nicola. There are five claims in the group.

On the *Almeda* claim of the group a shaft 76 feet deep has been sunk on a siliceous vein carrying some lead and zinc. A trial shipment of 36 sacks was made some years ago, which ran: 3.80 oz. silver and $3.80 gold to the ton; lead, 22 per cent.; zinc, 36 per cent.

The vein is small on the surface, dipping to west at about 45° and with a north-and-south strike. The shaft when visited was full of water. About 10 tons of ore was lying piled around the collar, which assayed: 0.20 oz. gold and 11 oz. silver to the ton; lead, 14 per cent.; zinc, 27 per cent.

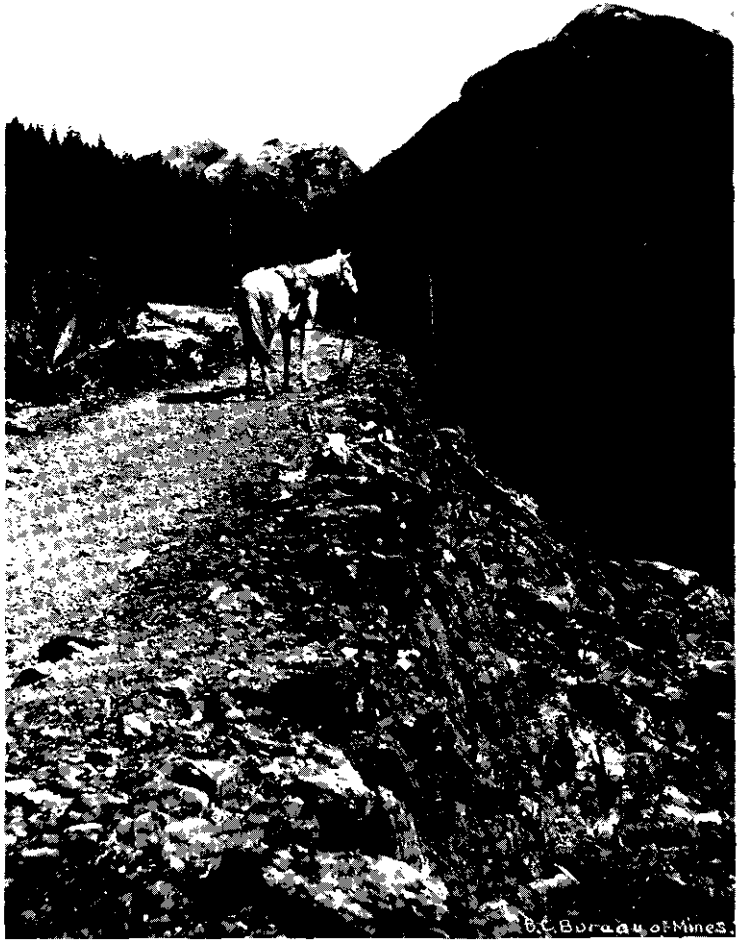
Some quartzose material, said to come from the bottom of the shaft, assayed: 0.30 oz. gold and 3 oz. silver to the ton; lead, 6 per cent.; zinc, 8 per cent. Since this property was looked over in 1922 some further work has been done on it, with, it is reported, favourable results.

In the same group, on the *Lucky Mike* claim, some copper-showings are in evidence. From this point during the war 22 tons averaging 4.5 per cent. copper were shipped by the owners. The Granby Company about this time did a little drilling on this claim.

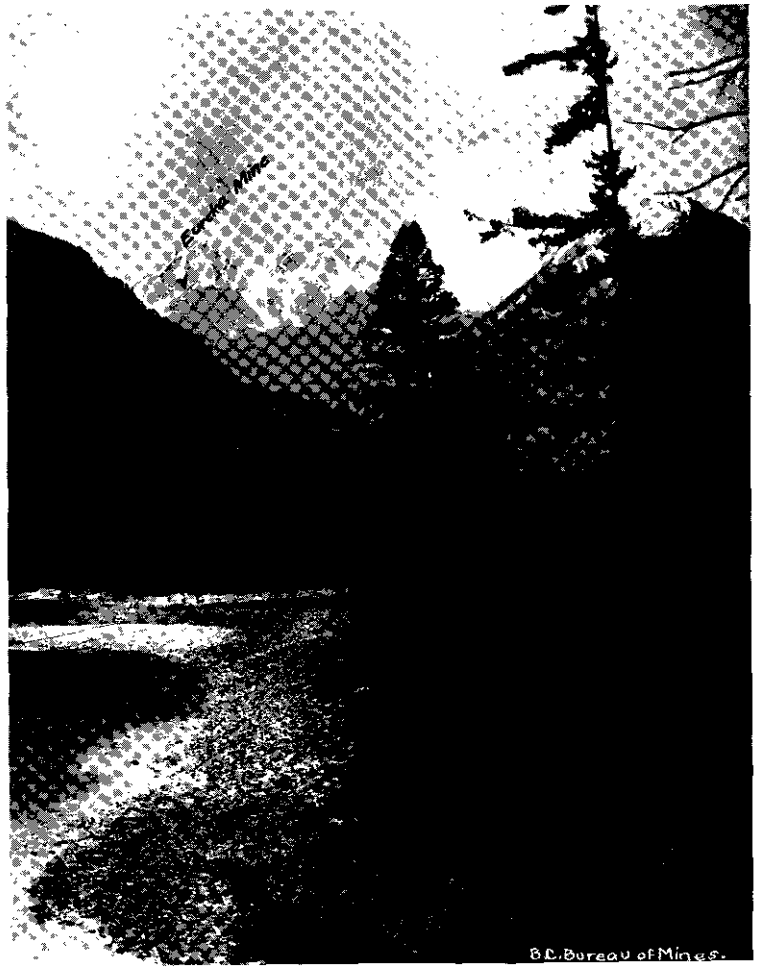
It would appear that the *Almeda* zinc-lead showing is the more important of the two and worth further prospecting.

NICOLA COAL AREA.

The Middlesboro Collieries, Limited, has been operated about half-time during 1924, making a total production of 60,408 tons for the year.



Dewdney Trail, near Hope, Yale M.D.



Eureka Mine, Hope, Yale M.D.

The Keystone Coal Company, Limited (Joseph Graham, manager) has been operating since April, 1924, the property formerly worked by the Fleming Coal Company, Limited, 2 miles southwest of Merritt. The company has been operating in a small way, endeavouring to locate a good working-seam of coal in the vicinity of the old Fleming No. 3 seam, which was considered to be the best seam the old company had. The production of coal from this mine for the year was 4,930 tons.

YALE MINING DIVISION.

On page 142 of the Annual Mines Report for 1922 a map of part of Yale Mining Division is given.

Emancipation. This property has had a checkered history. An absolutely inadequate mill, attempts to operate without sufficient ore being blocked out, and other causes have all militated against a successful career. It is a gold property of considerable merit and some exceptionally high-grade ore was shipped at one time by the original owners.

A communication regarding the mine recently received is to the effect that the property has been bonded to a syndicate from Bellingham, Wash., the intention being to install a semi-Diesel engine and compressor which will permit of efficiently operating the mine. In the summer of 1924 the owners state that they uncovered some good mill-feed in the big lead at the upper showing, and this is the area which will be first attacked by the bonders.

The *Emancipation* mine is referred to at some length in the Annual Report of the Minister of Mines, 1915, pages 257 and 258. Attention is also called to pages 136 to 140, inclusive, of Memoir 139, entitled "Coquihalla Area, B.C., 1924," by C. E. Cairnes, Geological Survey of Canada, in which the mine is fully described.

Gold Group.—This property, located on Hillsbar creek and referred to on page 163 of the Annual Report for 1923, is also dealt with in detail in the Summary Report of the Geological Survey of Canada, 1923, Part A, pages 81 to 83, inclusive.

Steamboat Mountain.—This section is located about 10 miles down the Skagit river from 23-Mile camp. The Defries group referred to in 1923 Annual Report is in this vicinity.

A number of groups in this section were visited during the summer of 1924. Some very large pyrrhotite-showings were seen and a little arsenopyrite, but not in important quantity. The zinc and copper values in any of the claims visited were not large enough to render them of any great interest.

The discovery of nickel ore reported last year near Haig, on the Canadian Pacific Railway (opposite Hope), has been verified. This ground was not visited during the summer, but the occurrence is of such interest that a preliminary report on it by C. E. Cairnes, of the Geological Survey, is given below.

"PRELIMINARY REPORT ON THE PRIDE OF EMORY MINERAL CLAIMS (SUBJECT TO REVISION) BY C. E. CAIRNES.

"The ore-deposits on the *Pride of Emory* group of claims are located on the headwaters of Emory creek, a stream entering Fraser river 2 miles above Choate, a flag-station on the Canadian Pacific Railway about 5 miles above Hope.

"A foot-trail unsuitable for pack-horses leads off from the Canadian Pacific Railway a few hundred yards below Emory Creek Crossing and affords a somewhat circuitous route to the property over a distance estimated at about 14 miles and requiring seven hours of diligent travelling.

"The principal showing occurs on the *Discovery* claim, between 4,000 and 4,500 feet above sea-level and about 500 feet below the summit of the divide between Emory and Stulkawhits creeks. A more direct and convenient trail could be constructed over this divide and down Stulkawhits creek. Such a route would probably be not over 7 miles in length and would reach the Canadian Pacific Railway close to Choate Station.

"The ore occurs in a massive, coarsely crystalline, basic intrusive composed chiefly of a pyroxene mineral and consequently termed a pyroxenite. This intrusive apparently forms a dyke-like body about 300 yards wide and trending 20° to 30° east of north. On either side it intersects similar granitic rocks having about the composition of granodiorite. The granodiorite is commonly somewhat foliated or gneissic in appearance, but is massive in its general structure. It was not observed to be mineralized. There is also a small but prominent hill of older fine-grained, probably sedimentary, rocks on the divide south of the principal ore-body, and a narrow

belt of very similar rock was encountered at points along the western margin of the pyroxenite and between it and the granodiorite. These older rocks are greatly altered and partly replaced by the intrusives, but do not appear to be of economic importance.

"The pyroxenite carries the ore-minerals and at different localities was observed to be quite highly mineralized, chiefly by pyrrhotite. At the principal showing a bluff 100 feet or so in length and 30 feet high is composed of nearly solid sulphide ore. Here again pyrrhotite is by far the most abundant sulphide, but chalcopyrite is also an important constituent. Other ore-minerals may also be present but have not been identified. Crystals of what is probably a pyroxene mineral are more or less plentifully scattered through the ore-deposit in such a fashion as to suggest that the ore had been introduced with the pyroxenite country-rock and all had crystallized out at about the same time.

"The ore-body may be said to form a lens-shaped mass which disappears at the base of the bluff under swampy land and may be very largely concealed by this swamp.

"Samples have been taken at different times and by different people either from selected points in the ore-body or, in a more general way, across the entire exposed face of the lens, which, near the surface, is considerably oxidized and consequently cannot be expected to yield entirely satisfactory assay returns. Probably the most reliable sampling was that done by Mr. Cleaves, who exercised considerable care in getting an average sample across the lens at an angle nearly at right angles to the apparent strike of the ore, where the lens had a width of about 45 feet. The assay returns from this sample gave a total value in gold, silver, copper, and nickel of about $15 to the ton. Between $11 and $12 was attributed to the nickel content, which was figured at 35 cents. Most of the remaining value was in the copper. Silver and gold values together averaged less than $1 to the ton. The present writer also obtained an average sample across this ore-lens, but has not yet had this assayed. Other samples obtained from this ore-body were said to have invariably shown much higher values than those obtained by Cleaves, running up to $30 or more to the ton.

"The general impression gathered from a visit to this property is that the bulk of the ore in the principal showing itself is large; that the ore is undoubtedly genetically related to the pyroxenite dyke; that careful prospecting may reveal much more ore on this property; that the nickel values are probably obtained from the pyrrhotite, although nickel minerals may be present; and that more reliable assay returns could be obtained from crosscuts on the ore-lens where less oxidized material could be reached. The future of the property would seem to depend, among other things, upon the expense involved in shipment and treatment of the ore and upon the metal market rather than on lack of tonnage on the property."

Eureka-Victoria. This property was the first Crown-granted group in British Columbia and was located in 1868. For the succeeding few years considerable high-grade ore was shipped; but the property was finally shut down in 1874. It has only been reopened within the past two years. The mine was visited in the middle of May last. Owing to its altitude of about 5,300 feet above sea-level, deep snow covered the mouth of the tunnel visited and it was necessary to dig down several feet through the snow to gain access to it. Any study of the surface conditions was, of course, impossible. The tunnel referred to is what is called the "carbonate tunnel" and was one of the original workings. It was at the time of my visit 200 feet long.

The vein followed in this working consists of a reddish iron carbonate carrying silver values and occurring in a fissure in the prevailing conglomerate. A sample taken across 20 inches at the face ran: Trace of gold and 26.4 oz. silver to the ton. Another sample taken a few feet back from the face ran: Trace of gold and 35 oz. silver to the ton.

A report received recently from the management of this property states that since my visit this tunnel has been advanced 450 feet with satisfactory results, and that a contract has been let to drive a 175-foot crosscut tunnel to cut the vein at a depth of 300 feet below this level. It is also stated that 150 feet of snow-sheds have been built and a permanent camp constructed for the crew.

A shipment this year of 5 tons of ore to Swansea is reported, which sampled 268 oz. in silver, with values in lead, copper, and antimony as well. The work so far carried out has been on only one of several ore-bearing fissures reported to be in existence on the property. Identified with the new company now developing the *Eureka-Victoria* are Arthur S. Williamson and G. D. B. Turner, of Vancouver.

C. E. Cairnes, of the Geological Survey of Canada, visited the mine during the summer and describes it in some detail. (*See* pages 152 to 160, inclusive, of Memoir 139, Geological Survey, "Coquihalla Area, B.C., 1924.")

Murphy. This group is also a very old location and has been reopened this year by G. D. B. Turner, of Vancouver. On it is an old tunnel 800 feet long, the adit of which is under the tracks about a mile above Haig, on the Canadian Pacific Railway. This property has only very recently been taken up and was inactive during most of the season. No information other than the above is available concerning it.

It will have been noted that Mr. Cairnes's reports, etc., have been freely quoted in connection with mining operations in the Hope area. In this Memoir 139 of his are detailed descriptions of a number of properties in this district which he has covered so thoroughly. A list of these is given below:—

Emancipation mine (gold), near mouth of Ladner creek.
Snow Storm group (gold), adjoining *Pittsburg* group on Ladner creek.
Idaho group (gold), Ladner creek.
Montana (gold), Ladner creek.
Rush-of-the-Bull Fraction (gold), Ladner creek.
Gem group (gold), Ladner creek.
Pipestem (gold), Ladner creek.
Morning group (gold), Coquihalla river.
Independence (copper), on the divide separating the Tulameen and Coquihalla rivers.
Eureka-Victoria (silver), on Silver peak, near Hope.
Aufeas (gold), on lower slopes of same mountain 3 miles from Hope.

A few extracts will be given in connection with certain properties not already touched upon:—

The *Independence* has, according to Camsell (Geological Survey), surface ore said to have given assays of 20 per cent. copper, but the ore on which the value of the property depends will only yield about 3 per cent. "Gold to the value of $1 a ton is associated with these ores. The chief ore-mineral is chalcopyrite. The ore-bodies are regarded as replacement deposits of the Butte type."

With regard to the *Aufeas*, Cairnes states: "It might appear that the *Aufeas* mine could be successfully worked either by developing the larger veins alone, or possibly by including larger bodies of sparsely mineralized rock intersected by numerous small ore-veins. The property is primarily a gold proposition, but the percentage of arsenic is large enough to form a valuable by-product."

ASHCROFT MINING DIVISION.

HIGHLAND VALLEY SECTION.

Empire Group. A new discovery of copper ore was made during the year on these claims, which are located about 3 miles to the south of the *O.K.* mine. The formation is the prevailing granitic batholith and the gangue, as in the case of the *O.K.*, is sericite and altered country-rock. At the time this ground was visited, early in the season, a shaft started on the outcrop, which has a heavy covering of drift, was only down a few feet.

This property was recently staked by J. N. J. Brown, of Vancouver, and bonded during the year to a Seattle syndicate for a substantial sum. At the discovery some very nice-looking bornite ore has been exposed on the surface. Its actual extent and grade at the time visited, owing to the lack of work done, could not be determined. The shaft, only down a few feet at that time, has since been sunk to a considerable depth, with, it is stated, satisfactory results.

A large number of claims have recently been staked in the country adjoining this property. No definite information is to hand at the present time as to the extent of the ore-showings existing on them.

Kathleen Group.—J. N. J. Brown, the discoverer of the property described above, has held this ground for a number of years and is continuing to prospect it. It is referred to in the Annual Reports for 1922 and 1923.

Two of the claims on the *Highland* group have been Crown-granted.

There is nothing to report in connection with the *Snowstorm* group. This is the copper-showing referred to in the 1923 and preceding Annual Reports. The buildings at this mine are

in a good state of repair and the diamond-drill cores and records are on hand, available for anybody investigating the property.

Glossie. This property is owned by Joe Burr, Sr., and associates, of Ashcroft. It lies on the slopes of Glossie mountain in the prevailing granitic formation and about 8 miles due north of the *O.K.* and on the other side of the valley of Pukaist creek. The elevation of the mine is about 5,500 feet above sea-level. On the property are one 100-foot shaft and two 40-foot shafts, with a lot of open-cutting as well. Everything being filled with water, no accurate sizing-up of the situation is possible.

That there is some high-grade bornite-copper ore around is obvious. At one of the 40-foot shafts (located a short distance above the camp buildings) a couple of tons or thereabouts of high-grade ore is piled up. This assays: 0.02 oz. gold and 6.5 oz. silver to the ton; copper, 15 per cent. The owners report a good showing of similar ore at the bottom of the shaft. No drifting is reported off this working. The intention was, when the last work was done at the mine, to drift to this point from the bottom of the 100-foot shaft, which is located a few hundred feet away, supposedly on the same vein; but operations were stopped before this could be done. The ground around where this ore is found therefore presents a favourable location for further development. Other good bornite-showings are reported on this ground, which, owing to the absence of a guide familiar with the locality, were not seen.

A few hundred feet on the opposite side of the 100-foot shaft from the 40-foot shaft already referred to, where the high-grade ore is located, is an open-cut showing considerable copper mineralization, two parallel bands of ore aggregating, say, 2 feet assayed: Trace of gold and 0.6 oz. silver to the ton; copper, 5 per cent. Whether this vein is identical with that on which the two shafts referred to above were sunk is by no means certain.

The 100-foot shaft is full of water. The dump shows considerable gangue-matter, but not much ore. An ore-sorting table is installed at the collar of the shaft and no doubt what ore originated from it has been shipped.

VERNON MINING DIVISION.

White Elephant Group. This property, referred to in some detail in the Annual Report for 1922, was rebonded in the fall of 1924 and the sinking of a shaft at once proceeded with. The name of the new organization in control of the mine is the Okanagan Premier Mines, Limited. G. R. Mason and R. E. A. Diespecker, of Victoria, are the promoters of the new enterprise. They report in December, 1924, that since work has started the shaft had been sunk to a total depth of 100 feet, leaving the ore, which was dipping at 55°, at a depth of 40 feet. A crosscut was then being driven from the bottom of the shaft to intercept the ore again.

From an inspection of this ground during the past summer it would appear probable that the ore exposed in the big open-cut, where all the shipments emanated from and where the shallow shaft is located on which sinking operations have been continued, is making on each side of a narrow basic dyke which crosses the shaft at about a 45° dip near the top. The result of this subsequent work would certainly appear to bear out this theory.

Considerable ground is held by prospectors in the vicinity of the *White Elephant* claim, but nothing but assessment-work has been done anywhere. Prominent among those to be classed in this category is Ebe K. Kight, of Penticton, who is holding and doing assessment-work on a number of claims, including the *Yellow Rose*, which adjoin the original *White Elephant*.

Siwash Creek Placer. On Siwash creek, which empties into the west side of Okanagan lake, about due west of Vernon, ground-sluicing operations were carried on for a considerable period during the year. Identified with this work were H. J. Blurton, of Mara; R. M. Reed, J. Lindsay, and E. Lindsay, of Kamloops. This is an old placer camp, some very old tunnels having been uncovered along the side of the creek where bed-rock mining operations had been carried on in the eighties. While a certain amount of gold was recovered during the season, the main idea of the present operations was, it was understood, to demonstrate that hydraulicking operations would pay.

Goodenough Group. This property lies on the mountain on the north slope of Siwash creek, about 2 miles west of Okanagan lake. It is owned by the same group of men mentioned in connection with the placer operations referred to above. Extending through the group in a general easterly and westerly direction is a wide

iron-stained zone, showing copper mineralization at various points where shallow shafts and trenching has been done. The formation is mainly altered lime with a belt of igneous rock, probably diorite, running through it.

From one open-cut sampled an assay of 0.20 oz. gold, 0.80 oz. silver to the ton, and 1.5 per cent. copper was obtained; and from the dump of a shallow shaft in the same vicinity: Gold, *nil;* silver, *nil;* copper, 0.80 per cent. Another 10-foot shaft in the same mineralized area was sampled, a cut sample being molled across the bottom. This assayed: Trace of gold and 1.6 oz. silver to the ton; copper, 1 per cent.

On this ground is a big mineralized area with not enough open-cutting to arrive at any definite figure as to the extent of the ore or its grade. Further work on the claims should be confined largely to stripping the surface, with the intention of getting some idea of the nature of the deposit. To carry on with much underground work would at present seem premature.

H. J. Blurton, one of the owners of the property, says: "Assays from Trail have given 1 to 8 per cent. copper on a 160-lb. shipment, and assays from the Provincial Mineralogist have run from 0.80 to 12 per cent. copper and carry in all cases traces of gold and up to 1.6 oz. of silver to the ton."

As of interest as a possible source of potash is the discovery of what is classed by the Geological Survey (a preliminary classification subject to revision) as "celadonite," a hydrous silicate of iron, magnesium, and potassium. This mineral has been discovered in this area in large quantity by H. J. Blurton, of Mara. In appearance it is a bright blue clayey looking material.

LILLOOET MINING DIVISION.

BRIDGE RIVER SECTION.

B.C. Alluvials, Ltd. This company reports that an ice-jam in the canyon of Bridge river, which broke loose and raised the river about 8 feet, carried out some of its piping and flume. The statement is made that at present the workings are in good pay-dirt just recently uncovered, and that had the mild weather continued a little later in the fall a satisfactory clean-up for the year's operations would have resulted.

Wayside. This property has been recently bonded by O. Fergusson and Chas. Walker and preparations for drifting from the bottom level were in progress when the mine was visited in October, 1924. Owing to the reluctance of the former owner in 1923 to show me certain parts of the mine, which were consequently unvisited, the reference to the property made in the 1923 Annual Report probably strikes an unduly pessimistic note.

There are some well-defined quartz leads on the *Wayside.* The mine lies in the same diorite-belt as the Cadwallader Creek mines, and the chances are as favourable as anywhere else in the district for systematic development opening up a shoot or shoots of ore which could be worked at a profit.

The face of No. 1 tunnel (the highest up) is in good ore, running 1 oz. gold to the ton. There is a chance of No. 2 tunnel being on the top of an ore-shoot. In No. 3 tunnel a slip has been followed from a point near the mouth which may be on the foot-wall of the true vein. An accurate survey in this connection would be of value. In No. 4 tunnel (the lowest working and 80 feet long) is a quartz vein which, though only a few inches in width, shows good gold values in the face, an assay from that point running 2.08 oz. gold and 0.5 oz. silver to the ton. The ground between Nos. 2 and 4 tunnels appears best worth testing out and it will not take the expenditure of a large amount of money to determine whether a pay-shoot of commercial size exists there or not.

Native Son Group. This ground was staked in the fall of 1923 by Henry Swartz and Joe Russell, of Lillooet, and has since been bonded to A. B. Trites, of Vancouver. The property is located on the Middle fork of Gun creek and about 6 miles distant by trail from the point where Eldorado creek empties into main Gun creek. The distance along the main Gun Creek trail from the Bridge River wagon-road to Eldorado creek is about 12 miles. This part of the trail can be converted into a good wagon-road at a minimum of cost, as the country it traverses is almost entirely a series of flat benches. The transportation situation at the *Native Son* group, if large shipments of ore were contemplated, would therefore be about a 3- or 4-mile aerial tramway to the flats near the mouth of Eldorado creek, and then a 60-mile wagon-road to Shalalth, on the Pacific Great Eastern Railway, all

built with the exception of the 12 miles referred to. With enough tonnage in view 1½ cents a pound should therefore easily land this ore, or whatever product were made, at the railway.

The elevation of the main showing is 5,840 feet above sea-level. The formation is slate with a north-and-south strike and dipping to the west at about 70°.

A series of parallel arsenopyrite veins or lenses are exposed on the steep hillside where cut by a small creek. The large width and general continuity of the veins, or of the mineralized zone anyway, are such that the chances for big tonnage look bright. These veins conform with the formation, which is slate. Within a distance of about 100 feet at right angles to the strike of the formation, three large-sized veins and one or two of minor size can be seen.

No. 1 vein (the highest up) has a width at the creek-bed of 16 feet. A general sample taken from this point, but only taken where open-cut made about 8 feet wide, assayed: Trace of gold and trace of silver to the ton; arsenic, 23 per cent.

No. 1½ vein (next below it), average sample across 4 feet assayed: Trace of gold and trace of silver to the ton; arsenic, 29 per cent.

No. 2 vein can be traced for 150 feet and is then covered. An average sample across 3 feet assayed: 0.04 oz. gold and 0.6 oz. silver to the ton; arsenic, 23.5 per cent.

No. 3 vein shows mineralization across 24 feet, but is by no means all clean ore. A grab sample, eliminating the higher-grade material, assayed: Gold, *nil;* silver, *nil;* arsenic, 15 per cent.

Since these samples were taken some underground work has been done, with, it is stated, very satisfactory results. A sample from a short tunnel and sent to this office consists of particularly high-grade and clean-looking arsenopyrite.

Although the demand for arsenic appears to have slackened recently, the consensus of opinion is that this is only temporary.

In the *Engineering & Mining Journal* of December 13th, 1924, is published an article entitled "Arsenical Ore Deposits in the Unted States," by Robert H. Sayre; to those interested in this type of ore it is well worth reading. A few quotations from it are given below:—

"I anticipate a continued demand and a price which will warrant the development of promising prospects in spite of occasional serious slumps. One deals with arsenic not in ounces and pounds, but in tons, and in districts far from present plants hundreds or thousands of tons must potentially be in evidence. As to grade, another generality may be useful where tonnage and other conditions promise a successful concentrating operation; a minimum of 8 to 10 per cent. arsenic would seem to be required."

Judging from the above, even as far back as the *Native Son* arsenic lies, it should still be seriously considered. The production of white arsenic on the ground would no doubt be advisable owing to the great reduction in freight which would result thereby.

Lucky Jem Group.

This property is owned by Grant White, of Rexmount. The workings on this group are located at the head of Eldorado creek at an elevation of about 6,400 feet above sea-level. Access to the property is gained in two ways. One route is via a very steep trail up Eldorado creek from its mouth at the same point where the *Native Son* trail branches off the main Gun Creek trail. The other is from this same Gun Creek trail at Pearson lakes (about a mile from the Bridge River wagon-road) in a north-westerly direction over the divide to the head of Eldorado creek, where the claims are located, a distance of about 10 miles. The property was formerly called the *White & Bell* group and as such is described in the Annual Report of the Minister of Mines for 1913.

Located on the Eldorado Creek side of the mountain separating the headwaters of Eldorado creek from Tyaughton creek, several veins are to be seen. The most westerly open-cut exposes an iron-stained quartz and pyrites vein with a north-westerly strike and unknown dip which assays across 6 feet: 0.90 oz. gold and 2.2 oz. silver to the ton.

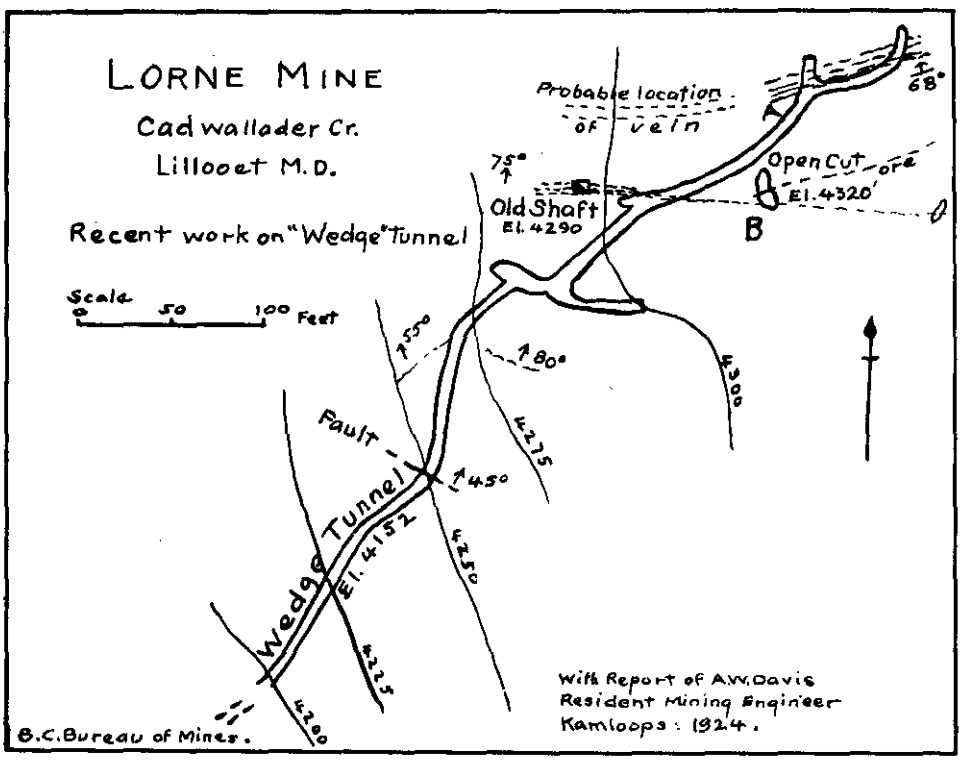
A few hundred feet to the east of this isolated working another vein with a general northerly strike has been followed up the hill for a distance of about 250 feet. A grab sample taken from several open-cuts assayed: 0.80 oz. gold and 0.2 oz. silver to the ton; arsenic, 20 per cent. This vein is narrow, being only 1 to 2 feet wide. It is composed of quartz iron pyrites and arsenopyrite.

Slightly to the east of the ore-exposures so far described and a little higher up are two 40-foot tunnels located at about the same elevation and only 100 feet or thereabouts apart. These tunnels are driven on some flat exposures of ore whose connection with the small vein described above is by no means certain. A grab sample from across 3 feet of ore near the mouth of the

most westerly of the two tunnels assayed: 0.06 oz. gold and 0.02 oz. silver to the ton; arsenic, 29 per cent. A sample from across 16 inches in the other tunnel assayed: 0.2 oz. gold and trace of silver to the ton. Not much arsenic was present and it was not assayed for that metal. The country-rock in the immediate vicinity of the vein resembles a reddish porphyry and may be a local alteration of the prevailing slate. This slate has a north-west strike and is part of the Eldorado series as classified by Drysdale.

Iron Ridge Group.

This group is located about 2 miles in a general easterly direction from the *Lucky Jem* and lies at the head of Taylor basin, which drains into Tyaughton creek. It is also owned by Grant White. The vein worked on has a strike of N. 23° E. (mag.) and a dip of 45° to the east. The vein, owing to the snow, was, when visited, inaccessible except at one point, where oxidized material for a width of 8 feet, with one irregular stringer of arsenopyrite included, could be seen.



A sample across the whole 8 feet assayed: Trace of gold and 0.2 oz. silver to the ton; arsenic, 3.5 per cent. A sample of the included stringer assayed: Trace of gold and trace of silver to the ton; arsenic, 10 per cent. These two groups just described, and particularly the *Lucky Jem*, what with the good gold values and the arsenic present, would appear worth further development.

A tramway 4 or 5 miles long from the *Lucky Jem* would reach the mouth of Eldorado creek, and if the *Native Son* arsenic-deposits were worked and a plant put up to handle the ore, this area could be seriously considered as a further source of supply.

CADWALLADER CREEK AREA.

Two properties in this area have received development during the year.

Pioneer.

This mine was bonded during the year and the sinking of a shaft from the bottom (200-foot) level proceeded with vigorously. When the mine was visited in October, 1924, the shaft had been deepened a distance of about 60 feet, the intention being to carry on with this work as long the season permitted. While sinking operations were progressing the mill was kept running, the ore feeding it being stoped from the upper

levels. In this way actual costs were being kept down to a minimum. It is the intention of the present operators to definitely block out below the 200-foot level sufficient ore to ensure *reasonable ore reserves before doing any stoping there.*

Lack of ore reserves and a general hand-to-mouth policy has so far militated against the successful operation of the mine. Under the sound treatment the property is at present receiving better results are to be expected. There is a good ore-shoot exposed on the bottom level of the *Pioneer* with values ranging around $20 in gold and no reason to expect why it should not extend *to a considerable depth.*

Lorne. The Wedge tunnel on this property has been extended a considerable distance and the "Old Shaft" vein, from which some high-grade ore was extracted in early days, thereby located at depth below. Where crosscut a 12-inch streak is exposed carrying $45.96 in gold. Adjoining this ore on the hanging-wall side is 3 feet of light-coloured altered rock running $6.05 in gold. There is more quartz crosscut than is indicated above, but the values are too low to constitute mill-feed.

On the surface, almost immediately above where the ore so far described was located, some trenching has located 7 inches of high-grade ore assaying 12 oz. gold and 3 oz. silver to the ton. The distance apart of these two points on the slope of the vein will be approximately 170 feet. A rough survey at present indicates that they are on the same vein.

A programme of work outlined for the winter includes drifting on the vein in the tunnel level and then raising to connect with the bottom of the shaft on the "Old Shaft" vein. If the results of this work are on a par with those obtained recently, a nice block of high-grade ore should be the result.

The mine during the year has been operated by Arthur Noel, who is responsible for the finding of the ore described above. The Cadwallader Creek mines generally and including the two properties touched upon above are discussed at length in the Annual Reports for 1922 and 1923.

PEMBERTON MEADOWS AREA.

This district was not visited during the season, although considerable activity prevailed there. Reference to a number of properties included in this particular district is made in the Annual Report for 1923, pages 166, 167, and 168.

Work was continued on the *Crown* group, owned by Alex. McLeod, of Pemberton Meadows, and under bond to a Boston syndicate. Favourable reports have been received concerning the *Li-li-kel* group, owned by Tom Lewis and associates, of Vancouver, with reference to new development in connection with the "Black Lead"; much higher gold values being reported. The *Moffatt* group on the north side of Tenquille creek was also worked by its owners.

CLINTON MINING DIVISION.

The Government Agent at Clinton reports the following:—

Watson Bar Placer. "More activity is evident in the placer areas of Watson Bar creek, particularly the North fork, west of the Fraser river. On the North fork about three leases and seven claims are being operated with a production this year of about $3,500 in gold from the claims, being about $6 a day average during the working season. About 1 mile of this creek has already been working out by claims.

"With regard to the three leases, 'pay' has been discovered on the lease worked by Daly & Johnson, but the work is still in the development stage. About $5,000 in actual work has already been expended, but it is expected that next year the looked-for results will be obtained.

"A great deal of development-work has also been done by A. C. Harris on the *Last Chance* lease, adjoining Daly & Johnson's. This lease is also expected to produce heavily next year.

"The ground in this locality is very hard and the overburden very heavy. Work consists mostly of open-cutting by ground-sluicing to get to bed-rock and tunnelling."

Crow's Bar Placer. "The four bench leases at Crow's bar on the Fraser river granted last year have now been assigned to Wm. Holden, of Vancouver. These leases were consolidated and development-work done. Work consisted of open-cuts along entire length of pay-channel and also in gulches to ascertain the value per cubic yard. Four additional hydraulic leases situated on the east bank of the Fraser river, about 2 miles north of Big bar, were applied for this year through W. H. Hammond, of Ashcroft."

B.C. Bureau of Mines

Hat Creek Valley, Clinton M.D.

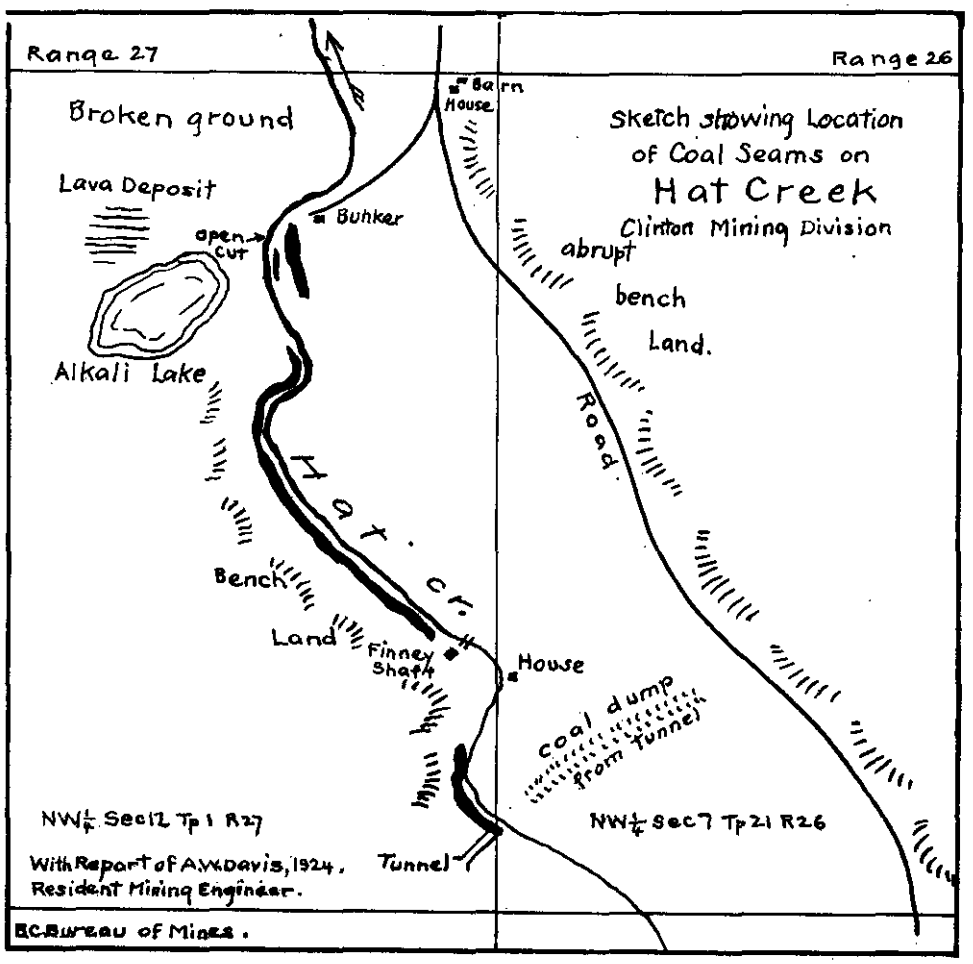
Clear Mountain Coal Co.--Workings on Hat Creek.

Considerable activity in connection with the location of gold-bearing quartz veins has been reported during the year in the vicinity of the North fork of Watson Bar creek. About fifteen claims were recorded. E. J. Taylor, owner of the well-known *Windfall* gold property on the Taseko and who is interested in this ground, reports the discovery of telluride.

TASEKO SECTION (WHITEWATER).

A large number of certificates of work have been recorded for the year in this district. The Taseko section was not visited in 1924. The discovery of a gold property by C. A. Baldwin and associates is reported on the west side of the Taseko river.

During 1924 prospecting was continued with considerable energy in the Taseko section, with, it is to be hoped, satisfactory results.



Windfall Group.—Some diamond-drilling was done on this property during the summer, but the results of this work are not known. Active development was stopped in the late summer, since which time the property has been inactive.

HAT CREEK COAL.

This coal is referred to in the Annual Report for 1923. Contrary to expectations, no drilling operations were proceeded with, with the result that the extent of the coal is still an unknown quantity. That there is a lot of it, the extent of the outcrop and the coal exposed for the full length of a tunnel driven about 200 feet into the hillside from the bank of Hat creek amply testify.

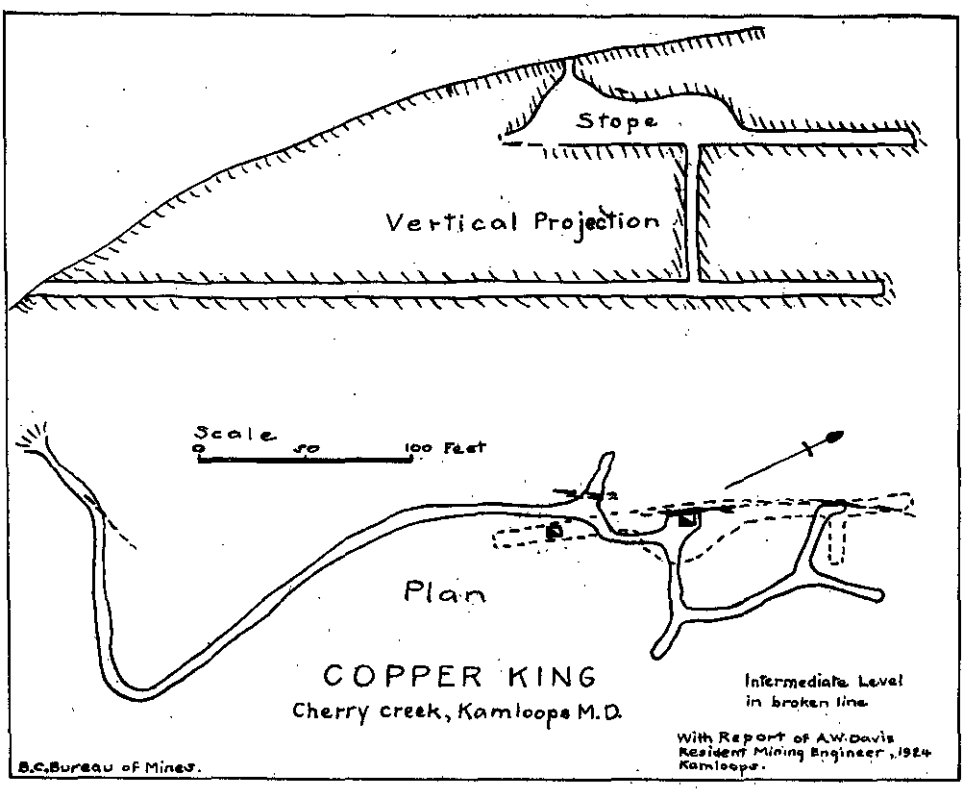
As a by-product coal this seam has possibilities. To attempt to ship it otherwise than by rail is probably futile; but, using steam-shovel methods and with a spur from Pavilion, on the Pacific Great Eastern Railway, 15 miles away, the proposition is worth further investigation.

KAMLOOPS MINING DIVISION.

KAMLOOPS SECTION.

Iron Mask.—This property, located only a few miles from Kamloops, was shut down early in the year. The low price of copper, the comparatively small tonnage handled in the mill, and other causes all tended to render profitable operations impossible.

Copper King. The old *Copper King* mine near Cherry creek, on the main Kamloops–Ashcroft road, was opened up and examined during the year. About 1,000 tons of ore averaging about 4 per cent. copper and $6 in gold was shipped from this property in early days. The ore was all stoped from above an intermediate drift driven about



75 feet above the main tunnel level, and there undoubtedly still exists ore below this intermediate level; just how much it is hard to say. It does not, apparently, extend down to the main tunnel level below. At the same time the mineralized zone along which the ore has made continues on the surface beyond the workings and other ore-shoots are possible. The ore occurs in a fissure-vein with a north-and-south strike and almost vertical dip in the prevailing diorite. Chalcopyrite is the main copper-bearing mineral, with some bornite as well.

Ajax Group. To the east of Jacko lake and about 4 miles in a southerly direction from the *Iron Mask* mine, G. J. Rogers has been carrying on development-work for some years on a large group of mineral claims. On the *Monte Carlo* a 60-foot shaft exists, the dump of which runs 3 per cent. copper, with no gold or silver values. Since the property was visited Rogers reports that in an open-cut about 30 feet to the north-west of the shaft he has exposed 10 feet of ore which will carry considerably more copper than that given above. He is now making an open-cut some 150 feet still farther to the north-west, with

the idea of picking up the ledge there. Heavy wash has prevented his reaching bed-rock as yet. This particular vein looks promising.

On the *Ajax* claim of the group Rogers has devoted most of his efforts in 1924 to driving a crosscut tunnel through the main mineralized zone. On the surface, cuts here and there, made on a knoll which the crosscut tunnel penetrates, and which has a maximum depth at its face of about 50 feet, show a certain amount of copper mineralization.

The formation is altered volcanic rock of Dawson's Nicola formation near its contact with the main granitic intrusion of the area. The copper on the surface is carbonate and some chalcopyrite. It is a fact that more consistent copper mineralization shows in the tunnel than on the surface, and possibly still further depth on the ore than is at present obtained might further improve the situation.

The following samples were taken along the side of the tunnel:—

Description.	Gold.	Silver.	Copper.
	Oz.	Oz.	Per Cent.
12 to 22 feet from mouth	*Nil*	*Nil*	1.0
22 to 31 feet from mouth	Trace	Trace	7.1
31 to 47 feet from mouth	*Nil*	Trace	1.0
47 to 61 feet from mouth	Trace	Trace	2.2

A mineralized zone runs in a general east-and-west direction through the whole group. The *Ajax* showing is at its westerly end and the *Monte Carlo* workings are located at the extreme easterly end of the group.

On the *Hercules* claim in the centre of the group a well-mineralized vein 3 or 4 feet wide can be followed for several hundred feet. Chalcopyrite is in evidence in all the cuts for a considerable distance. A grab sample from several points assayed trace of gold and silver and 2.4 per cent. copper.

Hilltop Group. This is a gold property owned by O. S. Batchelor, of Kamloops. It is located about 1,200 feet in elevation above the Thompson river on its north side, about 4 miles below Kamloops. Considerable open-cutting and one shaft down about 30 feet are in existence on this ground. The vein worked on is a fissure-vein with a quartz-filling. The formation is altered volcanic rock of Dawson's Nicola formation. Some quartz-porphyry dykes are in evidence.

The vein, where sunk on, is between 3 and 4 feet wide. A sample of the straight quartz in the shaft assayed trace of gold and 1.2 oz. silver to the ton. A sample across 20 inches, also in the shaft, of some more heavily mineralized material on the hanging-wall side (showing considerable oxidation) assayed 0.62 oz. gold and 5 oz. silver to the ton. This property was optioned during the year and steps taken to let a contract to develop the showing with a tunnel, but nothing has so far materialized.

Allies Group. This property is owned by O. S. Batchelor and is located about 10 miles up the Middle fork of Tranquille creek from its mouth at the Sanatorium. On this property an east-and-west vein has been traced for several hundred feet. Owing to the caved-in condition of the cuts and the general heavy covering of soil, very little information can be obtained relative to the formation and nature of the vein. At one point about 600 feet to the west of Tranquille creek a sample taken across 8 feet assayed 0.60 oz. gold and 0.4 oz. silver to the ton.

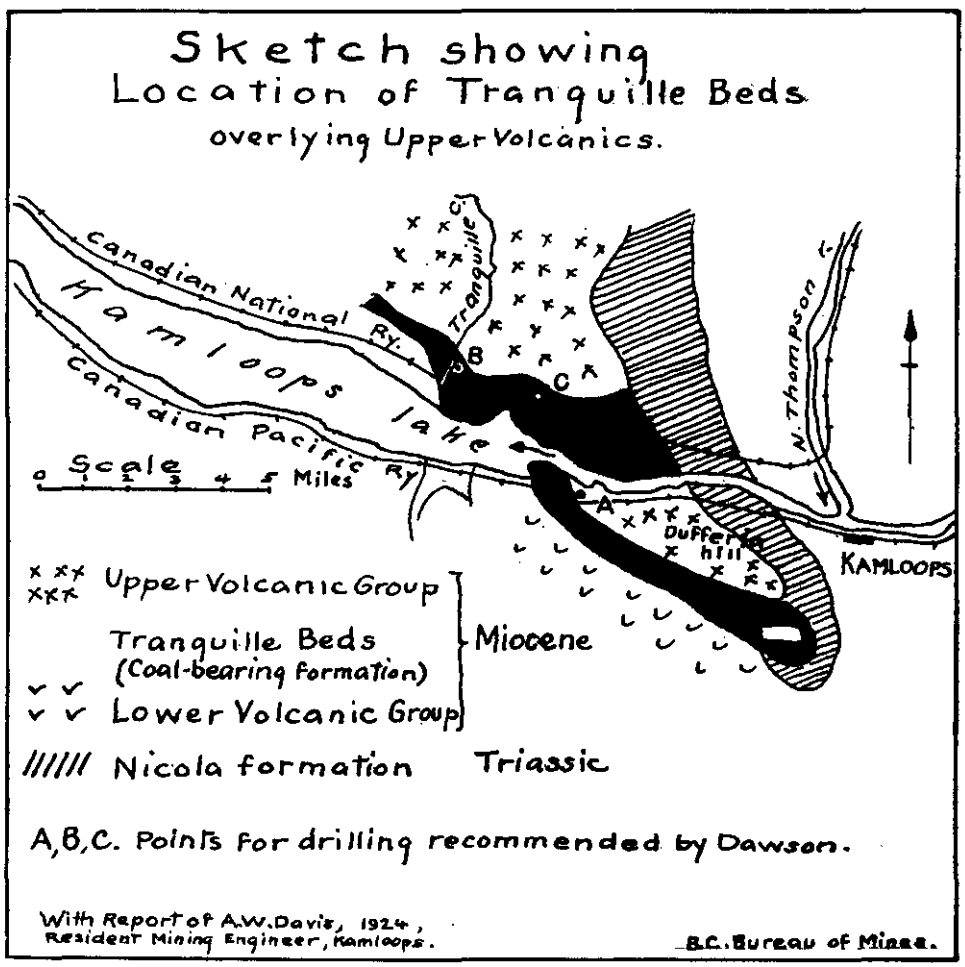
The material in this cut is a mixture of oxidized quartz and small fragments of country-rock. No actual sizing-up of the vein is possible. Eliminating the country-rock (apparently altered volcanic), there should be a vein here carrying good values and worth thorough prospecting.

KAMLOOPS COAL AREA.

The Guerin seam of coal exposed on the slopes of the mountain about 2½ miles in a south-westerly direction from the town of Kamloops received some development in 1924. After some diamond-drilling the work of cleaning out the old inclined shaft, sunk in early days, was proceeded with. Prominently identified with this enterprise is J. L. Brown, of Vancouver.

During the late summer and fall Archie Galloway and associates, of Kamloops, sank a 50-foot shaft on a low-grade shaly coal located on the lower slopes of the hills on the north side of the main Thompson river about a mile or so below Kamloops. The material sunk on was not a commercial coal, but it was hoped that conditions would improve with depth. This same syndicate has taken up coal leases extending from the point where their work was done as far west as Tranquille creek and proposes carrying on with further development next season.

In connection with the coal-prospecting operations described above, the following notes are descriptive of the coal-basin existing in the vicinity of Kamloops. Considering the great benefits



which would accrue to the town if a workable seam of coal be developed, this matter is worthy of serious consideration.

Adjacent to Kamloops occurs a Tertiary formation given by Dawson the name "Tranquille beds." These beds, unlike the other Tertiary rocks in the vicinity, have been laid down in water and are in places well bedded. In them are found, near Kamloops, some thin seams of coal, near what is called the Guerin ranch. Where the Tranquille beds are exposed at Red point, on the north shore of Kamloops lake, a small bed of lignite is reported by Dawson. He also reports traces of coal just north of Stump lake, where a small isolated patch of the Tranquille beds has been spared from erosion. The general inference is that these Tranquille beds are coal-bearing.

While the thickest seam of coal at Guerin's is only 12 inches and the total thickness of coal exposed in 50 feet of the formation only 30.5 inches, there is no reason why, elsewhere in

the Tranquille beds, a thicker seam of coal and one that could be worked at a profit should not be found.

Dawson (*see* Annual Report, Geological Survey of Canada, for 1894, page 170B) estimates that the thickness of the Tranquille beds is at least 500 feet and probably about 1,000 feet. He suggests that instead of prospecting still further the Guerin seam, it would be much better to put down one or more boreholes where this formation is at its thickest and not where it is feathering out. He goes still further and indicates the points where he would drill and which I have marked A, B, and C on accompanying map. On this map I show the coal-bearing Tranquille beds, along with the other Tertiary rocks above and below them, and, underlying everything, the Nicola formation of earlier age (Triassic).

The Guerin coal he states is a true coal, burning well and producing a coherent coke, and if in seams of really workable thickness would possess considerable economic importance.

Copper Creek Cinnabar.

Worthy of note is the reopening early in 1925 of the cinnabar property near the mouth of Copper creek, which empties into Kamloops lake from the north, about 6 miles from its mouth. J. Fleetwood Wells is in charge of operations, acting on behalf of a syndicate composed of various members of the old Cinnabar Mining Company which originally worked the property. Mr. Wells was in charge of operations on this property twenty-five years or more ago when it was originally worked. This property has been visited on two different occasions; but, owing to the general caved-in condition of the workings and the absence of anybody on the ground familiar with the mine, very little information was gained about it.

The following excerpts are taken from a letter received from Mr. Wells dealing with his operations:—

"I may say that since I have been working here some six weeks some good ore has been recovered in the neighbourhood of the old workings, from which some 100 flasks of mercury were taken in bygone days. The ore, which is erratic in its occurrence, is found in strongly formed igneous dykes varying in width from 2 to 4 feet. The ore does not seem necessarily to follow lines of cleavage, but is embedded in the formations. I may add I have no wish to exaggerate the possibilities of this property; its value is to be proved; but for the little work done the results are encouraging.

"Cinnabar is more or less in evidence over an area extending from Toonkwa lake, some 12 miles southerly from Copper creek, to Criss creek, some 10 miles to its north. On the Hardie Mountain properties, 3 miles north of the Kamloops lake at Copper creek, there are evidences of cinnabar crystals over a very large area. Some twenty-two samples taken by Luther Wagoner, an acknowledged authority on cinnabar, over an area of some 300 acres or more taken from open-cuts and the mud of an old lake-bottom which forms a depression, gave an average assay of 1.16 per cent. One piece of ore assaying 9 per cent. was also found. No solid ore-shoots of any width have been found. Minute particles of cinnabar can be panned out all over the upper part of this mountain from the grass-roots down."

HIGHLAND VALLEY SECTION (PART OF).

Reference has been made to this area in the Annual Reports of the Minister of Mines for 1922 and 1923, pages 140 and 150 respectively. It is also described in the Annual Reports for the years 1915 to 1920, inclusive.

It should be explained that part of the Highland Valley area lies in the Kamloops Mining Division, including the *Snowstorm* group, and part in the Ashcroft Mining Division, including the O.K. mine and other properties.

Snowstorm Group.

This group consists of Crown-granted claims and therefore not even assessment-work has been done on them this year. To anybody looking for a copper property with possibilities for big tonnage this ground is worth investigating. It is best reached by wagon-road from Ashcroft, on the main line of the Canadian Pacific Railway, being about 26 miles distant in a south-easterly direction. Although, if railway connection to it were desired, the construction of a spur line about 30 miles long from the Nicola branch of the same railway would be the best route to adopt. The claims lie at an elevation of about 5,000 feet above sea-level, with conditions good for cheap mining.

As stated in the 1923 Report, on this property are acres of 0.5-per-cent. ore, 100 feet of 1-per-cent. ore exposed in a shallow tunnel, and a more limited amount of 1.5-per-cent. ore,

with, of course, certain cuts showing much higher-grade material. Exploration by diamond-drilling is what the property needs and the showings of ore on the *Iona* claim of the group make this development well worth while. The presence of copper carbonates over a big area renders some scheme of leaching the ore worth bearing in mind.

CLEARWATER SECTION.

In this area, covering a big section of the country lying at the headwaters of the Clearwater river and its tributaries, there is not a great deal to report. The original group of prospectors kept up their assessments and some new country was prospected. There is still a great deal of virgin territory worthy of investigation. On page 156 of the 1923 Annual Report is given a good map of the district.

VAVENBY SECTION.

Sunrise Group. This is the same property referred to as the *Naomi* and described in the Annual Report for 1922, pages 145 and 146. The group has since changed hands and is now controlled by J. Beaton, of Vavenby. An inspection of the property in 1924 shows that a lot of work has been accomplished since it was examined in 1922.

At the camp and near where the main workings are located a high-grade streak is exposed carrying grey copper, from which good gold values can be obtained. A sample taken last summer assayed 4.6 oz. gold and 2.2 oz. silver to the ton. This streak is very small and erratic; but following up and tracing it would appear to be the best method of developing the property.

The 50-foot shaft and various open-cuts, which have recently been driven with the idea of proving up a big low-grade body of ore, would seem to be unjustifiable.

Noble Group. This ground lies some 2 miles to the north-west of the *Sunrise* group. It is owned by W. E. Noble, of Birch Island. He reports a showing of galena on which he is sinking. Further details are not available. A sample forwarded to this office assayed: Trace of gold and 1 oz. silver to the ton; lead, 24 per cent.; zinc, 35 per cent.

Vavenby Placer. Some little excitement was caused early in the summer by the discovery of placer gold on a small unnamed creek running into the North Thompson river from the east, about 1 mile above the town of Vavenby. The owners of the claims are John Larsen, C. A. Nord, and associates, of Vavenby.

The prospecting done this summer would indicate a chance existing of this ground being hydraulicked successfully. Further testing is of course necessary before starting any construction. The idea would be to divert the creek and mine the whole creek-bottom for a total width of, say, 100 feet. The gold so far recovered is fairly coarse and the proposition seems well worth investigating.

BIRCH ISLAND AREA.

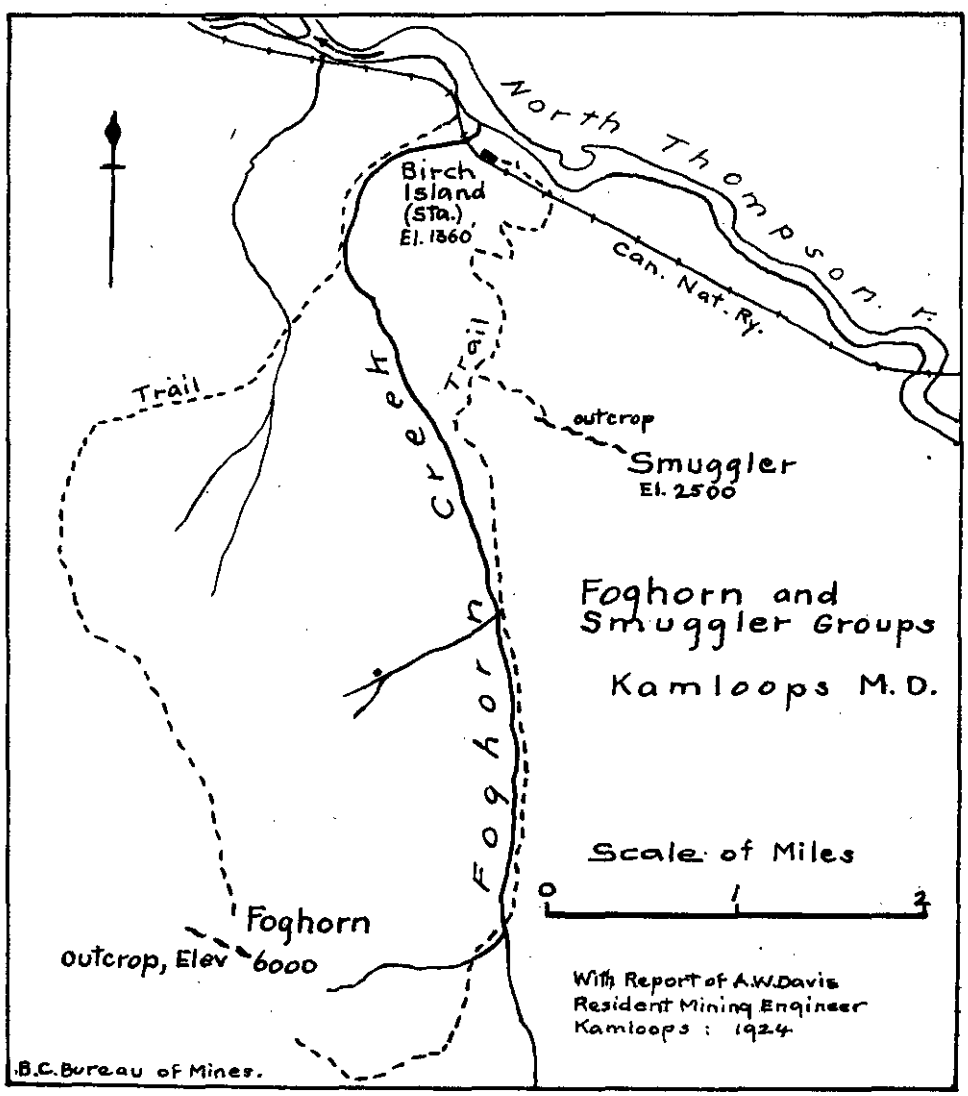
Considerable mining activity has been in evidence at Birch island during the year, most of the claims on which development is being carried on being located in the vicinity of Canyon creek, which enters the North Thompson from the south-east near the town of Birch Island.

Fog Horn Group. This property, consisting of five claims, is owned by Geo. Fennell and associates, of Chu Chua. They lie at an elevation of about 6,000 feet above sea-level on the west side of Canyon creek and distant about 6 miles in an air-line from Birch Island, on the Canadian National Railway. The formation is schist with a general north-easterly strike and flat dip to the north-west. There are two distinct mineralized zones on the property. In the upper one on the *Fog Horn* claim occur a series of more or less parallel veins which cut the formation at an acute angle. These veins are small and carry more or less galena. Their dip is nearly vertical. In former years about 75 tons of galena ore has been shipped from this source. Some recent work at a shallow shaft near the north end of the *Fog Horn* claim would indicate the chances for more tonnage than has heretofore been indicated.

Near the north end of the *Fog Horn No. 2* claim, near where the cabin is located, occurs a line of outcrop, or rather float, which should indicate a fair-sized vein below. Owing to the deep wash, ore in-place has not actually been located as yet at this point; but at least four piles of float roughly in a line and some pieces composed of good concentrating-ore would point to the advisability of further investigation. A sample from a pile of float about 200 feet to the

west of the cabin ran as follows: Trace of gold and 23.5 oz. silver to the ton; lead, 35 per cent. This is considerably better than the average value of the pile, which, however, would be good concentrating-ore.

Smuggler Group. This group is located on the east side of Canyon creek and, as map accompanying this report will indicate, a good deal lower down and nearer Birch island than the *Fog Horn*. The elevation of the claims is 3,600 feet above sea-level and they are distant about 2 miles from the railway. Here again a long line of float



can be traced in a general easterly and westerly direction along the gently sloping hillside showing considerable galena in a quartz gangue.

The silver-lead ratio is good, as the following samples, taken from two separate points, show. The average value of the ore at these points will, however, be somewhat lower than indicated in the following assays: (*a.*) 0.03 oz. gold and 30.6 oz. silver to the ton; lead, 8.4 per cent. (*b.*) 0.03 oz. gold and 32.8 oz. silver to the ton; lead, 23.8 per cent.

From a sizing-up of the situation it would appear that the width of ore would not be great, say around 2 feet, but that, on the other hand, the values would be good and the length of the ore-shoot considerable, as the float can be followed for over a claim-length or thereabouts.

There is considerable conjecture about the above remarks; but what is being attempted is to give an idea of the situation as it appeared to the writer. At any rate, this ground is worth some vigorous development.

Shamrock Group. This property lies on the west side of Canyon creek, about 6 miles by trail from Birch island, and takes in some of the ground between the *Lydia* mine and the *Fog Horn*. The owner is Tom Montgomery, of Birch Island. Considerable tunnelling was done on the property in developing a quartz ledge which has a north-and-south strike conforming with the prevailing schist. In the latter part of the season Montgomery, in prospecting some of his outlying claims, located some galena ore, details about which are not available. A sample of this ore assayed: 0.04 oz. gold and 68 oz. silver to the ton; lead, 26 per cent.

Minnesota Girl. This group is owned by J. Schlichter and associates, of Birch Island, and is located on the east side of Canyon creek. (*See* Annual Report for 1923, page 155, for a description of the property.) The tunnel referred to in this report was continued a further distance of 40 feet. Subsequent to the property's being inspected this year a mineralized area was encountered. Two samples sent in assayed as follows: (*a*.) Quartz from right-hand side of tunnel: Trace of gold and 1.2 oz. silver to the ton; lead, 1 per cent.; zinc, 1 per cent. (*b*.) Streak of galena: 0.08 oz. gold and 24 oz. silver to the ton; lead, 9 per cent.; zinc, trace.

Keystone Group. The *Lydia*, a copper-showing, was referred to in the Annual Report for 1923, page 154. Another occurrence of copper ore is to be noted in the district. This point is to the south of the *Foghorn* and in the granite mountain which has thrust its way through the prevailing schist. The ground staked is called the *Keystone* group and is held by B. T. Foote, of Auldgirth. It was not examined. Foote reports a big mineralized zone on the contact between the schist and the granite. He states that he has 2.4-per-cent. copper across 34 feet, with the ore still continuing, and that he has traced this type of ore for a considerable distance with open-cuts.

MICA MOUNTAIN (NEAR TETE JAUNE).

There are seven Crown-granted claims, comprising the holdings of the Western Mica Company, located on this mountain. Mica mountain is a high peak of the McLennan range south of the Fraser and west of the Canadian National Railway at the point where it diverges from the line running to Prince Rupert and swings south towards Kamloops.

Back in the early nineties John F. Smith, of Kamloops, became interested in the mica-deposits of Mica mountain and made several shipments of this mineral to the United States. There were no railways in those days in this northern country and Smith carried the mica with a pack-train of horses from the mine, a distance of 150 miles, to Kamloops, on the Canadian Pacific Railway. Smith states that out of one block of mica he obtained 90 lb. of merchantable mica, which gave him 15 lb. of 24- by 32-inch sheets, on which he realized $15 per pound, and an average size for the rest of the 90 lb. of 8- by 16-inch, for which he got from $1 to $7 per pound.

Owing to various causes, including a reorganization in connection with the ownership, the property was shut down shortly after this period and has lain idle ever since.

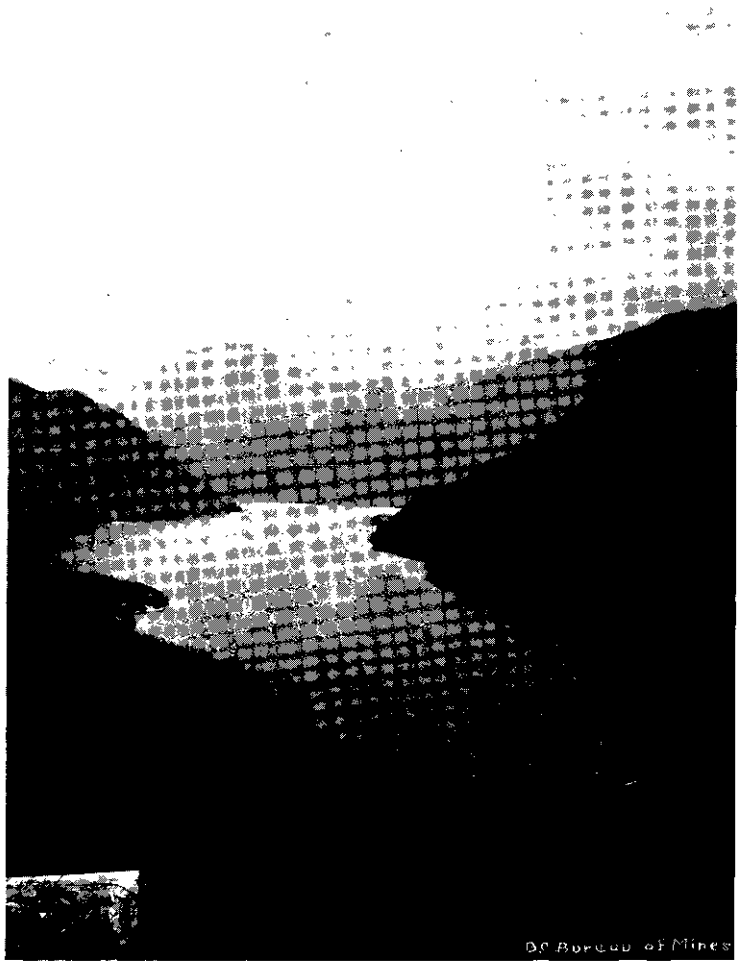
When visited in the summer of 1924 the basin in which the workings are located had been swept by snowslides and every vestige of them obliterated by the accompanying debris. This basin lies 1,000 feet above timber-line and on the south-east slopes of Mica mountain.

Another occurrence of mica owned by the same company and located on the north slope of the mountain was also visited. These workings were also inaccessible. Some big boulders were noticed, however, on the mountain-side containing 6-inch slabs of muscovite, and the whole area, in fact, looks promising as a possible source of mica. The prevailing formation is granite.

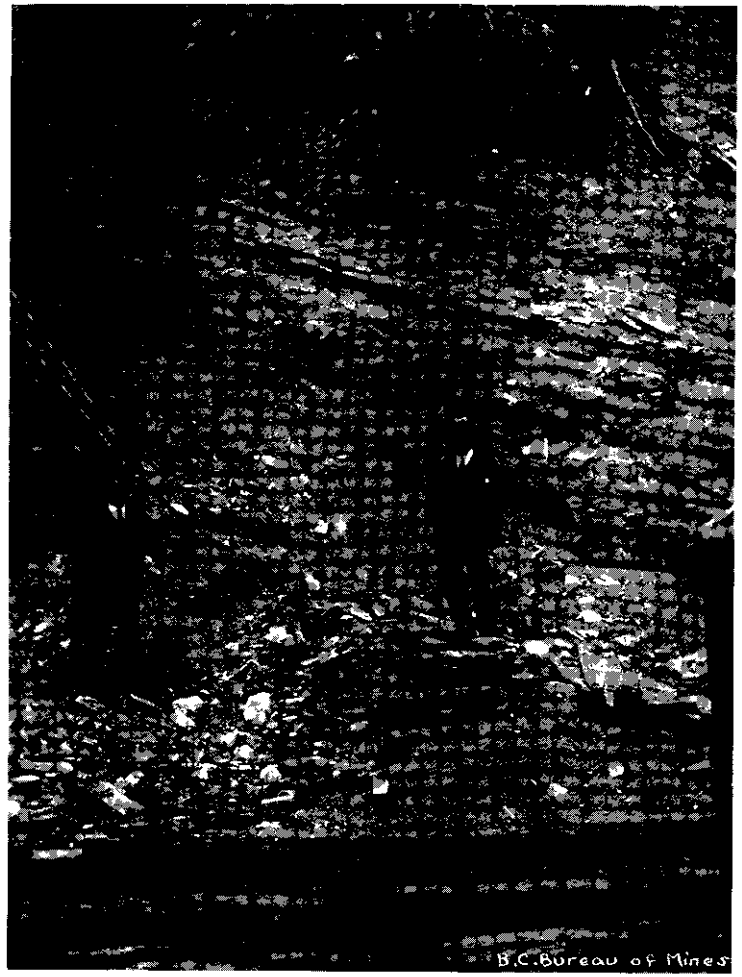
MOUNT OLIE AREA.

Some placer-mining leases are still held at 3-Mile creek near Mount Olie, but there has not been much activity in connection with them during 1924.

Some silver-lead ore is reported at the head of Lemieux creek, which enters the North Thompson river from the north-west, at Mount Olie. A sample sent in by A. Olson, of Mount Olie, who has been prospecting in the vicinity, assayed: 0.04 oz. gold and 2.05 oz. silver to the ton; copper, 0.2 per cent.; lead, 20 per cent.



Seton Lake, looking East.



Chu Chua Coal Co.

Still farther north, on the south side of Mahood lake, Wm. Spring has a group of claims. A sample received from this point consisted of quartzose irony-looking material. It assayed: 0.60 oz. gold and 1 oz. silver to the ton; copper, 0.3 per cent.

CHU CHUA AREA.

The two most prominent properties in this area, the *Windpass* and the *Gold Hill* group, are described in some detail in the Annual Report for 1923, pages 151 to 153, inclusive. The latter property is now under bond to an American syndicate and active development will be proceeded with in the spring.

Windpass. Some further development-work was carried on at this property during the year, two short winzes being sunk from the tunnel-level and also some diamond-drilling done. In the fall of 1924 the property was closed for the winter, but it is expected work will be resumed in the spring. While no great tonnage has as yet been opened up below the tunnel-level, nothing conclusive has been proven to the contrary, and it is to be anticipated that some further work in the coming season will bear satisfactory results.

BARRIERE SECTION.

For some years a group of prospectors, comprising P. Johnson, Karl Johnson, Paul Johnson, Oscar Bolin, and N. Forberg, has been engaged in carrying on vigorous development-work in the North Barriere Lake area. For several seasons their efforts were centred on the *Rainbow* and *Anaconda* groups, the latter being referred to on page 146 of the 1922 Annual Report. During the past year, however, their operations have been extended some distance in a north-westerly direction, and during the past season were centred on the *Creede* group of six claims located at the headwaters of Birk creek at an elevation of over 5,000 feet, and not much more than 5 miles in an air-line from Chu Chua. The formation is diorite near the contact of the Mount Baldie batholith and Fennell greenstone, and, judging by the ore occurrences at the *Windpass* and elsewhere where on the same contact, the chances should be good for the development of ore in this new locality.

This new area was not visited. The ore, the owners state, is galena. A picked sample of it assayed: 0.76 oz. gold and 64.10 oz. silver to the ton; lead, 83.5 per cent.

Anaconda Group. The *Copper Cliff* claim of this group was examined. The formation here is schist. In a short tunnel where a heavy impregnation of iron pyrites occurs two samples were taken. One sample of the pyrite several feet thick assayed: Trace of gold and 0.6 oz. silver to the ton; copper, 1 per cent. The other sample, consisting of harder and more quartzose material, assayed: Trace of gold and 0.6 oz. silver to the ton; copper, 1.5 per cent.

North of North Barriere lake some prospecting is being done by E. Bendelin, who reports having located some galena. A prospector named Shilling, with whom it is not possible to get into touch, is also said to have located some of the same material.

Silver Minnow Group. This property lies about 1,200 feet above the Barriere river on its eastern side, 4 miles below the outlet of North Barriere lake. It is owned by Harry Stephens, of Kamloops, and associates. The ore, which is galena, occurs in an altered limestone. What cuts were in existence in 1922 when this ground was visited showed no great quantity of this mineral. Recent reports, however, would indicate that a short distance below the original workings a new lead had been discovered which has bettered the situation. This ore is reported to assay around 78 per cent. lead, with 35 to 40 oz. in silver to the ton.

Queen Bess. This property, on which several thousand feet of development-work has been done, is located on the east side of the North Thompson river, near Auldgirth, on the Canadian National Railway, and a few miles north of Chu Chua. The lowest tunnel on the property is located about 900 feet in elevation above the track. A small concentrator was erected some years ago and a surface tram constructed connecting the mine with the mill; but very little ore was treated. There are four tunnels and several raises on the property, developing two of the several veins which occur on the group.

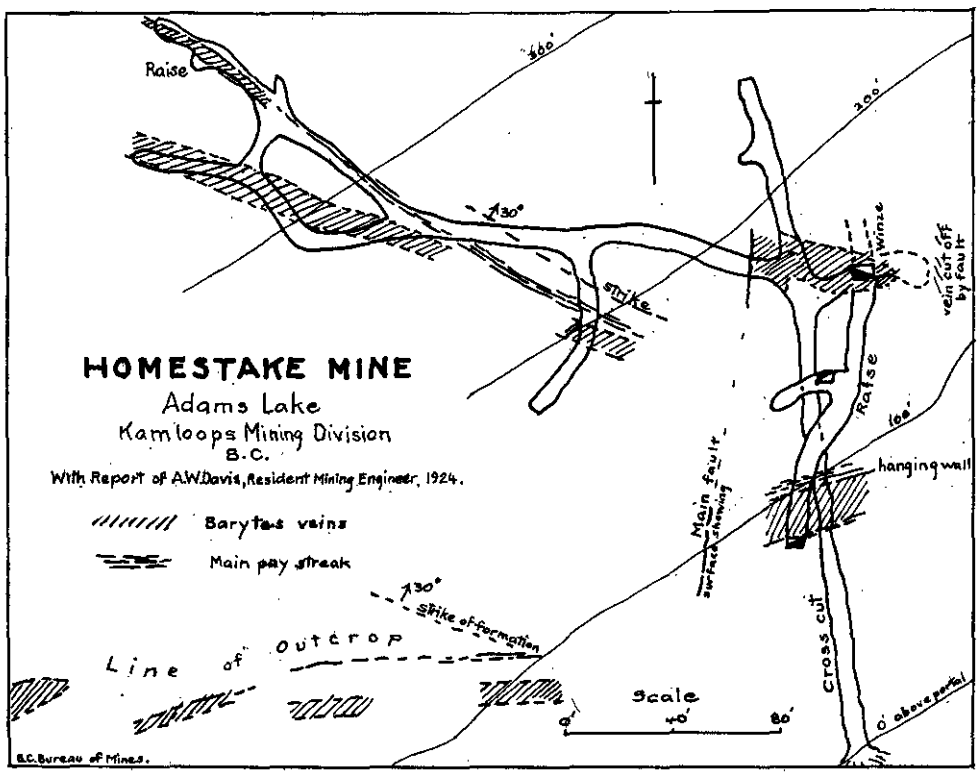
While there is no appreciable tonnage of ore blocked out, here and there in the mine are some fair showings of zinc-lead ore, and in view of the fact that a tramway and mill are already in existence, the latter of which with some remodelling could be made to treat the ore efficiently,

a little judicious development-work, carefully planned and not running into too much money, might be warranted.

LOUIS CREEK SECTION.

Homestake. A general description of the *Homestake* is given in the Annual Report of the Minister of Mines, 1922, page 147. Since that time the property has been operated by the Tretheweys, of Abbotsford, under the direction of F. A. Brewer. In the original workings the ore has a barytes gangue. To the west of the main fault it consists of the schist itself. In each case drilling and grinding costs will be low and correspondingly affect mining and milling costs.

Until the present operators of the property took control nothing much was known of the ore lying to the west of the fault shown on the map a few feet to the west of the main crosscut from the surface. Since then continuous ore has been proved up beyond this point for nearly



200 feet. This ore consists of a replacement of the schist, there being a central seam of high-grade silver-bearing material with the wall-rock on each side of it carrying lower values in silver. As an example of the values, the results are given of the samples taken in the crosscut to the south of the main drift, where the vein was cut. These are as follows:—

Description.	Gold. Oz.	Silver. Oz.
Across 5 feet on hanging-wall	Trace	11.2
Across 2 feet high-grade seam	0.06	109.0
Across 5 feet on foot-wall side	Trace	11.2

On the surface immediately above the point where these assays were taken there is an outcrop of high-grade ore. A sample across 2 feet assayed 0.10 oz. gold and 88.5 oz. silver to the ton. A Brunton survey indicates that this ore is identical with that in the crosscut below. The dip of the ore in each case is 30° (identical with the formation) and the distance apart of the two places sampled is about 165 feet on the slope of the vein.

The main silver-bearing minerals would appear to be grey copper and galena. The zinc present does not, according to the tests made, contain much silver.

As will be seen from an inspection of the map, the development-work is not such that the actual amount of ore in sight can be accurately measured. Certain assumptions must be made, and, making them, one can figure on around 20,000 tons of 30-oz. (silver) ore available. This may be high or may be low. The real figure may be 15,000, or, on the other hand, well over the 20,000 mark. It is the best that can be estimated for the time being.

With regard to the net value of this ore, it can be estimated that 30-oz. ore with silver at 70 cents, and allowing for railway freight and smelting charges, is worth $15.60 a ton. I estimate mining, milling, development, etc., at $6.60 a ton. This makes the net value of the ore $9 a ton. The ore carries a combined percentage in lead and zinc of around 5 per cent. (mostly zinc) which would be saved in the mill, but is not included in the above estimate.

The above figures are arrived at as follows, everything being worked out to the ton of ore: 30-oz. ore, estimate 85 per cent. saving in mill; ounces saved, 25.5 oz. Smelter pays for 95 per cent. of this 25.5 oz.=24.22 oz.; 24.22 oz. at 70 cents=$17, gross value in 1 ton of ore. Railway freight and smelting charge on 1 ton concentrates=$18. Say 10 to 1 concentration, although ratio will probably be greater. Then freight and treatment charge per ton of ore=$1.80. Deducting this from the $17 the net profit on 1 ton of ore becomes $15.20, and adding 40 cents in gold which the ore will run, $15.60.

Costs are estimated as follows: Stoping, $2; milling, $1.50; development, $1; overhead, $1.50; truck-haul, 60 cents; total, $6.60.

Hence the difference between $15.60, the net value of the concentrates in 1 ton of ore, and $6.60, the total cost of operating a ton of ore, is $9. That is, the actual profit on a ton of ore is $9 and on 20,000 tons $180,000.

I consider the mine can be equipped with a 60-ton mill, with Deisel engine big enough to run it, and a small compressor, and with some development thrown in as well, for $100,000. To connect the mine with the mill a 1,500-foot 2-bucket aerial tramway is necessary. This would cost about $3,000 and is included in the above estimate.

There is ample water for the mill close at hand. Concentration tests made a few years ago on the ore indicate that a good recovery can be made by using flotation. A copy of the results of these tests appears on the next page.

"MINERALS SEPARATION NORTH AMERICA CORPORATION.

"*Report of Flotation Test.*

"Sample: Homestake ore. Sent by Byron R. Jones & Co., dated July 1st, 1918. Address, Vancouver, B.C.

"*Test No. 1.*—Sample No. 4810. Weight test, 400 gms. Reference, X 3351.

	Weight Product per Cent.	ASSAYS.							DISTRIBUTION PER CENT.				
		Au.	Ag.	Cu.	Pb.	Zn.	Fe.	Ins.	Au.	Ag.	Cu.	Pb.	Zn.
Head	100.0	0.026	14.62	0.31	1.21	3.42	.....	.....	100.0	100.0	100.0	100.0	100.0
Conc.	8.3	0.24	153.60	2.48	14.60	37.60	2.0	11.6	75.7	87.2	67.1	100.0	91.2
Mid.	20.0	0.03	7.20	0.22	*Nil*	1.50	0.5	.....	223.3	9.8	14.3	.....	8.8
Tail	71.7	Tr.	0.60	0.08	*Nil*	*Nil*	0.4	.....	.....	3.0	18.6	.....	.....

"*Test No. 2.*—Sample No. 4810. Weight tested, 2,000 gms. Reference, X 3352.

Head	100.00	0.021	13.73	0.31	1.02	2.95	.....	.....	100.0	100.0	100.0	100.0	100.0
Conc.	6.23	0.22	168.00	3.68	16.40	39.20	2.0	7.6	34.2	76.3	72.7	100.0	82.9
Mid.	10.93	0.07	20.00	0.48	Tr.	4.60	1.6	.....	36.0	15.9	16.7	.....	17.1
Tail	82.84	Tr.	1.30	0.04	Tr.	Tr.	.....	.....	.....	7.8	10.5	.....	.....

"*Test No. 3.*—Sample No. 4810. Tested weight, 800 gms. Reference, X 3343.

Head	100.00	0.022	13.2	0.35	1.36	2.92	.....	.....	100.0	100.0	100.0	100.0	100.0
Conc. A.	3.45	0.36	301.0	6.24	35.20	17.60	5.8	7.6	56.7	78.9	61.6	89.7	20.9
Mid. A.	1.54	0.08	29.7	0.76	4.20	5.40	2.6	.....	5.6	3.5	3.5	4.8	2.9
Conc. B.	2.94	0.16	36.8	1.12	0.50	52.80	2.5	18.0	21.4	8.2	9.4	1.1	53.2
Mid. B.	12.02	0.03	5.7	0.22	0.50	0.60	1.5	.....	16.3	5.2	7.2	4.4	23.0
Tail	80.04	Tr.	0.7	0.08	Tr.	Tr.	.....	.....	.....	4.2	18.3	.....	.....

"E. W. WILKINSON,
Engineer in charge of Testing."

Summing up matters, the main speculation is connected with the spending of the first few thousand dollars. If what ore the present operators have developed with a couple of miners in the past two years can be duplicated in a few months with a fair-sized crew, the proposition would be a success. The chances for doing this are good. The main ore-shoot is exposed for a length of around 200 feet along the tunnel-level, with no reason why it should not persist for a reasonable distance. The initial development, it is submitted, should be mainly raising and sinking from the tunnel-level in the centre of this ore-shoot.

There are other areas, noticeably near the barytes bluff (*see* map), where the chances for finding ore-shoots are good.

A face sample taken from the lower end of the "Barytes Bluff" vein assayed as follows: 0.52 oz. gold and 0.86 oz. silver to the ton; lead, 5.5 per cent. This is interesting in view of the fact that this point on the slope of the vein is nearly 400 feet away from the ore in the tunnel-level below. The bulk of this Barytes Bluff vein does not carry values like this; there is, however, apparently a concentration of values at the point mentioned which is worth investigating.

Between the Barytes Bluff and the outcrop where the 86-oz. silver assay was obtained is a barytes vein, probably a continuation of the latter, where assays of 26 oz. in silver were obtained, and the region below here is worth prospecting. A raise driven from the level below would probably clear up the situation.

While the *Homestake* will not make a big mine, it has a very good chance of developing into a paying proposition of intermediate size.

Try Me Group. This property, owned by G. D. Rankin, is located on the north side of Agate bay, an inlet on the west side of Adams lake about 8 miles from its southerly end. The formation here is a continuation of the *Homestake* schist. A short tunnel near the lake-shore has been driven on a quartz vein carrying some chalcopyrite. This vein conforms with the schist, which at this point has an east-and-west strike and dips to the north at about 45°. There is no great amount of copper mineralization to be seen, although some nice specimens of chalcopyrite are obtained. The westerly continuation of this mineralized zone up the mountain-side has a strike, roughly, in the direction of the *Homestake*, some 4 miles distant, and has been followed with open-cuts for half a mile from the shore. A little galena has been found in spots in a small vein following the general strike. A sample taken (not assayed for lead, although a little present) assayed 0.04 oz. gold and 29 oz. silver to the ton. The silver content is good, and in view of the satisfactory results of the development-work at the *Homestake* a further investigation of this property is well worth while.

SEYMOUR ARM SECTION.

This area is described in the Annual Report for 1922, pages 149 to 182, inclusive. In view of the rising prices of lead and zinc the veins here merit some attention, and it may easily be the case that the time is not far distant when the prices of these metals will warrant development-work being carried on here on a larger scale than has heretofore been the case. The continuity of the ore is one of the attractive features of this camp.

NON-METALLIC SECTION.

GYPSUM.

The Canadian National Railway is completing the laying of steel on its Kamloops–Kelowna branch. This railway will render accessible the large deposits of pure gypsum (alabaster) located on it at Falkland. Steady shipments will at once start when this line is finally completed. At present the gypsum used at the Coast, mainly in connection with building operations, comes all the way from Manitoba. Besides the Manitoba Gypsum Company, Chas. Mandell, of Vancouver, and others have important deposits of this mineral at this point.

The operations of W. H. Hammond, of Basque (near Ashcroft), are worth noting. Here a genuine attempt is being made to exploit a deposit of gypsite (a low-grade pulverulent variety of gypsum) which he owns at that point. As a fertilizer in connection with the Fraser Delta soil this material has many good points, and Mr. Hammond by a personal canvass has succeeded in placing several car-load orders amongst the farmers of that district. It is to be hoped that as the good results of using this material become evident its use will become more general.

BARYTES, SODIUM SULPHATE, HYDROMAGNESITE, SILICA, MAGNESIUM SULPHATE, SODA.

Not much change has occurred in connection with the development of these mineral-deposits during 1924. With reference to them, *see* Annual Reports for 1922 and 1923, pages 154 and 170 respectively.

Further mention should be made of the activity in evidence in the fall of 1924 in connection with the soda-lakes lying in the region to the north of Clinton. The Government Agent at Clinton has the following to report in this connection:—

"*Soda-lakes Activities.*—Considerable activity is in evidence this fall in connection with operations on the soda-lakes, and from all appearances will continue throughout the winter months until the spring thaw.

"C. W. Austin is operating the *Anita* mineral claim, Crown-granted to E. C. Davison, of Vancouver. This claim covers a soda-lake about 4 miles west of the 70-Mile House, Cariboo road, and about 8 miles west of the Pacific Great Eastern Railway. A considerable amount of preparatory work has been done, such as sheds for storage, runways, etc., a force of about seven men being employed.

"About 300 tons of soda crystal has been taken off this lake, being the surface layer. One car-load has been shipped to the Prairies, and it is expected three additional cars will be shipped before the end of this year. If weather conditions continue favourable, it is hoped to ship three car-loads a week until March next, there being a market apparently in the Prairies as well as at the Coast.

"The *Margaret* mineral claim, adjoining the *Anita*, also covering a soda-lake, is not being worked this season, but shipping is expected to commence next year.

"The *Rose No. 3* and *Rose No. 4* mineral claims, situated on Burley Siding on the Pacific Great Eastern Railway, about 3 miles north of the 70-Mile House Station, are being operated under lease by J. A. Coulson & Sons from the Soda Mining and Products Company, Limited, Vancouver. A good deal of development-work has been done in connection with these claims in preparation for shipping, such as storage-sheds, runways from the lake, siding-roads, etc.

"One car has already been shipped and about six car-loads in storage. There are at present about four men handling the work and shipping is expected to continue until the spring. This soda is also obtained in the form of crystals from the lake.

"O. O. Janes, of Clinton, owner of the *Lela* mineral claim, adjoining the *Anita*, has made considerable preparations for shipping this winter, two car-loads having already been dispatched. It is reported that this claim has been leased to Vancouver interests.

"As far as I am aware, no work has been done this year on the Last Chance and Goodenough lakes, in the vicinity of Meadow lake."

LILLOOET DISTRICT.

LILLOOET MINING DIVISION.

REPORT BY JOHN DUNLOP, GOLD COMMISSIONER, LILLOOET.

I have the honour to submit the office statistics of the Lillooet Mining Division for the year ended December 31st, 1924.

Free miners' certificates issued	164
Mineral claims recorded	56
Mineral certificates of work recorded	158
Placer-mining claims recorded	1
Placer-mining leases issued	15
Placer-mining certificates of work issued	34
Placer-mining conveyances recorded	30
Mineral conveyances recorded	32

Revenue.

Free miners' certificates	$1,007 75
Mining receipts, general	2,365 70
Total	$3,373 45

CLINTON MINING DIVISION.

REPORT BY R. A. DORBELL, GOLD COMMISSIONER, CLINTON.

I have the honour to submit the office statistics of the Clinton Mining Division for the year ended December 31st, 1924.

Free miners' certificates	98
Mineral claims recorded	188
Certificates of work	230
Placer claims recorded	8
Bench leases issued	6
Bench leases in existence	~~11~~
Creek leases in existence	~~3~~
"Mineral Act," bills of sale, etc.	68
"Placer Act," bills of sale, etc.	5
Certificates of work (placer)	7
Certificates of improvement	14
Crown grants issued	10

Revenue.

Free miners' certificates	$ 616 50
Mining receipts, general	2,056 80
Total	$2,673 30

YALE DISTRICT.

NICOLA MINING DIVISION.

REPORT BY W. H. BOOTHROYD, MINING RECORDER.

I have the honour to submit the office statistics of the Nicola Mining Division for the year ended December 31st, 1924.

Free miners' certificates	80
Mineral claims recorded	46
Certificates of work	57
Bills of sale	6
Powers of attorney	1
Agreements recorded	1

VERNON MINING DIVISION.

REPORT BY L. NORRIS, GOLD COMMISSIONER, VERNON.

I have the honour to submit the office statistics of the Vernon Mining Division for the year ended December 31st, 1924.

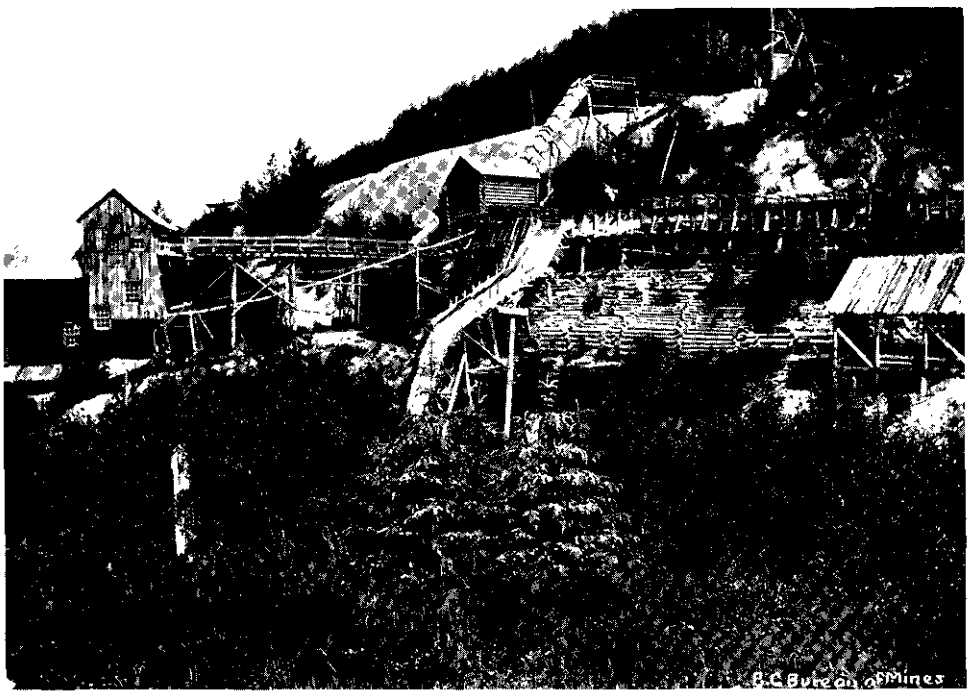
Free miners' certificates	289
Locations (mineral)	116
Locations (placer)	7
Certificates of work (mineral)	45
Filings	15
Placer leases	14
Conveyances	40
Leases of Crown-granted mineral claims	3

YALE MINING DIVISION.

REPORT BY D. A. HAZELTON, MINING RECORDER.

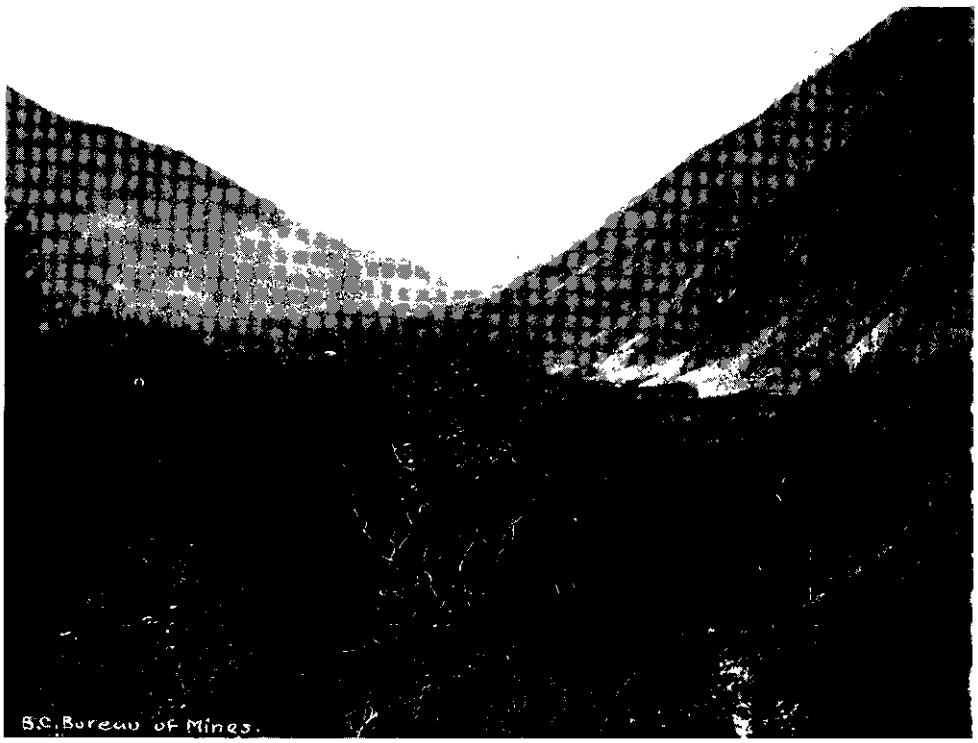
I have the honour to submit the office statistics of the Yale Mining Division for the year ended December 31st, 1924.

Free miners' certificates (ordinary)	205
Free miners' certificates (company)	2
Mineral claims recorded	153
Certificates of work (mineral)	161
Certificates of work (placer)	10
Placer leases in existence	~~18~~
Bills of sale, etc. (mineral)	68
Bills of sale, etc. (placer)	8
Powers of attorney (placer)	5
Filings	12



Pioneer Mine, Lillooet M.D.

Lorne Mine, Lillooet M.D.



Gun Creek, Lillooet M.D.

Native Son Mine, Gun Creek.

ASHCROFT MINING DIVISION.

REPORT BY W. C. ADAM, MINING RECORDER, ASHCROFT.

I have the honour to submit the office statistics of the Ashcroft Mining Division for the year ended December 31st, 1924.

Placer-mining leases granted	5
Mineral claims recorded	74
Certificates of works issued	86
Placer claims recorded	5
Free miners' certificates issued at Ashcroft	58
Free miners' certificates issued at Lytton	40

KAMLOOPS MINING DIVISION.

REPORT BY E. FISHER, GOLD COMMISSIONER.

I have the honour to submit the office statistics of the Kamloops Mining Division for the year ended December 31st, 1924.

Free miners' certificates (ordinary)	439
Free miners' certificates (special)	2
Mineral claims recorded	196
Mineral claims (partnership)	7
Placer claims recorded	10
Placer rerecords (partnership)	3
Placer leases issued	34
Certificates of work (mineral)	246
Certificates of work (placer leases)	16
Bills of sale	47
Powers of attorney	34
Certificates of improvements	4
Filings	47
Mining receipts	$7,683 40

SOUTHERN MINERAL SURVEY DISTRICT (No. 4).

REPORT FOR YEAR 1924.

By PHILIP B. FREELAND, RESIDENT MINING ENGINEER.

The above district, comprising four Mining Divisions—Grand Forks, Greenwood, Osoyoos, and Similkameen—is situated in the extreme south centre of the Province of British Columbia.

SYNOPSIS OF MINING IN THE DISTRICT.

The continued increase in the metal-output of the district during 1924, though small, is encouraging, especially to those dependent upon the mining industry for a living. Some new discoveries were made during the development of the older properties, most of which have lain idle for many years. The high price of lead and continued steady price of silver has helped the situation considerably and given impetus to the exploitation of the silver-lead areas.

Greenwood owes a debt of gratitude to those who have staked their time and money in the exploration of the mines adjoining the town and who are responsible for the influx of many new citizens. Their endeavours have met with a considerable amount of success and have been an incentive to others in other parts of the district to explore some of the older properties. Good transportation and power facilities have been a great assistance to those operating; and seeing that other parts of the district are as well served, further operations seem likely.

The *Horn Silver* mine near Similkameen Station, which has lain idle for several years, was leased and bonded by Vancouver interests, and from the latest reports some high-grade ore has been developed and shipped to the smelter, with prospects of further shipments being made.

Some ore of higher grade was discovered in the lower levels in the Hedley Gold Mining Company's property at Hedley, which seems to have given a more optimistic outlook for future operations, and it is to be hoped that the mine has many years' operation ahead of it.

Mining on Wallace mountain, Beaverdell, continued satisfactorily throughout the year, with increased shipments from the *Sally* mine. Both the *Bell* and *Sally* mines are instances of prospects developed into paying mines with a very small outlay of capital, plus a considerable amount of grit and good judgment on the part of Duncan McIntosh, of the *Bell*, and Ed. Nordman, superintendent of the *Sally*.

PLACER-MINING.

A greater interest than ever was shown in the Tulameen and Similkameen placers, especially in the vicinity of Olivine mountain, which is the origin of the platinum in the gravels. The continued high price of this metal ($115 an ounce) has been the chief incentive to development.

Attempts were made to save the magnetite and chromite sands (black sands) by means of mechanical devices on the ground, without very much success up to the present. Those interested continue working on the problem and are optimistic about overcoming such difficulties as present themselves—namely, (1) obtaining a sufficient tonnage of average economic value; (2) treating a large tonnage economically; (3) cleaning the product; and (4) treatment of the product after concentration.

The high price of arsenic early in the year created a demand for arsenical-iron ores. Several prospects were exploited especially in the neighbourhood of Hedley, but the price of arsenic dropped before much could be done to develop their size or mineral content. It seems probable that, unless some other insecticide is found, the demand for arsenic will be good, but fluctuating, owing to its seasonal use, so those interested would do well to continue their investigations. An arsenical-iron ore containing gold as well as arsenic is desirable.

The Allenby Copper Company at Princeton did not operate its properties on account of the low price of copper. With the price of copper about 15 cents a pound and a better constructive outlook for 1925, it seems likely that the company will once more resume work.

ROAD AND TRAIL ASSISTANCE.

Many trails and roads were built and repaired throughout the district by the Government in an endeavour to assist legitimate mining development. This work, wherever possible, was given

to the men interested in the properties to which a road or trail was built, and in this way the money earned found its way into the development of the mine or prospect concerned, thereby serving a double purpose.

The old *Nickel Plate* wagon-road from the Hedley Gold Mining Company's property to a point near the summit of the Keremeos–Penticton wagon-road was partially rebuilt. The remainder from the summit to the mine will probably be finished in 1925, as soon as the snow has melted. This road, although steep, will enable those resident at the mine to come and go by automobile instead of by the company tram-line, which has the drawback of only operating during certain hours.

COPPER.

There will undoubtedly be an increased demand for copper during the years to come, unless a substitute for it is found. The growing consumption of the metal in electrical products and the almost assured use of electricity in locomotion and as a heating factor all point towards a more extensive market in the future.

There is little doubt that, as time passes and our timber and coal resources diminish, our natural water-powers will be used for the generation of electricity, and as this business progresses the demand for copper should keep pace with it. Most authorities seem of the opinion that the price of copper will remain around 15 cents a pound for some time to come.

High prices for copper permit many small properties to operate, while most of the bigger copper companies, who rely upon large operations, low costs, and small profits per ton, can operate with lower metal prices. A higher price-level for copper in the near future may be caused by a larger demand due to the ability of European buyers to purchase all the copper they require. Therein lies some hope for the small tonnage medium-grade copper operator.

MINING.

The high price of lead was responsible for many inquiries from capital interests, some of which resulted in a considerable amount of development-work, resulting in a good measure of success. In others, not sufficiently backed by capital, little was accomplished and valuable time lost.

In nearly every part of the district attempts to commence operations after December 1st, unless camps have been established beforehand, generally results in failure and a large expenditure of money. Between April 1st and December 1st there is very little, if any, snow or frost and outside work can be done in an efficient way.

The boom in metal prices brought with it the usual number of promoters, some of whom were instrumental in spending the capital procured in a legitimate way and others in any other way but in mining development. The ardent desire of the wildcat promoter to build a mill before sufficient tonnage has been blocked out is an old one and very difficult to overcome. There are two good and sufficient reasons why a mill should not be built prematurely, namely: First, it is not good business until sufficient ore is obtainable to pay for the construction of the plant, together with some profit for the investor; secondly, until the ore is developed and its constituents known, the building of a mill would only be guesswork and the results probably disastrous. The argument that a plant built in a community would be an incentive to miners and prospecters to develop their claims might be good, but it does not alter the possibility or probability of the ores not being suitable for treatment in that design of plant.

TOTAL TONNAGE AND CONTENTS PRODUCED IN MINING DIVISIONS FOR 1924.

Division.	Ore.	Gold.	Silver.	Lead.	Copper.	Arsenic.	Coal.	Limestone.
	Tons.	Oz.	Oz.	Lb.	Lb.	Tons.	Tons.	Tons.
Grand Forks	604	302	2,891	.....	146,974	.....	.....	24,418
Greenwood	1,364	168	423,544	239,635	3,564	.....	.....	.....
Osoyoos	48,347	19,119	4,000	.....	.....	248	.....	.....
Similkameen	.....	.....	.....	.....	.....	.....	160,017	.....
Totals, 1924	50,315	19,589	430,435	239,635	150,538	248	160,017	24,418
Totals, 1923	45,019	10,934	227,047	161,008	.....	609	147,477	25,419

Approximately 700 tons of scrap from the floors of the Grand Forks and Greenwood smelters, averaging 8 per cent. copper, 0.25 oz. in gold, and 4 oz. in silver to the ton, was shipped to the Trail and Tacoma smelters. Correct figures on the placer-gold and platinum production are almost impossible to get owing to the fact that most of the metals are shipped out of the country or traded in at small stores for supplies, etc.

GRAND FORKS MINING DIVISION.

Fife Quarries.

These quarries, situated at Fife, were operated by the Consolidated Mining and Smelting Company, of Trail, during the year and 24,418 tons of limestone shipped to Trail for fluxing purposes.

Lightning Peak.

Operations in this camp were quiet during the year and only a few tons of silver-lead ore was shipped from the *West Fork* claim by W. Williams, of Edgewood. On the *Killarney* claim, owned by W. J. Banting, of Edgewood, a new cabin 13 by 15 feet was built and an open-cut 20 feet deep excavated. Development has opened up a lead 4 feet 8 inches wide, containing galena, gold, and silver, but not consistently mineralized. A new crosscut is being driven below the present workings which will give about 72 feet more depth.

Granby River.

Little Bertha. This property, owned by the Pathfinder Consolidated Company and situated about 12 miles from Grand Forks, was examined by United States interests and two men put to work in the lower crosscut tunnel. The upper workings, consisting of tunnels, a winze about 60 feet deep, and several upraises, show the vein to be generally broken and crushed and in the winze dipping at a very flat angle into the hill. The ore is pyrite and galena carrying values in gold and silver in a gangue of quartz. The country-rock is granodiorite intruded by porphyry dykes.

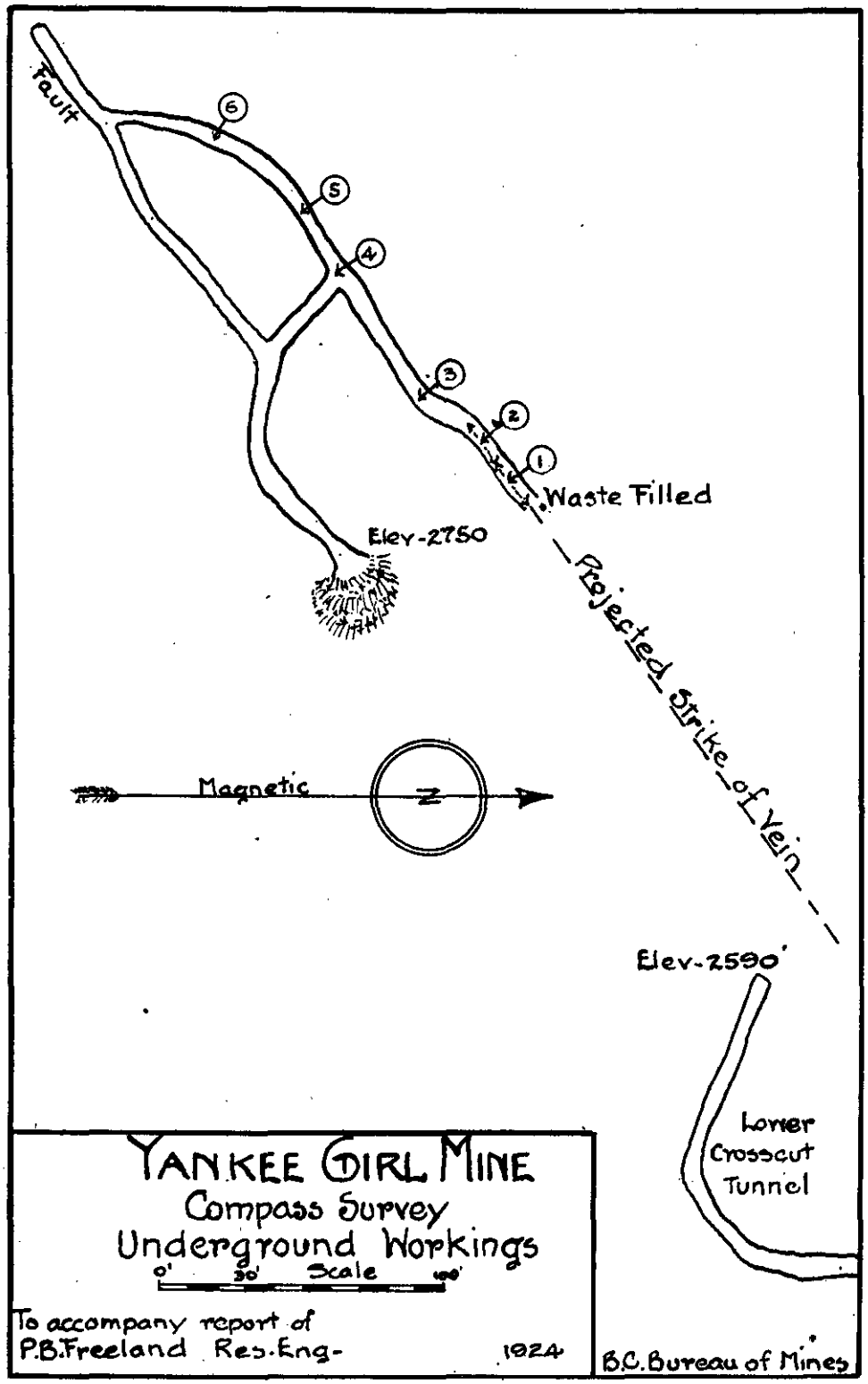
The lower crosscut tunnel, 600 feet long, was driven with the idea of cutting the lead developed in the upper tunnel at about 130 feet in depth. The driving of this tunnel, in the face of the fact that little or nothing was known about the vein at the bottom of the upper workings except hearsay, is not in accordance with good mining methods and therefore to be condemned. To open up the old crosscut tunnel which taps the bottom of the winze, and ascertain definitely the strike, dip, and values contained in the vein, would not cost much. By doing some development at that point the company would be sure whether or no a long tunnel below would be justified. The values in the vein below the winze may not be sufficiently high to pay for mining, or higher-grade ore may lie above and to the south of the winze, in which case the long crosscut tunnel would be an unnecessary development. If the values were found to be favourable in the winze an upraise could be driven from the lower tunnel after a survey had been made.

Mother Lode, Blue Bell, and Iron Mask. These claims are situated 8 miles north of Grand Forks, on the Granby river, and are owned by a Grand Forks syndicate. The old tunnel below the road, driven many years ago, was cleaned out and timbered, with the idea in mind of thoroughly sampling the mineralized zone. The results of the sampling have not yet been received. The ore is silver-lead and zinc in a gangue of highly silicified sedimentary rock. On the surface in a northerly direction there is a considerable amount of oxidation and development in this direction may open up an ore-body.

Copper No. 2. The development of the tunnel on this property, commenced two years ago by Pete Santure and Joe Gelines, of Grand Forks, was continued during the summer. Although there is a decided increase in mineralization, the contact of the limestone and granodiorite has not been reached at present.

Hardy Mountain.

Prospectors on Hardy mountain brought in some good-looking copper float. As this mountain is made up of limestone in different stages of alteration, also serpentine, formed from the alteration of basic igneous rocks, argillites, and greenstone intruded by granodiorite, it is a good area for intensive prospecting, especially in the limestone and serpentine contacts, where there is a possibility of finding platinum with the copper ores.


Fault
6
5
4
3
2
1
Waste Filled
Elev-2750
Projected Strike of Vein
Magnetic
N
Elev-2590'
Lower Crosscut Tunnel
YANKEE GIRL MINE
Compass Survey
Underground Workings
0' 50' Scale 100'
To accompany report of
P.B.Freeland Res.Eng- 1924
B.C. Bureau of Mines

Yankee Girl and Yankee Boy.

These two Crown-granted mineral claims, situated on Hardy mountain approximately 2 miles west of Grand Forks, have lain idle for some years until the autumn of 1924, when George Mattocks, of Grand Forks, obtained a lease and bond from the owners in Montreal. No development-work has been undertaken to date, due to the inability of the lessee to interest capital locally. A good deal of development has been done on the *Yankee Girl*, as follows: An upper crosscut 100 feet long and 360 feet of drifting on the vein, also a crosscut approximately 160 feet lower in elevation and 270 feet long. The lower crosscut has not cut the vein (*see* sketch), but will do so in about 30 feet, providing the vein persists in depth and holds its strike.

In the upper workings the vein varies in width from 2 to 16 inches and is made up of iron pyrites, galena, sphalerite, gold, and silver in a gangue of quartz. The country-rock is greenstone. A good wagon-road traverses the lower part of the claims.

Assays from samples designated on the map are as follows:—

No.	Gold.	Silver.	Lead.
	Oz.	Oz.	Per Cent.
(1)	0.50	0.50	.....
(2)	1.82	1.00	.....
(3)	0.30	0.30	.....
(4)	0.40	0.40	.....
(5)	3.24	2.00	0.8
(6)	2.20	1.20	.....
(7)	0.10	0.20	.....

OBSERVATION MOUNTAIN AREA.

Adjoining Grand Forks to the north and east are extensive areas of gneisses and highly metamorphosed chlorite, hornblende, and mica schists, with small inclusions of limestone. These rocks are in turn intruded by pegmatite dykes. A general mineralization of iron pyrites and magnetite occurs throughout the area, with smaller segregations of chalcopyrite, galena, and zinc.

In the latter much hornblende and chlorite is apparent and traces of gold and platinum are found. The finding of platinum in a schistose or gneissic rock is somewhat unusual, and it seems probable that its origin is due to an intrusive basic rock that does not outcrop, or it may be associated with the copper sulphide in the form of sperrylite. Washed, pulverized rock does not show any native platinum in a pan, but it may be included in the magnetite or chromite and be invisible under a magnifying-glass. A good deal of prospecting by means of shallow shafts, open-cuts, and short tunnels has been done in this area, but so far there has been no proven tonnage containing high enough values for profitable mining developed. Possibly deeper development may find larger segregations containing this mineral.

These gneisses and schists resemble (according to R. W. Brock) the Shuswap series of the Kamloops area, but the correlation has not been definitely proven.

PAULSON.

Berlin and Alice L.

A lease and bond was taken on these claims by a Spokane syndicate and the old 10-stamp mill put in order for a test run, with the addition of a small flotation unit. Good results were obtained, but the company ran short of funds and the plant closed down. These properties have been referred to in previous Annual Reports. These claims are in Trail Creek Mining Division.

Monito.

This claim lies in the Burnt basin about 3 miles west of Paulson, on the Canadian Pacific Railway. The owner, R. Cooper, of Trail, has done a lot of development-work by means of open-cuts, shallow shafts, and tunnels. The ore on the east side of the claim is a mixture of zinc and galena in limestone near its contact with a porphyry dyke.

There is a lot of mineralization through the limestone on this claim, especially on the west side, where the veins contain copper; they can be traced for 100 feet and vary in width from 2 inches to 2 feet.

Samples of ore in the west vein assayed 0.02 oz. gold, 11.3 oz. silver to the ton, 7.92 per cent. copper, 0.7 per cent. lead, and 27 per cent. zinc. A selected sample from the east vein assayed

0.02 oz. gold, 14.4 oz. silver to the ton, 32.1 per cent. lead, and 16.6 per cent. zinc. This claim lies in the centre of a mineralized area called Burnt basin and adjoins the *Molly Gibson* mine to the north

Grand Forks Smelter.—W. Clark, of the Boundary Equipment Company, cleaned up the floor and flumes of the old Granby smelter and shipped several car-loads of cleanings to the Tacoma and Trail smelters. Some of the material carried good values in copper and gold. Late in the season Mr. Clark erected a Wilfley table and concentrated some of the lower-grade sands and gravel successfully.

GREENWOOD MINING DIVISION.

Providence. This mine, under the management of W. Madden, of Greenwood, operated practically all the year. A total of 202 tons of ore was shipped to the Trail smelter, containing gold, silver, and lead. A small pocket of gold ore which showed a high percentage of the native metal was discovered in the 500-foot level. About forty men were employed in the mine.

Strathmore. A Greenwood syndicate of four men operated this mine on a small scale during 1924 and shipped 16 tons of silver, gold, and lead ore to the Trail smelter. Development-work consisted of 300 feet of drifting, a 40-foot shaft, and 45 feet of open-cutting and trenching. The property was mined about twenty-five years ago and some ore shipped. Since that time but little has been done until the present syndicate took over the mine.

The old workings consist of a tunnel and shaft and several drifts on the vein, as well as crosscuts. The vein varies in size from 1 inch to 1 foot and is mineralized with galena, iron pyrites, zinc, gold, and silver in a gangue of quartz. The country-rock is granite and diorite.

A few feet to the north of the old workings the vein has been faulted in an easterly direction, throwing it up the hill. The ore lying to the north of the fault was discovered and is being mined by the present owners. After the upper part of the vein was stoped out a crosscut was driven below to develop the vein at a greater depth.

Considerable difficulty was experienced owing to the lead being pinched to such an extent that it was unrecognizable and there being several other mineralized fissures.

After crosscutting for about 60 feet to the east the owners decided to follow the first vein cut. The fracture opened into an ore-shoot at about 100 feet from the crosscut. As there is ore in the bottom of the drift, it seems likely that another lift will be taken on the vein mined by driving an upraise from the old workings.

The ore carries from 0.23 to 1.82 oz. gold, from 128.4 to 176.4 oz. silver to the ton, and from 1.95 to 7.15 per cent. lead. A great deal of credit is due to the operators for their perseverance and faith in the property. The results so far do not appear to have repaid the syndicate for the effort made, but with the ore-body definitely located above and below the present tunnel profits may be looked for.

Elkhorn Fraction. This claim, owned by W. McKenzie, of Greenwood, and adjoining the *Providence* mine to the south-west, has been leased by G. S. Walters and associates, of Greenwood. A shaft has been sunk to a level deep enough so that solid rock will be struck when the crosscut driven south-east taps the projected strike of the *Providence* vein.

Providence creek cuts across the corner of the *Elkhorn Fraction* and has deposited a heavy overburden of gravel in the gulch. To avoid trouble with gravel and water it was found necessary to sink this shaft away from the strike of the vein.

Defiance. During the year Robert Lee, of Greenwood, continuously developed this claim, situated 1 mile north-east of Greenwood, by means of crosscuts, open-cuts, and shafts. Some high-grade gold, silver, and lead ore was mined, but owing to the extreme flatness of the faults the owner experienced some difficulty in extracting it. It is more than probable that as depth is attained the faulting will become less extreme and the ore more easily mined. A sample from a lower open-cut assayed 0.42 oz. gold and 132.6 oz. in silver to the ton.

Combination. The owners of this mine sank a 35-foot shaft on the vein in the tunnel to the south-west of the crosscut. The lead varies from 2 to 6 inches and is mineralized with gold, silver, and lead in a gangue of quartz. This mine was reported on in the 1923 Annual Report.

Spotted Horse. Further development by Spokane interests in the lower tunnel and upper open-cuts of this mine showed a continuance of the lead. As hand-drilling was resorted to, little progress was made in this extremely hard granodiorite. The company is contemplating the erection of a compressor to continue this work; this will greatly facilitate development and prove or disprove the possibilities of making a mine in a comparatively short period.

Prince Henry. A lease was taken on this old mine by G. S. Walters and associates, but no work was done during 1924. The lessees intend to erect a compressor and commence work early in 1925. Some high-grade ore was mined from this claim some years ago.

Old Canada Copper Company Smelter.—A shipment of about 54 tons of scrap, consisting mostly of converter linings, was made to the Trail smelter by the Boundary Equipment Company. This material contained between 3 and 4 per cent. copper, as well as gold and silver values.

D.A. Group. This group of claims, consisting of the *D.A.* and *D.A. Fraction*, is situated in Deadwood camp, which adjoins Greenwood to the west; it is owned by J. Graham and I. Hallet, of Greenwood. A lease and bond was taken on the group by English interests under the management of C. Skilton, of Spokane, and a compressor and engine erected.

Mr. Skilton's plans include the driving of a crosscut tunnel for about 600 feet, which will pass through two or three parallel veins outcropping about 125 feet above. The ore in these veins is a mixture of silver, lead, zinc, and iron pyrites in a gangue of quartz. Development-work on the surface consists of shallow shafts, trenches, and open-cuts.

A sample taken from the *D.A.* workings assayed 0.37 oz. gold and 43.6 oz. silver to the ton. A sample taken from the *D.A. Fraction* open-cut assayed 0.16 oz. gold, 124.20 oz. silver to the ton, and 10.4 per cent. lead. The veins vary from 2 inches to 2 feet in width.

The location of these claims, about 2 miles from Greenwood by wagon-road, greatly facilitates operations.

WALLACE MOUNTAIN.

Sally Group. This group, owned by the Wallace Mountain Mines, Limited, of Beaverdell, was operated steadily throughout the year with an average crew of twenty men. Development-work consisted of 805 feet of drifting, 355 feet of cross-cutting, and 344 feet of upraising. During the year 690 tons of silver-lead ore was shipped to the Trail smelter, averaging 358 oz. in silver to the ton, as well as some lead. Extensive improvements were added to the camp—namely, a Westinghouse 60-light electric-light plant; a storehouse and carpenter's shop was built, the mine office improved, and a private telephone-line built from the mine to Beaverdell. The bunk-house, dining-room, kitchen, and sitting-room were entirely renovated.

The superintendent, Ed. Nordman, writes that, on the whole, the year has been a most successful one, and with a considerable amount of ore in sight he expects as much success in 1925.

Bell. Operations on this mine continued satisfactorily throughout the year under the direction of McIntosh and Crane. A total of 384 tons of silver-lead ore was shipped to the Trail smelter. When blasting a stump to level some ground for a tennis-court a high-grade vein was discovered. Two or three car-loads of ore were taken from this vein, which proved to be the top of a vein already mined below. A fault had thrown the vein in the direction of the would-be tennis-court.

Standard Fraction.—This claim was leased by Messrs. Boyce and Jackson, of Grand Forks and Greenwood, and Mark Smith, of Beaverdell. A total of 8 tons of silver-lead and zinc ore was shipped to the Trail smelter.

Rambler Fraction. A lease and bond was taken on this claim by Vancouver interests and the lower crosscut tunnel extended with the idea of tapping the veins outcropping on the surface. The lease was dropped by those interested before sufficient work had been done. For many years, Wm. Rambo, the owner, has shipped ore from this claim and much development-work has been done by him during that time, consisting of two shafts 85 and 30 feet respectively, with 50 feet of tunnel from the bottom of the 85-foot shaft. Besides this work, numerous crosscuts, drifts, and open-cuts have been excavated.

Tulameen River -Testing Placer.

Peridotite Outcrop, Otivine Mountain.

The faulting system is similar to that on other parts of Wallace mountain and difficult to follow. A new company commanding Vancouver capital has taken hold of this property and is developing it.

Inyo and Ackworth. These claims, mentioned in the 1923 Annual Report, have been leased and bonded by Vancouver interests, and according to the latest reports a compressor has been erected near the workings. No information is available as to how much work has been done since the erection of the machinery, but the surface showings warrant some development.

OSOYOOS MINING DIVISION.

Morning Star Group. This group consists of the *Morning Star*, *Black Diamond*, and *Silver Crown* claims and is situated about 1 mile north of Fairview. A lease and bond was taken on these claims by Vancouver interests and the old surface workings cleaned up and some development-work done in the tunnel of the *Silver Crown*. Prior reports have alluded to these claims and the development-work done many years ago.

This year's underground work consisted of an extension of the upraise in the *Silver Crown* tunnel. The vein widened out to 8 feet and a sample assayed 0.32 oz. in gold and 5 oz. in silver to the ton. By sorting the ore probably much higher values could be obtained, because there are streaks of barren white quartz running through the vein. The persistence and width of the veins on this property seem to warrant further exploitation.

Juniper and Huntsman Group. This group consists of the *Juniper*, *Juniper No. 2*, and the *Huntsman* claims and is owned by Fred G. Watkin and J. Davis, of Fairview. The claims can be reached by trail about 4 miles south-east of Twin lakes or from Kreuger's ranch in Meyers flats. Fred G. Watkin has done a lot of surface development-work, consisting of trenches, open-cuts, and shallow shafts, on three quartz veins varying from 2 inches to 4 feet wide. A good deal of free gold is apparent in the quartz and is generally associated with a fine-grained galena.

A sample from the *Juniper No. 2* dump from a long open-cut assayed 0.88 oz. in gold and 0.20 oz. in silver; other samples from the *Huntsman* claim varied from a trace in gold and silver to 3.2 oz. in gold and 1 oz. in silver.

The country-rock is schist, cut by quartz porphyry dykes. The veins seem to conform to the strike of the schist and are much faulted and warped.

No development-work has been done below a depth of 10 feet, so that little can be said regarding the possible future of these veins. In the Fairview camp in the same mineralized belt, where the formations are similar, the veins have been developed to a depth of 300 feet, and if reports can be believed values from $6 to $10 a ton are obtainable.

The lack of sufficient water in the immediate vicinity is a drawback to any milling proposal should sufficient medium-grade ore be developed. About 4 miles to the south on the Fairview-Keremeos summit there is a small lake which might be diverted for use in a mill. Until more tonnage is developed and an average grade of ore assured that will pay for the construction of a concentration plant, together with some profit for the owners, it will be advisable not to spend any money on mill-construction.

These claims adjoin the old *Oro Fino* mine, where a good deal of development was done some years ago and a half-hearted attempt made to amalgamate the gold.

Nelson. This claim, situated on Independence mountain about 7 miles east of Hedley, is owned by James McNulty, of Hedley, and has been referred to in the 1923 Annual Report. Mr. McNulty this year sank a few feet on the winze at the end of the upper tunnel and drove a new open-cut on the strike of the lead about 50 feet lower in elevation. A sample of the ore from the lower open-cut assayed 1.04 oz. gold, 0.44 oz. silver to the ton, a trace of copper, and 3 per cent. arsenic.

Snowstorm. This claim is situated about 4 miles in a south-westerly direction from Hedley, on the east slope of Sterling creek, at an elevation of approximately 4,200 feet above sea-level. The owners, J. Robinson *et al.*, of Hedley, cleaned out the old shaft and excavated three open-cuts down the hill on the strike of the lead.

In two of the open-cuts ore was developed. The difference in elevation between the collar of the shaft and the lowest open-cut is about 60 feet and the horizontal distance 110 feet. The ore is arsenopyrite carrying gold, silver, and arsenic.

Due probably to its semi-oxidized state, a wide range of values has been obtained from several samples taken from the lead about 1 foot wide at the bottom of the shaft. One sample taken assayed 0.26 oz. gold and 0.40 oz. silver to the ton. The arsenic percentage was not calculated. Other samples assayed 0.56 oz. gold, 3 oz. silver to the ton, and 7 per cent. arsenic.

The lead being faulted and crushed in the shaft, it seems advisable to concentrate development-work in the lowest open-cut, where a tunnel could be driven.

Hedley Gold Mining Co.

Operations were successfully conducted throughout the greater part of the year by this company at Hedley until weather conditions in the late autumn prohibited further work. According to reports, a good deal of damage was done by ice to the company's dam across the Similkameen river. A sudden change of temperature causes the ice to move and congest in any narrow passage-way, which is a constant danger during a few weeks in the winter-time. A total of 48,300 tons of ore was mined and milled, from which 2,230 tons of concentrates was saved, containing gold and arsenic. A better grade of ore is reported to have been struck in the lower levels of the mine, which helped the yearly average considerably.

Horn Silver Group.—The British American Mining Corporation, operating this group near Similkameen, shipped about 47 tons of gold-silver ore.

SIMILKAMEEN MINING DIVISION.

Red Bird.

This claim, situated on Rabbit mountain about 4 miles in a south-westerly direction from Tulameen, is owned by F. J. McMahon, of Coalmont. During the past fifteen years this claim has been developed by other interests and two crosscuts driven, one about 400 feet long, with an inclined winze 50 feet deep, from the crosscut, and the other a lower tunnel 85 feet long and 75 feet below in elevation.

Mr. McMahon unwatered the inclined winze and sampled the vein, which is about 3 feet wide at the bottom. This sample assayed a trace in gold, 2.6 oz. silver to the ton, and 2.20 per cent. copper. The mineralization in the vein consists of pyrite, chalcopyrite, gold, and silver in a highly siliceous gangue. The country-rock is chlorite-schist.

The vein, which dips about 24° into the hill for 45 feet in the shaft, tilts to 45° at the bottom, and should this dip be maintained the lower crosscut tunnel should strike it 130 feet from the face.

Eureka.

This claim, situated on Treasure mountain and mentioned in the 1923 Annual Report, was developed during the season by the owner, Andy Jensen, of Tulameen. The work done upon the open-cut (as shown in map) exposed some high-grade galena which averaged about 18 inches in width and carried values of a trace of gold, 126 oz. silver to the ton, and 72 per cent. lead. Some carbonates scraped off the top of this vein assayed over 1,000 oz. silver to the ton. Further development on this open-cut proved the vein to be somewhat split up and displaced. The vein in the tunnel has also been split and lies in stringers.

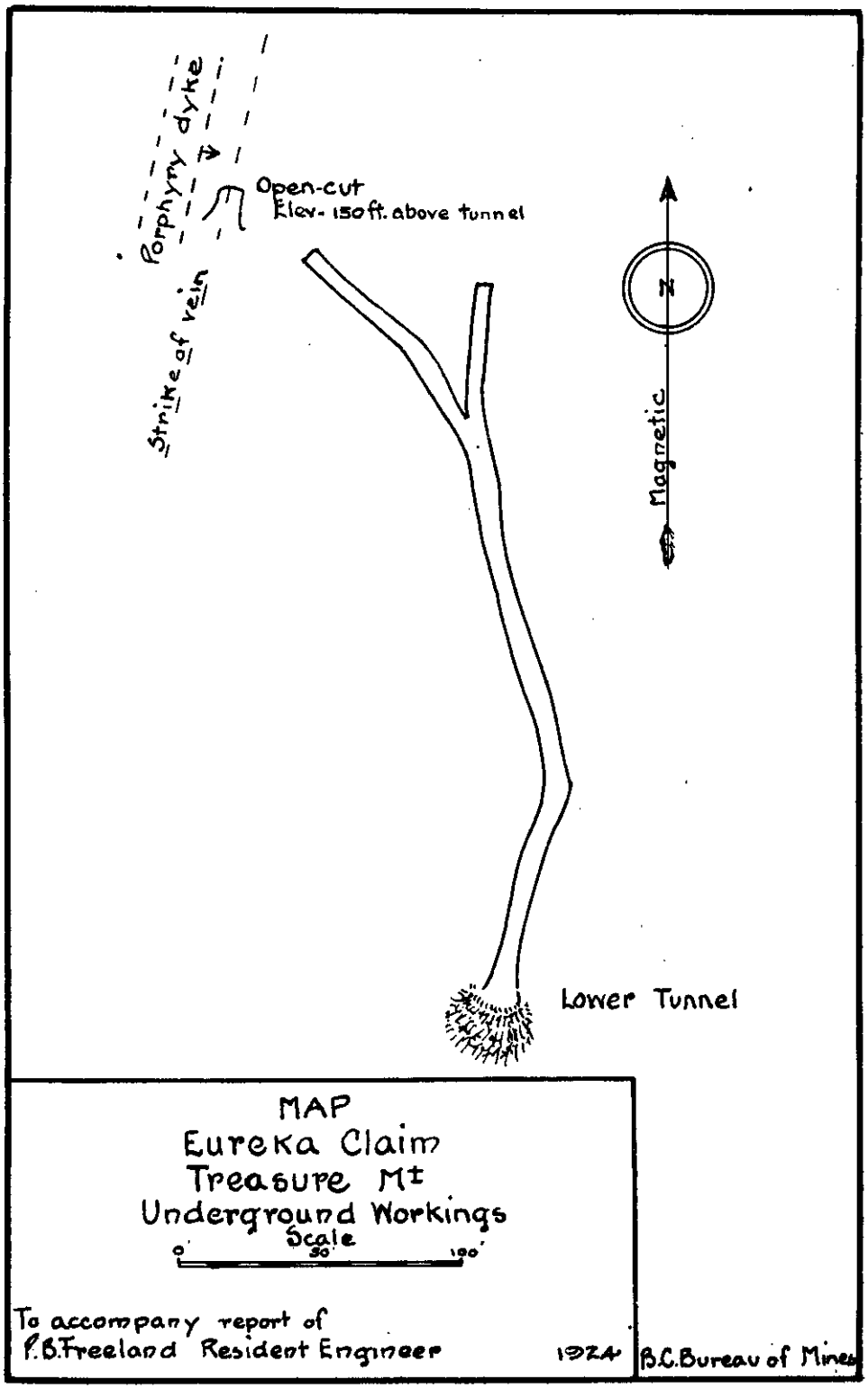
Practically all the better-grade ore on this mountain, so far as development has shown, lies within 100 feet of the surface; consequently it seems advisable for those interested to confine their efforts to the undeveloped ground lying above most of the present workings. Should this area contain ore-bodies of sufficient value, then exploitation at depth might be resorted to, in hopes of finding either more high-grade ore or large medium-grade bodies that might pay to mill.

The persistence of the veins, both on the surface and wherever developed underground, is an attractive feature in the locality and it seems quite possible that payable ore-bodies will be discovered.

The owners of claims would do well to remember that the assays of hand samples that do not represent any tonnage are not always sufficient evidence to warrant calling in outside capital, and more often than not much harm is done to the locality by overestimating the possibilities from such assay results.

OLIVINE MOUNTAIN.

In 1923 an examination of the ultrabasic irruptive rocks forming Olivine mountain and the surrounding territory was made by Eugene Poitevin, of the Mines Branch, Ottawa. The


Porphyry dyke
Strike of vein
Open-cut
Elev- 150 ft. above tunnel
N
Magnetic
Lower Tunnel
MAP
Eureka Claim
Treasure Mt
Underground Workings
Scale
0
50
100
To accompany report of
P.B. Freeland Resident Engineer
1924
B.C. Bureau of Mines

reason for this study was that these rocks are believed to be the source of the platinum in the Tulameen placers; a comparison was made of these rocks and similar formations in the great platinum placer-fields of Russia. Dr. Poitevin's report appears in 1923 Summary Report, Part A, of the Geological Survey, Canada, from which the following excerpts are taken:—

"*Chemical Composition of Platinum.*

"Native platinum found in dunite, pyroxenite, and placer deposits is not pure metal. It is essentially a solid solution of platinum and iron or of platinum and palladium, to which iridium, rhodium, osmium, copper, gold, silver, nickel, cobalt, and manganese are commonly added.

"*Primary Platinum Deposits.*

"After studying the Uralian and other platiniferous areas for more than twenty years Professor Duparc concluded that three typical primary deposits may be distinguished:—

"(1.) A dunite type in which the mother-rock of platinum is dunite surrounded by successive zones of koswite, pyroxenite, and gabbro. This is the classic type, and wherever dunite is observed with its marginal zones of pyroxenite and gabbro it is always more or less platiniferous. The great placer deposits of Taguil, Iss, Koswinsky, etc., were derived from such type of rocks and so were the Tulameen placers.

"(2.) A pyroxenite type in which the mother-rock of platinum is practically a koswite. This pyroxenite may be associated with gabbro but never with dunite. Even in the Urals such occurrence is rare. Placer deposits derived from this type or primary ground are always poorer than the dunite type and their occurrence does not necessarily mean the presence of platinum.

"(3.) A peridotite type in which the rock is in all places a peridotite carrying more or less large quantities of rhombic pyroxenes and some accessory monoclinic pyroxenes. These peridotites pass laterally to dunite, but rarely to true pyroxenites. They mostly contain brownish spinels and chromite grains. Moreover, these peridotites may be serpentinized to such an extent that none of the primary minerals can be recognized. Rocks of this type occur at Khrebet-Salatim, northern Ural mountains, Russia; and at La sierra de Ronda, Andalusia, Spain. According to Professor Duparc, placer deposits derived from such rocks are not sufficiently known to allow any conclusions to be drawn as to their commercial value.

"Although native platinum is not commonly observed in massive dunite, several localities in the Urals are known where it was found in-place. In some cases it was observed either as minute, isolated octahedra 1 to 3½ millimetres in diameter that are associated with more recent olivine crystals, or as minute segregations. Native platinum may also occur in dunite as large, compact masses older than the associated olivine. It has also been recognized as inclusions in chromite. In many cases when the chromite is removed by a bisulphate of carbonate fusion the remaining platinum forms a spongy mass. Platinum is a product of magmatic crystallization formed later than chromite.

"Dr. Wyssotaky gathered a large number of dunite and chromite specimens from the primary outcrops of Taguil, Weressowy, Kamenouchky, etc., from which twenty-five samples of all descriptions were prepared and submitted for assay. Twenty-two of them gave negative results and the remaining three revealed very small quantities of platinum. Similar results were obtained in assaying the Tulameen dunites.

"When searching for native platinum in dunite or serpentinized areas, it should be remembered that this alloy has an erratic distribution and that negative assay results may be the rule in either rich or poor primary platiniferous ground.

"About twenty primary platinum deposits are known in Ural mountains. Most of them are located in chromite schlieren; a few are in dunite. Although small bonanzas were found at times, experience showed that systematic mining of primary ground was impracticable.

"No primary platinum deposits have yet been recorded from Tulameen map-area. This is probably due to the removal in Pleistocene time of preglacial dunitic debris from the gulches.

"*Placer Deposits.*

"The richness of platiniferous placers derived from dunite and its associated rocks is governed by several factors, such as the area of primary rocks exposed (especially the dunite), the length of time during which the rocks were submitted to destructive agencies, and, to a certain degree, to the abundance and volume of chromite segregations (since platinum is associated with chromite). The preservation of accumulated gravels, sand, and pay-dirt from

subsequent disturbances such as glacial action is a factor among others that may influence the economic value of placer-grounds.

"During post-Tertiary time special climate conditions favoured the erosion of the Ural rugged mountain system; hence the rapid disintegration of ultrabasic rocks and the formation of huge platinum placers. Continental ice which invaded European Russia never developed in the Urals and the placers already formed were not disturbed.

"In the Urals, to each primary dunite-outcrop corresponds a large volume of platiniferous river-gravels.

"From the primary dunite-outcrop of Taguil 65 miles of workable platiniferous gravels are distributed along the valleys of the Martian, Wyssim, and Tschauch rivers, Taguil area, Russia.

"From the primary outcrops of Weressowy and Swelti-Bor were derived 125 miles of platiniferous gravels distributed along Iss river and its tributaries; from the primary outcrops of Kamenouchky, 30 miles of river-gravels; from the Sosnowsky, 28 miles of river-gravels; from Koswinsky-Kamen, 28 miles of river-gravels.

"The above list does not include all the smaller placers, and yet more than 276 miles of platiniferous gravels along the rivers in the Urals have been actually exploited or are being worked.

"The topography of Tulameen map-area is distinctly of the plateau type. With the exception of Tulameen river, which divides the main dunite-exposure into two parts, the drainage is limited to a few creeks. The disintegration of basic rocks was accordingly not so extensive as in the Urals. Tulameen valley was overrun by local glaciers, and thus certain parts of the valley, which probably at one time contained the richest platiniferous deposits of the district, were severely glaciated and the platiniferous gravels left behind greatly impoverished.

"Before glaciation Tulameen river and its tributaries probably had more than 30 miles of platiniferous gravels, but whereas the gravels of the Urals were spread in broad valleys, these of Tulameen were deposited in narrow, almost canyon-like channels.

"From 1824 to 1915 (ninety-two years) the total platinum production of the Urals is officially given at 14,479 poods, corresponding to 231,664 kilos of approximately 8,120,000 troy ounces. According to Professor Duparc, these figures are low because they do not include the large amount of platinum stolen by the labourers or the professional thieves. At Taguil alone it has been proved that only half the output of the placers reached the owners.

"The total platinum production of Tulameen map-area is officially given as 10,000 oz., but it is generally conceded that the output of the placers was more likely to have been 20,000 oz.

"The above notes will explain why the placers of Tulameen are smaller, poorer, and cannot be compared with the Uralian placers, although the primary dunite-outcrop of Tulameen was as rich in platinum as any of the Uralian dunite exposures of the same size.

"*Conclusions.*

"The following detailed study of Olivine and Grasshopper mountains, Tulameen map-area, shows that the primary platiniferous rocks of Tulameen are of the Uralian type. The area of dunite and pyroxenite exposed is smaller than at Taguil, but is quite comparable in size and otherwise with several other Uralian occurrences. This petrographic comparison adds strength to Duparc's statement that placer deposits derived from rocks of the Uralian type are always platiniferous. The present investigation does not change any conclusions arrived at by Camsell as to the economic future of Tulameen. The placers of that district were fairly prospected and up to date probably 20,000 oz. of platinum has been recovered from them, but unfortunately the greater part of this output was disposed of when platinum was at its lowest price.

"The basic rocks from which the platinum placers of Russia are derived were proved by Professor Duparc to constitute thick sills. These sills were in many places sufficiently truncated by erosion to expose the dunite and its consanguine associates. Thus, for 300 miles along the east flank of the Urals, dunite is to be found outcropping at intervals. If, as there is every reason to believe, the Tulameen irruptives are similar in form, it is to be expected that they are distributed along a line somewhat parallel to the Coast range. Olivine and Lodestone mountains are the only two separate dunite-outcrops of the same age known to exist in the part of British Columbia, but it is most probable that other exposures are likely to be found, especially south of Tulameen map-area, where the country is not so heavily covered by younger volcanics as it is north of Olivine mountain.

"Although southern British Columbia is in no way an ideal territory to look for placer deposits, prospecting for primary platiniferous dunite in that direction may nevertheless lead to a possible discovery similar to that of Tulameen, which when at its best would have been a good business proposition had native platinum then been worth $122 an ounce instead of $2 or $3.

"Briefly summarized, the following suggestions may be of value and assistance to those interested in prospecting for native platinum.

"Prospecting should first be carried on preferably in an unglaciated area, to locate basic irruptives having the petrographic characters outlined in the following pages. When such an area is located, the gravels of those parts of old or recent streams traversing it should be very carefullly examined. Native platinum in many cases is extremely fine and it may be overlooked by expert panners. This will occur especially if the platinum is magnetic, as the metal will then adhere and be carried by magnetite, which generally forms a good percentage of the heavy concentrates. No dunite or serpentinized area should be abandoned as being non-platiniferous because any assay of some specimens failed to give positive results."

Dr. Poltevin's interesting report shows a distinct similarity between the Russian platinum-bearing rocks and those of the Tulameen River area, so that those intending to search for platinum might do well to familiarize themselves with the Tulameen variety before starting on a prospecting expedition.

Granite Creek.

Swan Lease. This old placer-ground, situated about 2 miles up Granite creek from its mouth, has been operated by the Hematite Iron and Gold Mines Development Company, with offices in Seattle, Wash. A tunnel was driven 350 feet from Granite creek north-west and a 60-foot shaft sunk from the tunnel in an endeavour to strike bed-rock near the old workings, but without success. The vertical walls, 66 feet wide and striking in a north-east direction, encountered in the tunnel point to an old river-channel and possibly a canyon, where there seems to be little likelihood of finding pay-gravel. A new tunnel was commenced in September from the Tulameen river near Coalmont and distant about 4,000 feet from the old *Swan* property workings. This tunnel has possibilities of success as far as the pay-gravels of the Tulameen river are concerned, but it is probably too low and too far distant to be of any service for extracting the old *Swan* claim gravels. It is estimated that this 4,000-foot tunnel, if excavated, would reach a point 100 feet below the bottom of the shaft in the *Swan* lease tunnel.

If the outlet of this buried channel could be discovered on the Tulameen river there would be a better chance of finding pay-gravel. It seems advisable, therefore, to continue the new tunnel until bed-rock is reached and then swing it along the south bank of the Tulameen river with the idea of picking up the gravels deposited near the outlet of the *Swan* channel.

Bush Lease. A syndicate of four men financed this lease, which is situated about 4 miles up Granite creek. During the low water a pipe-line was constructed from Holmes creek, so that hydraulic operations could be carried on as soon as the spring run-off commenced. This lease is situated on the east side of Granite creek and Holmes creek is on the west, so that the pipe-line had to be slung across Granite creek.

Princeton Mining and Development Co. This company's property, situated 4 miles east of Princeton and mentioned in the 1923 Annual Report, was developed on the upper and lower levels during 1924. The lower tunnel, driven through the quartz-porphyry dyke for about 150 feet, encountered andesite, or the same formation that is ore-bearing in the upper levels. The fractures in the andesite are slightly mineralized close to its contact with the porphyry, but no regular vein had been discovered at the time of examination. The upper tunnel was also driven and the same class of ore encountered.

The new 250-ton ore-bin was finished and a spur 400 feet long completed from the Great Northern Railway, so that the property, with compressor, boiler, and all necessary mining equipment, is ready to commence operations. The higher price of copper will help this mine and no doubt shipments will be made shortly.

Princeton B.C. Colliery Co., Ltd. A new shaft was sunk on this company's property on the west side of the Similkameen river, adjoining the town of Princeton, and a good seam of coal developed. The new shaft was found necessary because the No. 1 on the east side of the river caught fire some years ago and was considered dangerous. No. 2 shaft, still farther east, was not considered satisfactory owing to severe

crushing caused by intrusive rocks. The new shaft when sunk to a sufficient depth will enable the coal lying beneath the fire-zone in No. 1 shaft to be mined safely. The quality of this coal is excellent.

Tulameen Valley Coal-mine.

This property, a recent discovery made by Chas. Hunter, of Princeton, is situated on the owner's ranch, about 1½ miles west of Princeton. An opening driven about 125 feet developed a 10-foot seam of clean coal, which the owner shipped to and sold in Princeton. Little can be said regarding the future of this discovery until more work has been done, but should the quality and size be maintained there is every promise of an assured market for the product. The Kettle Valley Railway is within a mile of the opening on level ground, and, when tonnage demands it, no doubt a spur will be built.

Voight's Camp.

A full geological report made by Dr. Dolmage, of the Geological Survey of Canada, on this area is in course of preparation and is expected to be published in 1925. Many instructive theories will probably be advanced which may be exceedingly useful to those operating in the area, as well as the prospector, who may apply such theories advantageously in other areas of similar character.

An examination was made of some of the surface and underground workings on some of the claims. The ore-bodies appear to have been formed in lenses having a general north-and-south strike. Their size has not been definitely proven, but judging by the surface indications there is a very extensive area of mineralized rock containing variable amounts of copper. The minerals observed under a magnifying-glass were chalcopyrite, bornite, magnetite, and pyrite, in a siliceous gangue. The ore, especially on the *Duke of York* claim, which lies on the Similkameen River slope, is formed in the fractures of a pink feldspathic rock.

Much development has been done by Emil Voight, the owner, by trenches, open-cuts, shafts, and tunnels, which has not definitely proven any ore-bodies, but has shown the surface and in some measure the underground extent of the mineralization; this work will be a most important guide to future necessary development before the property can be operated.

The situation of these deposits is ideal from an operating standpoint, having electric power, a railway, and water all within comparatively easy reach. The more hopeful outlook of the copper market should bring these properties to the attention of the public.

BENTONITE.

This mineral, occurring with the coal-measures near Princeton, has created a good deal of interest. Hugh S. Spence, Mines Branch, Ottawa, examined this deposit in 1924 and his report can be obtained from the Mines Department, Ottawa.

The main constituents of this mineral are, according to Mr. Spence, silica, alumina, and water, which make up 90 per cent. of the material. The remaining constituents are chiefly iron, magnesia, lime, and the alkalies. The origin of bentonite has been defined as a transported, stratified clay formed by the alteration of volcanic ash shortly after its deposition, probably in shallow bodies of water. Its colour varies from light grey and cream to yellow. The chief value seems to be in its absorbent qualities. An illustration in Mr. Spence's report shows a small cube of dry bentonite beside the same cube 13.8 times larger after having absorbed all the water it would hold. Before any important demand is likely to be evidenced a product of required purity will have to be placed on the market. This remark by Mr. Spence is called for on account of the varied amounts of impure constituents found in the bentonite-deposits. He also states, however, that there has not been a sufficient amount of work done on the Princeton deposits to prove whether or not there is a sufficiently large tonnage of a required purity.

At present there appears to be only a very small market for bentonite, which the known deposits are more than adequate to supply. The following are some of the more important fields of possible usefulness for bentonite mentioned by Mr. Spence:—

As an absorbent; for cements and plasters; for pottery; as a dewatering agent; in the dye industry; for emulsions; in explosives; for fertilizers as a filler; in foundry-work; in horticultural sprays and animal dips; in paints, paste, glue, or size; in pencils or inks; in pharmaceuticals and cosmetics (bentonite is used in many of the numerous facial clay-packs and so-called beauty-clays placed on the market recently); in pulp and paper; in refining oils and fats; in putty, soaps, and stove-polish; and in softening water.

Since Mr. Spence's visit to Princeton what appears to be a much larger deposit of bentonite has been discovered near Princeton. The material in this deposit is of a much finer grade than other deposits in the vicinity and comparatively free of grit, which is an important factor. However, in the face of the fact that there is more than enough to supply the market at the present time, those interested will do well to keep in touch with Ottawa. The location of the Princeton deposits, close to the railway and water, is a very attractive feature.

PLATINUM IN BLACK SAND.

The continued high price of platinum ($115 refined) attracted many leasers and prospectors to the Tulameen River area above Tulameen village.

John Marks operated his lease continuously while the high water lasted, with fairly good returns in gold and platinum. A few pebbles of olivine and chromite containing platinum were found on the riffles.

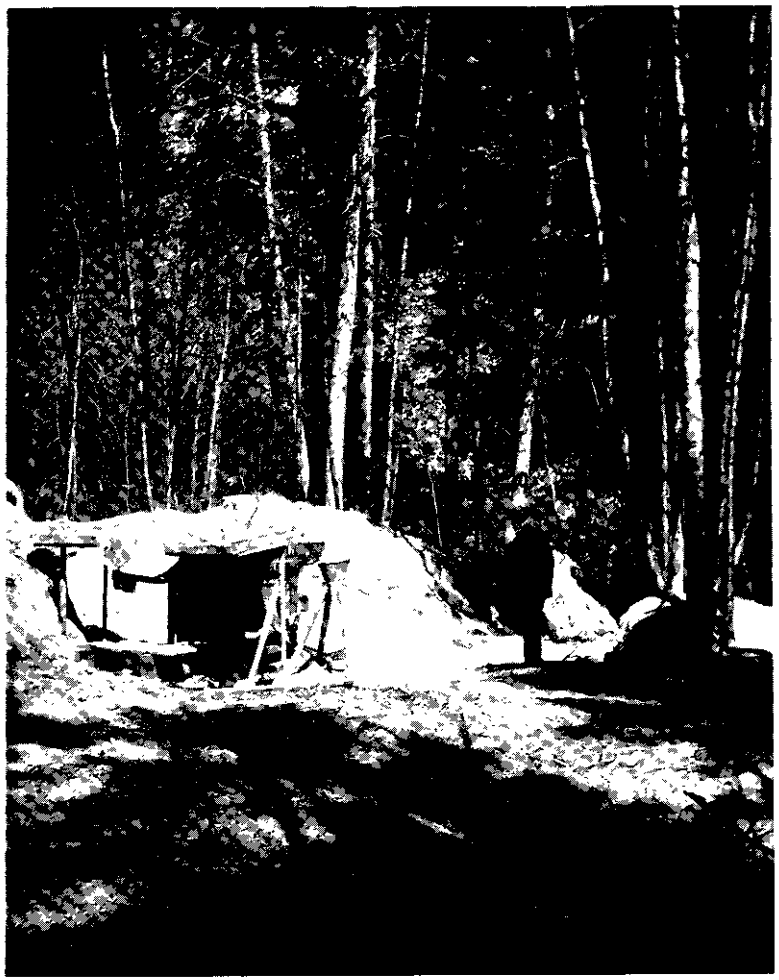
On the Christopherson lease a machine was constructed to save the black sand. During the time of examination this machine was not in operation, so its pretensions could not be gauged. Mr. Christopherson stated that he did not think the machine had been a success because it could not handle a sufficient tonnage. Other attempts were made by lessees to solve the black-sand problem and a good deal of this material was shipped away for testing purposes.

It is to be hoped that some economical device may be discovered that will do the work. When this has been done, great care should be taken to ascertain the values in the sand to be concentrated, because experience has shown that the gold and platinum are not evenly distributed throughout the black sand and one or two assays may be misleading. The black sand can be quite easily saved by ordinary water-concentration methods, but the difficulty seems to be in getting rid of the coarser barren pebbles. A series of grizzlies under a good head of water would go far towards eliminating this trouble.

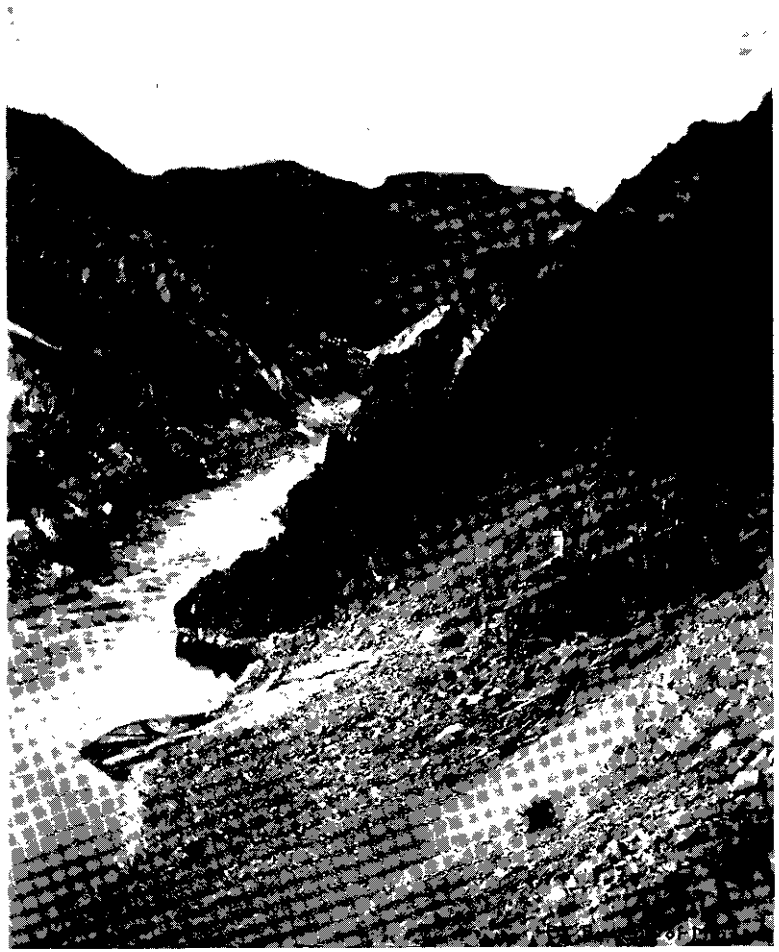
PETERSEN FLAT.

This flat lies about 4 miles above Princeton, on the Tulameen river, and has been formed by a widening of the valley below a canyon in the river; it has been prospected by pits and shafts. The owners, Claude Snowden, A. E. Perman, and J. McLeod, of Princeton, have endeavoured to interest capital in this area, but so far without success. One of the chief supposed detriments to dredging this river is the size of the boulders that will be encountered.

All the prospect-shafts examined show that nearly all the large boulders lie on or near the surface, so this supposed detriment need not be taken seriously into consideration. The gravels from the shafts and pits averaged about 60 cents in platinum ($115 an ounce) and gold to the yard.



Gypsite Mine at Basque.



Big Slide Mine, Fraser River, staked in 1872.

BOUNDARY DISTRICT.

GREENWOOD MINING DIVISION.

REPORT BY P. H. MCCURRACH, GOLD COMMISSIONER, GREENWOOD.

I have the honour to submit the office statistics of the Greenwood Mining Division for the year ended December 31st, 1924:—

Free miners' certificates	128
Locations (quartz)	33
Placer rerecords	9
Placer leases	1
Certificates of work	97
Leases of reverted claims	18
Bills of sale	5
Agreements	3
Certificates of improvements	3
Filings	12
Miscellaneous	6

GRAND FORKS MINING DIVISION.

REPORT BY CHAS. MUDGE, GOLD COMMISSIONER, GRAND FORKS.

I have the honour to submit the office statistics of the Grand Forks Mining Division for the year ended December 31st, 1924.

Free miners' certificates	77
Records of location	23
Certificates of work	54
Bills of sale	9
Filings	4
Leases of reverted claims	10

OSOYOOS MINING DIVISION.

REPORT BY E. S. COPE, GOVERNMENT AGENT, PENTICTON.

I have the honour to submit the office statistics of the Osoyoos Mining Division for the year ended December 31st, 1924.

Location (quartz)	72
Certificates of work	70
Conveyances	13
Abandonment of mineral claims	1
Free miners' certificates issued	184
Filings	12
Forfeited claims leased	3

SIMILKAMEEN MINING DIVISION.

REPORT BY H. HUNTER, GOLD COMMISSIONER, PRINCETON.

I have the honour to submit the office statistics of the Similkameen Mining Division for the year ended December 31st, 1924.

Free miners' certificates	189
Location records (mineral claims)	91
Certificates of work (mineral claims)	238
Bills of sale (mineral claims)	14
Certificates of improvements	27
Record of placer claims	5
Leases (placer)	31
Certificates of work (placer)	34
Powers of attorney (placer)	38
Permissions to assign (placer)	13
Bills of sale (placer)	13

EASTERN MINERAL SURVEY DISTRICT (No. 5).

REPORT FOR YEAR 1924.

BY A. G. LANGLEY, RESIDENT MINING ENGINEER.

(Reports marked * are by B. T. O'Grady, Assistant.)

District No. 5, or Eastern Mineral Survey District, covers East Kootenay, comprised of Golden, Windermere, and Fort Steele Mining Divisions, and West Kootenay, which includes the Ainsworth, Slocan, Slocan City, Nelson, Arrow Lake, Trail Creek, Lardeau, Trout Lake, and Revelstoke Mining Divisions. The headquarters office of the district is in the city of Revelstoke.

INTRODUCTORY REMARKS.

Never before in the history of British Columbia has the output of lead been as great as that of this year, while the zinc production has also surpassed all previous records. This very satisfactory state of affairs, which in all probability will continue for many years, is due to the activities of the Consolidated Mining and Smelting Company, both at the *Sullivan* mine and the metallurgical plants at Kimberley and Trail. The Kimberley concentrator, working to full capacity, treated more ore than the refineries at Trail could handle, with the result that large quantities of zinc concentrates and lead bullion were shipped abroad.

With the new extensions to the Trail plant which are now under construction, the company will soon be able to convert the entire product of the *Sullivan* mine into refined metals.

The production of the various silver-lead-zinc mines throughout the district compared favourably with that of last year and added considerably to the total output of the district.

Owing to the high price for lead and the well-maintained prices of silver and zinc, much outside interest is being taken in the district and more capital is available for exploratory and development work; this will undoubtedly have the effect of stimulating mining and prospecting.

LEASING.

Among minor operations, the activity of leasers in the Slocan and Ainsworth Divisions has been responsible for a considerable production of high-grade ore, and under existing conditions we may expect to see even more leasers working next year.

PROSPECTING.

Generally speaking, more interest was taken in prospecting than in recent years and several promising finds were recorded. At the same time there is not nearly as much prospecting being done as this richly mineralized district warrants.

NEW WORK.

Among the most important new mining enterprises the following may be mentioned: The exploration and development of the *Stemwinder* and *North Star* properties by the Porcupine Goldfields Development and Finance Company, Limited, of London; the development of the *Ruth-Hope* by the Ruth-Hope Mining Company, Limited, of Vancouver; the reopening of the *Lucky Jim* by A. G. Larson and associates; the consummation of the deal for the *Utica* mine by the Canadian Mines Merger, Limited; the continuation of the development of the *Whitewater* by the Whitewater Mines, Limited, which company intends following an extensive development programme as mapped out by its consulting engineer; the reopening of the *Enterprise* mine by H. B. Pilcher and associates; the reopening of the famous *Blue Bell* mine by S. S. Fowler and B. L. Eastman; the acquisition of the *Nugget-Motherlode* properties by the Western Mines Company, Limited, an English company planning extensive development-work next spring; the reopening of the *Emerald* mine of Sheep creek, which again has been placed on a producing basis. Besides the above, there are a number of other developments of more or less importance.

GENERAL.

Summing up, the conditions during the year have been very encouraging for the silver-lead miner and point to a steady progress being made for a number of years.

The businesslike and legitimate mining methods now being generally pursued throughout the district will no doubt be reflected not only in an increased production, but will also have the effect of inspiring the confidence of mining men and the investing public in its possibilities.

In conclusion, the writer wishes to acknowledge the courtesies extended by the mine-owners and prospectors throughout the district.

EAST KOOTENAY DISTRICT.

GOLDEN MINING DIVISION.

No new developments have been reported in this Division, while little new prospecting has been undertaken. However, judging by inquiries received, it is likely that more activity will be witnessed during next year.

The only producing property was the *Monarch* at Field, which was operated during the summer by the Monarch Mines, Limited, under the management of W. E. Narkaus, of Seattle. Shipments to the Trail smelter amounted to 99 tons of lead concentrates, and it is understood that two or three car-loads of zinc concentrates were shipped to Belgium. It is reported that the property was acquired by other interests in the fall, but no particulars are available at the time of writing.

WINDERMERE MINING DIVISION.

Prospecting has been more active in this Division than last year, while the production shows a substantial increase. The present favourable marketing conditions for silver-lead ores will no doubt stimulate mining activities during the coming year.

Paradise. This mine, owned by Randolph Bruce, of Invermere, was operated steadily during the season, a crew of about thirty-five men being employed. Its production for the year was 1,186 tons of silver-lead ore. Development included 1,170 feet of drifting and 240 feet of raising.

White Cat Group. After many years of inactivity this property was acquired by H. T. Harding and associates, of Stettler, Alberta, and work was started under the direction of Mr. Morland. The road up Slade creek was improved and a stretch of new road constructed to the property, at which two cabins, a bunk-house, and cook-house were built.

The season's work is reported to have been confined principally to surface diggings, from which 38 tons of ore was shipped to the Trail smelter. Smelter returns on this shipment gave average values of about as follows: Silver, 34 oz. to the ton; lead, 76.6 per cent. Owing to the altitude and somewhat dangerous location of the present workings no attempt was made to continue work during the winter, but it is intended to start operations again as soon as possible in the spring. The property is described in the Annual Report for 1923.

Leadville Group. This property is situated near the 15-Mile post on the Horsethief Creek road. It comprises a group of claims staked on the lower slopes of the mountain rising from the north side of the creek. Recently located by the Larrabee Bros., of Wilmer, and owned by them and J. McCullough, of Radium Hot Springs, it was acquired by H. E. Perlain late in the fall of the year. The surface exposure, consisting of crushed and highly oxidized material and carrying small values in silver and lead, first attracted the attention of the prospectors. Shallow underground work revealed a strong outcrop of this material at an approximate elevation of 100 feet above the creek-level, but the average values were not high enough to constitute shipping-ore.

Finally it was decided to drift on a small vein exposed in the face of a bluff at a short distance below the outcrop. After driving for about 15 feet the face of the tunnel broke into an underground cave of considerable dimensions, extending from within a short distance of the surface to the level of the creek. The cave, which has several chambers, resembles a large empty stope the bottom of which is covered to a considerable depth with rock debris which has fallen from the roof and sides. Some ore and boulders heavily mineralized with iron pyrites and galena are mixed with this material.

On account of the height of the cave the roof formation could not be examined, neither could the floor on account of muck. At the ends, however, the formation presented the appearance of being crushed and leached across a width of from 8 to 10 feet. Samples of this crushed and leached material indicated the average values would assay about as follows: Gold, 0.05 oz.; silver, 7.85 oz. to the ton; lead, 7.3 per cent.; zinc, *nil*. The apparent width was 5 feet.

From what little could be seen within the confines of the dark and extensive cave, it was not possible to form an opinion of the possible extent of mineralization. At only one place could sulphide ore be seen in-place, this being in the floor near the wall of the cave, where a narrow streak of galena had been uncovered; a sample of this assayed: Gold, 0.04 oz.; silver, 12.3 oz. to the ton; lead, 69.1 per cent.

The formation in which this cave has been formed is limestone, which apparently has been subjected to fracturing in an easterly and westerly direction about parallel to the creek, while further work may reveal the presence of cross-fracturing at the intersection of which the ore-deposit may have been formed. A considerable amount of exploratory work may be necessary to determine the possibilities of the property.

The area is an interesting one from a geological standpoint, as it lies in the marginal contact-zone of a large granite intrusion which forms a lofty mountain at the confluence of McDonald creek, a few miles west of the property.

It is understood that H. E. Perlain intends to systematically explore the property and to continue work through the winter. With this object in view a cook-house and bunk-house have been built, also a short stretch of road and bridge across the creek to connect the mine-workings with the main road. A crew of ten men is being employed.

Outcrop and Outlet.* These claims, owned by J. Standridge and Mrs. McAndrews, are situated on the southern side of the North fork of Toby creek, about 1 mile by trail from the wagon-road at the 25-Mile camp. The old workings are situated above timber-line on the steep mountain-side at elevations ranging from 6,850 to 7,080 feet above sea-level. The rocks of the area include quartzites, limestones, schists, and shales, striking north-westerly with dips which vary considerably, but approximate to the vertical on these claims.

Striking straight up the mountain-side and apparently conforming to the stratification of the enclosing limestone and schist, the vein is from 1 to 4 feet wide. The associated minerals are galena, zinc-blende, and pyrite in a quartz gangue. A few shallow cuts at intervals for a length of some 140 feet show from 8 inches of solid galena up to 30 inches of quartz and galena mixed. About 135 feet vertically below the lowest cut on the vein, but to one side of it, a tunnel has been driven 100 feet in the country-rock.

Samples of the ore taken at various points along the outcrop assayed as follows:—

Description.	Gold.	Silver.	Lead.	Zinc.
	Oz.	Oz.	Per Cent.	Per Cent.
Across 18 inches	0.01	12.6	46.5	2.0
Across 12 inches	Trace	3.8	11.7	13.4
Across 24 inches	Trace	5.5	16.0	7.9
Selected ore	0.01	44.3	45.4	7.1

In conclusion, it may be said that the property has a small well-defined vein, well mineralized wherever it is exposed, which fully warrants further exploratory work.

Phoenix Group. This property, situated at the head of the South fork of Horsethief creek and formerly known as the *Tatler* group, originally belonged to R. S. Gallop, who, it is understood, disposed of a half-interest to H. Holland. A long tunnel was driven during the year to explore the vein system at depth. The results of this work are not known. Reference to the property may be seen in the Annual Report of 1920 under the heading of the *Tatler* group.

Steele Group. This property is situated on No. 3 creek, near Brisco. Work has been resumed at this property by a Vancouver syndicate, which, it is understood, intends to operate during the winter. Sinking a winze on the ore is contemplated with the view to driving a lower tunnel should the results of this work prove satisfactory.

Dragon.* This old Crown-granted claim, owned by W. McRae, of Golden, is situated on the northern side of a small unnamed tributary creek of Toby creek, about 1½ miles by old trail from the wagon-road 16 miles from Wilmer. At an elevation of 5,400 feet above sea-level, or 1,300 feet above the wagon-road, there is a tunnel 40 feet long driven on a vein which conforms to the bedding-planes of the enclosing limestone strata. Throughout the length of the tunnel the vein is mineralized with copper and iron sulphides occurring in streaks and bunches in a siliceous gangue over a width of 4 or 5 feet. Owing to the irregularity of the mineralization it is difficult to obtain a sample which would represent the average value of the ore exposed in the tunnel. Samples of selected ore gave assays as follows:—

Description.	Gold.	Silver.	Copper.
	Oz.	Oz.	Per Cent.
Selected ore from tunnel	0.08	0.45	13.36
Selected ore from dump	0.08	1.30	14.58

PLACER-MINING.

There is evidence of more interest being taken in the placer-mining possibilities of this Division than usual.

On Findlay creek several dredging leases were staked by H. B. Pilcher and W. A. Drayton, of Fort Steele, while some forty hydraulic and placer leases were staked higher up the creek by H. E. Perlain and R. A. Ballentine. On these latter some preliminary work has been done in preparation for an early start in the spring.

FORT STEELE MINING DIVISION.

Sullivan. This mine by virtue of its large production of lead and zinc in now world-famous and has been responsible for industrial activities during the year which have completely overshadowed those of all other commercial endeavours in the interior of British Columbia. The total tonnage mined and concentrated this year amounted to 1,033,062 tons. The production of the concentrator, with the exception of some 44,000 tons of zinc concentrates shipped to Belgium and some 6,000 tons shipped to Butte, was all converted into refined metal, except some 15,000 tons of lead bullion which was shipped to Europe for refinement.

The exportation of lead bullion and zinc concentrates was made necessary on account of the fact that the company's plant at Trail had not sufficient refining capacity to handle the increased output of the large concentrator at Kimberley, which was put into commission in August of last year.

In the process of mining, concentrating, smelting, and refining the ores of this mine the company gives employment to nearly 3,000 men, while vast amounts are necessarily spent in raw and manufactured products for the equipment and maintenance of plant. Hence it is easy to realize what a great asset an industry of this nature is to British Columbia—in fact, to Canada.

Owing to the prominence of this property in the mining world and the great interest generally taken in it, a brief review of its history and development will be given, although many references may be seen in previous Annual Reports.

History.—The following résumé briefly covering the history and development of the *Sullivan* mine has been compiled partly from data published by the company's staff in Bulletin No. 146 of the Canadian Institute of Mining and Metallurgy, excerpts from which will be given, and partly from information on record at this office.

Discovery.—"In May, 1892, Pat Sullivan, John Cleaver, and Mike Holland left the Coeur d'Alene country, in the State of Idaho, to seek their fortunes in the Kootenay Lake district in British Columbia. They were aided in their venture by James Cronin, afterwards locator and owner of the *St. Eugene* mine at Moyie. Two months later the party broke up, Sullivan and Cleaver crossing the mountains from Crawford bay, on Kootenay lake, to the headwaters of St. Mary river, the course of which they followed down to Fort Steele. Here they found a good

deal of excitement about the *North Star* mine, and, joined by Ed. Smith, who was familiar with this part of the country, they determined to return and prospect in its vicinity.

"On reaching the *North Star* they found all of the hill located, but, impressed with the exposure of galena there, they decided to continue their search, in the course of which they crossed Mark creek and prospected on the other slope. The second day out Pat Sullivan found the outcrop of the *Sullivan* vein almost directly opposite the *North Star* outcrop. Four claims were located, one for each of them and one for James Cronin, who next year came up to see these claims and also the *North Star*. At Fort Steele he heard of the *St. Eugene* ore and returned to Moyie, where he located the *St. Eugene* and *Peter* claims. Going back, he looked over the claim staked for him on Mark creek and decided to abandon it and devote his attention to the *St. Eugene*."

In 1896 the *Sullivan* group was bonded to A. Hanson, of Leadville, but the bond was not taken up. It was then bonded to Col. Redpath, Judge Turner, and associates, who formed the Sullivan Group Mining Company.

Early Development.—Up to 1899 the development consisted of surface trenching and shallow underground work. In 1898 and 1899 the Kimberley branch of the Canadian Pacific Railway was built to connect with the main line at Cranbrook. The year 1900 marks the beginning of systematic development and the first shipments of ore were made to the Hall Mines smelter at Nelson and to the Canadian smelting-works at Trail. At the end of three years, after shipping some 4,000 or 5,000 tons, carrying 35 to 40 per cent. lead and about 15 oz. silver to the ton, it was decided that sufficient tonnage had been developed to warrant the erection of a smelter.

Smelter-construction.—In 1903 construction was started and a smelter (of sorts) rose into being at Marysville. The following year this smelter was entirely remodelled. (Refer Annual Reports of Minister of Mines for 1903 and 1904.) Finally after smelting some 75,000 tons the smelter closed down for good late in 1907.

The reasons for failure to operate profitably have been attributed to insufficient development of the ore-bodies, lack of efficient sorting methods, and metallurgical problems due to the complex character of the ores, while the drop in the prices of lead and silver may have been a factor which discouraged further expenditures.

However, at the end of its smelting career, the Sullivan Group Mining Company became financially embarrassed with many creditors, the principal one being the Crow's Nest Pass Coal Company, which obtained judgment under which a seizure was made, subject to the interest of the bondholders.

"In 1909 the bondholders and the creditors, including the Crow's Nest Pass Coal Company, reorganized the company under the name of the Fort Steele Mining and Smelting Company, the control of this company being vested in the Federal Mining and Smelting Company."

Cons. M. & S. Co. become interested.—"In December, 1909, the Consolidated Mining and Smelting Company of Canada, Limited, took a lease and bond on the Federal Mining and Smelting Company's holdings in the Fort Steele Mining and Smelting Company. They immediately took steps to improve the grade of ore mined and installed additional sorting facilities on the surface. This had such a marked effect on the grade of ore shipped that further improvements in the sorting plant were made.

"The underground development and diamond-drilling convinced the officials of the Consolidated Mining and Smelting Company of Canada, Limited, that the mine contained a large tonnage of complex ore which would become valuable when a satisfactory process of extraction had been developed, also that there were high-grade ore-zones which could be worked during the interval and smelted for lead in a suitable smelter with a proper ore mixture. Subsequently, towards the close of 1910, the option on the stock of the Federal Company and on that of some of the other shareholders was exercised, and the control passed into the hands of the Consolidated Mining and Smelting Company of Canada, Limited."

After the acquisition of the *Sullivan* group and adjoining claims, the metallurgical problems were attacked in earnest and the output of the mine gradually increased until in 1914 the *Sullivan* became the largest lead-producer in Canada, which distinction it has retained ever since. It may here be noted that during the Great War zinc was badly needed by Great Britain and her Allies, which fact, no doubt, stimulated the efforts of the company's staff to arrive at a process by which the zinc could be separated from its intimate association with iron and lead sulphides and economically converted into a commercial product. No expense was spared in

this direction by the company, and the results of the experiments were such that in 1915 construction of a large electrolytic zinc-refinery was started at Trail, and in 1916 regular shipments of zinc ore were commenced, since which date zinc has been one of the principal products of the Trail plant.

Geology.—The *Sullivan* mine is situated near Kimberley, on the easterly flank of the Purcell range. This mountain system occupies the area between the great valley known as the Rocky Mountain trench on the east and Kootenay lake on the west, the latter being referred to geologically as the Purcell trench.

In British Columbia these mountains extend from the International boundary to near the main line of the Canadian Pacific Railway, where they merge into the main Selkirk range and lose their identity as a separate mountain system.

The rocks from which the greater part of the Purcells are formed are of Pre-Cambrian age. The Aldridge formation, in which the *Sullivan*, *North Star*, *Stemwinder*, and *St. Eugene* deposits occur, is classified by Dr. S. J. Schofield as the earliest formation of the Purcell series. (Refer Memoir No. 76, Geological Survey of Canada.)

As regards the Sullivan ore-deposits, the following is an excerpt from Bulletin No. 146, Canadian Institute of Mining and Metallurgy:—

"The ore-deposits are found in a series of argillaceous quartzite and argillites known as the Aldridge formation, which covers an area of not less than 2,500 square miles. This formation has been intruded by several large sills of gabbro, none of which, however, are in the vicinity of the ore-bodies. Near the mine the beds strike approximately north and south and dip to the east at angles averaging about 23°. While possessing many of the features of a regular vein, the ores are essentially replacement deposits in the argillaceous quartzite. Irregularities of the foot and hanging walls are prevalent, but in general the deposits are conformable to the beds. . . .

"The ore as developed occurs in two zones, which for convenience have been called the South and North ore-zones. In the upper levels between these ore-zones the replacement is composed entirely of pyrite, while in the lower workings it consists of fine-grained massive pyrrhotite. The maximum length of the pyrite-zone is 800 feet. Subsequent to the replacement period a moderate folding took place, which resulted in some fissuring and, in places, a readjustment of the outlines of the ore-bodies, as well as a rearrangement of the minerals composing them. Some faulting occurred at this later period, the lines of fracture striking north and south. The greatest displacement shown is about 150 feet, but it has no appreciable effect on the ore-body. While the two ore-zones do not vary greatly in the ratio of lead to zinc, both have produced ores of fairly high grade in each metal. In the same working-face it is not unusual to find clean galena, zinc-blende, and pyrrhotite, as well as the usual intimate mixture."

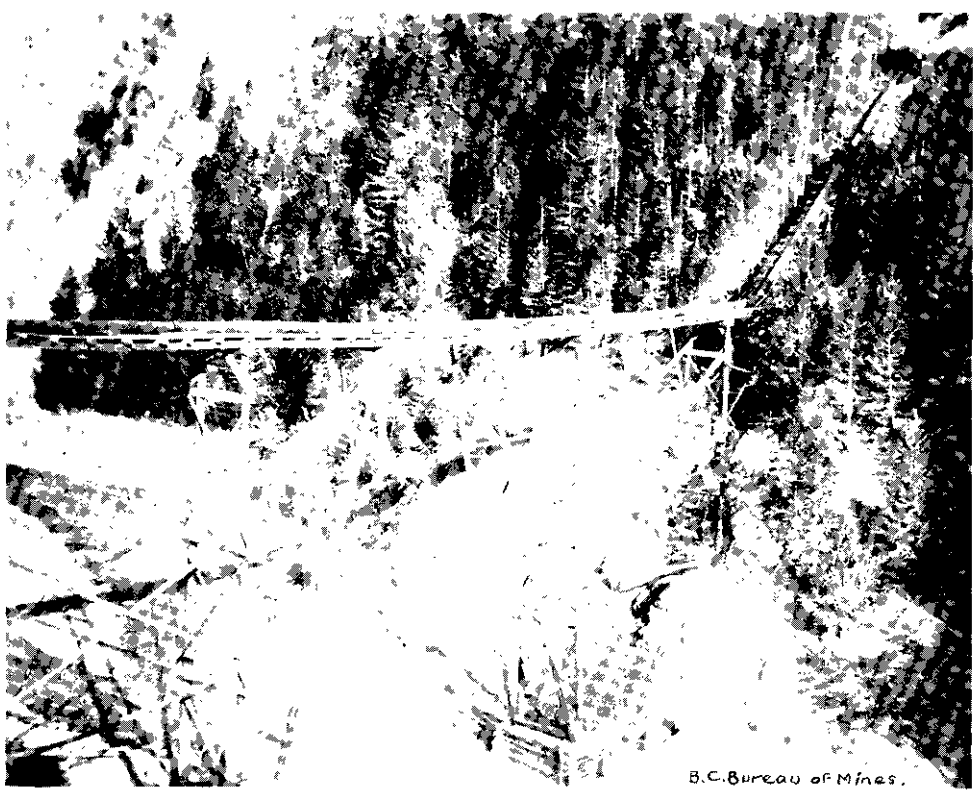
The South ore-body, which has been developed for a depth of approximately 700 feet on the lower or 3,900-foot level, has an average width of between 30 and 40 feet. The North ore-body, which is now being developed, promises to be even greater than the other, having a width in places of over 200 feet. The characteristic ore is a fine-grained mixture of zinc-blende, pyrite, and pyrrhotite. The blende is of the variety known as marmatite, represented, in this case, by the formula FeS_2ZnS. Microscopic examination shows that the iron sulphides crystallized first and the galena last. The average mill-feed runs 3 oz. in silver to the ton, 11 per cent. lead, 10.5 per cent zinc, and 36.5 per cent. iron.

Development.—Up to 1919 the production was derived entirely from the upper workings, which are situated at an elevation of 4,500 feet above sea-level. Here the ore-bodies were attacked by a long adit-tunnel known as the 1,000-foot level, which has been driven into the hill for 3,600 feet and from which stoping has been carried up to the surface.

Two enormous ore-bodies separated by a zone of pyrite were encountered on this level, the downward continuation of which are now being developed on the 3,900-foot level. In the upper portions of the vein near the surface square-set timbering was necessary, but as depth was gained a pillar-and-room system was adopted which proved entirely satisfactory owing to the toughness of the quartzite hanging-wall.

During the earlier period of the mine's history selective mining for lead ore was resorted to and the zincky material was left in the pillars. In one section of the vein, carrying high-grade lead ore, cribs were successfully used instead of pillars.

Hydraulic Mining, Wildhorse Creek, Fort Steele M.D.



Pipe-line Bridge, Wildhorse Creek, Fort Steele M.D.

Low Tunnel Development.—Early in 1915 the results of development and diamond-drilling were considered to justify a more extensive development campaign and a long tunnel was started from Mark creek, at an elevation of 3,900 feet above sea-level, or at a vertical distance of 600 feet below the upper level. This tunnel is known as the 3,900-foot level. It is driven in the foot-wall parallel to the strike of the vein and lies about 40 feet below the South ore-zone. This ore-body was encountered by a raise from the tunnel at a distance of 7,100 feet from the portal.

The original size of the tunnel was 8 by 10 feet, which was enlarged to 9 by 12; the first 600 feet was timbered owing to loose ground and the timber has now been replaced by concrete posts and steel girders for caps. The mine-tracks, consisting of 45-lb. rails, have a gauge of 36 inches. Granby self-dumping mine-cars are used, having a capacity of 80 cubic feet; 6-ton electric locomotives are used for hauling, with a voltage of 250. At first 550 volts were used, but as this was considered to endanger the safety of the men it was reduced to 250 volts. The approximate length of the 3,900-foot adit-tunnel is 2 miles, while the total development exceeds 10 miles.

Mining and Later Development.—Soon after ore was located from the 3,900-foot level a crosscut 1,075 feet in length was driven into the foot-wall side, from the end of which a connection with the upper workings was first established by a $2^{11}/_{32}$-inch diamond-drill hole; this was immediately followed by a raise driven at the same angle—namely, 47°. The diamond-drill hole proved useful in providing water for the drills, as an alignment, and as a means of ventilation.

At the same time the adit was being advanced to tap the North ore-body and the South ore-body was vigorously developed. This ore-body was first attacked by raises and crosscuts from the main tunnel and subsequently by raises from laterals in the foot-wall and running parallel to the main tunnel. The raises were driven through the vein to the hanging-wall and stoping was undertaken from the sill-floor and from the tops of the raises near the hanging-wall.

Profiting by experience gained in the mining of this ore-body, the management has formed definite plans for the development of the North ore-body. These embody similar methods of foot-wall development from lateral drifts. Stoping operations are commenced from raises through the ore-body by first side-swiping near the hanging and blasting down shoulders of ore towards the foot-wall. Gravity is made use of as long as possible, the ore running into chutes or, in places where the stoping operations are carried down to the sill-floor, over a heavily timbered set with a covering of loose poles and built over the drift. By prying loose the poles the ore falls into mine-cars on the track below.

When the muck ceases to run drag-line scrapers are used; these are operated by air-hoists and have a radius of about 250 feet, which necessarily governs the distance between the chutes. According to present plans, pillars 100 feet square and spaced at 300 feet between centres will be left to support the roof.

A new type of double raise is now being used to tap the ore-body; each compartment is 14 by 7 feet, with 20 feet of solid rock separating them. One compartment is used as an ore-pass and the other as a manway.

Work was started late this fall on a big double raise to connect with the upper workings. This will be used for hoisting men and supplies and for handling ore and waste from the upper workings. One compartment will have two skipways and space for a manway and pipes; this will be separated by 20 feet of solid rock from the other compartment, which will have an ore-chute and waste-chute.

Power Plant.—The power plant is situated on Mark creek at a short distance from the portal of the tunnel. Briefly, it consists of one water-driven compressor coupled to an auxiliary steam-engine and having a capacity of 3,000 cubic feet of free air a minute; two Nordberg compressors driven by synchronous motors and having a capacity of 3,000 cubic feet of free air a minute each; one Ingersoll-Rand compressor driven by a synchronous motor having a capacity of 6,000 cubic feet of free air a minute, which makes the total capacity of the plant 15,000 cubic feet of free air a minute. Power is supplied by the East Kootenay Power Company and is delivered at this plant at 2,200 volts. Air is delivered to the 3,900-foot level workings by one 10-inch and one 8-inch main.

Other Underground Equipment.—One-man water Leyner-type machines of various manufactures are used for drilling, with jack-hammers for block-holing. For blasting 35-per-cent.

powder is used in the stopes and 50-per-cent. in development-work. Storage-battery locomotives are used for assembling loads.

The use of mucking-machines has been found expedient under certain conditions. An electrically driven Myers-Whaley machine was used when driving the long tunnel was first started; this was followed by an air-driven Armstrong shovel and more recently an air-driven Hoar shovel was put into operation.

Electric power is supplied to an underground sub-station at 2,200 volts, where it is converted to 250 volts d.c. by a 125-kw. Fuerst, Friedman & Co. motor-generator set, and is also transformed to 220 a.c. for light and motors.

Most modern practice has been followed in providing excellent accommodation for the men, both at the mine and the mill. The sites for the various buildings and houses have been well chosen, while the style of architecture is both practical and pleasing to the eye.

Fine new company offices have been built in Kimberley, which town has taken on a new lease of life and is bustling with activity; new buildings are going up in every direction.

No special reference will be made to the new concentrator which was dealt with in last year's report, except that it is doing what it is was designed to do, in such a way as to almost exceed the most sanguine expectations. Improvements during the year include the addition of two Hardinge ball-mills and additional plant for treating the zinc middlings. The company employed an average of 1,100 men during the year at the mine and concentrator.

Stemwinder and North Star. These properties, which are situated on the south side of Mark creek, opposite the *Sullivan* mine, have been inactive of recent years. This year, however, they were acquired under option by the Porcupine Goldfields Development and Finance Company, Limited, of London, England. The *Stemwinder* was equipped in the fall with an Ingersoll-Rand 2-stage compressor having a capacity of 720 cubic feet of free air a minute, also a drill-sharpener, hoist, and other equipment. An extensive development campaign is planned, including the sinking of the shaft to a greater depth and establishing levels, from which drifting and crosscutting will be undertaken.

At the *North Star* diamond-drilling is being done with one drill, but as soon as more water is obtainable in the spring it is the intention of the management to put on more machines. Charles C. Starr is in charge of the work at both properties.

St. Eugene. Leasers working at this property shipped a few car-loads of ore to the Trail smelter. It is reported to be the intention of the Consolidated Mining and Smelting Company, owners of the property, to erect a concentrator next year in order to treat the old dumps, in which there is said to be a large tonnage suitable for mill-feed.

Aurora.—This property has been acquired under option by Spokane interests, but nothing has been accomplished yet owing to lack of necessary capital to carry on the development as planned.

It is understood that the *Society Girl* is under option to the same interests.

Copper King. This property, consisting of two claims—*Copper King* and *Copper Queen*—is situated on Bull river and is owned by W. S. Santo, of Cranbrook. During the year underground development was proceeded with by a small crew of men and a car-load of ore is reported to have been shipped to Trail.

Boy Scout Group. This property is situated on Hellroaring creek and N. A. Wallinger, M.L.A., of Cranbrook, is agent. It is reported that the tunnel driven on the vein has been extended 100 feet, making its total length 200 feet. The vein is said to have a width of from 4 to 12 feet. The ore is chiefly of milling grade and carries values in silver, lead, and zinc; the gangue minerals are quartz and a little iron pyrites.

Evans Group.—The Evans Bros. continued work on the property during the season, with results that are claimed to have been very satisfactory. The property is referred to in previous reports.

Brenda Group. This property is owned by the Globe Mining Company and situated near Skookumchuck creek. Shaft-sinking was continued with a small crew of men under the direction of Dan. McIntosh, of Cranbrook. The shaft is now down a vertical depth of 115 feet and the values are said to be improving. Recently an oil-engine and air-compressor were erected and two log cabins as well as a small power-house have been erected. The property is referred to in the Annual Report for 1922.

Bird's Nest Group.—Bird Bros., of Cranbrook, have been working steadily at this property, which is situated on Perry creek. The development, consisting principally of a 100-foot crosscut, is said to have been encouraging.

Eagle Plume Group.*

This group consists of the *Eagle Plume*, *Hornet*, and *Osprey* claims and is being worked under bond by John Larson, of Bull River. The workings are situated on the lower slopes of Lone mountain, a few hundred feet above the flats near Horseshoe lake, 4 miles from Fenwick Siding on the Kootenay Central Railway. The ore, which is disseminated chalcopyrite in a quartz gangue, occurs in parallel fissure-veins striking easterly up the steep mountain-side in a zone of altered limestone and schist. The veins are well defined and stand nearly vertical. The width of the ore in the veins varies from 2 to 4 feet. Samples taken by the writer gave the following results:—

Description.	Gold.	Silver.	Copper.
	Oz.	Oz.	Per Cent.
Grab from upper tunnel dump	0.02	0.3	5.42
Across 2 feet of lower tunnel	0.03	0.4	6.63
Across 3½ feet of upper tunnel	Trace	0.2	0.61

At the time of the writer's visit in May the workings consisted of two short tunnels, aggregating 125 feet, and some surface cuts. Other work done by Mr. Larson included the construction of 675 feet of surface tram, a blacksmith-shop, and an ore-bin. The property is close to transportation, the overburden is light, and further prospecting may disclose ore of better grade.

PLACER-MINING.

Wildhorse Creek.—Hydraulicking was carried on continuously during the season by the Wild Horse Gold Mining Syndicate, of which W. A. Drayton, of New York, is managing director and E. H. L. Attree, of Fort Steele, secretary. The preliminary work necessitated the repairing of an old ditch, known as the "Victoria" ditch, which takes water from a dam across Wildhorse creek at a point 5½ miles from the workings.

The syndicate was organized by H. B. Pilcher last year and the ground previously worked by the Gamble Mining Company was acquired. The other source of supply—namely, that used by the Gamble Mining Company—was a ditch on the east side of the creek, which took water from two small tributaries. This ditch was extended, repaired, and a trestle built to carry the pipe-line across the creek. All this work, which involved a considerable expenditure, was done in a workmanlike and efficient manner under the direction of H. B. Pilcher.

In previous years there had been insufficient water for hydraulicking this ground, except for a short period during high water. This year the "Victoria" ditch, having a capacity of 50 second-feet, provided ample water for one monitor, while another monitor supplied by the east-side ditch was only effective for a short period. In order to obviate this, work was started on an extension of the latter ditch to connect with the main creek at a point about half a mile below the dam.

The amount of the season's clean-up is not definitely known, but it is understood to have been satisfactory to the management, and it is intended to start operations again in the spring as soon as weather conditions permit. The gold recovered was fairly coarse and of high grade, running $18.12 to the ounce.

Other work consisting of drifting along bed-rock has been done on Boulder creek. Here a narrow pay-streak containing some coarse gold lies next to the bed-rock. Should the development of this ground prove up sufficient yardage of gold-bearing gravels, hydraulicking is contemplated.

GYPSUM.

A large deposit of gypsum was located near Wardner. Where a small creek forms a ravine it is exposed over a width of about 40 feet and occurs as a bedded deposit in limestone formation. In the bench above the bank of the ravine there are numerous pot-holes about 15 feet deep. Shallow diggings at the bottom of these holes have disclosed the gypsum lying under the overburden. A sample taken at random by the writer gave the following analysis: Insol., 10.2 per

cent.; $CaSo_4$ and 2Aq, 63.2 per cent.; $CaCo_3$, 12.4 per cent.; $MgCO_3$, 9.5 per cent.; Fe_2O_3 and Al_2O_3, 1 per cent.; soda, etc., 1 per cent.; balance, water; total SO_3, 29.4 per cent. These samples were taken from the surface, so that they probably do not represent the best grade obtainable.

As the property is conveniently situated to the railway, it would appear to have commercial possibilities. It is understood that H. B. Pilcher and associates have it under option.

WEST KOOTENAY DISTRICT.

AINSWORTH MINING DIVISION.

The season of 1924 has not witnessed as much increase in mining activity as conditions would appear to warrant, but according to present indications more progress with greater production may be expected during 1925.

AINSWORTH CAMP.

Practically the entire production was due to small-scale operations of leasers; among the various properties active the following may be mentioned:—

Spokane-Trinket.—This property, which has been a small but steady producer for a number of years, was worked by C. Sherman and partner.

Albion.—Acquired under a lease and bond by J. Hawes and associates. A new trail was constructed and according to recent reports there is a good showing and a car-load of ore ready for shipment.

Silver Hoard.—Worked under lease by W. E. Lane and associates. A production of several car-loads of silver-lead ore is expected this winter.

Highland.—Owned by the Consolidated Mining and Smelting Company. Work was resumed with a crew of about twelve men under the superintendence of W. L. Oughtred.

Florence.—Except for minor leasing operations, this property was idle during the year.

RIONDEL.

Bluebell. This famous mine is being reopened by S. S. Fowler and B. L. Eastman. Work was started late in the fall with a small crew of men, which will be added to as conditions warrant. It is understood that unwatering the mine is being proceeded with and at the same time the plant is being overhauled preparatory to starting up the concentrator in the spring.

Kirby. This property, which has been referred to in previous reports, is being operated by the Shepherd Mining Company under the direction of R. Guthrie. A plant consisting of a small compressor and semi-Diesel type engine has been erected near the portal of the low tunnel. This tunnel, which has been driven from the edge of the lake to intersect the northerly extension of the vein, is in gravel for about 700 feet, then boulder-clay, and finally bed-rock was reached at 745 feet from the portal. At this point some vein-matter was encountered carrying slight mineralization, which would appear to belong to a parallel vein, as the one being driven for should lie considerably farther in the hill; the tunnel was being continued to intersect it.

At a distance of approximately three-quarters of a mile north of the main tunnel there are some old workings on the *Kirby No. XI.* claim. This work was done in order to explore a surface showing of zincky ore in a gangue of quartz and spathic iron, replacing limestone and apparently having a strike of north and south. This ore lies at the portal of a tunnel which has been driven into the hill for a distance of 125 feet and follows an east-and-west fracture. More surface work near the portal would appear to be advisable.

Peggy. This property, owned by G. Davis, of Riondel, is situated on the lake-shore at about 1 mile north of the *Kirby* main tunnel. Prospecting has disclosed an 18-inch quartz vein in granite, dipping to the south-east and striking north-easterly. The quartz is mineralized with a little iron pyrites and occasional specks of molybdenite. A sample taken of the quartz assayed as follows: Gold, 0.04 oz.; silver, 0.8 oz. to the ton.

Molde. This property, situated about 2 miles south of Riondel, on the lake-shore, is owned by Ed. Osler, of Riondel. A short length of tunnel exposes a quartz vein which has been formed along an east-and-west fault-fracture; at the face there is a 2-foot width of quartz carrying a little galena. The formation consists of hornblende-schists and limestone striking north and south and dipping at 30° to the west. About 500 feet to

the east of the tunnel, and in line with the strike of the vein, a shallow shaft has been sunk in soft decomposed iron-stained material, in which low values have been obtained.

KASLO.

Cork-Province. This property, situated on the South fork of Kaslo creek, was operated throughout the year until November, when cold weather interfered with the source of power and the mine was closed down. The mill ran from May 12th to November 14th on the basis of sixteen hours daily, and produced 687 tons of silver-lead concentrates and 294 tons of silver-zinc concentrates, which were shipped to the Trail smelter. It is reported that work done on the 400-foot level proves the ore to be fully as good grade as that on the 300-foot level, and that conditions are favourable for profitable operation, providing sufficient funds are available for development.

Silver Bell.—Development-work was continued on this property during the year.

Silver Bear Group. This property is situated on the South fork of Kaslo creek and is operated by M. S. Davys, of Kaslo. Development of the crushed zone, which is referred to in the Annual Report for 1923, has been proceeded with, a small crew of men being employed. During the summer work was mostly confined to the No. 2 level, where some 200 feet of drifting has exposed crushed vein-matter lying next to a heavy streak of black gouge on the hanging-wall side; this streak, which marks the course of the vein, is persistent in strike and dip, which are, respectively, N. 40° E. and 70° to the south-east.

Limestone, which apparently forms the foot-wall, has been intruded by granite, which makes its appearance along a section of the vein. The country-rock, however, on either side of the vein has been crushed and contorted, indicating that the hanging-wall represents a plane on which movement has occurred, resulting in the crushing of the vein and shattering of the adjoining wall-rock. The vein-matter consists of crushed country-rock with quartz fragments and occasional small pockets of broken ore. A promising ore-shoot near a granitic intrusion on the foot-wall side yielded some five car-loads of ore which averaged as follows: Silver, 163 oz. to the ton; lead, 8 per cent.; zinc, 12 per cent. This was followed down with a winze for 65 feet, but the lower level, which has been driven at an additional depth of 200 feet, has as yet failed to disclose its downward continuation.

Another vein, lying parallel and at a distance of 80 feet farther into the hill, has been prospected and presents a similar structure and mineralization. Surface trenches and open-cuts demonstrate the presence of vein-matter for a considerable distance beyond the underground workings and suggest further possibilities.

The crushed and contorted nature of the formation within this sheared zone in which the veins occur, together with the heavy covering of overburden, have added to the difficulties of underground and surface exploratory work.

Daybreak.—At this property, which was formerly known as the *Gibson*, a little contract-work was done, and it is reported that it has been amalgamated with the *Gold Cure* and that the two properties will be exploited by the same management.

Among others, it is understood that work has been done during the year on the *Martin*, *Revenue*, and *Rainbow* properties.

Whitewater. This property has been operated by leasers in a small way during the entire year. Shipments of 212 tons of hand-sorted silver-lead ore and 137 tons of hand-sorted silver-zinc ore were made. One car of lead ore is reported to have run as high as 261.9 oz. silver to the ton. The management reports that the company has started to open up the mine by crosscutting from the No. 12 station to intersect the hanging-wall, which will give 1,500 feet of backs on the slope of the vein. In the spring it is proposed to build suitable camp buildings and to make improvements towards establishing the mine on a producing basis again.

Charleston.—Situated near the *Whitewater*. It is reported A. J. Harris continued development-work.

Utica. The Canadian Mines Merger, a company organized by Colonel Henry H. Armstead, acquired the entire interests of the Utica Mines, Limited, in September, together with ten other claims contiguous to the *Utica* properties. At the present time exploration-work is being confined to the continuation of the long crosscut, which is being driven to intersect and develop the downward continuation of the rich ore-shoots

mined from the upper level; this latter has been driven at an elevation of 350 feet above. The low tunnel is now reported to be in about 2,400 feet and ore is expected to be encountered in a distance of several hundred feet.

It is understood that improvements have been made to the mine camp and power plant and that work will be steadily proceeded with. Reference to this property may be seen in the Annual Report for 1922.

Leviathan Group. This group and adjoining claims have been acquired under option by R. H. Stewart, of Vancouver. It is situated on Campbell creek, which enters Kootenay lake at a point almost opposite Kaslo. At the upper portion of the property a deep open-cut and several surface diggings disclose a band of a highly silicified schistose rock having a width of from 8 to 10 feet and lying on top of a narrow band of marbleized limestone. This rock is highly mineralized with pyrrhotite and in places has been found to carry values in gold and silver. Sampling at the uppermost workings by the writer indicated the values to be decidedly spotty, for while an occasional good assay return was obtained, others were disappointing, with nothing to indicate the reason for variation. Oxidized material heavy in iron, deposited along small seams following the joint-planes, which was sampled by the writer, clearly indicates a concentration of the gold values along the channels so provided; the sample running as follows: Gold, 1.41 oz.; silver, 2.9 oz. to the ton.

This same bed of schist, which dips at an angle of about 32° to the west, can be traced for a long distance towards the lake, and is disclosed lower down the hillside in an old tunnel, where extensive sampling by R. H. Stewart indicated sufficient values to encourage further exploration. This will probably be undertaken early next year. The area is underlain by highly metamorphosed sediments of the Shuswap series and has been intruded by granite and pegmatite dykes.

HOWSER.

Lavina.—This property, situated on Hamill creek, which has been lying idle for a number of years, was worked by E. Nordman and associates with a small crew of men. It is expected that a car-load of ore will be shipped this winter.

Surprise Group.* This group, situated on Glacier creek near Howser, was worked intermittently in a small way by W. B. Smith, who bonded the property in 1923 from F. A. Devereux, of Victoria, and Victor Johnson, of Portland, Ore. The property, which is described in the Report of the Minister of Mines for 1923, has a fine showing of grey copper containing high silver values. On account of its friable character the ore is difficult to sort and the future of the property would appear to depend on the development of sufficient ore to justify the erection of a mill. The ore seems well adapted to concentration by flotation methods.

Red Cloud Group.* This group, consisting of three claims owned by N. McLeod, of Fort Steele, is situated at the head of Idaho creek, about 5,000 feet in elevation above the upper Duncan river, at a point about 22 miles from Howser. There is no trail to the claims, which have been staked and abandoned by various parties for many years and were restaked by Mr. McLeod in 1923. Reports were current that this was a big tonnage low-grade gold proposition, but the "big vein" is simply the "lime dyke" which, being tilted at a steep angle, forms the precipitous summit of the mountain. The limestone, considerably silicified, is mineralized in places with pockets of red earthy material derived from the oxidation of iron sulphides. Samples of this material taken by the writer failed to give any appreciable values. The old workings consist of a few open-cuts and a short tunnel now caved in. There is no cabin or shelter on the claims.

International Group.* This group, situated on McGuire creek, which flows into the upper Duncan river 19 miles above Howser, has been acquired by John Noihl, who restaked the claims this year. Some surface work done by him has exposed stringers of clean galena, a sample of which assayed: Gold, trace; silver, 34.6 oz. to the ton; lead, 73.8 per cent.; zinc, 1 per cent. The property is described in the Report of the Minister of Mines for 1918.

POPLAR.

It is reported that the usual number of prospecting activities and small mining operations have been carried on during the season, and that conditions appear favourable for an increase during the coming year.

As the writer did not have an opportunity of visiting this section of the district, detailed information of the various operations is not available.

LIST OF SHIPPING-MINES, AINSWORTH MINING DIVISION, SHOWING TONNAGE SHIPPED.

Mine.	Locality.	Tons mined.	Character of Shipment.
Cork-Province	Kaslo	9,831	Ore milled producing 687 tons silver-lead concentrates and 294 tons silver-zinc concentrates.
Martin	Kaslo	5	Silver-lead ore.
Rainbow	Kaslo	1	Silver-lead ore.
Whitewater	Retallack	212	Silver-lead ore.
Whitewater	Retallack	137	Silver-zinc ore.
Charleston	Retallack	26	Silver-lead ore.
Spokane-Trinket	Ainsworth	51	Silver-lead ore.
Firebrand	Ainsworth	16	Silver-lead ore.
United	Ainsworth	11	Silver-lead ore.
No. One	Ainsworth	10	Silver-lead ore.
Albion	Ainsworth	38	Silver-lead ore.
Florence	Ainsworth	655	Silver-lead ore.
Silver Hoard	Ainsworth	23	Silver-lead ore.
Highland	Ainsworth	3,985	Silver-lead ore.
Caledonia	Ainsworth	2	Silver-lead ore.

NELSON MINING DIVISION.

During the season this Division has received more attention from the prospector and mining men generally, which should foreshadow an increase in mining activities during 1925. Probably the most important event was the resumption of shipments by the *Emerald* mine after a period of inactivity extending over several years. It is owned and operated by a company named the Iron Mountain, Limited, which is largely controlled by American capital, and has a large production of lead ore to its credit. Lack of shipping-ore combined with milling troubles led to the suspension of operations a few years ago.

A detailed geological survey made by A. Lakes, of Nelson, resulted in locating the vein beyond a fault, and subsequent development exposed sufficient ore to warrant the necessary expense of remodelling the mill, which was duly accomplished. The mine is again on a producing basis and steady shipments of ore and concentrates are being made to Trail. Between twenty-five and thirty men are employed. Shipments for year total 477 tons silver-lead ore and concentrates.

A deal which may mean important developments for the Sheep Creek camp was consummated between the Selkirks Mining Company, Limited, and the Western Mines Company, Limited, whereby the latter company proposes to operate the *Nugget-Motherlode* groups. The agreement between the two companies necessitates the expenditure of a considerable sum in development and exploratory work, which no doubt will be undertaken as soon as weather conditions are favourable. This work will be directed by C. D. Wilkinson, consulting engineer for the company.

Development at the *Reno* group on Fawn creek was carried on by a small crew of men and principally confined to drifting from the No. 3 level, where the vein is said to show up stronger than in the No. 2 level, 150 feet above, and to maintain the same high values. More work on the *Donnybrook* vein is also reported to have been highly satisfactory. A new road built by the Government from Sheep creek to Fawn creek basin gives access to the *Reno* and other properties.

Molly Gibson.—This property, owned by the Consolidated Mining and Smelting Company, was operated under lease by W. A. Cameron, of New Denver. A small crew of men was employed and 69 tons of silver-lead-zinc concentrates was shipped to the Trail smelter.

Among numerous other activities, the following have been reported: The *Spokane* group on Canyon creek was worked by Laib Bros., of Sirdar, who are now endeavouring to raise a little capital to put the property on a producing basis. Work at the *Fern* mine, near Hall, was carried on by H. Miller with a small crew of men. A new ore-showing is reported to have been

opened up. A small crew of men was also employed at the *Gold King* mine, near Hall. It is reported that a car-load of ore has been extracted for shipment. R. Qua, of Nelson, put in a season at the *Humming Bird*, gold-quartz prospect, situated at a distance of about 5 miles by trail from Apex, on the Great Northern Railway. The *Gold Hill* on 49 creek, belonging to Alex. MacDonald, of Nelson, was further developed during the season, a small crew of men being employed. The *Granite-Poorman* was worked by leasers, who operated the mill and made a shipment of 65 tons of concentrates to the Trail smelter. At the *Golden Age*, near Hall, a small compressor was erected and the driving of the low tunnel continued. At the *Summit* mine on Sheep creek C. Olsen had a small crew of men working.

Central.* This property, consisting of the *Central* and *Central Fraction* Crown-granted claims, owned by W. Dumont and L. Neveu, is situated at about 3,900 feet elevation on the western side of Eagle creek, about half a mile by trail from the *Eureka* mine road, which it leaves at a point 2 miles from the upper Granite road west of Nelson. The property has been shut down for a number of years. At the time of the writer's visit in September, Mr. Dumont, who started work with a small crew in the spring, had nearly completed unwatering the shaft and workings.

The old shaft, 96 feet deep, with four short tunnels driven from it at different levels, develops a fissured and crushed zone in granodiorite near the contact, with rocks of the Rossland Volcanic group. The mineralization, consisting of stringers of copper and iron sulphides and their oxidation products in a gangue of altered country-rock, is most pronounced over a width of from 4 to 6 feet, but extends also for some distance into the wall-rock as low-grade disseminated ore. Small values in gold and silver are associated with the sulphides. The trend of the vein is northerly and southerly with a dip approximating the vertical.

In the year 1906 two lots of 12 tons each of sorted ore were shipped to the Trail smelter. The returns for these shipments gave assays as follows: Gold, 0.16 and 0.09 oz.; silver, 2.6 and 0.9 oz. to the ton; copper, 10.8 and 11.8 per cent. Another shipment of 24 tons of sorted ore shipped in the same year netted $960 after paying freight and treatment charges. The present owners propose to mine and sort similar ore for shipment and continue development with a view to proving the character and continuity of the deposit.

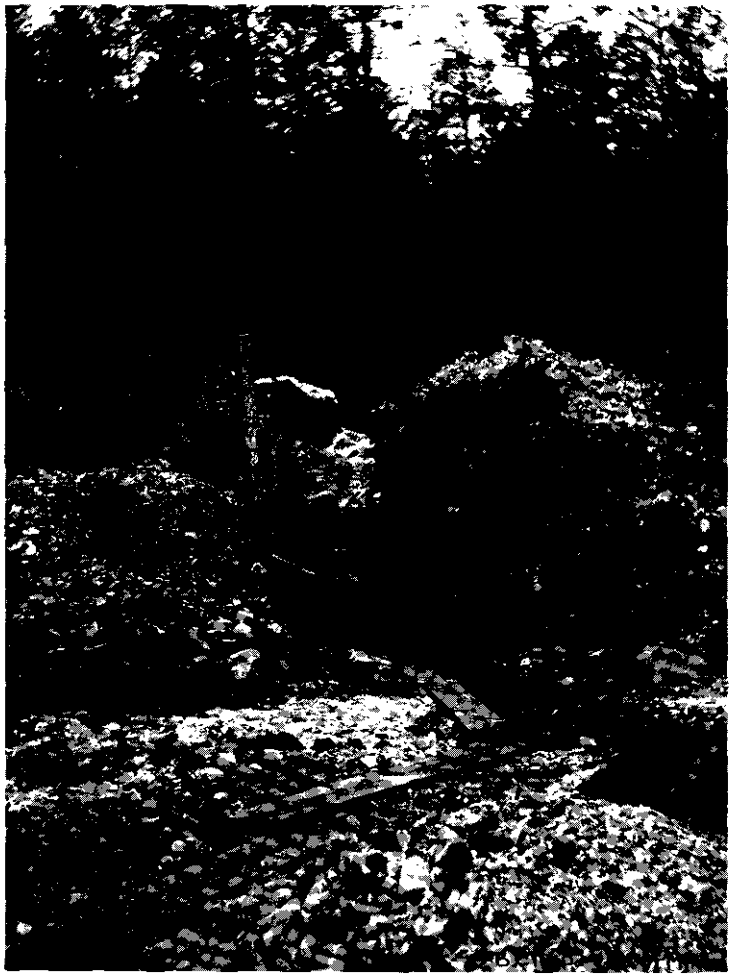
Goodenough Group.* This group, consisting of the *Goodenough*, *Demaricott*, and *Little Nell* claims, owned by O. Lovell, Alex. MacDonald, and H. Jackson, of Ymir, was bonded early in the year by P. J. O'Brien, of Kettle Falls, Wash. Most of the work done has been confined to the *Goodenough* claim, which adjoins the south-western boundary of the *Ymir* property. As the *Goodenough* group was described in the Annual Report of the Minister of Mines for 1923, only brief mention will be made here of the work done since then.

Work has been continued in the tunnel and some very good ore encountered in the No. 2 lead between the first crosscut and the face. Samples taken at various places between these points gave the following results:—

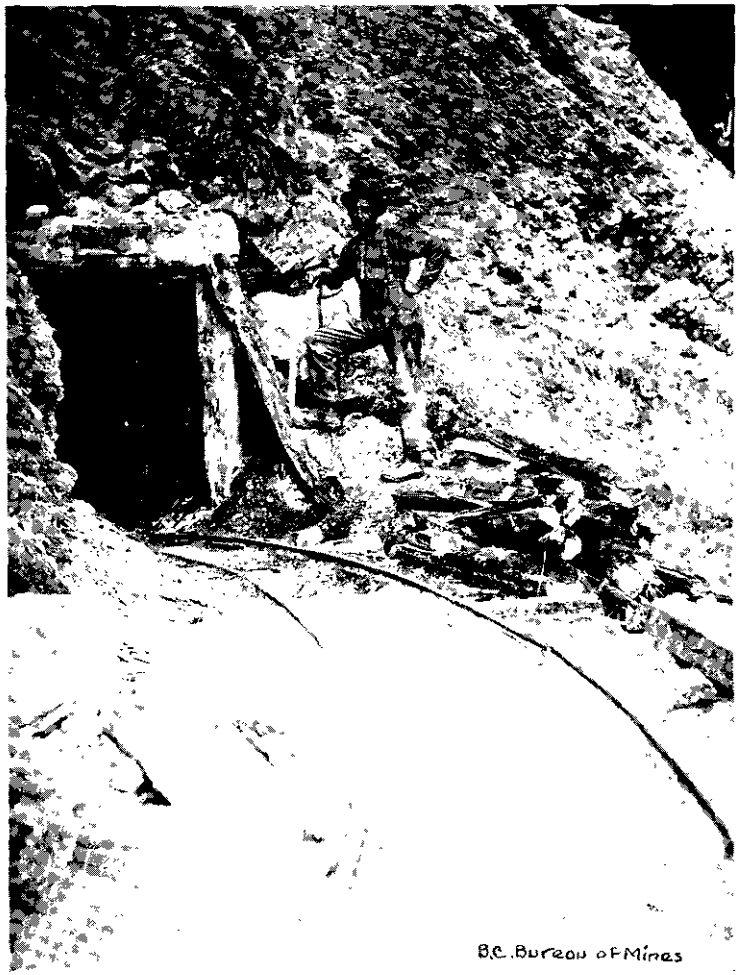
Description.	Gold.	Silver.	Lead.	Zinc.
	Oz.	Oz.	Per Cent.	Per Cent.
Across 20 inches of siliceous ledge-matter, heavily mineralized with pyrite, opposite the mouth of the first crosscut	4.68	20.1	.....	.....
Across 6 feet of siliceous vein-matter, containing finely disseminated galena and zinc-blende, just beyond the mouth of the first crosscut	0.44	19.1	14.3	13.0
Across 2 feet, heavily impregnated with galena, 30 feet back from face	3.16	14.9	20.9	.....
4-inch pay-streak on foot-wall in face of tunnel	0.56	2.9	.....	.....

Between the points where the above samples were taken the ore varies considerably in width, narrowing down in places to mere streaks.

There are two short crosscuts from the tunnel to the No. 1 lead, which is parallel to and on the foot-wall side of the No. 2 lead. In the first crosscut 22 inches of crushed vein-matter carrying sulphides of lead, iron, and zinc gave: Gold, 1.85 oz.; silver, 34.4 oz. to the ton; lead, 3 per cent.; zinc, 1.9 per cent. In the second crosscut a sample across 18 inches of crushed vein-



White Elephant, Vernon M.D.



Homestake, Adams Lake, Kamloops M.D.

matter gave: Gold, 0.12 oz.; silver, 1.4 oz. to the ton. The results obtained so far are still somewhat indefinite, but the high values encountered are very encouraging.

Iron Cap Group.* This group consists of the *Iron Cap*, *Bunker Hill*, *Gold Bug*, *Dewdrop Fraction*, *Falls No. 2*, *United No. 2*, *Fawn Fraction*, and the *Yip Fraction* claims, owned by Neil McColeman and the George Revell estate. The property is situated on the eastern side of Fawn creek, about 1½ miles by road and trail from the Sheep Creek wagon-road, or a total distance of about 10½ miles from Salmo. The elevation of the cabin is about 5,400 feet above sea-level.

The formation, which includes quartzites, schists, and limestones, belongs to the same geological series as that of the adjacent Sheep Creek area in which gold quartz is mined, but there is greater evidence of igneous rocks, granitic and aplitic dykes being intruded into the formation. The strike of the rocks is about N. 12° E. and the dip varies from about 50° to 70° to the east.

On the property there is a wide band of crystalline limestone mineralized in a number of places with disseminated lead, zinc, and iron sulphides, the deposit apparently being of the replacement type. In some places galena occurs in stringers and bunches which can be sorted into a good shipping product, but the ore is chiefly of the disseminated variety or "mill-feed." In a shallow incline shaft there is a width of 4½ feet of ore, from which the owners made a shipment of 5 tons of sorted ore some years ago. The smelter returns for this shipment, inspected by the writer, gave: Silver, 34.5 oz.; lead, 46.3 per cent.; zinc, 10 per cent. Most of the ore exposed is in narrow trenches made by ground-sluicing and at the time of this examination no body of ore of commercial proportions had been defined. However, there is evidence of mineralization scattered over a large area, indicating possibilities of finding large bodies of low-grade ore.

The property is favourably situated, as it is on the lower slopes of the mountain at a comparatively low altitude, with no danger of interruption of work from snowslides and being within easy reach of transportation. The proximity of the property to the Sheep Creek gold-mining camp is in its favour, and successful operations in the neighbourhood will no doubt lead to some co-operation in power-development.

Red Bird Group. This group, comprising the *Red Bird*, *Lead Pot*, and *Lead Cup* claims, belongs to S. Coulter and A. J. Campbell, of Ymir, and is situated at a distance of about a mile in a direct line from the Pend d'Oreille river. This property has been staked in a mineralized zone which can be traced in a north-easterly direction across the river for some distance, and in it a number of claims have been staked, including the *Rio Tinto* group, which is referred to in the Annual Report for 1923. The mineralization, principally consisting of lead and iron sulphides, apparently occurs as replacement deposits in limestone near its contact with quartzites. This formation, consisting of beds of limestone, quartzite, and schists striking north-easterly and dipping at an angle of about 50° to the south-east, belongs to the Pend d'Oreille series of the Carboniferous period.

At the *Red Bird* group the workings, consisting of several open-cuts on the hillside at an elevation of about 1,500 feet above the river, expose a large mass of oxidized and leached material, carrying values in lead and zinc. An average of four samples taken of this material indicated that the values would run about as follows: Gold, trace; silver, 0.92 oz. to the ton; lead, 4.85 per cent.; zinc, 12.68 per cent. There being no rock-exposures in the immediate vicinity and as no walls had been encountered in the open-cuts, it was not possible to form an opinion of the character or extent of the deposit; leaving doubt as to whether it was in-place or belonged to a lead farther up the hill. However, the possibilities appeared to be encouraging for the development of a considerable tonnage of low-grade ore at increased depth and to fully justify further work being done.

Sarah Group.* This group, consisting of the *Sarah* and *Ruby* claims and owned by Jas. Tiyo, is situated on the western side of Prospect creek, which flows into the Goat river at a point about 3 miles northerly from Duck Creek Station. The property is reached by a trail about 1 mile in length from the Canadian Pacific Railway tracks. The elevation of the *Sarah* tunnel is about 3,200 feet, or 1,300 feet above the tracks.

The rocks of the area include quartzites, limestones, and siliceous and calcareous schists which have a north-easterly trend up the steep mountain-side, with dips varying from 80° to the east to nearly vertical. The claims have been staked along the outcrop of a wide band of

shattered limestone, in which occur replacement deposits of zinc-blende associated with iron sulphides and occasionally some galena. The mineralization occurs as disseminations, stringers, and lenses in the limestone, graduating from nearly barren material to ore containing 32 per cent. zinc. The silver values vary from a trace to 2 or 3 oz. to the ton.

The outcrop is considerably decomposed and stained from oxidation, which condition, however, only seems to extend for a few feet in depth to where the sulphides are found. Superficially the "capping" is quite extensive. Most of the work, consisting of short tunnels, trenches, and open-cuts, has been done near the south-western extremity of the *Sarah* claim, where the indicated width of the mineralized zone is about 60 feet. These workings indicate the continuation of the mineralization for a length of several hundred feet south-westerly from the *Sarah* tunnel, which is close to the north-easterly limit of the work done. The workings are scattered and as yet nothing definite in the way of an ore-body has been outlined, but the strong indications of mineralization on an extensive scale give promise that further work will disclose ore-bodies of commercial proportions.

Alfred, Josephine, etc.* This property, consisting of the *Alfred*, *Josephine*, *Belleview*, *Robin*, and *Nickel Plate* claims, owned by John Desireau and wife, Mrs. R. Mitchell and John Deary, is situated on the eastern side of the Canadian Pacific Railway near Duck Creek Station, from which point it is reached by an old logging-road 2½ miles in length. The workings vary in elevation from 3,000 to 4,350 feet above sea-level.

The rocks of the area include schists, limestones, quartzites, and quartzose mica-schists, which strike north-easterly up the mountain-side, with dips approximating the vertical. The claims are staked along the outcrop of a silicified band of limestone, 80 to 100 feet wide in places, which contains sparsely disseminated pyrite, chalcopyrite, and galena associated with quartz, which occurs in stringers, bunches, and masses in the limestone. Specks of grey copper and small amounts of zinc-blende were noted in places.

The workings consist of trenches, open-cuts, a glory-hole, an old shallow shaft, and some short tunnels scattered along the outcrop throughout the five claims. A number of samples taken by the writer show that in general the mineralization is too low grade to constitute mill-feed. Selected ore from the dump at the glory-hole on the *Alfred* claim assayed: Gold, trace; silver, 10 oz. to the ton; copper, 1.5 per cent.; lead, 2 per cent. However, the property is very easy of access, the overburden is light, and further prospecting may disclose ore of better grade.

Leadville.* At this property, 6 miles from Kitchener, no mining was done this year, but several miles of road were built with a view to taking in a compressor, boiler, and other machinery for development-work to be undertaken on the west side of Goat river across from the old workings. The owners of the property are the Leadville Mining Company, Limited (H. C. Gillman, president; J. Francis, secretary).

SLOCAN MINING DIVISION.

Mining and development work has been actively carried on in the Slocan at a number of properties during the season, and although no startling developments have been made, conditions generally may be considered to have been satisfactory, with an encouraging outlook for 1925.

The production, which has principally been maintained by the Silversmith Mines, Limited, the Rosebery-Surprise Mining Company, Clarence Cunningham, and the Ruth-Hope Mining Company, was supplemented by a considerable tonnage mined by leasers at the *Standard*, *Hewitt*, *Lucky Thought*, *Rambler-Cariboo*, and also by about the usual number of minor operations.

It is to be hoped that the new development-work being undertaken at the *Ruth* and *Lucky Jim* mines will result in a substantial increase to the production for next year.

SANDON.

Silversmith. Mining and milling operations have been carried on steadily during the year, giving employment to about 100 men. Development and exploratory work has been vigorously undertaken in various parts of the mine. On the 1,000-foot level in the easterly portion of the mine a shaft has been sunk on the vein for 150 feet, with the object of picking up the downward continuation of the famous *Slocan Star* ore-shoot, which during the earlier period of the mine's history yielded large tonnages of high-grade ore from the levels above. As depth was gained by the shaft the vein flattened and entered crushed

and slickensided ground in which pockets of ore were encountered; these conditions appear promising for future development.

In the westerly end of the workings the *Silversmith* ore-shoot, which has yielded the principal tonnage during recent years, has been developed down to the 1,100-foot level. Here the ore occurs with a gangue of quartz, calcite, and spathic iron and becomes more zincky than in the upper levels. Step-faulting of the vein in the lowest workings is more pronounced than above.

Crosscutting from the 1,000-foot level has revealed the presence of two distinct ore-shoots, one on the hanging-wall side and one on the foot-wall, the distance between the two on this level being 76 feet, while at the 800-foot level they come together.

A large intrusion of quartz porphyry having a known length of 800 feet and a width of 600 feet cuts the slate formation and closely follows the vein, to which it apparently has a close structural relationship.

The mine is well equipped, having an up-to-date machine-shop and blacksmith-shop, while the camp buildings provide excellent accommodation for the men. Production was being maintained at a rate of about 345 tons of lead ore and 402 tons of zinc ore a day. The average mill-feed runs about: Silver, 20.65 oz. to the ton; lead, 6.52 per cent.; zinc, 7.25 per cent. The lead concentrate runs about 65 per cent. lead and the zinc concentrate about 46 per cent. zinc.

A few improvements were being made to the mill, including the erection of a ball-mill in closed circuit with a Dorr classifier to replace hydraulic classifiers and thereby lessen the amount of water in the circuit, as small values escaped with the overflow from the Dorr thickener and had to be recovered from a large settling-pond. During the fall of the year a new wire rope was placed on the tramway.

Ruth-Hope. This property was acquired last year by the Ruth-Hope Mining Company, of Vancouver. During the present year financial arrangements were concluded by which the management is enabled to carry out the systematic development and exploratory work as originally planned. While conditions in various parts of the mine-workings give promise of yielding a considerable tonnage of silver-lead ore with the further possibilities of opening up new ore-shoots of commercial importance, perhaps the greatest importance is being attached to the development of the probable extension of the *Silversmith* ore-shoot on the *Blue Grouse* claim, which adjoins the *Silversmith* to the west. In order to accomplish this a 2,200-foot crosscut tunnel is being driven from the *Ruth* No. 5 level, which is about 30 feet lower than the 1,000-foot level of the *Silversmith*. This tunnel will also prospect favourable ground between the *Ruth* and *Silversmith* workings.

The main vein of the *Ruth* is a wide sheared fissure, cutting a slate formation in which occur broken segments of porphyry dykes having a north-westerly trend; these lie in close proximity to the ore-shoots and are in evidence in many parts of the mine-workings.

The width of the vein, which in places is between 30 and 40 feet, together with numerous fault movements, have produced complex geological conditions, making it difficult to follow the ore; but this is compensated by the added possibilities of finding ore previously missed and the location of new ore-bearing ground. During the last year or so a considerable tonnage has been extracted from old workings which was previously overlooked; also an entirely new ore-body was developed from grass-roots in the Stewart or No. 2 vein.

A detailed description of the various places at which work was being done at the time of the writer's visit would serve no useful purpose as conditions change rapidly under a progressive development campaign. Hence it will suffice to say that the management is wideawake to all possibilities and no chances are being overlooked.

Mine-cars which are giving good satisfaction in the long crosscut are of U-shaped pattern, 22 cubic feet capacity, with roller bearings; they dump sideways, revolving on a rack and pinion attachment at either end. A crew of about twenty-five men are employed under J. Hanna, mine foreman. The work is being directed by R. H. Stewart.

Wonderful.—This property, which is owned by Clarence Cunningham, was operated with a small crew of men, the work being confined to development on the lower level, which was extended 1,200 feet to tap the ore-shoot mined from the level above and from which a considerable tonnage of good-grade mill-feed was extracted in 1923.

The *Sovereign*, owned by C. Cunningham, was worked by leasers.

American Boy.—A small crew of men was employed at development.

The *Richmond-Eureka*, which is owned by the Consolidated Mining and Smelting Company and has been lying idle during recent years, was operated by leasers, who made a small shipment to Trail.

On the *Mascot* Joe Johnson and partner are driving a crosscut.

Canadian Group.—This property was worked under lease by Neil McMillan and D. McGillivray, who got out a car-load of ore from the upper workings. Other leasers were employed at some old workings on the south side of the summit. J. Brandon, of Sandon, one of the principal owners, is in charge of the property.

Surprise.—This property, owned by the Rosebery-Surprise Mining Company, was worked under lease by Bruce Kirk, A. Watson, and C. Towgood, who shipped 111 tons of silver-lead and zinc ore to the Trail smelter.

The *Sapphire*, situated in the "Washington" basin, was worked by Jackson Bros.

The *Gem*, near Cody, was worked by the owner, M. Byrne, who put in a season driving a prospect-tunnel in an endeavour to locate the source of large quantities of galena float found in the gravels of the creek.

Minnehaha. This property, which is situated within a short distance of Sandon and at an elevation of about 4,900 feet, was systematically prospected by George Clark, with very encouraging results. Up till last year little, if any, work had been done on this claim, and as the ground was favourable for prospecting the possible extension of a vein which had been exposed on adjoining claims, it was decided to look for it.

The surface of the claim is covered to a considerable depth with overburden, so trenching to bed-rock across the strike of the vein was undertaken, and after some 600 or 700 feet of this had been done the vein was encountered, and then traced for 1,000 feet or so along the hillside by means of shallow open-cuts at intervals. This resulted in disclosing a strong outcrop of galena along a length of 40 or 50 feet. At this point a deep open-cut exposes a width of about 8 feet of oxidized ledge-matter, in which some nice bunches of galena occur. A sample of the clean ore ran: Gold, trace; silver, 74.2 oz. to the ton; lead, 78.4 per cent.; zinc, trace.

The vein, having a north-easterly strike and dipping to the east, follows the contour of the hill, cutting a slate formation which, above the exposure, appears to be blocky and broken, suggesting disturbed conditions at the surface and that evidence of faulting may be expected at no great depth.

To explore the outcrop at depth a crosscut tunnel was driven from a point 75 feet below (by aneroid) the principal showing. This encountered the vein in a distance of 124 feet and at about 75 feet to the east of the showing. Drifting had been done in a westerly direction for 37 feet; this showed about 2 feet of calcite and spathic iron with ore indications which looked promising at the face. This vein, in the writer's opinion, has good possibilities and is worthy of a thorough exploration. There is a good cabin on the property and the situation and topographical features lend themselves to cheap mining.

Victor Group. This property, which is owned by Geo. Petty, of Sandon, is still in the initial stages of development, but promises to become a steady producer. The ore so far encountered is high-grade silver-lead and apparently occurs in the same zone of fissuring as the *Queen Bess*, situated on the other side of the hill, and which has made a large production of high-grade ore.

Average values of two shipments of 31 and 28 tons made from the *Victor* last year are as follows: Silver, 299.3 oz. to the ton; lead, 64.35 per cent.; zinc, 0.5 per cent.; and silver, 271.6 oz. to the ton; lead, 51.5 per cent.; zinc, 1.3 per cent., respectively. The net smelter returns from these two shipments were $12,089.41.

The lower tunnel had not developed the downward continuation of the ore-shoot exposed in the upper workings, but was in good-looking ground in which ore might be expected at any time. A curious phenomenon was noted near the portal of the lower tunnel, where bright crystalline silver occurs in oxidized ledge-matter.

Two new cabins are conveniently situated to the workings and a new trail was being constructed to Sandon. The property is referred to in the Annual Report for 1923.

Cinderella. This property, comprising one claim and a fraction, is situated on the south side of Carpenter creek at a distance of about 1 mile from Three Forks. The claim adjoins the *Lone Batchelor* and covers the possible extension of the *Victor* vein. A considerable amount of work was done on the property some twenty-five years

ago, principally consisting of four adit-tunnels driven at irregular intervals over a vertical range of about 540 feet; from these workings a small tonnage of ore was extracted. The slate formation has been subjected to crushing and faulting movements, while intrusions of porphyry dykes add to the complex geological conditions. As a prospect it has possibilities which would appear to justify further exploration in those sections of the workings which show the strongest mineralization.

Monitor.—This property, situated near Three Forks and owned by the Rosebery-Surprise Mining Company, was worked under lease by George Gormley, who shipped 196 tons of high-grade ore to the Trail smelter.

McAllister. This property, situated on Kane creek, is now being operated by the Standard Silver-Lead Mining Company, of Silverton, which recently acquired the controlling interest. The ore is quartz carrying grey copper, and although in places exceptionally high silver values have been obtained, it is essentially a milling proposition. Hence the management has confined its attention to the development of sufficient ore to warrant mill-construction. This work is being proceeded with and conditions are now reported to be considered favourable for the construction of a 50-ton mill, which is contemplated in the spring. W. H. North is in charge of the work.

The *Queen Bess*, owned by Clarence Cunningham, was worked under lease by A. Anderson and Jack Jones, who shipped 86 tons of silver-lead ore containing 12,826 oz. of silver and 122,353 lb. of lead. It is understood that the owner also has a small crew working at the property.

The *Jo-Jo*, situated on Kane creek, near the *McAllister*, was worked by the owner, T. Trenery, and a small shipment of high-grade silver ore made to the Trail smelter.

The *Rambler-Cariboo* was worked under lease by W. A. Cameron, of New Denver, who had a crew of about eight men steadily employed during the summer. The ore was milled and a small shipment of concentrates made.

Hinckley.—A considerable amount of exploratory work was done on this claim by the Standard Silver-Lead Mining Company.

Lucky Jim. At this mine, which is situated near Bear lake, on the Kaslo–Nakusp Railway, a crew of men was steadily employed at development-work, which according to recent reports is meeting with encouraging results; the probabilities are that next season will see the mine among the steady producers. The undertaking is backed by strong Spokane interests and the mining operations are being directed by A. G. Larson, who during former years had charge of the property.

After rather a short but successful career on this occasion the property was closed down owing to the unsatisfactory state of the metal market at the close of the war, which did not lend encouragement to further development. However, under present metal prices and facilities for the treatment of zinc ores afforded by the Consolidated Mining and Smelting Company, the property is considered to offer possibilities, which are responsible for attracting the present capital.

Soho.—Work was started on this property during the early part of the season, but discontinued when the manager, J. C. Ryan, of Spokane, met with a serious motor accident.

NEW DENVER.

Bosun. This property, owned and operated by the Rosebery-Surprise Mining Company, had a good record of production for the year, having been successful in developing an exceptionally high-grade ore-shoot. Practically all the available ore had been mined above the sixth level by the latter part of the year. On this lowest level the ore was found to be faulted into the hanging-wall side and has been picked up by closely following the faults. In one place the ore is continuous for about 200 feet and shows along the bottom of the drift, having been stoped out above.

The fact that ore has been developed on this level beyond any that was developed on the upper levels has encouraged the management to explore still farther into the hill, and the tunnel which is now being advanced is 100 feet past any of the upper workings. Twenty men are employed.

Molly Hughes. This property, which is owned by H. Clever, of New Denver, was worked during the year by a local syndicate. Mining operations, principally confined to stoping from the bottom of the shaft, were greatly handicapped by lack of sufficient compressed air to hoist and run machine-drills, which resulted in the drilling being done by hand and the compressor only being used for hoisting ore and waste.

At the bottom of the shaft the vein had been stoped along a length of 35 feet and for a height of 10 or 15 feet, leaving about 50 feet of backs to the next level. The vein, which is a quartz-filled fissure in granite, varies in width, and here carried about a 6-inch streak on the hanging-wall and a high-grade streak on the foot-wall, the two being separated by 2 or 3 feet of quartz. The ore is high grade, but, being narrow in width, sorting and cobbing was necessary before shipment. A grab sample from a pile of ore ready for shipment assayed as follows: Gold, 0.16 oz.; silver, 167.5 oz. to the ton; lead, 4 per cent.; zinc, 4 per cent. F. Flick, of Vancouver, who took an option on the property in the fall of the year, intends to erect a more suitable plant.

The *Mountain Chief*, worked under lease by John Cechelere; the *Mowich*, worked by Jarvis, Peel, and White under lease; and the *Apex*, under lease by Amel Bettele, are all situated near New Denver and close to the Sandon road. About three men are working on each property, of which the *Mountain Chief* shipped a car of ore.

SILVERTON.

Standard.—This mine is being worked by leasers, who have kept the concentrator running and have shipped a considerable tonnage of ore and concentrates to the Trail smelter.

Hewitt. This property is being worked on a leasing system, there being about eleven men working in various parts of the mine. The ore is concentrated before shipment, each leaser getting his *pro rata* of the smelter returns. M. S. Davys, of Kaslo, is in charge of the property, under whose direction the milling is done and settlements made. It is understood that this arrangement has proved very satisfactory to all concerned.

Lucky Thought. This property, owned by the Consolidated Mining and Smelting Company, is also being worked on a leasing system similar to that in force at the *Hewitt*, with M. S. Davys in charge. A 2-bucket tram has recently been erected, connecting the mine-workings with the *Hewitt* mill, where the ore is concentrated before shipment. About six men were working.

Van Roi. This property, located near Silverton, on Silverton creek, is owned and operated by C. Cunningham, of Alamo. It is a well-equipped mine; the camp, affording good accommodation for the men, is conveniently situated to the workings. A 2,100-foot length of aerial tram connects the No. 5 level with the concentrator, which is situated on Silverton Creek wagon-road. Water-power is used to operate both the mine compressor and the mill. The property was first operated by the Van Roi Mining Company, of London, a subsidiary of the Le Roi No. 2, of Rossland, and its productive activity has extended over a number of years.

There are two veins on the property which have been extensively developed—namely, the main vein and the south vein. The south vein strikes at a slight angle to the other, converging towards their easterly extension. Another vein has been prospected on the surface towards the summit of the ridge, which is well mineralized in places and looks promising for further development.

The average width of the veins is about 8 feet and, roughly conforming to the stratification of the enclosing slates, they represent sheared fractures through which siliceous mineral-bearing solutions have freely circulated. They show remarkable continuity, the ore occurring in shoots at intervals. The walls of the vein not being well defined, the ore might easily be missed in drifting. An example of this was in evidence on the seventh level, where a raise driven to tap the downward continuation of an ore-shoot from the level above finally revealed it to lie considerably farther in the foot-wall side than was expected. Ore-shoots in the south vein have been found to lie about opposite to those in the main vein, which fact led to the recent discovery of a promising showing of high-grade ore in the south vein on the ninth or lowest level. At the time of the writer's visit, in October, about a 3-foot width of galena and high-grade streaks carrying ruby silver had just been exposed in the face of a short drift. Should an ore-body be developed on this level it will mean a great deal to the future of the mine.

Work was also being done on the seventh level, where ore had just been encountered at 50 feet above the tunnel. This level has been driven for a distance of 2,800 feet on the vein, which is faulted and lost near the face. Work was also being done on the fifth level, from which ore was being extracted for shipment.

The vein system lies in the same fissured zone as the *Hewitt*, the adjoining property to the west. The ore is a "dry ore," the bulk of the milling grade running low in lead, averaging, according to previous reports, from 11.2 to 18 oz. in silver to the ton, 4 to 7.75 per cent. lead, and 9.1 to 12 per cent. zinc. The high-grade ore, carrying ruby silver and grey copper, is, of course, sorted out and shipped direct. Some 6,250 tons of ore was mined and milled. The concentrates shipped were as follows: 512 tons zinc concentrates containing 12,519 oz. silver and 448,619 lb. zinc; 137 tons lead concentrates containing 9,913 oz. silver and 169,543 lb. lead.

A crew of about twenty men has been steadily employed throughout the year. For a detailed description of mine-workings and plant refer to Annual Report for 1911, page 148.

Galena Farm.—This property was operated in a small way by R. Ainslie and a shipment of 228 tons made to the Trail smelter. It is reported that an important strike was made during the latter part of the season.

L. & H.—A. R. Fingland continued development-work from the lower tunnel.

Metallic.

This property is located at a short distance from Silverton, on the wagon-road leading towards Slocan. Since last visited the drift had been advanced 60 feet. Near the face a small pocket of ore is exposed, making into the foot-wall side. A sample taken across a width of 2 feet ran as follows: Gold, 0.01 oz.; silver, 33.4 oz. to the ton; lead, 5.8 per cent.; zinc, 15.3 per cent. The hanging-wall is well defined and the vein and ore are of similar character to those encountered in the same zone of fissuring on Silverton creek. It would appear to be a property worthy of further development.

The *Fisher Maiden*, located on Silverton creek, is being worked by N. Tucker and partner.

LIST OF SHIPPING MINES IN SLOCAN MINING DIVISION, SHOWING TONNAGE SHIPPED.

Mine.	Locality.	Tons mined. Shipped Crude or Concentrated.*	Tons shipped as Concentrates.	Character of Shipment.
Apex	New Denver	28	.....	Silver-lead ore.
Bosun	New Denver	738	.....	Silver-lead ore.
Bosun	New Denver	819	.....	Silver-zinc ore.
Canadian	Sandon	29	.....	Silver-lead ore.
Cinderella	Sandon	2	.....	Silver-lead ore.
Galena Farm	Silverton	228	.....	Silver-lead ore.
Hewitt	Silverton	2,115*	423	Silver-lead concentrates.
Jo-Jo	Three Forks	16	.....	Silver-lead ore.
Lucky Thought	Silverton	2,135*	133 350	Silver-lead concentrates. Silver-zinc concentrates.
Lucky Jim	Zincton	50	.....	Silver-lead ore.
Molly Hughes	New Denver	108	.....	Silver ore.
Monitor	Three Forks	162	.....	Silver-lead ore.
Monitor	Three Forks	34	.....	Silver-zinc ore.
Mountain Chief	New Denver	54	.....	Silver-lead ore.
Queen Bess	Alamo	86	.....	Silver-lead ore.
Richmond-Eureka	Sandon	20	.....	Silver-lead ore.
Ruth	Sandon	450	.....	Silver-lead ore.
Rambler	Rambler	3,200*	89 65	Silver-lead concentrates. Silver-zinc concentrates.
Silversmith	Sandon	37,790*	3,746 3,714 172	Silver-lead concentrates. Silver-zinc concentrates. Crude silver-lead ore.
Sovereign	Sandon	18	.....	Silver-lead ore.
Standard	Silverton	4,044*	135 876	Silver-lead concentrates. Silver-zinc concentrates.
Surprise	Sandon	62	.....	Silver-lead ore.
Surprise	Sandon	49	.....	Silver-zinc ore.
Van Roi	Silverton	6,230*	137 512	Silver-lead concentrates. Silver-zinc concentrates.
Victor	Three Forks	40	.....	Silver-lead ore.
Totals		58,507	10,352	

SLOCAN CITY MINING DIVISION.

Generally speaking, activity in this Division was about the same as last year, the production being confined to a few properties. However, the reopening of the *Enterprise* on Enterprise creek will probably result in an increase of production next year, providing arrangements are made whereby the present scheme of development can be carried out. This should have the effect of stimulating mining in this area.

Enterprise.

This property is situated on Enterprise creek at an approximate distance of 8 miles from Slocan lake, whence a good wagon-road leads to the mine. The elevation of the lowest tunnel is 4,600 feet, or 3,000 feet above the lake. The property was acquired under option this year by H. B. Pilcher and associates and the necessary capital invested to make necessary repairs to the plant and carry on development during the winter months.

The *Enterprise* vein was located in 1894 by R. Kirkwood, of New Denver, and J. McKinnon, of Revelstoke, and was operated on a fairly extensive scale by the Enterprise Mines (B.C.), Limited, which company built a 50-ton concentrator, a compressor, and all the necessary camp buildings to accommodate a crew of thirty or forty men. By the methods then extant, great difficulty was experienced in making a satisfactory separation of the silver-lead and zinc and in recovering the silver values which were associated with the tetrahedrite and intimately associated with zinc-blende. Some twenty years ago this company ceased operations and the mine was subsequently worked intermittently by leasers. During recent years it has lain idle.

Its record of production up to 1906, as given in the report of the Royal Zinc Commission of 1906, is as follows: "8,215 tons of shipping-ore, 2,466 tons being concentrates from the mill and 5,749 tons of hand-sorted ore. Included in this tonnage of concentrates is a middling product sold as silver ore, though containing 27.98 per cent. zinc, 71.6 oz. silver, and 2 to 4 per cent. lead. The general shipments from the property averaged about 127 oz. silver to the ton, 19.2 per cent. lead, and for the last few years 23.77 per cent. zinc. A sample of the *Enterprise* zinc concentrates was obtained and forwarded to Denver for magnetic separation; it assayed: Silver, 115 oz.; lead, 4.8 per cent.; zinc, 43.7 per cent."

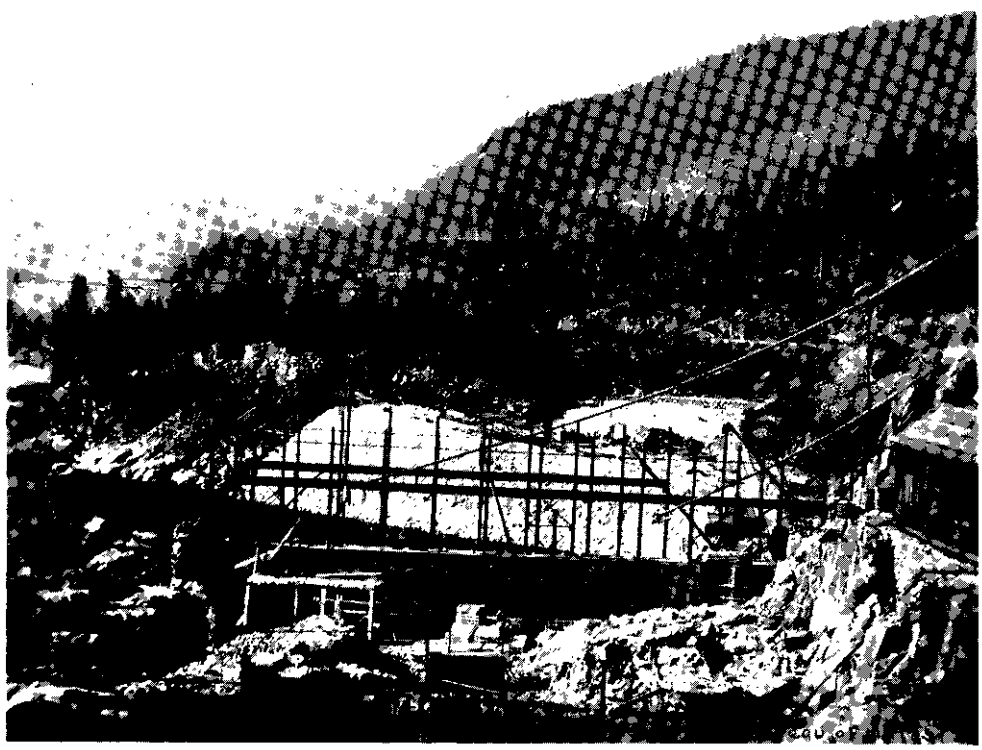
The area is underlain by the Nelson granodiorite, typical of the Slocan City area. This rock-mass exhibits different stages of crystallization, varies in composition from the acidic phase to the more basic variety, and has been intruded by various types of dykes, the older being acidic and the more recent of the lamprophyre type and post-mineral in age. From a geological point of view the area appealed to the writer as being extremely interesting and at one time had occupied a position close to intensive igneous activities. As far as could be ascertained, the dyke intrusions had little influence on the character of the vein, except that faulting might be expected by the lamprophyre dykes, which has been the case in other veins in this granite area.

There are two known parallel veins on the property, lying at about 300 feet apart. The No. 1 has been developed extensively, and the No. 2, more recently discovered and having similar characteristics to the No. 1, so far has only been developed by about a 100-foot tunnel near the outcrop. The No. 1 vein, a well-defined fissure striking N. 57° E. and dipping at about 75° to the south-east, shows remarkable continuity, only interrupted by a few fault displacements which have been easy to follow. On the No. 4 level it has been stoped almost continuously over a length of 1,000 feet.

The mine has been opened by seven adit-levels driven along the vein, which cuts the hillside at an oblique angle. The difference in elevation between the uppermost workings and the lowest or No. 7 tunnel is approximately 870 feet, at which depth the vein shows similar characteristics. Below this its downward continuation has been still further developed by an incline shaft, said to be down 214 feet on the adjoining property—namely, the *Iron Horse*. At the time the property was visited the only level which was open for its entire length was the No. 7, the other workings only being accessible for a short distance in.

From what could be seen, the vein lies between massive walls and has an average width of about 10 or 12 inches, narrowing in places to a few inches and widening in others to about 3 feet. The vein-filling consisted of a band of zincky ore on the foot and hanging walls, the intervening space often being filled with a brecciated mixture of country-rock, quartz, spathic iron, and calcite, with some zinc-blende and galena. Indications point to there having been two distinct periods of mineralization. The ore does not replace the wall-rock and the impression

Velvet Mine, Rossland.



West Kootenay Power Co.'s Extension, Bonnington Falls.

was gained that it could be stripped from the walls, thus avoiding the mixing of a large proportion of waste with the ore when mining.

In the No. 7 level the vein has been followed for approximately 650 feet, with ore showing for practically the entire length, when it was cut and apparently faulted by a lamprophyre dyke, past which 180 feet of drifting was done with unsatisfactory results. Crosscutting should be done from this end of the level. Samples taken from this tunnel were as follows:—

Across 24 inches at about 60 feet from the portal: Gold, 0.01 oz.; silver, 18.4 oz. to the ton; lead, 7.1 per cent.; zinc, 36.1 per cent.

Across 14 inches at 315 feet from portal: Gold, 0.01 oz.: silver, 19.5 oz.; lead, 7.5 per cent.; zinc, 33.7 per cent.

Across 18 inches at 360 feet from portal: Gold, 0.01 oz.; silver, 32.8 oz.; lead, 13.8 per cent.; zinc, 39.9 per cent.

Across 12 inches at 492 feet from portal: Gold, 0.01 oz.; silver, 14.6 oz.; lead, 12.2 per cent.; zinc, 30.5 per cent.

Across 10 inches at 651 feet from portal: Gold, 0.01 oz.; silver, 8.4 oz.; lead, 4.8 per cent.; zinc, 35 per cent.

Above the entire length of this tunnel there is virgin ground to the No. 5 level, which has been driven at a vertical distance of about 200 feet higher. A considerable amount of stoping has been done above the No. 5 level, but there is still a block of ground between this level and the No. 4 which would appear to offer good possibilities, as well as other portions in the uppermost workings of the mine. A sample taken at the surface across a width of 8 inches above the portal of No. 5 tunnel gave the following returns: Gold, 0.01 oz.; silver, 124.2 oz. to the ton; lead, 4.9 per cent.; zinc, 19.8 per cent It is understood that recent development of the No. 2 vein has met with encouraging results and that ore is being mined for shipment.

Samples taken from the mill tailings, of which there is a considerable tonnage, indicate possibilities for a profitable reclamation of this material. A sample taken from the upper layer of this dump and close to the mill assayed: Silver, 14.1 oz. to the ton; lead, 0.7 per cent.; zinc, 5.2 per cent.; while one taken from the lower end of the dump assayed: Silver, 27.2 oz. to the ton; lead, 2.2 per cent.; zinc, 5.2 per cent.

The various camp buildings at the property are in a good state of repair, likewise the mill building. The concentrating equipment, however, is mostly out of date. Water conveyed by a flume 3,100 feet long (now dilapidated) supplies the necessary power at a head of 95 feet for driving an Ingersoll-Sergeant compound compressor of about 10-drill capacity, a dynamo for lighting purposes, and the mill machinery. Three Pelton wheels are installed. All of this equipment appears to be in fairly good repair.

It is understood that milling tests recently made indicate that a satisfactory separation and recovery of the silver, lead, and zinc can be made by oil-flotation.

Neepawa. Ed. Shannon put in a season's prospecting on the hillside below the old mine-workings. Here a tunnel driven for about 200 feet in a south-westerly direction was in soft crushed ground, in which small kidneys of fine-grained galena were occasionally encountered. This ore, being rounded and worn from shearing movements, evidently was not in-place but had been broken from a vein. The property adjoins the *Enterprise* on the south.

Ottawa.—This mine, owned by the Consolidated Mining and Smelting Company, was worked under a lease by P. Maguire, of Slocan; 7 tons was shipped to Trail.

Anna Group.—This group was worked by the owner, K. Zimmerman, who shipped 6 tons of silver ore to the Trail smelter.

L.T.—This property was worked by the owner, D. B. O'Neail, who shipped 6 tons to the Trail smelter.

Royal Group.—This property is situated at the head of the North fork of Enterprise creek. M. Murphy put in a season's work and has about a car-load of ore ready for shipment.

Alma.* This group, consisting of the *Alma* and *McBride* claims, owned by J. E. Tattersall, of Slocan, is situated on the divide between Springer and 12-Mile creeks, 1½ miles by trail from the end of the *Ottawa* mine road, or 6½ miles in all from the railway at Slocan. The old workings are situated on a flat at an elevation of 5,275 feet above sea-level. They develop a wide sheared zone in granite,

highly silicified, in which occur shoots of "dry" silver ore. The mineralization consists of disseminated grey copper, silver sulphides, and occasionally native silver.

The vein strikes N. 3° E., with a dip to the east of from 45° to 50°. A short distance westerly from the outcrop of the vein a vertical shaft has been sunk 80 feet and short crosscuts driven to the vein at the 40- and 80-foot levels. The lower crosscut is an adit connecting with the surface. Short drifts on the vein extend southerly from the ends of the crosscuts and the extremities of these drifts are connected by an inclined raise on the vein.

On the 40-foot level a 25-foot vertical raise leads to a small stope on the hanging-wall side of the vein. In this stope ore is exposed over a width of from 4 to 4½ feet for a length of about 35 feet. Samples taken at intervals in the stope gave assays as follows:—

Description.	Gold.	Silver.	Lead.	Zinc.
	Oz.	Oz.	Per Cent.	Per Cent.
Across 4 feet	Trace	14.2	*Nil*	2.1
Across 4½ feet	0.02	36.4	Trace	Trace.
Across 4 feet	0.04	104.6	*Nil*	1.6

The ore evidently extends over a greater width towards the foot-wall side, but no samples could be taken below on account of the timbering in the raise. No ore was encountered on the bottom level, but this may be accounted for by the apparent flat "rake" of the ore-shoot on the 40-foot level.

The property is favourably situated in regard to transportation; timber for mining purposes is plentiful and the grade of the ore encountered should encourage further work with a view to ensuring sufficient tonnage of ore to warrant the construction of a milling plant. The ore should be amenable to concentration by flotation methods.

LIST OF SHIPPING MINES IN SLOCAN CITY MINING DIVISION, SHOWING TONNAGE SHIPPED.

Mine.	Locality.	Tons mined.	Character of Ore.
Anna	Springer creek	6	Silver ore.
L.T.	Springer creek	6	Silver-lead ore.
Ottawa	Springer creek	7	Silver ore.
Peg Leg	Slocan City	2	Silver ore.
Slocan Chief	Enterprise	2	Silver-lead ore.
Total		23	

TRAIL CREEK MINING DIVISION.

ROSSLAND.

The Rossland mines were operated steadily during the year by the Consolidated Mining and Smelting Company, employing about 400 men. The output was 153,000 tons, all of which was shipped to the Trail smelter, where it was concentrated and smelted. Judging by statements recently made by high officials of the company, the results of the season's work, which may be looked upon as an experiment, were far from satisfactory and in all probability the mines will be partially closed down in January, 1925.

On account of the increase in population at Trail, due to the enlargement of the smelter and refineries, Rossland will no doubt become a popular residential section. However, it is to be hoped that further exploratory work will disclose more ore in the company's mines and that other properties will be developed and brought to a producing basis.

Velvet. A few car-loads of ore were shipped from this mine, where the owners are now driving a long tunnel to tap the vein below the present workings. The men interested in this property are all practical miners of Rossland, and, having a thorough knowledge of the mine, should stand a good chance of making a success of their undertaking.

I.X.L.

The leasers who have been responsible for the successful development of this property, resulting in the mining of a considerable tonnage of exceptionally high-grade gold ore, continued mining and development during the year. Stoping operations were being undertaken from the intermediate or 350-foot level, where the vein shows a width of about 16 inches for a length of 90 feet, with the same characteristics as prevail on the upper levels, being frozen on the hanging-wall and carrying a thin streak of gouge on the foot-wall, while the high-grade ore carrying visible gold makes where cross-fractures intersect it. Some 25 feet below this level broken and crushed ground was encountered, in which the vein was lost; similar conditions prevail on the No. 4 level, about 150 feet lower down the hill.

The success met with at the *I.X.L.* has been responsible for considerable prospecting activity at adjoining properties. At the *Midnight*, which adjoins the *I.X.L.* to the east, a tunnel was being driven to pick up the possible extension of the *I.X.L.* vein in this direction, and a small compressor and gasolene-engine were installed to facilitate the work.

At the *O.K.*, which adjoins the *I.X.L.* to the west, a tunnel was being driven in a north-westerly direction from an elevation slightly higher than the No. 3 tunnel on the latter property. This tunnel was in 200 feet. At 84 feet a quartz vein, having a strike of N. 35° E. and dip of 70° to the north-west, was cut. This vein has a banded structure, is mineralized with a little galena and iron sulphides, and would appear worthy of more attention than it has received. Beyond this the formation has been faulted and sheared and the tunnel ends in serpentine streaked with quartz.

At the *Rubenstein*, which is located on the steep hillside above the Rossland–Cascade road, a tunnel has been driven at an elevation of 4,200 feet. At a distance of 85 feet in, small values were encountered near a dyke, along which a drift was run for 20 feet, but no ore in commercial quantity was developed. Abandoning these works, another tunnel was started 200 feet higher up the hill to prospect iron-stained showings in a massive bluff of what appeared to be finely crystalline basic igneous rock, possibly an altered serpentine. This tunnel was in 15 feet.

At the *Gold King*, which lies to the east of the *Rubenstein* and adjoins the *I.X.L.* to the north, a crosscut tunnel was being driven to explore quartz stringers and inclusions exposed at a short distance up the hillside. This tunnel had a direction of N. 70° W. and was in 35 feet. No appreciable values had been obtained on the surface, hence it was difficult to realize the necessity of the tunnel. At a short distance around the hill an old tunnel had been driven for a few feet on one of these quartz-outcrops. A sample taken here of what appeared to be the best-looking material ran: Gold, trace; silver, 2.9 oz. to the ton. The formation consists of quartzites, silicified limestones, and slates of the Mount Roberts formation.

It may be explained that prospecting on this higher portion of the hill above the *I.X.L.* was undertaken by virtue of theories advanced by some that the whole block of ground in which the *I.X.L.* vein occurs had at one time been dislodged from the higher extremities of the mountain. The writer, however, could discern no evidence of this having happened in the area examined.

A few men were also employed at the *Golden Drip*, which lies at the foot of the hill, adjoining the *I.X.L.* to the south. Here the low tunnel was being extended to prospect the ground below the upper workings of this property, from which a small quantity of high-grade ore was extracted many years ago.

TRAIL SMELTER.

Of the many extensions and improvements made necessary by the increased production of lead and zinc ores, the following are the most important: Doubling of the capacity of the zinc plant; adding 150 tons to the capacity of the lead-refinery; addition of four Dwight & Lloyd furnaces to the lead-smelting plant; and the construction of four Cottrell treaters. This construction is all under way and very little, if any, of it will be completed this year.

An average of about 1,600 men was employed during the year. A large crew of men has also been steadily employed at the construction of the new power-house at Bonnington, in which three 20,000-horse-power units are being installed. This installation, involving an immense amount of rock-excavation and concrete-work, represents a splendid piece of engineering which is being ably brought to completion by members of the company's staff under the personal supervision of L. A. Campbell.

ARROW LAKE MINING DIVISION.

A small crew of men was working at the *Millie Mack*, near Burton, during the season. About the usual amount of prospecting was done during the year, but no news of any important developments has been received.

REVELSTOKE MINING DIVISION.

At the *Wigwam* group, on Isaac creek, W. T. Dumbleton, of Tacoma, had a crew of about thirteen men working during the season, most of the time being occupied by the construction of 6¼ miles of road to the claims. The development-work done at the property is said to have met with encouraging results and will be proceeded with next year, when it is planned to erect a 42-horse-power semi-Diesel engine and compressor. The property is described in the Annual Report for 1923.

In the "Big Bend" district north of Revelstoke a little Keystone-drilling was done to check up a report issued some years ago by a company called the Cal-Canadian Gold Dredging Company, of San Francisco, which was promoted for the express purpose of placing a gold-dredge in the valley of Goldstream. In the prospectus of this company the valley of Goldstream is pictured as a veritable treasure-house, while many other extravagant statements are made.

The drilling-work was done this year under the direction of Eugene H. Dawson, a mining engineer of New York, who represented the Gold Fields American Development Company, of New York. The following is an excerpt from his letter to the writer:—

"With reference to my findings at French creek and Goldstream, they are, briefly, as follows: The only apparent sources of gold in the Goldstream valley are French and McCullough creeks, small tributaries flowing into Goldstream from the north. Eroded portions of an old upper channel of French creek were the sources of gold in French creek itself, and uneroded portions yielded further amounts by drifting and hydraulicking. We drilled two holes near the centre of Goldstream valley, 50 and 89 feet deep respectively. At a depth of 89 feet we were drilling in fine gravel and sand, which indicates that it is still considerable distance to bed-rock. No values were recovered from either of these holes, which confirms the opinion that there is no gold run from above French creek. The holes are located opposite the mouth of French creek, but too far out in the valley to be affected by the discharge from this stream. This opinion is confirmed by N. Remillard, who reports that he could not raise more than a colour when on a prospecting-trip on upper Goldstream, and further substantiated by the absence of any old workings left by the miners of the time of the French creek activities. My conclusions are that the Goldstream valley was made during the glacial period, and very deep, subsequently filled, and then reopened by the present stream. The source of gold-supply is inadequate to sufficiently enrich the Goldstream valley to make a profitable mining operation; and, further, the depth to bed-rock is too great for dredging operations."

The *J. & L.* group on Carnes creek, owned by E. McBean, was examined by Dr. Hurst, of the Geological Survey of Canada, in connection with his investigation of the arsenic resources of the Province.

The *Mastodon* group on LaForme creek, which has been lying idle for a number of years, was examined by W. Peterson for the owners, who, it is understood, intend to carry on development next year along the lines suggested in his report.

At the *Waverley-Tangier*, situated on Tangier creek (North fork of the Illicillewaet), a small crew of men was employed during part of the year under the direction of Orville Young. The property, which is described in the Annual Report for 1921, is owned by the Waverley Mines, Limited, of Spokane, of which F. M. Martin is president and G. M. Walters secretary.

At the *Lanark* near Laurie a considerable amount of diamond-drilling was done in the fall of the year. So far the results have not been reported. During recent years the property has been responsible for a small tonnage of silver-lead ore under the management of W. Dornberg, of the Lanark Mines, Limited.

At the *Woolsey* group on Silver creek Dave Woolsey and his two sons put in a season's development-work. Latterly it is reported that they have been working at the *Donald* near Flat creek. At the *Dempsey* group, situated up Bostock (Cariboo) creek, some 5 miles from Flat creek, John Forbes put in a season's work.

LARDEAU MINING DIVISION.

CAMBORNE.

This small settlement is situated at a distance of about 6 miles from the boat-landing on the North-east arm of Arrowhead lake, from which point a jitney service is maintained during the summer months. The Mining Recorder's office is at Beaton, which is situated at a short distance from the lake and at the junction of the Trout Lake and Camborne roads.

Some twenty years ago Camborne was the scene of considerable mining activity. It boasted of three or four hotels, quite a few stores, small residences, and the usual proportion of shacks. It was then, as it is now, the starting-off place for the prospectors of the Lardeau Mining Division, which embraces the great mountainous area adjacent to the valley of the Incomappleux river, commonly known as Fish creek, which latter is a misnomer, for it is not good for fishing and is much too large to be classified as a creek.

Gold and silver-lead-zinc ores were discovered in this area in the early nineties, but it was the gold ores which were principally responsible for the influx of mining men and the establishment of the camp. In a short time no less than four small stamp-mills were erected within a radius of 5 miles of the camp; two of which—namely, the *Eva* and *Oyster-Criterion*—were located on Pool creek within the limits of the townsite.

Unfortunately the honest endeavours of a few were unavoidably attended by those of others who were, perhaps, more interested in making their gains by the sale of stock or by the sale of properties to the public than in actual mining. This resulted in factitious boosting which adversely affected the best interests of mining and made it both difficult to raise money for legitimate propositions and for the prospectors to get either a grubstake or encouragement. These conditions, of course, are not peculiar to the Lardeau, but also apply to other sections of the Kootenays.

There is no doubt that it is a well-mineralized area in which many prospects await development, although on account of its rugged nature and timbered hillsides it is not an easy country to prospect or for the prospector to get his ore out of.

Generally speaking, the geology of the Lardeau is similar to that of the Trout Lake area, which adjoins it to the south-east, there being two distinct mineralized zones; the one in the vicinity of Camborne being occupied by a belt of green schists and phyllites interbanded with rusty weathering diabase-schists. In this zone the principal deposits are of gold quartz. The schists have been invaded by an abundance of siliceous solutions, which have followed lines of fissuring both with and cutting the schistosity of the rocks, in places forming strong quartz-exposures. The cross-fissures have been found to yield the better values, which become more pronounced at their intersection with other veins.

Fairly extensive development was undertaken in past years at the *Eva*, *Oyster-Criterion*, *Gold Finch*, and *Independence* groups, all of which are within this zone and lie within a small area. At the *Eva*, on which most work has been done, the grade of ore milled, running between $5 and $6 a ton, was not high enough to allow profitable small-scale operations; hence the future of this and the adjoining properties would seemingly depend on the development of sufficient tonnage to warrant operation on a large scale. In order to determine whether a scheme of this sort is feasible a thorough examination of the area and a lot of sampling would be necessary, also some of the old workings would have to be cleaned out. Should conditions be found to warrant further exploitation, it would probably be found necessary to group the properties and work them as a unit with a centrally situated plant. The situation is ideal for the development of water-power and the general conditions are favourable for low mining costs.

The other mineralized zone lies to the east and is occupied by rocks of the "lime dyke" series, including limestones, slates, schists, and quartzites, which formation may be correlated with the Slocan series. In this zone silver-lead-zinc ores predominate, which are similar in character to those of the Slocan. The term "lime dyke" derives its origin from the steep and lofty ridges of limestone left standing, due to the erosion of an anticlinal fold.

As the rocks of this series are recognized to be the most favourable for the deposition of silver-lead-zinc deposits in the West Kootenay District, this zone, extending south-westerly through the Trout Lake district and north-easterly beyond the main line of the Canadian Pacific Railway, no doubt has great potentialities, and although many claims have been staked little has been done in a substantial way to prove their worth. This has been largely due to the

rugged and inaccessible nature of the country, which has militated against the activities of the prospector and retarded development.

This year a good deal more interest has been taken in the district than usual, which it is to be hoped will be reflected by an increase in development-work during the coming season. The new discovery at the head of Sable creek promises to be the most important that has been made for many years. This is fully described elsewhere in the report.

Multiplex Mining & Milling Co.

This company, which was incorporated in 1914, with a capitalization of $1,000,000, divided into $1 shares, owns a group of eighteen claims on Pool creek. The registered office of the company is at Revelstoke. O. T. Bibb, the president, has for many years struggled with financial and geological problems in an endeavour to develop sufficient ore to justify the erection of a concentrator; for the bulk of the ore so far developed, being a complex mixture of lead, zinc, and iron sulphides with a little chalcopyrite, is essentially of a milling grade. Development and exploratory work has mostly been confined to the *Spider* claim.

Each year sees several men working at the property; hence progress has been slow, and while not discouraging, the results obtained have been indefinite. There is evidence of considerable mineralization, but unfortunately it is scattered and lacks continuity, occurring in bunches and following small cracks and fissures in the country-rock, which consists of a green schist. The surface, being heavily covered with overburden, adds to the difficulties of prospecting and a considerable sum has been spent in an endeavour to trace the ore and define its boundaries.

In the uppermost workings, where there are several large open-cuts and a 40-foot length of tunnel, small stringers of galena and zinc-blende crosscut the schist, which latter has a strike of N. 55° W. and dips to the north-east at an angle of 80°. A sample taken of the sorted ore from this tunnel assayed: Gold, 0.08 oz.; silver, 85.9 oz. to the ton; lead, 39.2 per cent.; zinc, 26.2 per cent.

At about 125 feet down the hill a tunnel was driven to develop the original discovery of ore on this claim, and a small shipment was made to the Trail smelter in 1912, which averaged: Gold, 0.1 oz.; silver, 6.86 oz. to the ton; lead, 17.2 per cent.; zinc, 15.4 per cent.; iron, 23 per cent.; lime, 8 per cent.; insoluble, 23 per cent.; sulphur, 16 per cent.

To explore this area at still greater depth a tunnel has been driven, under the direction of O. T. Bibb, at some 200 feet below the uppermost workings. In this tunnel similar complex geological conditions were encountered—namely, the occurrence of ore in streaks and bunches—resulting in a large amount of dead-work in proportion to the amount of ore developed. At the time of the writer's visit in June this lower tunnel was being advanced to explore the possible downward continuation of the ore exposed in the uppermost workings. The development had not, in the writer's opinion, proved the existence of sufficient tonnage to justify mill-construction plus the incidental cost of providing adequate transportation facilities.

With the amount of work accomplished and in view of the complicated structural conditions, it would appear to be a case where the directors would be fully justified in getting an up-to-date survey and report by a reputable independent mining engineer to place before the shareholders, when an intelligent decision could be arrived at as to the future operation of the property. The property is conveniently situated and the persistent efforts which have been made to bring it to a producing basis are certainly deserving of success.

Ritchie Group.*

This group, comprising four claims—*Rambler-Cariboo*, *Blackhead*, *Margaret*, and *Mary Jane*—is owned by G. Ritchie, G. Edge, and F. R. Blockberger. It is situated at the head of the Middle fork of Sable creek, 9 miles (estimated) from the Fish Creek wagon-road, at a point about 4½ miles above Camborne. When the property was visited in September there was no trail for the last 4 miles of the ascent, but since then a rough trail is reported to have been built at the upper end, so that the trip can now be made without difficulty.

The ground was originally staked some years ago by Messrs. Ritchie and Edge, prospectors of the Lardeau, following their discovery of boulders of float-ore, which are strewn for 1,000 feet or more along the gentle slope below the glacier. These boulders, varying in weight from a few pounds to a ton or more, consist of galena and iron pyrites with little or no gangue. This year the retreating of the glacier, due to the exceptionally dry summer, led to the discovery

of the ore in-place just below the shallow rim of the glacier at an elevation of about 7,200 feet above sea-level.

The ore-showing is from 8 to 10 feet wide and 36 feet long, consisting for the most part of a solid mass of galena and pyrite, in which the galena, ranging in texture from the coarse cubical to the steel-grained variety, predominates. A very small amount of zinc-blende was noted in spots and there is also a little quartz containing disseminated galena. A sample of the galena, fairly free from iron, assayed for the owners gave: Silver, 45 oz. to the ton; lead, 75 per cent.

The country-rock is limestone, striking north-westerly and dipping to the north-east, and the big showing apparently occurs in a cross-fracture. At the north-easterly or upper end of the showing the ore appears to continue under the rim of the glacier, which is only a few feet thick for 100 feet back. A short distance below the showing the limestone is cut by a narrow, rusty, weathering dyke, probably diabase-schist. South-westerly from the big showing there are some wide stringers of galena and pyrite, up to a foot in width, which follow the trend of the limestone. As the deposit is situated on flat to gently sloping ground it would take a very long tunnel to gain any appreciable depth. The showings are a long distance above timber-line and the upper approaches to the property (by the Middle fork or South fork of Sable creek) are reported to be bad for snowslides, but if the ore-body proves up to expectations these difficulties should soon be overcome.

Among the prospecting activities the following may be mentioned: Owen Rowland put in a season at the *Independence* group, where he has accomplished a lot of work single-handed, consisting of numerous trenches and open-cuts, mostly in a diabase-schist formation. In places some good values have been obtained. Samples taken across a width of about 10 feet of decomposed diabase-schist along several of the trenches indicated this material carried small gold and silver values running from about $1.50 to $2 a ton. The old workings of the property are described in the Annual Report for 1914. The property adjoins the *Goldfinch* and lies in the same mineralized zone as the other gold-quartz properties mentioned elsewhere in this report. On Pool creek J. M. Humphreys, of Malakwa, and associates acquired an interest in the *Mowhawk* group, which they bonded from T. B. Dowling, and leased from the Government the *Moscow*, a reverted Crown-granted claim. It is understood that a start has been made on development and that work will be continued in the spring. J. E. Lindsley, of Camborne, and J. A. Darragh, of Revelstoke, acquired the *Eclipse* group on Pool creek and intend to carry on development. Samples assayed for the owners gave high values in gold and silver. The two last-mentioned properties are described in the Annual Report for 1914.

TROUT LAKE MINING DIVISION.

The season witnessed a decided revival of interest in this section of the district and a number of mining engineers and others interested in mining registered at the beautifully situated hotels at Trout Lake and Ferguson. There is no hardship in travelling the hills of this picturesque country, where every turn in the trail presents a new scene of mountain grandeur. Good accommodation is always obtainable, while horses can be hired for riding and packing purposes, by which means far-distant points on the summits can be reached with little exertion.

The area is well mineralized and covers the south-easterly extension of the mineralized zones which cross the Lardeau Mining Division. It has been responsible for the bulk of the production of silver-lead-zinc ores from the northern section of No. 5 District. These ores favour the slates and limestones and, unlike the ores of the Slocan, frequently carry appreciable gold values, especially in the zone of oxidation.

The rocks of the sedimentary series, which are classified as belonging to the Carboniferous period, no doubt correspond to the Slocan series. The steeply tilted beds striking to the north-west and dipping to the north-east are composed of slates, limestones, quartzites, and magnesian schists. Interstratified with these beds there are well-defined bands of green schists, which represent sills or dykes of igneous origin. In these schists, which are generally highly silicified, many quartz veins occur, in some of which good gold values have been obtained.

Water-power and timber are generally available for mining purposes, while the topographical features lend themselves to great depths being gained by adit-tunnel development.

True Fissure. This property, which is situated within a short distance of Ferguson, is owned by the True Fissure Mining and Milling Company, controlled by American capital. As the property has been described in previous Annual Reports, only a brief review of the outstanding features will be given. The *True Fissure* vein consists of a well-defined fault-fissure cutting the formation of calcareous and highly silicified schists at an oblique angle. On the upper portion of the hill the hanging-wall has been eroded by glaciation, leaving a large surface exposure on the foot-wall, which forms a layer of varying thickness of lead, zinc, and iron sulphides.

After exploring this outcrop by shallow diggings it was decided to develop the vein at depth. In order to do this two tunnels were driven; one, gaining a depth of about 200 feet below the outcrop, was driven for 190 feet, and the other, gaining an additional depth of 80 feet, was driven for a distance of about 438 feet. These tunnels were driven parallel to the vein in the hanging-wall side and the vein was explored at intervals by crosscuts.

After an interval of inactivity the company resumed operations in 1922, when the lower tunnel was extended to a total length of about 800 feet. Several crosscuts to the foot-wall expose low-grade ore and vein-matter consisting of a large percentage of quartz with some spathic iron and calcite, through which lead, zinc, and iron sulphides occur in irregular disseminations. The hanging-wall is remarkably uniform in strike and dip and represents a plane along which there has been considerable movement, as indicated by its smoothness and streak of gouge. At the face of this tunnel some finely crystalline ore was exposed, a sample of which assayed as follows: Gold, 0.06 oz.; silver, 11.1 oz. to the ton; lead, 16.5 per cent.; zinc, 19.8 per cent.

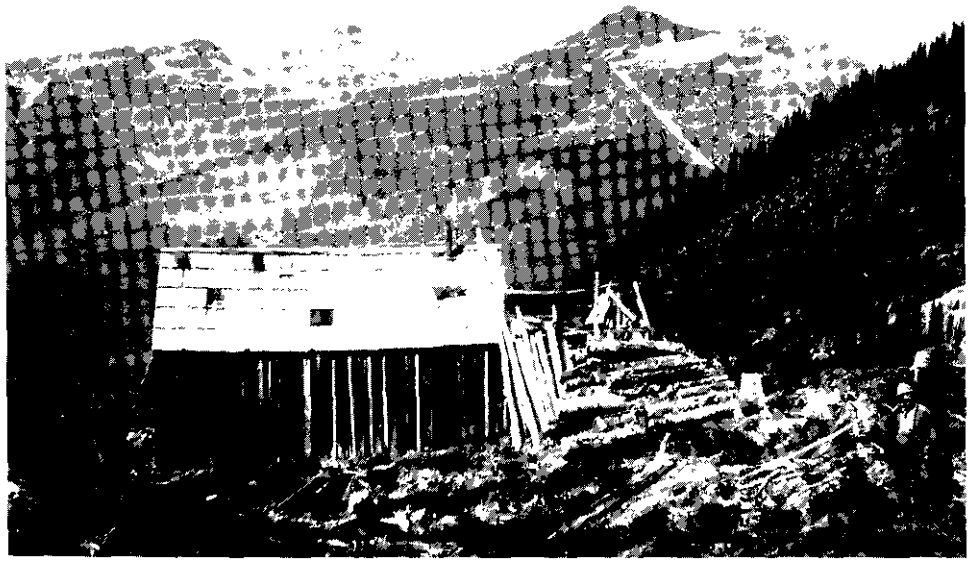
In the writer's opinion this tunnel should have been continued and more work done on the ore where it was encountered in the crosscuts. It is possible that the ore may make into the foot-wall following cross-fractures.

Upon cessation of work at this tunnel the company started another tunnel at an additional depth of about 300 feet. This tunnel has been driven in a direction of S. 70° W. and crosscuts a limestone and schist formation. At a distance of 767 feet it intersects the main vein, which has been drifted on for 646 feet. No ore in any appreciable quantity was encountered, but the vein is characterized by the same well-defined hanging-wall and shows a strong width of quartz, calcite, and siderite. Considerable difficulty was experienced in this drift, due to the heavy flow of water, which in places has had the effect of leaching the silicified limestone, leaving a reticular structure of silica.

Other workings may be seen at the *Blue Bell* and *St. Elmo* claims, where small tonnages of good-grade ore have been extracted in past years. The relation of these veins to that of the main vein was not quite apparent from the amount of work done, and the company very wisely had a survey of all the various workings made in the fall of the year. It is understood that systematic development-work has been planned with a view to explore the ore where it has been encountered and to seek its continuation in the most likely localities. As the property stands to-day, the development has demonstrated that while there are possibilities for winning small tonnages of high-grade ore, the bulk of the ore is essentially of a milling grade. There is evidence of heavy sulphide mineralization at scattered points, but the work has been done in such a way as to neither prove the existence or non-existence of a large ore-body.

All work is being done under contract by Dave Morgan, of Ferguson, who has been at the property since 1922, during which time he accomplished a lot of work with a small crew of men. The present development programme is being carried out under the direction of W. T. Dumbleton, of Tacoma. A crew of ten men is being employed this winter.

Nettie L. This property, comprising the *Nettie L.*, *May B.*, and *Ajax* claims, is situated at a short distance from Ferguson at an altitude of about 5,000 feet above sea-level, or 2,000 feet above Lardeau creek. Ownership is vested in the Ferguson Mines, Limited, an English company, of which James Anderson, of Kaslo, is agent. The discovery was made by W. B. Pool, of Nelson, in the nineties, and is described in the Annual Report for 1900 as follows: "The discovery on this group consisted of a highly mineralized zone in the schists, about 60 feet wide, and outcropping on the hillside. The mineralization consists chiefly of sulphides of iron, with a little copper and some lead, carrying values in gold and silver. On the surface these sulphides had been oxidized, forming an 'iron cap' and making a considerable showing."



Free Coinage Mine, Trout Lake M.D.

Uplands in Trout Lake M.D.

Between the years 1900 and 1904 a large amount of work had been done on the property and some 3,000 tons shipped to the smelter, which averaged: Gold, 0.13 oz.; silver, 149.6 oz. to the ton; lead, 26.7 per cent. This was the most active period of production and has been followed by intermittent leasing operations.

The development, which has mostly been done on the *Nettie L.* and *Ajax* claims, totals some 7,000 feet of underground workings, although the ore-bearing portion of the mine is confined to comparatively small areas.

There are two vein systems, one being in the nature of a sheared fracture almost conforming in strike to that of the formation and the other cross-fractures cutting the formation at various angles. The bulk of the ore shipped was won from a well-defined cross-fracture, which intersects a strong and well-defined sheared fracture referred to as the main vein. The ore which outcropped on the surface has been developed from grass-roots to a depth of 368 feet below the outcrop.

This cross-fracture intersects the main vein on the various levels of the mine, but does not cross it. As there is evidence of post-mineral faulting in the plane of the main vein, it is possible that the cross-fracture is faulted by it and its continuation may be found on the northerly side of the hill.

Entry is gained to the mine by adit-tunnels consisting of two upper levels on the south side of the hill and the lowest level on the north side, which latter gains an additional depth of 300 feet. It consists of a long crosscut driven to the main vein, which it intersects at a distance of about 700 feet, from which point a long drift has been run in an easterly direction.

The condition of the workings was such that little knowledge could be gained regarding the character or extent of the mineralization without spending a great deal more time than was at the writer's disposal. However, it was apparent that the vein was chiefly composed of sheared country-rock with inclusions of broken quartz fragments, the whole having a schistose structure. A streak of gouge defines either wall.

According to old reports, lenticular ore-shoots were developed in the main vein at intervals, and the values are characterized as being "spotty." Very little stoping has been undertaken from the lowest level.

A considerable amount of work has also been done on the *Ajax* claim, which adjoins the *Nettie L.* to the east, 1,000 feet or so from the main outcrop of the latter claim. Here some high-grade silver-lead ore was developed and a shipment of some 550 tons was made.

Summing up from information mostly gained from reports written at a time when the mine was in operation and all workings were accessible, it would appear that, having exhausted the available high-grade ore, there remained a considerable tonnage of milling-grade ore and great reliance was placed in the *Silver Cup* mill then under construction (1903) for its economical treatment.

It will suffice to say that this mill was a complete failure and its construction no doubt was largely responsible for the closing-down of this property and the *Silver Cup*, which is also owned by the Ferguson Mines, Limited. At this time the problem of saving the silver values, associated with grey copper and separating the zinc from its associated minerals during the process of concentration, had not been solved. Now, however, with modern oil-flotation equipment, no doubt a satisfactory separation and saving of the values could be accomplished.

Should statements made in previous reports be correct—namely, that there is a large tonnage of milling-grade ore averaging: Gold, 0.15 to 0.4 oz.; silver, 30 to 50 oz.; lead, 3.5 to 4 per cent.; zinc, 4.5 to 20 per cent.—then the property certainly has very attractive possibilities from a milling view-point, while others are offered in the location of the continuation of the high-grade ore-shoot which occurred in the cross-fracture. As mentioned before, there may be a possibility of picking up the northerly extension of this cross-fracture beyond the main vein.

I.X.L. Fraction. This property, owned by W. White, of Ferguson, is staked on the westerly extension of the *Nettie L.* mineralized zone. The workings consist of an adit-tunnel driven into the hillside from the mine wagon-road at an elevation of about 4,900 feet above sea-level. At this point the road swings round the westerly end of the ridge on which the *Nettie L.* workings are located, and the vein, which is exposed in the face of a rock-cut, apparently represents the westerly continuation of the *Nettie L.* main lead. It has a strike of N. 25° W. and, dipping vertically, cuts at an oblique angle a narrow belt of dark schists and silicified limestone striking N. 70° W. and dipping about 60° to the south-west.

The tunnel has been driven easterly along the vein for about 400 feet. In this length the vein has an apparent width of between 3 and 4 feet and shows a narrow streak of galena and zinc-blende along the foot-wall side for a length of about 100 feet, in places swelling to form small lenses of ore which might be mined profitably. A sample across 6 inches of fine-grained ore assayed: Gold, 0.02 oz.; silver, 23.5 oz. to the ton; lead, 26.7 per cent.; zinc, 22.8 per cent.; and a sample of galena and zinc-blende in a quartz gangue across a width of 12 inches gave the following returns: Gold, 0.11 oz.; silver, 13.9 oz. to the ton; lead, 16.5 per cent.; zinc, 33.4 per cent. Work is being continued on the property by the owner this winter.

Free Coinage.

This claim, which is now the property of George Yuill, of Trout Lake, adjoins the *Silver Cup* to the south, covers the summit ridge, and extends into the *Triune* basin. The elevation of the workings is about 7,000 feet above sea-level. Exploratory work consisting of several shallow shafts and a tunnel was done many years ago in an endeavour to pick up the continuation of the *Silver Cup* ore-bodies.

In order to appreciate the possibilities of this claim it is necessary to have at least a slight knowledge of the geological conditions surrounding the *Silver Cup* ore-deposits. The original shaft on the *Silver Cup*, which was primarily responsible for the discovery of high-grade silver-lead ore-bodies, lies about 300 feet from the *Free Coinage* tunnel. This old shaft was started on an insignificant surface showing which improved in depth until further development revealed the presence of two veins, one of which is known as the "Cup" lead and the other as the "blind" lead, because it does not outcrop. In these two leads, which are about 50 or 60 feet apart, lenses of high-grade silver-lead ore were developed over a length of between 300 and 400 feet. Ore was also developed along the cross-fractures connecting the two leads. Old reports mention that a considerable tonnage of low-grade ore was developed in the "blind" lead, which suggests milling possibilities.

The formation as exposed in the upper part of the summit ridge, including the area occupied by the *Free Coinage* and *Silver Cup* claims, consists of steeply tilted magnesian schists and spotted phyllites; interbedded with these rocks there appears to be a highly altered intrusive rock, classified in the field as a light-coloured porphyritic schist, which lies on the hanging-wall side of the vein system, while a spotted phyllite forms the foot-wall. The veins roughly conform to the stratification of the enclosing rocks, striking to the north-west and dipping at 65° to the north-east.

The *Free Coinage* tunnel has been driven into the hill for a considerable distance in a south-easterly direction, approximately parallel to the *Silver Cup* lead. Slips have been followed and an occasional pocket of high-grade ore encountered, but apparently the tunnel lies to the south of the "Cup" lead, while it is doubtful if other workings, supposedly on the "blind" lead, are far enough to the south. Hence there is a possibility that the workings on the *Free Coinage* lie between the two leads; therefore crosscutting would be advisable in either direction.

The owner of the property spent part of the season in prospecting the precipitous face of the bluff forming the side of the *Triune* basin by means of a long rope.

Surprise Group.

This group, comprising three claims—*Adelina*, *Surprise*, and *Welsh*—is owned by D. Morgan, of Ferguson. The property is located on Surprise creek at a distance of about 7 miles from Ferguson. The elevation of the workings is 4,650 feet above sea-level, or about 600 feet above Ferguson creek. A considerable amount of shallow prospecting-work had been done by the owner before the war; since then the property has lain idle and the trail became obliterated, making access somewhat difficult. The work done has only been sufficient to demonstrate that there are possibilities for the development of a large tonnage of low-grade silver-lead ore, but further exploratory work is necessary to enable a definite conclusion to be drawn.

The vein, lying between steeply tilted greenish schists on the foot-wall and a band of limestone on the hanging-wall, conforms to the strike and dip of the formation, which are respectively N. 68° W. and 80° to the north-east. It is remarkably persistent in strike and can be traced for 1,000 feet or more along the creek-bottom. The mineral-bearing solutions following the line of fissuring have replaced the limestone to form a low-grade mixture of lead and iron sulphides across an average width of 8 or 10 feet, which might be expected to vary considerably under conditions of folding and cross-fracturing, while it is possible that further work will disclose places in the vein where there has been a greater concentration of values than so far exposed. As the vein was partly under the creek, it was not possible to sample across its entire width, but

a sample across 5 feet gave the following values: Gold, trace; silver, 0.8 oz.; lead, 11.4 per cent.; zinc, *nil*. Lower down the creek, where a tunnel has been driven across the vein, the mineralization is confined to a narrow band; a sample taken here across 21 inches assayed: Gold, trace; silver, 2.1 oz. to the ton; lead, 16.3 per cent.; zinc *nil*. Other samples indicate similar values.

There is ample water and timber available for mining purposes, and should ore be developed in quantity the transportation problems could no doubt be satisfactorily solved. After the writer's visit Government assistance was given towards reopening the trail, and since then it is reported that R. H. Stewart has taken an option on the property with the intention of doing some exploratory work next spring.

Black Warrior Group.

This property, for which H. N. Coursier, of Revelstoke, is agent, comprises three claims—*Black Warrior*, *White Star*, and *Eva May*. It is situated at the head of McDonald creek, which drains into Westfall creek (West fork of the Duncan river). Access is gained by trail from Ferguson up Ferguson creek and over the summit of the divide between Trout Lake and Ainsworth Mining Divisions, the total distance from Ferguson being approximately 16 miles.

The altitude of this summit is 7,300 feet and that of the trail below the workings is 6,250 feet, which means that ore would have to be packed up a steep switchback trail for about 1,000 feet in elevation. However, in spite of serious handicaps due to transportation difficulties, a considerable amount of work was accomplished many years ago. The surrounding country is of a rugged nature, and while the mine-workings appear to be safely situated, the steep slide-swept hillsides which the trail crosses are forbidding to winter travel.

The formation in the vicinity of the mine-workings is composed of beds of limestone and slate schist which, striking in an easterly and westerly direction, have been tilted at a steep angle to the south-west. The strike and dip are fairly uniform and no intrusions of igneous rock were noticed. The workings which were examined consisted of a deep open-cut and three tunnels driven into the precipitous hillside forming the easterly slope of McDonald Creek valley.

At an elevation of 6,550 feet a deep open-cut terminating in a short length of tunnel has been driven for 30 feet. This follows the hanging-wall of a massive quartz vein some 2 feet in width and sparsely mineralized with galena; the ore lies between this wall and schist and consists of coarse cubical galena in a quartz gangue, the associated minerals being zinc-blende and a little iron pyrites and chalcopyrite. The vein strikes S. 35° E. and dips at 70° to south-west and has been formed in the schist near the contact of limestone. In the face there is a pretty showing of ore extending from the top to the bottom of the drift and having a width of about 2 feet. A sample taken across this width gave the following assay returns: Gold, 0.28 oz.; silver, 71.2 oz. to the ton; lead, 57.3 per cent.; zinc, 7.8 per cent.

Tunnel No. 1 has been driven at a vertical depth of about 25 feet below the open-cut. It follows the hanging-wall side of the vein for its entire length, which is 85 feet. A section of the vein which has been exposed by a few shots shows it to be quartz sparsely disseminated with galena. From this tunnel a raise connects with the open-cut, but as it is now completely filled with broken ore and waste the amount of work done on the vein above the level could not be ascertained.

Tunnel No. 2 has been driven at a vertical distance of 100 feet below the No. 1. It is slightly caved at the portal, but access was gained without much difficulty. It also has been driven along the hanging-wall side of the vein and has a total length of about 205 feet. Although a little disseminated galena in quartz may be seen at several places, there did not appear to be any ore of commercial value. Several crosscuts have been driven for a short distance into the schist on the foot-wall side, while at the end of the level a 65-foot crosscut to the north-east crosses the schist and ends in limestone on the foot-wall side of the vein.

Tunnel No. 3 has been driven at a point 200 feet below the No. 2 level and has a total length of about 350 feet. The vein was not developed in this tunnel and there is nothing of importance to be seen.

According to a rough Brunton compass survey, this tunnel lies wholly in the foot-wall side of the vein, and crosscutting to right or south-west at the most favourable place would probably get the vein, if same is continuous with depth, in a distance of about 50 feet.

Exploratory work should first be done at the open-cut by following the ore to prove its continuity. The ore extracted might be sorted and shipped at a profit, which would at least help to pay the cost of such work. Should this work prove satisfactory it might be followed up

by further work from the Nos. 1 and 2 levels. It would not appear advisable to do any work in the No. 3 level until more ore has been opened up in the upper portion of the mine.

More prospecting in the slate-schist formation outcropping in the creek-gulch above the cabin would appear to be justifiable. The mine cabins, which are situated below the workings, are dilapidated, but there is a small cabin near the property which could accommodate two men.

Elsmere Group. This group is situated on Ferguson creek at a distance of 10 miles from Ferguson and close by an old stopping-place called Circle City, which can only boast of one old dilapidated log cabin. The group, comprising a number of claims, was partially developed by the Circle City Mines, Limited, in 1917–18, when the funds became exhausted and the property reverted to the original owner, E. A. Hillman, of Beaton, who was working on it at the time of the writer's visit. Since the property was described in the Annual Report for 1917 little development of any importance has been done.

Upon looking over the workings, consisting of several tunnels and open-cuts, it was evident that the ore-deposition is in the form of replacement deposits in limestone along the contact of a green schist, the ore sometimes forming in the schist where it has been crushed and loosened by faulting movements.

A fault-fissure along this contact, which no doubt provided the channel for the mineral-bearing solutions, has a north-westerly strike and a dip of 60° to the north-east. Ore can be traced for a considerable distance on the surface and over a vertical range of about 300 feet, the highest exposure being about 6,700 feet above sea-level.

The northerly end of the showings, where a little surface work had been done, appeared to offer good possibilities for further prospecting, for here the mineralization extends over a greater width than elsewhere, and, although low grade, is worthy of further exploration, which could be accomplished at small cost by shallow surface work. A sample taken at this point across the most highly mineralized section, representing a width of 15 inches, assayed as follows: Gold, 0.02 oz.; silver, 1.9 oz. to the ton; lead, 31.9 per cent.; zinc, 1.3 per cent.

The remainder of the ledge, some 10 feet in width, was sparsely mineralized with disseminations and streaks of galena, constituting a low-grade mixture, of which a small sample might only be misleading; in any event not enough work had been done at this point to allow any great importance being attached to the assay returns. The clean galena from one of the lower showings assayed: Gold, 0.08 oz.; silver, 2.4 oz. to the ton; lead, 68.6 per cent.; zinc, 2 per cent.; which with other assays demonstrates that the highest values are in lead, the silver and zinc being low.

Revenue. This property is situated on Ferguson creek at a short distance from the end of the Ferguson wagon-road. L. Thomson, of Ferguson, is principally interested. The work examined consisted of a tunnel driven in a westerly direction for 75 feet, at which distance a small vein was encountered and followed for 25 feet in a north-westerly direction. The vein has a strike of N. 45° W. and dips at 75° to the north-east, cutting a silicified schist formation. At the face a streak of ore is exposed, which should be further prospected. A sample from a small pile of sorted ore assayed: Gold, 0.04 oz.; silver, 16.1 oz. to the ton; lead, 23.3 per cent.; zinc, 1.8 per cent. It is understood that work will be proceeded with this winter. The property apparently lies in the same mineralized zone as the *Nettie L.* and is easily accessible.

The *Ophir-Lade* gold-quartz property was acquired by a Vancouver syndicate, in which W. T. McArthur, Gordon Wismer, and F. W. Welch are interested. A new cabin was built and a small stamp-mill and equipment were taken into Ferguson to be erected next year.

The *Big Five* group on Ferguson creek was also acquired by Vancouver interests. During the late fall a small crew of men was at the property making preparations for next year's work.

Work on a small scale was done at the *Cromwell*, which is now the property of Colonel H. H. Armstead, of Kaslo. The low tunnel which is being driven to cut the vein at depth is reported to be in 500 feet. Further work is contemplated for next summer.

NORTH-EAST KOOTENAY DISTRICT.

GOLDEN MINING DIVISION.

REPORT BY G. E. SANBORN, GOLD COMMISSIONER, GOLDEN.

I have the honour to submit the office statistics of the Golden Mining Division for the year ended December 31st, 1924.

Free miners' certificates (ordinary)	70
Mineral claims recorded	52
Certificates of work issued (mineral)	19
Certificates of work issued (placer)	1
Placer leases issued	5
Bills of sale, agreements, powers of attorney	23

Revenue.

Total receipts	$935 75

WINDERMERE MINING DIVISION.

REPORT BY E. M. SANDILANDS, MINING RECORDER, WILMER.

I have the honour to submit the office statistics of the Windermere Mining Division for the year ended December 31st, 1924.

Claims recorded (quartz)	49
Free miners' certificates issued (ordinary)	108
Free miners' certificates issued (special)	4
Placer leases (dredge)	2
Placer leases (hydraulic and creek)	42
Certificates of work issued	73
Bills of sale, bonds, powers of attorney, agreements, etc.	36

SOUTH-EAST KOOTENAY DISTRICT.

FORT STEELE MINING DIVISION.

REPORT BY F. A. SMALL, GOLD COMMISSIONER, CRANBROOK.

I have the honour to submit the office statistics of the Fort Steele Mining Division for the year ended December 31st, 1924.

Free miners' certificates issued	300
Mineral claims recorded	120
Placer claims recorded	3
Placer leases granted	4
Certificates of improvements	33
Bills of sale (mineral) recorded	29
Bills of sale (placer) recorded	30
Leases of Crown-granted mineral claims	10
Crown grants issued	33
Certificates of work	121

Revenue.

Free miners' certificates	$1,805 00
Mining receipts, general	2,427 62
Total	$4,232 62

NORTH-WEST KOOTENAY DISTRICT.

REVELSTOKE MINING DIVISION.

REPORT BY CHARLES AMAN, MINING RECORDER, REVELSTOKE.

I have the honour to submit the office statistics of the Revelstoke Mining Division for the year ended December 31st, 1924.

Free miners' certificates	196
Free miners' certificates (company)	2
Locations recorded	56
Certificates of work recorded	120
Assignments recorded	11
Powers of attorney recorded	11
Bills of sale recorded	23
Leases of Crown-granted mineral claims recorded	22
Placer leases	12
Groupings recorded	6
Placer claims recorded	2

Revenue.

Mining receipts	$1,291 15
Free miners' certificates	761 60
Mining leases	425 00
Total	$2,477 75

LARDEAU MINING DIVISION.

REPORT BY E. ROBERTS, MINING RECORDER, BEATON.

I have the honour to submit the office statistics of the Lardeau Mining Division for the year ended December 31st, 1924.

Free miners' certificates	30
Free miners' certificates (company)	1
Certificates of work	35
Locations recorded	39
Grouping notices	11
Bills of sale	11
Trade licences	2
Agreements recorded	1
Certificates of improvements	12
Agreements abandoned	1

SLOCAN DISTRICT.

AINSWORTH MINING DIVISION.

REPORT BY RONALD HEWAT, GOLD COMMISSIONER, KASLO.

I have the honour to submit the office statistics of the Ainsworth Mining Division for the year ended December 31st, 1924.

Free miners' certificates	156
Mineral claims recorded	71
Certificates of work recorded	264
Bills of sale, agreements, etc.	19
Dredging leases recorded	4
Leases of reverted Crown-granted mineral claims	7

SLOCAN MINING DIVISION.

REPORT BY ANGUS MCINNES, MINING RECORDER, NEW DENVER.

I have the honour to submit the office statistics of the Slocan Mining Division for the year ended December 31st, 1924.

Free miners' certificates issued	132
Claims recorded	34
Certificates of work issued	83
Agreements recorded	5

Revenue.

Free miners' certificates	$ 911 75
Mining receipts	318 35
Total	$1,230 10

SLOCAN CITY MINING DIVISION.

REPORT BY THOS. MCNEISH, MINING RECORDER, SLOCAN.

I have the honour to submit the office statistics of the Slocan City Mining Division for the year ended December 31st, 1924.

Free miners' certificates issued	45
Certificates of work recorded	59
Locations recorded	17
Transfers recorded	5
Notices to group	6

Revenue.

Receipts	$884 85

TROUT LAKE MINING DIVISION.

REPORT BY ROY JACOBSON, ACTING MINING RECORDER, TROUT LAKE.

I have the honour to submit the office statistics of the Trout Lake Mining Division for the year ended December 31st, 1924.

Free miners' certificates	44
Free miners' certificates (company)	1
Certificates of work recorded	121
Notices to group filed	24
Locations on mineral claims	40
Locations on placer claims	2
Transfers of mineral claims	15

Revenue.

Free miners' certificates	$313 50
Mining receipts	313 50
Total	$627 00

NELSON DISTRICT.

NELSON MINING DIVISION.

REPORT BY J. CARTMEL, GOLD COMMISSIONER, NELSON.

I have the honour to submit the office statistics of the Nelson Mining Division for the year ended December 31st, 1924.

Free miners' certificates (individual)	320
Free miners' certificates (company)	2
Free miners' certificates (special)	3
Claims recorded (mineral)	123
Claims recorded (placer)	1
Claims rerecorded (placer)	1
Certificates of work issued	362
Agreements, transfers, etc.	31
Grouping notices filed	18
Certificates of improvements issued	1
Leases of forfeited Crown-granted mineral claims issued	18

Revenue.

Free miners' certificates	$1,775 00
Mining receipts, general	1,398 80
Lease fees (forfeited Crown-granted mineral claims)	450 00
Total	$3,623 80

ARROW LAKE MINING DIVISION.

REPORT BY WALTER SCOTT, MINING RECORDER, NAKUSP.

I have the honour to submit the office statistics of the Arrow Lake Mining Division for the year ended December 31st, 1924.

Free miners' certificates	38
Certificates of work recorded	7
Mineral claims recorded	3

ROSSLAND DISTRICT.

TRAIL CREEK MINING DIVISION.

REPORT BY W. H. REID, GOLD COMMISSIONER, ROSSLAND.

I have the honour to submit the office statistics of the Trail Creek Mining Division for the year ended December 31st, 1924.

Free miners' certificates (individual)	113
Free miners' certificates (company)	3
Free miners' certificates (special)	2
Locations recorded	28
Certificates of work recorded	37
Assessments paid in lieu of work	1
Bills of sale recorded	11
Notices to group	4
Leases of reverted Crown-granted mineral claims	5

WESTERN MINERAL SURVEY DISTRICT (No. 6).

REPORT FOR YEAR 1924.

BY WM. M. BREWER, RESIDENT MINING ENGINEER.

The Western Mineral Survey District (No. 6) includes the following seven Mining Divisions: Alberni, Clayoquot, Quatsino, Nanaimo, and Victoria (embracing the whole of Vancouver Island), and Vancouver, New Westminster, and a portion of Nanaimo, on the Mainland.

The area within the boundaries of the district is approximately 248 miles from north to south by 213 miles from east to west, including the area covered by water between the Mainland and Vancouver Island.

The writer wishes to extend to the several members of the Geological Survey of Canada, mine managers, prospectors, and to all others engaged in the mining industry with whom he has had business during the past year his sincere thanks and appreciation for the many courtesies that have been extended to him.

In 1924 the writer commenced field-work on March 4th and was engaged almost continuously in making examinations of mines, prospective mines, and newly staked prospects until January 1st, 1925, when the *Britannia* mine was visited and the underground development-work performed during 1924 was examined.

During a part of April the mining and shipment of 20 tons of magnetite-iron ore for experimental purposes in the manufacture of sponge iron occupied several days. The results from this shipment are referred to later in this report.

The following named sections in District No. 6 were visited and examinations made during 1924:—

Alberni Mining Division: West coast of Vancouver island—China creek and the summit on the Island highway between Alberni and Nanaimo.

Clayoquot Mining Division: West coast of Vancouver island—Clayoquot sound, Sidney inlet, Nootka sound, and Tahsis canal.

Quatsino Mining Division: West coast of Vancouver island—Elk lake, South-east arm of Quatsino sound, and Holberg, head of South-west arm of Quatsino sound.

Nanaimo Mining Division: East coast of Vancouver island—Cassidy, Nanoose, Cumberland, and Courtenay.

Nanaimo Mining Division: Mainland—The mountains easterly from Malaspina strait near Lund, Powell lake, Phillips and Frederick arms of Cardero channel.

Nanaimo Mining Division: Islands—Texada, Lasqueti, and Thurlow.

Vancouver Mining Division: Mainland—The mountains adjacent to Jervis inlet, Hotham sound, Seechelt inlet, Salmon arm, Pacific Great Eastern Railway section, upper Squamish and Mamquam rivers, and the mountains adjacent to Howe sound.

New Westminster Mining Division: Pitt lake, Chilliwack and section easterly from there, and Ruby creek.

Victoria Mining Division: Vancouver island—Sooke River section; Mounts Skirt, Sicker, and Brenton; Koksilah river; Sooke lake and Leech river; also several points in the vicinity of Victoria.

PROGRESS IN METALLIFEROUS MINING.

In the Western Mineral Survey District metalliferous mining has shown considerable progress during 1924, as well as a greater production, despite the low price, of copper; but there has been no increase in the number of producers. The increased production is accounted for by the Britannia Mining and Smelting Company, Limited, having operated continuously during 1924, although not to the full capacity of the mine or mill. The daily normal capacity of the mill is 2,500 tons of dry ore, and if necessary the daily capacity can be increased to 3,000 tons. During 1924 780,948 tons of ore was mined. The production of the *Britannia* mine during 1924 exceeded the production for 1923 by 1,670,436 lb. copper and 4,846 oz. silver, but the gold recovered shows a decrease of 786 oz., while the tonnage of ore mined in 1924 was 98,437 tons greater than in 1923. These results, all things considered, are satisfactory.

Unfortunately the *Britannia* was the only producing mine in District No. 6 in 1924, as the only other producing mine in 1923, the *Indian Chief* at Sidney inlet, in the Clayoquot Mining Division, on the west coast of Vancouver island, which has been operated by the Tidewater Copper Company since 1917, was closed down in November, 1923, and has not been working during 1924.

Progress in the industry, however, is shown by the development-work performed on the *Old Sport* mine, operated by the Coast Copper Company at Elk lake, Quatsino Mining Division, as well as by the work of owners on many properties. Some of these are recent discoveries and others are older locations on the northern end of Vancouver island, also on the Mainland near Powell river and on Texada island, in the Nanaimo Mining Division, as well as at the head of Chilliwack lake and at Pitt lake, in the New Westminster Mining Division; and in Vancouver Mining Division, in the vicinity of the southern part of the Pacific Great Eastern Railway, development-work as well as opening up some new prospects has attracted considerable attention from mining operators and engineers.

From the foregoing it may be considered that conditions in the metal-mining industry in District No. 6 are considerably improved since the Annual Report of 1923 was made and give promise of favourable progress during 1925.

COAL-MINING.

No mention is made relative to the coal-mining industry in the following report, because full reports on that industry are made by the Coal-mine Inspectors, other than a description of the introduction of what may be termed a new branch of the industry, which has been started by P. E. Peterson, specialist in concentration methods, at Cassidy, by which the slack-dumps at the colliery of the Granby Mining, Smelting, and Power Company are being treated and sold. A full report on Mr. Peterson's operations will be found in the description of the Nanaimo Mining Division in this report.

BIBLIOGRAPHY.

The bibliography pertaining to the Western District (No. 6) has been increased during 1924 by the publication of the following reports:—

Annual Report of the Minister of Mines, B.C., for 1923.

Precise Levelling; Bulletin "A," Vancouver, B.C., and adjacent district as far east as Mission, Matsqui, and Huntingdon; Department of the Interior, Canada; Geodetic Survey of Canada; F. B. Reid, Supervisor of Levelling.

Geology of Fraser River Delta Map-area, by W. A. Johnston; Memoir 135, No. 116, Geological Series; Canada Department of Mines; Geological Survey.

PROSPECTING.

The inauguration by the British Columbia Chamber of Mines of a class for prospectors that was started in the late fall of 1923, and which was attended by about eighty men who received instruction in the rudiments of assaying, mineralogy, and geology, acted as an incentive toward increasing the ranks in that very useful occupation.

So far as District No. 6 is concerned, it was noticeable that there were more prospectors in the mountains than has been the case in the recent past, also that their work was more systematically done, with the results that in some localities there were new discoveries made which attracted considerable attention.

Two cases in particular may be referred to because of the unusually high gold assays found in ore discovered in sections which had previously received practically no attention from prospectors. One was in the mountainous section drained by the upper Squamish river on the Mainland, and the other in the banks of the Zeballos river, which flows into the Zeballos arm of Esperanza inlet, west coast of Vancouver island. In both cases there were conditions which were calculated to promote fair-sized stampedes, had much publicity or sensational advertising been allowed to reach the public before the discoveries were investigated. Both of the sections mentioned merit thorough prospecting, but apparently the conditions surrounding the occurrences of the high-grade ore do not warrant any spectacular stampede, and such should be discouraged, and has been not only by the discoverers, but by the Mines Department. There are in both instances many difficulties to be overcome by prospectors, as to transportation, packing in

supplies, opening up trails, and mountain-climbing, that suggest that only experienced men should attempt the work.

All of the sections in which new discoveries have been made have been visited by the writer during the past season and descriptions in detail will be found in the following report under their proper headings.

This District (No. 6) was visited during 1924 by several mining engineers representing capital from Eastern Canada, the United Kingdom, and the United States. Some transactions were consummated, while others are pending decision by the principals represented by the engineers, and it is hoped will be closed in the near future.

NON-METALLIC MINERALS AND BUILDING-STONE.

The non-metallic minerals found in the Western Mineral Survey District include gypsum, talc, bauxite of low grade (used in refining gas), potter's clay, fireclay, shale (used in making sewer-pipe, paving, and pressed brick), common brick-clay, natro-alunite, and limestone (used for the manufacture of sulphite in the pulp and paper mills, also in the copper-smelters for flux, and exported in barrels as calcined lime).

Building-stone occurs at several points, the varieties being marble, granite, sandstone, and andesite, which are, with the exception of marble, quarried on a commercial scale. The most extensive granite-quarries at present being operated are on Nelson and Granite islands, Jervis inlet, about 50 miles north-westerly from the city of Vancouver. Sandstone of excellent quality for building occurs on Newcastle island near Nanaimo, Vancouver island, where a large quarry has been opened. Andesitic tuff, used in the erection of the Parliament Buildings and other important buildings, is quarried on Haddington island, 4 miles west of Alert Bay.

CRUSHED ROCK AND GRAVEL.

The most extensive quarries from which crushed rock and gravel are obtained are on the east side of Howe sound on the Mainland, and near Albert head at the entrance to Esquimalt harbour near Victoria.

LABOUR CONDITIONS.

During the past year the relationship between capital and labour in the mining industry has been harmonious. In the early spring the difficulty of finding experienced hard-rock miners presented quite a serious proposition, but at the time of this writing the mining companies are experiencing no difficulty in securing all the miners needed.

This condition applies to coal as well as hard-rock miners in the Western Mineral Survey District, where, although owing to the low prices of copper during a part of the past year the force at the *Britannia* mine was reduced for a short time, there was little complaint relative to unemployment.

IRON AND STEEL.

During the early spring of 1924 the Hon. the Minister of Mines was approached by the officials in charge of the Experiment Station of the United States Bureau of Mines at Seattle, Washington, with a proposition that if he would furnish some magnetite-iron ore for experimental purposes they would, in association with K. W. B. Worsoe, of the Wallace Foundry, Vancouver, use it to demonstrate the feasibility of making sponge iron from the ore direct, and in return they would make a full and detailed report to the Minister as to the success of the experimental tests, besides inviting a representative of the Mines Department to be present.

This proposition having been accepted, the writer was instructed to obtain 20 tons of magnetite-iron ore under the provisions of the "Iron-ore Supply Act" and ship the same to Mr. Worsoe for experimental purposes. These instructions were carried out. The ore was mined from the deposit on the *Volunteer* mineral claim on Texada island, owned by the Tacoma Steel Company.

The sponge iron produced as a result of the experiments was of good quality, and both iron and steel castings were made from the sponge iron direct, which were pronounced by competent foundrymen as being of excellent quality.

A full report on the production of sponge iron from ore is published by the United States Department of the Interior as Bureau of Mines Serials Nos. 2578 and 2656. These reports have

been made by Clyde E. Williams, superintendent and metallurgist, North-west Experiment Station (Seattle, Washington) of the Bureau of Mines, assisted by Edward P. Barrett, assistant metallurgist, and Bernard M. Larson, junior metallurgist. The last-named report was made after the experiments with the Texada magnetite were concluded.

The report is too voluminous for reproduction here, but the following extracts are of such importance that they are copied, as follows:—

"*Iron and Steel Production.*

"The possibility of making sponge iron and converting it to steel without passing through the stage of pig-iron production has been suggested from time to time, and hundreds of so-called 'direct-steel' processes have been proposed or tried during the past century. Unquestionably, the production of steel from sponge iron has theoretical advantages over present standard methods. Moreover, the production of both steel and pig-iron from sponge iron has economic advantages in certain localities. In regions remote from iron- and steel-producing centres, where coke is expensive and electric energy cheap, sponge iron made cheaply from iron ore and low-grade coal can probably be converted into iron and steel by treatment in the electric furnace in competition with the imported products. The fact that both the electric-melting and the sponge-iron production processes can be conducted economically on a small scale makes such a proposed process particularly advantageous in communities that do not consume much iron or steel. Electric-furnace processes, being inherently expensive, are advocated for the production of iron and steel only where unusual conditions prevail.

"*Summary.*

"(1.) The rotary kiln has proved to be simple in construction and operation, giving consistently good results in large-scale continuous production. It is well adapted to reasonably small units. For the problem of supplying sponge iron for chemical uses this furnace offers a satisfactory solution. Its importance in the problem of direct steel production will be largely dependent upon future developments.

"(2.) In a plant properly designed for mechanical handling of all materials the labour costs should be low, with but one skilled man needed to operate the kiln.

"(3.) The close regulation of charge temperatures near to the range of 925° to 950° C. is very important to smooth, continuous production.

"(4.) The charge of ore and coal crushed to pass an 8-mesh screen must be held in the reducing zone for a period of 40 to 60 minutes to obtain complete reduction; dense magnetite requires a longer time than hæmatite.

"(5.) All types of oxide iron ores may be reduced to produce sponge iron. No phosphorus can be eliminated, but part of the gangue and sulphur contents of the ore may be removed in the process. Low-grade coals are very good reducing agents.

"(6.) Cooling, magnetic concentration, and delivery of sponge-iron concentrates (running 70 to 90 per cent. total iron) to the point of use may be made entirely automatic at very low handling costs.

"(7.) Further tests of the process on a fairly large commercial scale are much to be desired, to give the data necessary for further refinements in kiln and improvements in economy of operation.—Reports of Investigations, Department of the Interior, Bureau of Mines."

INVESTIGATIONS RE DEPOSITS OF IRON ORE BY THE GEOLOGICAL SURVEY OF CANADA.

Under an arrangement between the Ministers of Mines of the Dominion and the Province an exhaustive examination of the iron-ore deposits of the Province was made in the field seasons of 1923 and 1924 by the Geological Survey of Canada. G. A. Young, of the survey staff, was engaged on the work in 1923 and W. L. Uglow in 1924. This investigation was decided upon by the Provincial Department of Mines in order to get absolute information regarding the iron-ore reserves of the Province. This information is essential to any one considering the feasibility of commencing an iron and steel industry in the Province.

It was expected by the writer that the reports of Dr. Young and Dr. Uglow, who were engaged in the examinations, would be finished so that a reference in this report could have been made regarding the deposits in the Western District, but they are not.

ALBERNI MINING DIVISION.

The conditions relating to the metal-mining industry in the Alberni Mining Division during 1924 have been decidedly disappointing, for the reason that there have been no operations other than the performance of the annual assessment-work on un-Crown-granted mineral claims, of which there are thirty-three in good standing. Owing to this inactivity, and as all of those mineral claims on which promising prospects occur have been described in the various Annual Reports of the Minister of Mines since 1916, it is not deemed necessary to repeat such in this report. One new location known as the *Grizzly* mineral claim is interesting because of an occurrence of native arsenic which is of sufficient importance to merit thorough prospecting and enough development-work to demonstrate whether or not the prospect possesses commercial value.

Grizzly.

This mineral claim is situated about 10 miles south-easterly from Port Alberni, in the mountains on the south side of China creek. The claim is owned by E. Loubert, Port Alberni. The route by which the *Grizzly* mineral claim is reached at present is via wagon-road from Port Alberni to the dam across China creek on the old *Duke of York* hydraulic mine, where the intake for the Port Alberni city waterworks is located. China creek is crossed near the dam on a foot-log, and there is a blazed line from the crossing to the prospecting-work done on the *Grizzly* claim, distant about 2 miles in a westerly direction.

Ore-deposits.—There occurs on the *Grizzly* claim a rather extensive outcropping of native arsenic, some samples from which are said to have assayed high in arsenic. Should the ore-deposit maintain continuity to any considerable depth it is reasonable to presume that it will change from native arsenic to one of the sulphides, probably arsenopyrite, which is the most common ore of the arsenic group.

As the trail to this property was blocked by windfalls and the 8-foot shaft was reported to be full of water an attempt to examine the property in October was abandoned.

Samples obtained from E. Loubert, the owner, and said to represent the vein-matter at the bottom of the shallow shaft across the full width 3 feet 6 inches, were assayed with the following results:—

Description.	Gold.	Silver.	Lead.	Zinc.	Arsenic.
	Oz.	Oz.	Per Cent.	Per Cent.	Per Cent.
No. 1. Section across 1 foot starting from hanging-wall	Trace	0.2	*Nil*	*Nil*	10.6
No. 2. Section across 1 foot adjoining No. 1 towards foot-wall	Trace	Trace	*Nil*	*Nil*	1.0
No. 3. Section across 1 foot adjoining No. 2 towards foot-wall	*Nil*	*Nil*	*Nil*	*Nil*	Trace.
No. 4. Section across 6 inches next to foot-wall	*Nil*	*Nil*	*Nil*	*Nil*	Trace.

The hanging-wall of the vein is a metamorphosed rock, which may have been volcanic and in which grains of pyrite could be seen with a lens. The foot-wall is an argillite with veinlets of calcite and much shattered.

General Characteristics of Arsenical Ores.—Arsenical ore usually occurs as arsenopyrite or mispickle, accompanied by pyrite and other sulphides, from which the arsenic of commerce (white arsenic) is produced. The ore after being crushed is first treated by concentration and later the concentrates are roasted and treated. Chas. J. Young, in the *Engineering and Mining Journal-Press*, of New York, May 10th, 1924, describes the following method in use at the plant of the Toulon Arsenic Company, Toulon, Nevada, which is one of the few companies at present producing white arsenic on a commercial scale in the United States:—

"Roasting is accomplished in two six-hearth Wedge furnaces. The upper three hearths of each furnace are provided with separate flues and dampers so as to control the roasting positively. Roasting is at a relatively low temperature, 1,400° F., and little or no extraneous fuel is used. The gases pass to cylindrical brick dust-chambers and are then conducted to four balloon flues or condensers in series, the residual gases being discharged by a stack.

The arsenic trioxide is deposited in the flues. Fuller details of the calcining practice are withheld by the company. The method of handling was invented by E. H. Wedekind, now deceased. White arsenic is 95 to 96 per cent. pure.

"The furnace ore consists of pyrite, arsenopyrite, accompanying sulphides, and gangue. Its analysis approximates 18 per cent. sulphur, 15 per cent. arsenic, 20 per cent. iron, and 18 per cent. 'insoluble.' Both lead and zinc occur in small amounts, as well as gold, silver, and copper. The calcine carries about 2 per cent. arsenic and is shipped to custom smelters. The recovery of arsenic is 85 per cent., the arsenic trioxide, which is from 95 to 96 per cent. pure. It is packed in barrels, marketed to chemical-manufacturers in car-load lots, and used for the manufacture of weed-killers and insecticides, as well as in plate-glass manufacture.

"The capacity of the plant is 50 tons of ore per furnace per day. The output of arsenic ranges from 125 to 250 tons per month, depending upon the grade of the ore. Arrangements are being completed to treat oxidized arsenical ores, which will be mixed with sulphide ores and furnaced."

Further information relative to arsenical ore is given in the *Engineering and Mining Journal-Press*, November 22nd, 1924, on pages 821 and 822, in an article written by P. C. Stoess, mining engineer of Seattle. In this article, descriptive of the arsenopyrite ore of the *Monte Cristo* mine in the State of Washington, he says as follows:—

"The bulk of the arsenic-gold-silver ores of this district, sold either as crude ore or concentrate, went to the old plant of the Puget Sound Reduction Company at Everett, where the first arsenic-recovery plant in the United States was erected in 1899 and operated there until it was bought by the American Smelting and Refining interests, which several years later dismantled the Everett arsenic plant and rebuilt it at the plant of the Tacoma Smelting Company, which they also owned. This pioneer arsenic plant at Everett treated most of the ore from *Monte Cristo* up to the time of its being dismantled, and marketed the white arsenic product at the then prevailing prices, 2¾ to 4 cents per pound. The white arsenic made at this plant rapidly gained a reputation for its purity and uniformity. The mines, however, were not given credit for arsenic content until many years later, when the Tacoma Smelting Company made tentative agreements, based on marketing the product, to pay the mines on 80 per cent. of the assay content of metallic arsenic. They deduct 5 cents per pound from the market price and then pay to the mine 50 per cent. of the balance on the 80-per-cent. content basis. At the present time this arrangement is still in effect and offers the only market for arsenical ores available for this district."

During 1924 a trail was made from the *Morning* group on Taylor river, about 4 miles from the head of Sproat lake, across the divide to Kennedy (Elk) river, which flows into Kennedy lake. The prospectors on the west coast of Vancouver island have desired this trail for years, because it opens up a section of country that has not been explored and connects the mineralized zone on the Taylor river with that on the Kennedy, in both of which ore carrying good gold values has been found.

One of the most disappointing features with regard to the metal-mining industry in the Alberni Mining Division is the fact that so many Crown-granted mineral claims are allowed to remain idle. There are more than 200 of such claims in the Alberni Assessment District, which includes the Alberni, Clayoquot, and Quatsino Mining Divisions.

Within recent years about 100 Crown-granted mineral claims have reverted to the Crown in this assessment district for non-payment of taxes. Some of these have since been leased to mining men under the provisions of the "Taxation Act," passed to encourage the further development of such mineral claims. This Act provides for leasing reverted Crown-granted mineral claims for one year on payment of $25 rental, renewable for another year on like payment, and a new Crown grant obtained by payment of all of the back taxes and other expenses.

Although further development-work has been done on the leased claims, none has yet been placed in the ranks of shipping-mines, but are being held in the hope of making a sale.

CLAYOQUOT MINING DIVISION.

The Clayoquot Mining Division extends from the north-westerly boundary of the Alberni Mining Division, which it adjoins near the west entrance to Barkley sound, to Esperanza inlet, on the west coast of Vancouver island, where it adjoins the southerly boundary of the Quatsino Mining Division. The easterly boundary of the Clayoquot Mining Division is the summit of the

lofty range of mountains which forms the backbone of Vancouver island, locally known as the Beaufort range, and the westerly boundary is the Pacific coast, between the points already referred to.

Fortunately, from the prospector's view-point, none of the Clayoquot Mining Division is inside the Esquimalt & Nanaimo Railway Belt, and consequently is all open to prospectors, and not subject to the dual control which has proven such a serious handicap in the more southerly and easterly parts of Vancouver island, where the precious metals only belong to the Crown, while all of the base metals, coal, and petroleum are controlled by the Esquimalt & Nanaimo Railway Company.

In November, 1923, the Tidewater Copper Company, owners of the *Indian Chief* group, which had been shipping since 1917, closed down all work; the company went into the hands of a receiver and machinery and other equipment was partially scrapped. This property had been the only shipper from the Division in recent years.

In the Annual Report for 1923 the writer described very fully the southerly section of the Clayoquot Mining Division. During 1924 there has been no extensive development-work done in that section, so that it is not necessary to repeat the descriptions as there are no outstanding changes in the conditions of the properties. It is possible, if the price of copper remains around 15 cents a pound, that some of the best of the groups of mineral claims will enter the shipping-list in the near future.

In the northerly section of the Clayoquot Mining Division, in the vicinity of Nootka sound and Esperanza inlet, there has been considerable activity in prospecting and about thirty new mineral claims have been recorded during 1924. These are about evenly divided between the Zeballos river, Esperanza inlet, Muchalat arm of Nootka sound, and Tahsis canal, which connects Nootka sound with Esperanza inlet.

This section of the Clayoquot Mining Division has been prospected to a greater or less extent for several years past and is reported to have been the scene of mining for placer gold by the Spaniards when they held possession of Nootka island about 150 years ago; colours of gold can be panned from the gravels in the bed of Gold river, which flows from a high mountain range near the centre of Vancouver island into Muchalat arm of Nootka sound. The main river and its tributaries drain an enormous area, practically the whole of which is unexplored. Judging from the saw-tooth formation of the high, precipitous, snow-clad and glacier-covered peaks in the range in which Gold river has its source, the section presents many difficulties for the prospector to overcome. Judging, however, from the several discoveries of gold-bearing quartz that have been made from time to time in the mountainous section to the south-easterly from the Gold River section, at and near the head of Bedwell (Bear) river and in the Big Interior mountains, it is quite probable that thorough prospecting may expose similar veins in the unexplored territory; as was done in the summer of 1924 near the mouth of Zeballos river, Esperanza inlet, where the *Eldorado* group of eight mineral claims was located and recorded.

Eldorado Group. This group contains eight mineral claims, recorded (with names of owners) as follows: *Eldorado* (A. Ostman), *Eldorado No. 1* (J. West), *Eldorado No. 2* (J. Ballantine), *Eldorado No. 3* (M. F. Burnyeat), *Eldorado No. 4* (Sir H. Bayer), *Eldorado No. 5* (Sarah Burnyeat), *Eldorado No. 6* (R. W. Burnyeat), *Eldorado No. 7* (Guy Senhouse), and *Eldorado No. 8* (George S. Gamble). Owing to the fact that most of the recorded owners are residents in England, who own 51 per cent. of the property, it is being represented in British Columbia by George S. Gamble, the Vancouver manager of the Prudential Trust Company, of Montreal.

Location.—The *Eldorado* group is situated near the mouth of the Zeballos river, which flows into the Zeballos arm of Esperanza inlet. The Zeballos river is a torrential stream that heads high up in the saw-tooth mountain range which is the backbone of Vancouver island and drains a large area.

Ore-deposits.—The discovery of a very complex ore was made in the summer of 1924 by two prospectors, J. West and A. Ostman, who brought in samples which assayed as high as $600 in gold to the ton. Through the influence of P. W. Thomas, assayer, Vancouver, the prospectors were enable to secure a purchaser for 51 per cent. of the group of mineral claims and but little publicity was given to the discovery; consequently no stampede was started or encouraged.

Later, in September, the writer secured a sample of ore from the vein, which assayed: Gold, 12.8 oz.; silver, 12 oz. to the ton; copper, 0.5 per cent.; zinc, 12.8 per cent.

A piece of this sample was polished by Dr. Dolmage, of the Vancouver office of the Geological Survey of Canada, and showed such an interesting face that he had a slide made and examined it under a microscope, when it was seen that the ore contained the following minerals: Native gold, galena, zinc-blende, and pyrrhotite, as shown in the accompanying photo.

An attempt to examine the property in October was abandoned owing to bad weather and high water in the Zeballos river.

Wm. Poole, a veteran prospector on the west coast of Vancouver island, and a very reliable man, had, however, made an examination of the *Eldorado* outcroppings some time previous and had brought away two samples, one of which he considered represented the high grade and the other the low. The high-grade sample assayed: Gold, 22.30 oz.; silver, 20 oz. to the ton; copper, 1 per cent.; zinc, 8 per cent. The low-grade sample assayed: Gold, *nil;* silver, *nil;* copper, *nil;* zinc, *nil.*

No work had been done except a few shots which exposed a vein in the bed and bank of the river, about 3 feet long and a few inches wide, that appeared to make up the rich part; the low-grade vein material which adjoins the high grade is of an undetermined width. A part of this low-grade ore, according to samples assayed by P. W. Thomas, of Vancouver, carried about 2 oz. in gold, in addition to some silver and zinc.

During the coming season the owners of 51 per cent. of the property have made arrangements with Mr. Poole to systematically prospect the group, so that it will be definitely known whether the prospect is of any commercial value. Evidently the high-grade ore occurs irregularly.

Star of the West Group.

This group contains the *Hakadato*, *Wolverine*, and *Star of the West* mineral claims, situated on the westerly side at the head of Tahsis canal. The property is owned by William Poole and T. T. Gardhouse, of Nootka. The *Star of the West* claim is about 1,600 feet from the shore of the canal. The space between the shore and the claim was first staked in 1923 as the *Tahsis*, and later restaked as the *Jessie R.* by A. Park, mainly in order to afford a water-front to the *Star of the West* group. The head of Tahsis canal is about 4 miles northerly from Tahsis narrows, which connects the canal with Esperanza inlet and the open Pacific ocean.

During 1924 considerable further prospecting and some development-work has been done by the owners of the group, most of the work being on the *Hakadato* claim. This work has exposed the ore-body for a width of 17 feet instead of 6 feet, as reported in the 1923 Annual Report.

In the 1923 Annual Report the *Star of the West* group was described in detail, so that it is not necessary to repeat.

During 1924 considerable prospecting was done by Wm. Poole and Arthur Park on the Little Zeballos river, the East fork of the main river, but so far no occurrences of ore showing commercial value have been discovered.

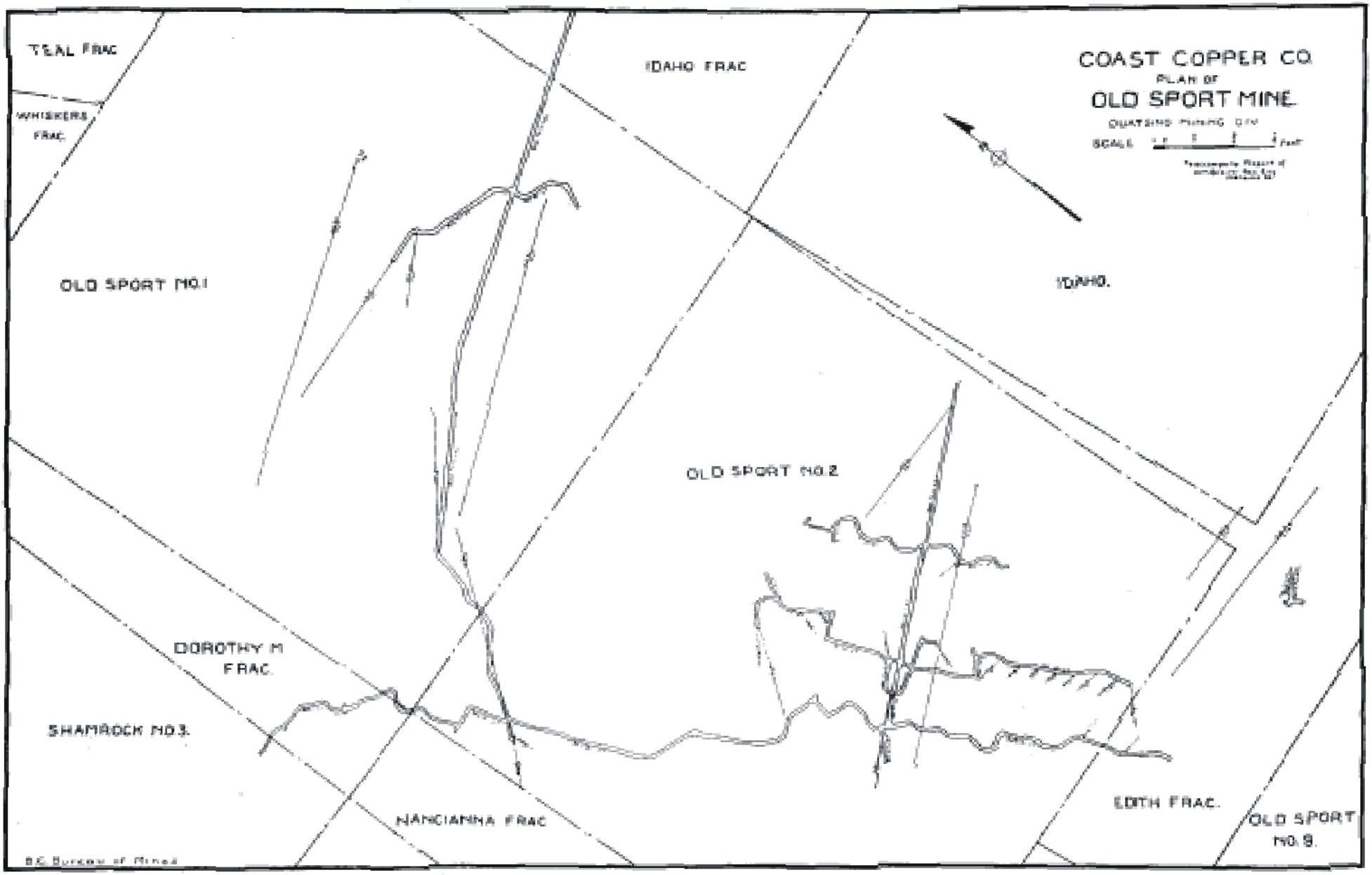
In the Muchalat Arm section of Nootka sound several claims were staked by J. West and associates.

In the same section Arthur Park located the *Lady Grace* and submitted some of the outcroppings for assay. One sample assayed: Gold, 0.20 oz.; silver, 1 oz. to the ton; copper, 22 per cent. Another sample assayed: Gold, 0.40 oz.; silver, 2.2 oz. to the ton; copper, 5 per cent. Another sample assayed: Gold, *nil;* silver, *nil;* copper, 0.7 per cent. No work had been done on the *Lady Grace* mineral claim up to the time of the writer's last visit to Nootka sound in October, 1924, but Mr. Park proposes to thoroughly prospect the claim during the coming season.

Iron Ore.—During the summer of 1924 W. L. Uglow, of the Geological Survey of Canada, and assistants were engaged for three weeks examining the deposits of magnetite near the head of Head bay, Tlupana arm of Nootka sound. The guidance of Wm. Poole was obtained to show where the deposits occur, as all of the old trails are obliterated.

QUATSINO MINING DIVISION.

During 1924 the mining industry in the Quatsino Mining Division has been more active than elsewhere on the west coast of Vancouver island, owing to the vigorous manner in which development has been carried on at the *Old Sport* mine; the intensive prospecting done by Messrs. Clancy and Kinsley; the further prospecting on the *Millington* group of mineral claims


TEAL FRAC
WHISKERS FRAC
IDAHO FRAC
COAST COPPER CO
PLAN OF
OLD SPORT MINE
OLD SPORT NO.1
IDAHO.
OLD SPORT NO.2
DOROTHY M FRAC
SHAMROCK NO.3.
NANCIANNA FRAC
EDITH FRAC.
OLD SPORT NO. 9.
B.C. Bureau of Mines

near Holberg, at the head of the West arm of Quatsino sound; as well as prospecting done in the vicinity of Alice lake and on the north-east coast of Vancouver island.

There are eighty-four un-Crown-granted mineral claims in good standing in the Quatsino Mining Division, in addition to a large number that are Crown-granted. These figures include a number of mineral claims on Kokshittle inlet, Kuyuquot Sound section of the Division. On none of those last mentioned was work other than the annual assessment-work done in 1924.

The Quatsino Mining Division offers exceptionally attractive opportunities to the prospector to explore the mountainous sections, owing to the several arms of Quatsino sound. These waters are well sheltered, except of course in case of heavy ocean storms, but even then launches and small boats can find safe harbours in some of the coves, of which there are a number in either the South-east, the West, or Rupert arms of the sound. In addition to these facilities for reaching the mountains from the sea-shore, there are a large number of lakes in the mountainous sections which also afford good opportunities to reach the higher altitudes from their shores. These lakes also abound in various species of fish, while in the adjacent mountains deer and bear are plentiful, so that a prospector is always assured of fresh meat.

In Kyuquot section of the Quatsino Mining Division at the head of Kokshittle inlet there are herds of elk, as well as fur-bearing animals, so that by trapping in the winter months the prospector is assured of occupation during the entire year.

Old Sport. This name is given to the various groups of mineral claims which constitute the property. These are as follows: The *Penstock*, *Old Sport No. 1*, *Old Sport No. 2*, *Idaho*, *Machets*, *Robin*, *Eagle*, *Bean*, *Merry Widow*, *Martin*, *Hemlock*, *Oak*, and *Teal Fraction*. Each of these groups contains a varying number of mineral claims, totalling seventy-two claims, many of them Crown-granted and Crown grants applied for the rest.

Ownership.—The *Old Sport* mine is owned by the Coast Copper Company, a subsidiary of the Consolidated Mining and Smelting Company of Canada, Limited, of Trail, and has been under development by that company since September, 1916, but the work has been carried on more vigorously during 1924 than during any year since the close of the war.

History.—The *Old Sport* has an interesting history. The original stakers were a number of the early settlers in the Quatsino district, who made the first locations about 1897 and later bonded the original *Old Sport* group of eight claims to a Spokane syndicate, which developed the ore-body on what is known as the 500-foot level by driving a crosscut adit 452 feet long at an elevation of about 500 feet above the level of Elk lake. This lake is the farthest south-easterly of a chain of lakes that are connected by Benson river, which flows into the Rupert arm of Quatsino sound. The *Old Sport* mine is on the south-westerly side of the lake, with the lake-shore forming the north-easterly boundary of that part of the property on which most of the development-work has been done.

After the crosscut adit had been completed and the ore-body exposed, the late Horace Winchell, a prominent mining engineer, was employed by New York capitalists to make an examination, and under instructions a series of deep trenches were dug to bed-rock along the line of strike of the outcroppings. These trenches were spaced 50 feet apart and the series extended for a length of 3,000 feet.

Mr. Winchell reported adversely and, the Spokane syndicate having exhausted its capital, the work was closed down. Engineers for the Consolidated Company then examined the property, and an agreement was made to take over the Coast Copper Company, which had been organized by the Spokane syndicate. Active operations were commenced in September, 1916, under the supervision of Wm. Clancy, who had been in charge of all of the development-work done previously. Since then the original number of mineral claims in the property has been added to as results of intensive prospecting.

Location and Transportation.—As already stated, the *Old Sport* mine (original location) is located on the south-westerly side of Elk lake, with some of the more recently acquired groups, notably the *Robin*, located on the Benson river a little west of north of the mining camp; the *Merry Widow*, about 2 miles (by trail) south-easterly from Elk lake; the *Eagle* group, south-westerly from the *Merry Widow;* the *Martin* group, on Raging river, which flows into the head of Elk lake; the *Hemlock* group, on Canyon creek west of the main camp; and the *Oak* group, on Kathleen lake between Canyon creek and the lake north-westerly from the main camp.

On the *Martin* group on Raging river is located the proposed power-site, at which it is intended to develop water-power to generate power to drive all of the machinery for a concentrating plant, the present water-power developed on Canyon creek being insufficient to meet the future demands of the property.

The transportation facilities at present are not as good as is desirable owing to the necessity of changing from pack-horses to launches, and vice versa, as follows: The steamer-landing at the point at which supplies are delivered from the steamer "Princess Maquinna," which supplies the regular west coast service, is known as June Landing and is located on the South-east arm of Quatsino sound about 8 miles south of the settlement. From there the route to the *Old Sport* is by pack-trail 6 miles to Alice lake in an easterly direction, where pack-horses are exchanged for gasolene-launch, and a crossing of about 2 miles made to a landing, where horses are again used to convey supplies 3 miles in a south-easterly direction to near the outlet of Kathleen lake, where another transfer to a launch is made and the length of the lake, about 2 miles, travelled to a boat-landing, where another transfer is made to horses to travel across a portage 1½ miles to the outlet of Elk lake, where the main mining camp is situated.

Several preliminary surveys have been made, from which it is the intention of the management of the Coast Copper Company to select a route for a railway to connect the *Old Sport* mine with either the east or west coast of Vancouver island to provide a tide-water terminus for the product of the mine. The distance to either coast in an air-line is about 12 miles, and, considering the mountainous topography of the country, there are no very serious engineering difficulties to overcome.

Management and Main Camp.—The *Old Sport* mine was visited between September 6th and 10th and all of the more recent mine-workings, camp equipment, etc., were examined. Since the last examination Wm. Clancy, superintendent, and J. I. Priesner, assistant superintendent, have resigned. C. A. Seaton, who was formerly superintendent at the *Sullivan* mine, Kimberley, is now in charge of operations. The writer is much indebted to Mr. Seaton and his staff for many courtesies and assistance during his visit, and desires to express his thanks and appreciation.

The main mining camp is on the shore of Elk lake, 1 mile northerly from the low-level adit. It has a somewhat different appearance from formerly owing to a fire which destroyed the superintendent's old house, which has been rebuilt on a different location. A flourishing garden is cultivated, which furnishes all of the green vegetables used in camp. The electric-lighting machinery, compressor plant, with a capacity to run four drills, and sawmill, capacity 10,000 feet board measure a day, are driven by water-power from Canyon creek, which furnishes 150 horse-power with a 350-foot head of water carried through a flume 7,000 feet long. The blacksmith-shop, equipped with a modern steel-sharpener, is at the portal of the low-level adit.

A commissary store has been recently added to the main camp owing to the distance from a distributing centre, the nearest being either Victoria or Vancouver. This store is run on the system to make only a small profit, which is devoted to the purchase of magazines.

During a recent shut-down at the Whalen pulp-mill at Port Alice the Coast Copper Company paid the Port Alice doctor $100 a month to be on call in case of emergency. In the case of ordinary accidents, of which there has fortunately been very few, Mr. Seaton, who holds a first-aid certificate, also certificate for mine-rescue work, gives his personal attention and is organizing a class on first-aid work from amongst the employees, of which there were about fifty in September last.

Geology.—The geology of the Quatsino section of the west coast of Vancouver island is described by Victor Dolmage, of the Geological Survey of Canada, in the Summary Report, 1918, Part B, from which the following is quoted: "The Quatsino limestone at the *Old Sport* mine overlies a thick flow of andesite and has interbedded in it near its base a much thinner flow of andesite, as well as some very thin beds of tuff. The main concentration of ore is confined to the bed of limestone lying between the two andesite flows. The whole series has been cut by a large intrusion of diorite which has extensively metamorphosed both the limestone and the andesite, and evidently produced the ore.

"The intrusion is a true diorite, having a dark-grey colour and medium coarse texture, and consisting essentially of labradorite, biotite, and augite." After referring to the alteration of the rocks due to metamorphism, the secondary minerals produced, and the occurrence of chalcopyrite, he continues: "There can be but little doubt that the copper originated with the

magma of the diorite, and was carried up into the limestone and andesite by solutions and vapours, which passed along joints and bedding-planes and was finally deposited where the proper conditions were reached. Owing to the more insoluble and therefore more impervious character of the volcanic rocks, the mineralizing solutions would be to some extent guided by them, and have a tendency to develop large channels along the contacts with the more easily soluble limestone and form the largest deposits there. Many basic dykes crosscut the ore. These, similarly, would be relatively impervious, and at their intersections with the andesite flows would form troughs in which the invading solutions would be more or less trapped and induced to form rich ore-shoots. In the case of the narrow band of limestone enclosed by the two beds of andesite, as shown on the diagrammatic section, the conditions are as outlined above, and, as might be expected, the best ore-bodies are in this bed."

Ore-deposits and Development.—The ore-deposits on the *Old Sport* mine belong to the contact-metamorphic type, with crystalline limestone as the hanging-wall and andesite for the foot-wall dipping towards the west at angles varying between 30° and 32°, and with the mineralized zone striking north-westerly. The mineralization is made up of chalcopyrite, pyrrhotite, pyrite, and magnetite, with much epidote and garnetite in the gangue.

The value in the ore is principally copper, but there are also small values in both gold and silver. It is not of sufficiently high grade, however, to warrant direct smelting, but is apparently an ideal ore for treatment by the oil-flotation method of concentration.

The early development-work on the property consisted of a crosscut adit driven 452 feet south-westerly on the *Old Sport No. 2*, known as the 500-foot level adit, its portal being at about that elevation above the shore of Elk lake. At a point 40 feet from the face an ore-body was exposed and drifts run at right angles to the adit. The drift to the southerly is 250 feet long and that to the northerly is 525 feet long.

Later an incline winze was sunk from the floor of the crosscut adit to a depth of about 500 feet on the dip of the ore-body, about 30°. This winze was started on the foot-wall of the ore, passed through the ore-body diagonally, between the floor of the crosscut adit and 275 feet in depth, and was continued down on the hanging-wall about 225 feet deeper. A crosscut was driven 50 feet long on this low level, known as the 800-foot level, and drifts driven in northerly and southerly directions.

At a point 80 feet above the bottom of the winze drifts were also driven at right angles to the winze; that is, to the northerly 380 feet and to the southerly 550 feet. In both of these drifts ore of concentrating grade was exposed, but its width is undetermined.

The management, after doing this work, decided to drive an adit at a much lower level in the mountain-side overlooking Elk lake. This is known as the 800-foot adit, with the portal only about 100 feet higher elevation than the lake, and about 400 feet lower than the crosscut adit just described. This adit is 2,100 feet long; it is intended for the main haulage-adit when the mine is operated on a commercial scale and will be equipped for hauling ore-trains of several cars with electric locomotives.

The 800-foot adit has its portal on the *Idaho Fraction*, crosses the *Old Sport No. 1*, and has its face on the *Old Sport No. 2*, where it intersects the northerly drift on the 800-foot level; this drift, together with the southerly drift on the same level, traverses the entire width of that claim, and extends into the *Dorothy M. Fraction* to the north and the *Edith Fraction* to the south, having a total length of about 2,100 feet.

The 800-foot adit was driven through diorite for 750 feet, where a narrow vein carrying chalcopyrite ore was exposed between diorite walls. This was drifted on in both directions from the adit; the drift to the westerly is 280 feet long and that to the easterly 150 feet long. The width of this vein, which is known as the *Idaho*, averages 2.5 feet.

Beyond the *Idaho* vein the adit is driven 1,350 feet to its face, 1,300 feet of this distance being through diorite. At a point 50 feet from the face of the adit a mineralized zone is exposed which is 50 feet wide where the adit crosscuts it and contains some concentrating copper ore in a gangue made up of garnetite, epidote, and shattered country-rock.

The drift in a northerly direction from the bottom of the winze on the 800-foot level intersects the 800-foot crosscut adit 960 feet northerly from the winze, but ore of commercial grade is only exposed for 200 feet in a northerly direction from the winze. In the drift, at a point 325 feet northerly from the winze, a minor fault occurs which throws the vein 60 feet

apparently in a westerly direction, which is the direction of throw by the major faults so far exposed in the workings. The drift crosses the faulted zone for 80 feet and is driven about 600 feet farther in mineralized vein material, but there is no ore of commercial grade exposed in that distance.

At a point about 925 feet northerly from the winze and 35 feet southerly from the junction of the drift with the 800-foot adit the mineralized zone already mentioned, exposed 50 feet from the face of the adit, is entered by the drift in which ore of commercial value is exposed continuously for 125 feet, or 90 feet northerly from the junction, to where a major fault occurs. The course of the drift is then westerly for 70 feet after crosscutting through the fault, which had thrown the ore 50 feet to the west. Here ore of commercial grade was again exposed and the drift continued in such ore for 320 feet, which was the face on October 31st, 1924.

In the drift on the 800-foot level driven southerly from the bottom of the winze for a distance of about 700 feet a good ore-body is exposed that is known as the "Winze" vein.

In addition to the development-work above described, approximately 2,500 feet of diamond-drilling has been done.

The mine-workings have therefore demonstrated that there are two distinct ore-bodies exposed by the long drifts on the 800-foot level. One of these, the "Winze" vein, is proven from the 800-foot level to the surface, but the northerly vein has not yet been proven between the 800-foot level and the surface.

No attempt has yet been made to estimate the tonnage of ore in sight or the average values of the ore exposed, but further development-work will be vigorously carried on to determine whether or not there is a sufficient tonnage available to warrant the construction of a railway from the mine to the Coast, as well as a concentrating plant to treat the ore by the oil-flotation method. A very considerable tonnage of the ore exposed on the 800-foot level is evidently of sufficiently high grade to warrant shipping direct to a smelter.

Alice Lake Group.

As the result of intensive prospecting by Wm. Clancy and W. D. Kinsey, of Quatsino, the *Alice Lake* group, comprising the *Alice Lake*, *Lucky Strike*, *Paystreak*, and *Galena*, was located and recorded during July, 1924. Systematic work preparatory to extensive development was carried on which included building a camp. The group is situated about 5 miles east of June Landing on the east side of the South-east arm of Quatsino sound, on the easterly slope of the mountains overlooking Alice lake. The group is reached by travelling the pack-trail from June Landing to the old *June* group, whence a new trail branches off to the *Alice Lake* group, about 1 mile.

Geology.—The country-rock in the vicinity of the *Alice Lake* group belongs to the Vancouver series as classified by Dawson, with a belt of Quatsino limestone which has been intruded by felsite porphyry and other igneous rocks. A similar geologic formation occupies a zone to the north-west and south-east of the location of the *Alice Lake* group, which is the direction of the line of strike of the ore-body on those claims.

Several years ago deposits of zinc-blende ore were discovered in the zone about 2 miles distant in a south-easterly direction near Victoria lake, also to the north-westerly near Quatse lake, about 12 miles distant from the *Alice Lake* group as the crow flies. Although these deposits carried good values in zinc, the lack of demand for that metal and the penalty charged by the smelter companies on account of the zinc content in the ore were such a serious handicap that prospecting in the geologic zone was practically abandoned until during 1924.

Ore-deposit.—The ore occurrence on the *Alice Lake* group belongs to the contact-metamorphic type, with limestone on the hanging-wall and felsite porphyry on the foot-wall. The strike is N. 15° W. and dip, so far as can be determined by the outcrop, is south-west, with the angle undetermined. The outcrop and open-cuts expose a vein averaging about 2 feet wide, with the surface farther along the strike covered.

Development-work.—On September 10th, when the group was examined, the only development-work done was some open-cuts and the erection of a house for a camp.

Samples.—Two samples were taken which represent fair averages from the faces in the open-cuts. One of these across 20 inches assayed: Gold, 0.40 oz.; silver, 8 oz. to the ton; lead, 12 per cent.; zinc, 15 per cent. The other across 10 inches assayed: Gold, 1.46 oz.; silver, 8 oz. to the ton; lead, 4 per cent.; zinc, 15 per cent.

Other samples taken by Mr. Clancy from other parts of the prospect assayed as follows:—

Description.	Gold.	Silver.	Lead.
	Oz.	Oz.	Per Cent.
No. 1. Oxidized surface ore 20 feet wide	1.16	8.20	13.0
No. 2. Unoxidized surface ore 20 feet wide	0.50	20.00	31.8
No. 3. Oxidized surface ore 2 feet wide (4 feet lower on dip than No. 1 sample)	0.38	7.08	4.5
No. 4. Sulphide ore (6 feet below surface, 1 foot wide)	1.22	10.14	8.6
No. 5. Arsenopyrite 1 foot wide from surface 30 feet south of No. 1 sample	0.94	1.62	1.1

Millington Group.

This group contains the *Cracker Jack*, *Millington*, *Hood*, *Mollie B.*, *Mollie Bawn*, and *Paystreak* claims, owned by Dave Spooner, E. Spooner, E. Peterson, P. Obling, J. Bell, and James Spooner, of Holberg. The group is situated on a tributary of Spruce river, about 3 miles from Holberg, at the head of the West arm of Quatsino sound. In the Annual Report for 1920, pages 205 and 206, there is a detailed description of this group, so that the description is here confined to the development-work done since 1920.

As classified by Dolmage, the rock formation in the vicinity is a highly amygdaloidal basalt. Lenses of solid bornite copper ore occur as impregnations in the basalt country-rock; in the lower adit, at a depth of about 150 feet below the outcroppings, the bornite is associated with a little chalcopyrite. The ore in the crosscuts and drifts in the lower adit occupies a zone of impregnation, with the ore occurring usually as particles and grains disseminated through a width of about 40 feet of the amygdaloidal basalt, but occasionally lenses of solid bornite occur under somewhat similar conditions to those in the outcroppings.

The work done since the last examination of the *Millington* group consists of a crosscut 40 feet long from the lower adit starting at a point 21 feet in the drift, to the left from the main adit. Opposite to the entrance to this crosscut a drift is driven 35 feet long, which cuts the zone of impregnation diagonally, and from it two short crosscuts have been driven, one 8 feet and the other 10 feet long.

An average sample was moiled across 6 feet in the crosscut first mentioned from the main drift, which assayed: Gold, trace; silver, trace; copper, 0.5 per cent. A second sample moiled across 11 feet next to the first sample taken assayed: Gold, trace; silver, trace; copper, 1.2 per cent. A third sample taken from the dump at the portal of the lower adit assayed: Gold, trace; silver, 2 oz. to the ton; copper, 11.5 per cent. The last-named sample was a fair representative of the dump, but as to what proportion it represented of the material mined in driving the crosscuts and drifts can hardly be estimated.

The owners propose during 1925 to mine and ship the bornite ore occurring above the lower adit and drive a low-level adit below the present one to prospect the property to determine whether or not the ore-bodies maintain continuity to any greater depth than the present lower level.

VANCOUVER MINING DIVISION.

Prospecting and some development-work have been done in parts of the Vancouver Mining Division during 1924, the results of which are so promising as to warrant the opinion that the future of the mining industry will be more favourable than the past. This work is described later in this report.

The most important property is the *Britannia* mine, a full description of which is given.

Britannia Mining and Smelting Co.

It rarely occurs that a mining engineer is called upon to examine a prospect in the very earliest stages of development and twenty-five years later to examine the same property after nearly 50 miles of underground development-work has been done, and when an annual production of about 800,000 tons of ore is being made. This did happen to the writer on the last day of 1924, when he made an examination of the latest development-work done in the *Britannia* to obtain information for this report.

History.—Although the history of the *Britannia* mine has been recorded in several of the Annual Reports of the Minister of Mines since 1899, as well as in various technical journals and papers presented before conventions of various Mining Institutes, it is of such great importance to the Province and the mining industry that a further reference to it in this report is deemed permissible.

In the late fall of 1898 the writer's attention was first called to the mineralized zone, now known as the "Britannia Mineral Belt," and the group of mineral claims that had been staked by Oliver Furry and associates, but it was not until January, 1900, that he was called upon to examine the prospects. At this time the total development amounted to about 220 feet of cross-cut adit and drift on the *Jane*, one of the seven original claims of the *Britannia* group. This work was done on what is now known as the 1,000-foot level, and where the first mining camp was established, consisting at that time of two cabins for the five or six miners employed. To-day the company employs between 600 and 700 men in and around the mines exclusive of those employed in and around the concentrating plant at Britannia Beach.

Since the visit in 1900 the *Britannia* mine has been worked continuously and has passed the quarter-century mark as an operating mine, although it did not enter the ranks of producing mines until about five years later. Under the management of the late George Robinson, the smelter at Crofton, on the east coast of Vancouver Island, was purchased from Messrs. Breen and Bellinger and a concentrating plant erected at Britannia Beach to treat low-grade ore by water-concentration. The intention of the management was to ship the better-grade ore, after sorting, direct to the smelter and concentrate the lower grade. An aerial tramway in two sections connecting the mine-workings on the 1,000-foot level with the Beach camp was also constructed. This tramway was used to transport all ore mined and supplies for the mining camp until the occurrence of the disastrous snow and land slide in 1915 which destroyed the camp on the 1,000-foot level. This was followed by the selection of the present camp on the 2,200-foot level.

The lower section of the tramway is still used when needed. The present transportation system consists of electric trains over a narrow-gauge switchback railway between the 2,200-foot level and the adit on the 2,700-foot level, where the ore is delivered at the top of an ore-raise and drops 1,500 feet to the main haulage-adit on the 4,100-foot level. From this point it is drawn and transported, in cars of 15 tons capacity hauled by electric motors, about 4,000 feet through the adit and delivered to the receiving-bins of the concentrating-mill about on the same level as the portal of the adit. The railway continues down the mountain from the 2,700-foot level to the town at Britannia Beach on sea-level. No ore is hauled on it below the 2,700-foot level, where it connects with an incline tramway equipped with skips of 20 tons capacity. This tramway was used for transporting ore until the 1,500-foot raise was finished.

The early history of the *Britannia* mine illustrates unique conditions with regard to the financial management. The original group of mineral claims was first sold in 1898 by Oliver Furry and associates to Leo Boscowitz, of the fur-buying firm of Boscowitz & Sons, of Victoria, for $10,000, when the development-work on the *Jane* claim was begun. In 1899 a syndicate headed by the late Howard Walters, of Libby, Montana, purchased seven-tenths of the property for $35,000. The development-work was continued with a small force of miners; at the same time, under an agreement with Boscowitz, Walters endeavoured to secure a purchaser of the entire property, for the reason that as the development-work progressed it became quite apparent that large capital investment would be necessary to successfully develop the mine. In a word, the work indicated an enormous body of low-grade ore, such as would necessitate plants for both mining and treatment of much more than ordinary capacity, and consequently an outlay of capital far beyond the ability of the average mining operators to secure. The original syndicate had first been organized on the basis of ten men furnishing $1,250 each, in shares or units of $125 par value. Later, before a sale could be consummated, some of the same men, together with some friends, invested a similar amount of cash as further capital was needed. During 1900 the property was examined by several leading mining engineers representing some of the largest operators of copper-mines in the world, but the price asked by the syndicate, $1,000,000 with a very heavy cash payment on a short-term bond, was generally considered too great for an undeveloped prospect. However, the shares subscribed for by the members of the original syndicate were so eagerly sought after that in the autumn of 1900 some were sold on the basis of $1,500 for an original $125 unit.

It is not necessary to follow the various reorganizations of the original syndicate. About 1902, when the late George Robinson, of Butte, Montana, associated with the late Henry Stern, of New York, secured the controlling interest in the property, as well as the three-tenths interest retained by Boscowitz, it was incorporated as the Britannia Copper Syndicate, Limited. In 1908 the present company, known as the Britannia Mining and Smelting Company, Limited, was organized after the control of the property passed into the hands of Moore & Schley, of New York. The Britannia Mining and Smelting Company, Limited—capitalization $2,500,000, shares $25 par—is organized under the laws of British Columbia, but is controlled by the Howe Sound Company, of New York.

The first description of the *Britannia* mine published in a technical journal was by myself for the *Engineering and Mining Journal* of New York in January, 1900. The first mention of the property locally is in the Annual Report of the Minister of Mines for 1899, in which the description published in the *Engineering and Mining Journal* is copied.

The next description of the Britannia Company's operations is in the Annual Report for 1911, written by Wm. Fleet Robertson, Provincial Mineralogist. It is interesting to note the introductory paragraph of this report, as follows: "Little is heard about the *Britannia* mine, and it is realized by but few how much work has been going on there, very quietly, for a number of years back; the company does not advertise itself and its stock is not one usually dealt in on the exchanges. Yet the property employed during 1911 an average of 145 men below ground and 180 men above ground, and mined about 500 tons of ore a working-day, all of which was concentrated and shipped to Tacoma for smelting. The output of the mine for the last year was about 118,900 tons, which contained approximately 46,000 oz. of silver and 8,685,000 lb. of copper."

Attention is drawn to the above-mentioned report particularly because the year 1911 may be said to mark a milestone in the history of the *Britannia* mine, as it witnessed several changes in both the management and policy of the company. It was in this year that the late Grant B. Schley saw the realization of his confidence in the property that it would make a mine.

This confidence had been backed in a most substantial manner by the investment of large capital, regardless of pessimistic opinions held by some authorities, and for this confidence, enterprise, courage, and liberality Mr. Schley's name will always be honoured not only in British Columbia, but in the whole Dominion of Canada. It is unfortunate that men of the late Mr. Schley's calibre are not more numerous in the mining industry.

In November, 1911, J. W. D. Moodie, who had been formerly in charge of the Tintic properties in Utah, succeeded R. H. Leach as manager, the latter having resigned on account of failing health after having been in charge of development-work for about two years. It was during the same year that the *Britannia* mine was brought into the ranks of important shippers following the extensive development-work on the *Fairview* claim, which had demonstrated the advisability of opening up that section of the property on a much more extensive scale.

It was during the latter end of 1911 that serious experiments were undertaken with the oil-flotation method of concentration. The result was that this method was adopted for the treatment of all of the ore mined and has been responsible for the present entirely modern and extensive milling and concentrating plant at Britannia Beach to-day, with a capacity to treat 2,500 to 3,000 tons of ore a day, which was erected to replace the mill destroyed by fire in 1921. The new mill was designed by Bradley, Bruff & Labarthe, of San Francisco. In the Annual Report for 1921, page 226, the construction was described, but since March, 1923, when milling operations were started, several changes have been made in the flow-sheet, which will be described later.

The period from 1921 to 1923, when the new mill was put into operation, may be said to form another important page in the history of the *Britannia* mine, for then the debris from the disastrous fire and flood of 1921 were removed at Britannia Beach. It was also a period of reconstruction, for the new mill was erected, while new residences were built on a high terrace where there is no danger of flood.

At the present time C. P. Browning is general manager of the company, with headquarters at Britannia Beach. I. J. Moore, Jr., is superintendent, H. L. Batten assistant to Mr. Moore, and W. A. Matheson secretary-treasurer.

The following extracts are made from S. J. Schofield's report in the Summary Report, Part B, 1918, Geological Survey of Canada, entitled "Britannia Map Area":—

"The mineralized zone of the Britannia area is entirely located in a belt of metamorphosed sedimentary and igneous rocks which forms an inclusion in the granodiorite batholith of the Coast range. The trend of the rocks in this large inclusion, which has an approximate width of 2 miles and a length of 7 miles, is almost east and west, with an average dip of 70° to the south. Hence this mass has a trend which varies about 60° from the general trend of the Coast range. Mr. Camsell also has noted the same phenomenon along the section of the Pacific Great Eastern Railway from Squamish to Lillooet.

"*Britannia Shear-zone.*

"Mineralization is confined to the great shear-zone, sometimes called the 'Britannia' mineral-zone, which stretches at least from the *Daisy* on Britannia creek to the *Reggie* on the West fork of Seymour creek, a distance of at least 5 miles. It is certain that the extent is greater than that given above, but the *Reggie* claim is as far east as the explorations were carried. The width of the shear-zone varies greatly, but the maximum width would be about 500 feet. The shear-zone strikes 140° (ast.) and dips from 40° to 70° to the south-west. In the vicinity of the *Empress* the strike changes to 170° (ast.), but resumes the old strike on the *Victoria* and *Queen*. An examination of the bed-rock geology shows that the Britannia formation and the Britannia sills make a similar change in strike. The shear-zone is almost entirely located in the porphyry of the Britannia sills and, as far as known, to the Fairview sill, the sill in which the *Fairview* ore-body is located.

"In the shear-zone the quartz porphyry is changed to a fissile, greenish quartz mica-schist, spotted with green films of chlorite up to an inch in length. This schist is locally called the Britannia schist. All gradations exist between the porphyry and the greenish quartz mica-schist.

"*Mineralization.*

"Mineralization is confined to the shear-zone at irregular intervals. The ore-bodies of the *Jane* and *Fairview* occur where the shear-zone shows a decided change in strike. As this was the only area of mineralization examined, it cannot as yet be stated that all mineralization of importance occurs at such points, but it is worthy of consideration and study. In the mineralized area the ore-bodies occur as lens-shaped masses separated by barren ground of various thicknesses. Mineralization is of the nature of impregnation and replacement of the schist by pyrite, chalcopyrite, and cupriferous pyrite, with minor amounts of zinc-blende. The gangue is almost entirely the quartz-schist which in places is highly silicified.

"*Gypsum and Sulphur.*

"The non-metallic minerals occurring in the schist-belt are worthy of notice on account of their scientific interest and, in the case of the gypsum, of its future economic value.

"The gypsum occurs in the quartz mica-schists on the *Fairview* claim in lenses from 10 to 30 feet in width. It is greyish-white in colour. The contact with the schist is quite sharp. Long, thin flakes of the schist are found in the gypsum and these flakes hold the original orientation of the schist. The gypsum shows no traces of shearing.

"The sulphur occurs in the same shear-zone, but widely removed from the locality of the gypsum. It occurs in well-defined veins and as impregnations in the schist. The veins vary in width from thin almost microscopic stringers to veins 4 inches wide. The sulphur is bright yellow in colour and when it impregnates the schists it gives them a yellowish-green colour. The flakes of the schist close to the veinlets are separated by sulphur. Small, colourless crystals of gypsum were found associated with the sulphur."

Since Dr. Schofield's examination was made in 1918 the Britannia Company has continued the employment of a qualified geologist and assistant, whose duty it is to examine and map the geology in detail and keep the data up to date.

Geography.—The property of the Britannia Mining and Smelting Company, Limited, extends from the east side of Howe sound at Britannia Beach to Indian river, about 10 miles in an easterly direction from Howe sound, comprising about 550 mineral claims and fractions. The area within these boundaries is mountainous, heavily timbered, with many deep-cut gorges, canyons, and watercourses, but rarely any valleys except very narrow ones. Some of the mountain peaks within a few miles from Howe sound reach altitudes exceeding 5,000 feet above sea-level. There are several lakes at high altitudes which are the sources of torrential streams,

some of which flow into Howe sound, while others are tributaries of Indian river, which flows into the head of the North arm of Burrard inlet.

Mines and Mining Camps.—For convenience the present workings of the Britannia Company are named as follows: Reading from west to east, the *Jane*, *Bluff*, *Fairview*, *Empress*, and *Victoria*, comprising only about seven mineral claims. These adjoin and are connected underground by a tunnel 8,500 feet long on the 2,200-foot level, which is the present main haulage-level, through which ore is transported by electric locomotives.

The levels are numbered from the original surface of the glory-hole at the summit of the Britannia range at an elevation of 4,250 feet above sea-level downward, so that the 2,200-foot level is approximately 2,050 feet above sea-level.

The main entry to the underground workings of the mines is on the 2,200-foot level by a tunnel driven in a south-easterly direction in the foot-wall on the westerly part of the *Kalespiel* claim, at the forks of Britannia creek, and a tributary entering from the north.

At this point is situated the main mining camp, known as the "Townsite." This consists of compressor plant; blacksmith and machine shops; boarding-house with dining-room to seat 280 men; bunk-houses for about 300 men, with four men to each room; boarding and rooming house for single members of the staff; residence for the mine superintendent; also separate houses for the doctor and married members of the staff; hospital, school-house, store, movie-picture house, church, and other necessary buildings.

During 1924 the improvements made at the "Townsite" were as follows: New bunk-house 30 by 120 feet, two stories and basement, to accommodate 112 men with four men to each room; cook-house extended 50 by 30 feet, which increases the size of the dining-room seating capacity to 280 at one sitting; rearrangement of the hospital by building a covered passage-way and connecting the old hospital building with the old residence of the mine superintendent, which was remodelled to suit hospital uses and furnish more beds than formerly. An up-to-date operating-room furnished with X-ray equipment for accident cases that were in the past sent to the hospital at Britannia Beach for treatment; extension to movie-picture hall 30 feet long, making the dimensions 110 feet long by 30 feet wide; rearranged school accommodations by remodelling a two-story dwelling-house into two large class-rooms, and connecting it with the old school-house by a covered passage-way; fitting the old school-house for a gymnasium and play-room for the sixty-four scholars at present attending school; completed a new residence for the mine superintendent, one and half stories with basement, dimensions 38 by 42 feet; converted heating plant for bunk-houses and cook-house from coal to oil-burners, which plant also furnishes hot water for the entire bunk-house system, including baths. The residences and other houses on the "Townsite," except the superintendent's house, the general office, and hospital, are heated with stoves, while the exceptions mentioned are heated with electricity. The cook-house is equipped with a large oil-burning range, the first, it is said, in use in any mining camp in the Province.

The whole boarding-house system of the Britannia Company is managed by John Hedley, and includes the system at the "Townsite"; the hotel at Britannia Beach; the camps at the *Victoria* mine, where 250 men can be accommodated; the *Empress* camp and that known as the *Barbara* camp, where the miners employed in the *Empress* section of the mines and the glory-hole miners are accommodated.

Mining Development and Production.—The development-work done in the mines during 1924 was as follows: Drifts, 10,158 feet; crosscuts, 3,293 feet; raises, 964 feet; winzes, 27 feet; stope development-work, meaning driving manways from the tops of stopes to the level above, after the stopes have been carried up above half-way between two levels, 1,489 feet; total, 15,931 feet. The work has been distributed throughout all of the mines at present working, but a larger proportion has been done in the *Fairview* and *Victoria* sections than in the *Jane*, *Bluff*, and *Empress* sections.

The production by the Britannia Mining and Smelting Company, Limited, during 1924 was as follows: Tons, 780,948; ounces of gold recovered, 4,090; ounces of silver recovered, 113,810; pounds of copper recovered, 23,829,329.

The concentration was on the basis of 1 ton of concentrates to 13.3 tons of ore. The copper content of the concentrates averages 20.83 per cent.

In addition to the copper, gold, and silver, the concentrates carried 27.2 per cent. iron, 8.5 per cent. insoluble, and 10.6 per cent. water. The tonnage of ore reserves broken in the stopes

at December 31st, 1924, was 1,500,000 tons. The tonnage of "positive" ore estimated in the mines at same date is 6,500,000 tons. No tonnage of "possible" or "probable" ore is figured by the company.

Description of Mine Development-work done during 1924.—A study of the attached section of the *Britannia* mines, although it does not show the drifts and crosscuts, will afford an intelligible idea of the immensity of the operations that have been carried on by the earlier operators and the present company during the past twenty-five years. Reference to the various Annual Reports of the Minister of Mines will show details with regard to development-work in the mines previous to 1924.

The main entrance to the underground workings is by way of the main haulage-tunnel on the 2,200-foot level. This tunnel is driven in a south-easterly direction a distance of 4,200 feet to the station at the bottom of the main shaft which connects the 2,200- and 1,000-foot levels. The portal of the tunnel is in the foot-wall country-rock on the westerly part of the *Kalespiel*, and is driven from there under the *Bluff* section into the *Fairview* section, which it enters near the main shaft, and is extended in an easterly direction for a further distance of about 4,500 feet through the *Empress* section into the *Victoria*, and from there into the *Princess Fraction* claim, so that on the 2,200-foot level there is underground connection through all of the sections in which mining operations are being carried on.

During 1924 most of the new development-work has been done in those parts of the *Bluff* and *Victoria* sections that may be considered new ground, for the reason that the ore in the *Bluff* section was exposed westerly from the older workings in 1924 on the 2,200-foot level, confirming previous diamond-drill information, while in the *Victoria* section the first development was undertaken in the fall of 1921, previous to which time the *Jane*, *Bluff* (old workings), *Fairview*, and *Empress* sections made up the working-part of the *Britannia* property.

Bluff Section.—The recently exposed ore-body in the *Bluff* section has been explored on the 2,200-, 1,800-, and 1,400-foot levels, and a raise is being driven from the 2,200-foot level to the 1,800-foot level. The dimensions of this ore-body as shown to date are as follows: On the 2,200-foot level the mineralized zone is 10 feet wide by 250 feet long; on the 1,800-foot level it is 18 feet wide, has been driven on some 400 feet in length, and drifting is being continued; on the 1,400-foot level it is 60 feet wide with no length yet proven.

The most development-work at the present time is being done on the zone on the 2,200-, 1,800-, and 1,400-foot levels, especially on the 1,400-foot. Apparently this ore-body does not extend upwards above 50 feet higher than the 1,200-foot level, where it appears that the *Fairview* slates cut it off.

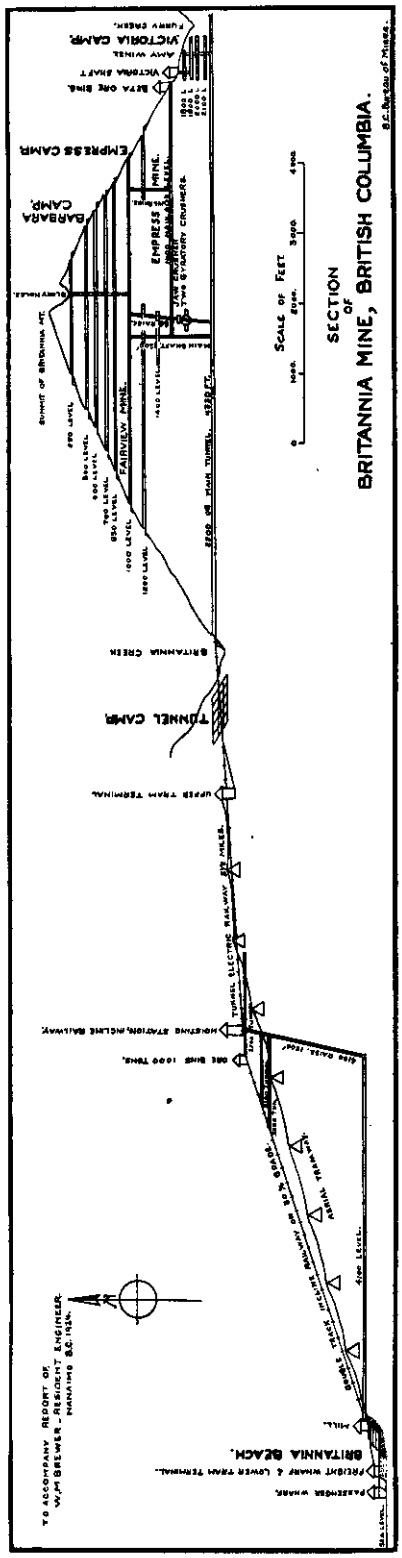
On the 1,400-foot level drifts are being driven from the crosscut, and the point where the ore-zone is crosscut is 250 feet west of the old work on that level in the *Bluff* section.

At present work on the old *Bluff* section on the 1,600-foot level is principally confined to stoping in the Remy E., Remy foot-wall, and Remy hanging-wall stopes, each of which has been carried up a little less than half-way towards the 1,400-foot level. Stoping is also being done from the 1,400-foot level up towards the 1,200-foot level and has reached a point about half-way up between the two levels.

This section of the *Britannia* mines produces about one-third of the total output, while about another one-third comes from above the 500-foot level and glory-holes, and the remainder, of 2,500 tons, the daily output, is mined in the middle *Fairview*, *Empress*, and *Victoria* sections.

Victoria Section.—The *Victoria* section is the part of the *Britannia* mine situated the farthest east of the productive area at this time, and has been developed since the fall of 1921, after an ore-body had been proven by diamond-drilling. This section has only recently been connected underground with the other sections by the driving of the main haulage-tunnel 4,500 feet easterly from the main shaft on the 2,200-foot level in the *Fairview* section. For prospecting the ground still farther east this tunnel has been continued 1,000 feet to the east to prospect and open up new ground known as the *Robinson* section on the *Princess Fr.* claim, easterly from Furry creek in "South Valley," the local name given to that locality.

In developing the *Victoria* section several conditions not met with in the older sections were encountered. The most formidable were the unusual quantity of water underground and the crushed state of the schists, which presented many difficulties in driving tunnels and sinking shafts and winzes, making it necessary to close-timber workings which is unnecessary in other parts of the mines. The fact that the surface on the *Victoria* was at so much lower level than


SECTION
OF
BRITANNIA MINE, BRITISH COLUMBIA.
B.C. Bureau of Mines.
SCALE OF FEET
VICTORIA CAMP.
EMPRESS CAMP.
BARBARA CAMP.
FAIRVIEW MINE.
EMPRESS MINE.
TUNNEL CAMP.
BRITANNIA CREEK
BRITANNIA BEACH.
TO ACCOMPANY REPORT OF
W. M. BREWER - RESIDENT ENGINEER.
MANAINO, B.C. 1914.

in the older sections presented a condition that necessitated the forming of a new transportation in order to deliver preliminary crushed ore to bins on the 2,200-foot haulage-level on the opposite side of Britannia mountain and necessitated the extension of the main haulage-tunnel.

The first underground connection made between the older sections and the *Victoria* was on the 1,600-foot haulage-level, which was used for transporting ore mined in the *Victoria* to the 68 main transfer raise. After it has been hoisted up the Amy winze from below the 1,800-foot level, and has been carried upward by an aerial tramway from the portal at the 1,800-foot level to the Beta ore-bins at the portal of the 1,600-foot level, it is drawn into cars, transported along the 1,600-foot haulage-tunnel to the 68 raise, and dumped into the crushers. In future this method will be abandoned and all ore mined on the *Victoria* section will be transported underground and crushed in a gyratory crusher to be installed just below the 2,100-foot level on the *Victoria*, which will discharge into a transfer storage raise and the ore be pulled on the 2,200-foot level into 15-ton cars hauled by electric locomotives direct to the 4,100-foot raise on the 2,700-foot level, down which it will be dumped to the 4,100-foot level, the main haulage-tunnel, there drawn into 15-ton cars hauled by electric locomotives, and delivered to the receiving-bins at the mill.

By employing this last-mentioned method the aerial tramway that has been used to connect the portal of the 1,800-foot level on the *Victoria* with the portal on the 1,600-foot level on the *Empress* will be abandoned, and the cost for transportation be very much reduced, as power was necessary to hoist the ore from the 1,800-foot to the 1,600-foot level, while the several transfers tended to increase the cost.

The structure of the ore-bodies on the *Victoria* section is very similar to that of the *Fairview* ore-bodies, with zones of concentration within the main mineral-zone, so that there are so-called seven veins, for convenience designated as A, C, D, E, F, G, and H. All of these veins are exposed on the 1,800-, 1,900-, 2,000-, 2,100-, and 2,200-foot levels near the Amy winze, but just west of the winze the A, C, and D veins form a junction, while veins E and G combine about 200 feet west from the Amy winze, but east from the winze veins A, C, and E are separate from each other.

The development-work to date has proven that the mineralized zone on the *Victoria* section is 900 feet in length by 200 feet wide.

During 1924 the most prominent development-work has been drifting and crosscutting the ore-zones on the various levels below the 1,800-foot, as well as stoping and raising the new *Victoria* shaft about 75 feet east of the Amy winze, which will take the place of that winze for handling ore, so that as soon as connection is made in the shaft between the 2,100- and 2,200-foot levels the winze will be used only as a manway and for handling materials, and the shaft will be sunk below the 2,200-foot level.

Stoping on the levels between the 2,100-foot and above the 1,800-foot level has been done on the A and C veins; between the 2,000-foot to above the 1,900-foot on the D vein; and between the 2,100-foot and 1,900-foot on the E vein.

Hard-pan cuts off the C and D veins above the 1,800-foot level and the E and G veins just above the 1,900-foot level on the easterly end of the mineralized zone. At present stoping is being done above the 2,000-foot level on the C and D veins, also on the westerly end of the A vein, while between the 2,100- and 2,000-foot levels two big stopes are being worked. Above the 2,200-foot level on the E vein one small stope is being opened to make room for waste from the 2,100-foot level.

The *Victoria* section is being developed under the detailed supervision of C. V. Brennan, a Canadian mining engineer, formerly with the Utah Consolidated Mining Company, who has been with the Britannia Company for nearly a year.

Mining Methods.—The mining methods employed in the older sections of the *Britannia* mines were described by C. P. Browning, general manager, in a paper which was published in the monthly bulletin of the Institute of Mining and Metallurgy, January, 1922, pages 50 to 61. In the *Victoria* section, as Mr. Browning predicted, timbering is necessary.

This paper deals with the various ore-bodies in the *Britannia* mines that are being worked at present, and which, with the exception of the *Victoria* section, then only being prospected, were being worked when he wrote the paper referred to. This is followed by a detailed description of the mining methods then employed as to drilling and blasting operations, the tools used, the explosives, tramming system, transfer raises, arrangement to facilitate handling ore by

gravity as far as possible, and the preliminary crushing underground. The shrinkage stoping system as used in the *Britannia* mines is fully described in every detail and in such comprehensive language that it is perfectly intelligible to the layman as well as instructive to the mining engineer. The paper is so interesting as well as instructive that it is with regret that lack of space in this report prevents its reproduction in full.

In the *Victoria* section, where the mineralized schists are very badly broken, much crushed, and overlain by a depth of surface wash about 150 feet thick, as well as being thoroughly saturated with water, the old square-set method of timbering is necessary, and, in fact, in some of the drifts spiling had to be driven ahead of the drift sets due to the badly crushed condition of the schists, but it is hoped that as greater depth is attained conditions will improve. In places the mining system has been modified to permit the use of the incline cut-and-fill or rill stoping.

A sawmill of 20,000 feet daily capacity is located near the portal of the *Victoria* 1,900-foot level and supplies this section of the mines with framed timber.

Milling Practice.—The following particulars relative to the milling practice at the *Britannia* mines were obtained from A. C. Munro, mill superintendent: "The concrete-work on the new *Britannia* mill was started in April, 1922. The erection of steel commenced on July 10th. The installation of woodwork and machinery began on November 4th and was pushed to completion in January, 1923. The new mill building is an all-steel structure enclosed with galvanized corrugated steel. All main floors and foundations are of reinforced concrete, which makes the building practically fire-proof. The mill building rises on a steep hillside to a vertical elevation of 210 feet and has seven distinct floors for the various operations. The building is exceptionally roomy and well lighted, both by day and night. The capacity of the mill, as originally designed, was to be from 2,000 to 2,300 tons daily output, but this capacity has been increased to close to 3,000 tons.

"The *Britannia* ores are schistose alterations of both quartz and diorite porphyries, which were later mineralized. The minerals, iron pyrites and chalcopyrite, constitute about 17 per cent. of the total weight of the ore. The remaining portion of the original constituents of the altered porphyries, other than the sulphides previously mentioned, has been almost completely silicified and retains the structure of the altered schistose of the original porphyries. Only a very small percentage of the feldspars in the original porphyries are to be observed in the ores; therefore very little true colloidal material results from fine grinding. The ore ranks high in the scale of hardness, and due to its schistose character has a tendency to split into elongated pieces rather than break into cubes.

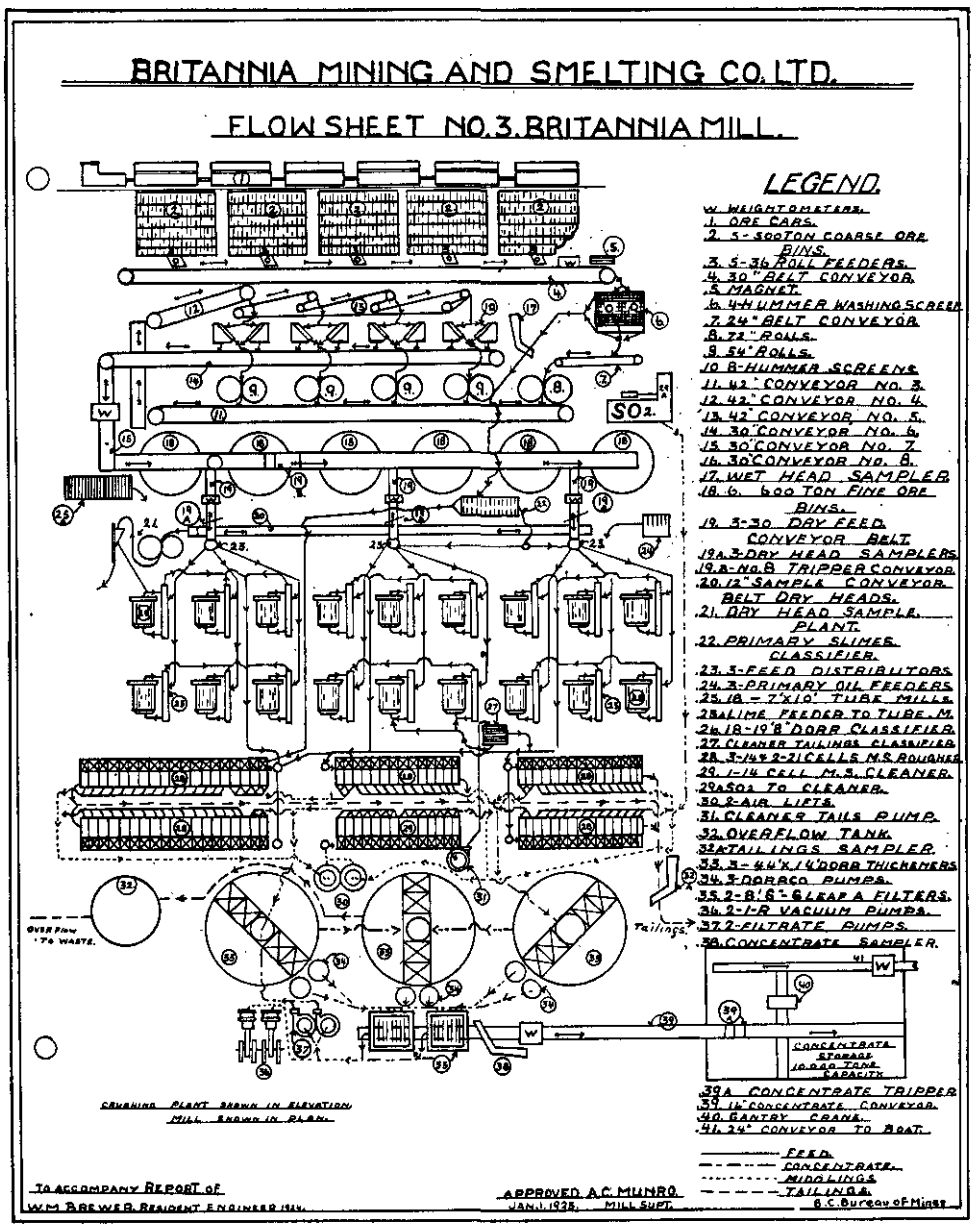
"The coarse crushing plant at the mine consists of one 24- by 36-inch Blake crusher taking mine ore and delivering a 6-inch product to two Allis-Chalmers No. 7½ gyratory crushers, crushing to 2 inches. From the coarse crushing plant the ore is transported by electrical haulage and rock-raises to the mill-bins. Cost of this crushing is 5 cents a ton.

"The plant at the Beach has a live storage capacity of 2,500 tons in five steel bins. The ore is drawn from the bottom of these bins by 36-inch mechanical roll-type feeders, delivering to a 30-inch belt-conveyor over which is hung an electric lifting-magnet for removal of tramp iron.

"The moisture content of the ore as received from the mine ranges from 5 to 15 per cent., mainly in the surface fines. Millmen often use and abuse the word 'grief' in citing their various milling troubles and will agree that in attempting to dry-crush ore of such high moisture content there was something more than 'grief.' The fines would adhere to the rolls, the conveyor-belts, and even adhere to and close up vertical chutes. The only remedy at the time appeared to be the redesigning of the plant for wet crushing. This work would have meant the expenditure of a large sum of money and several weeks' delay. A way out of the difficulty was found by the installation of a washing plant ahead of the coarse rolls. The fines are washed out of the ore by spraying and the ore is then passed over hummer screens having a $^{3}/_{16}$-inch opening. At the bottom of the screen the ore receives a further drying by jetting with compressed air. The undersize, representing about 20 per cent. of the total ore, plus the wash-water, goes to a drag classifier, oversize of which is taken into general mill-feed, the slimes going direct to a separate flotation-machine for special treatment. The washed oversize, containing only 2 per cent. moisture, is the feed to the crushing plant.

"*Dry Crushing after Washing.*—The oversize from the washing plant passes to one 72- by 20-inch Traylor roll, crushing to ¾ inch. The discharge from this roll is then kept in closed

circuit by a series of conveyor-belts to eight hummer screens, delivering oversize to four 54- by 20-inch Traylor rolls until reduced to pass the $^{3}/_{16}$-inch opening of the hummer screens and thence by belt-conveyor and movable tripper to mill storage-bins of 3,600 tons capacity. Our total live storage capacity at the Beach is approximately 6,000 tons. The crushing plant is



operated for sixteen out of the twenty-four hours, with normal tonnage, and a total crew of ten men. The cost of roll crushing is approximately 10 cents per ton.

"*Arrangement of Mill below the Crushing Plant.*—Beginning with the fine storage-bins, the mill consists of three separate units. The distribution system is so flexible that any machine in any unit can be cut in or out, as desired, without impairing the efficiency. A cross system of laundering from unit to unit permits of a well-balanced load on machines that otherwise might be overburdened.

"The feed from the mill storage-bins is drawn by three 20-inch conveyors and is here weighed by three Merrick scales. At this point, also, automatic head samples are taken every twelve minutes and conveyed by belt to a sampling plant equipped with a small set of rolls and revolving cutters.

"*Fine-grinding Mills.*—The feed from the fine-bins, conveyed by 20-inch belts, is divided by switch distributers to eighteen 19-foot Simplex Dorr classifiers, each operating in closed circuit with a 7- by 10-foot tube-mill (now blocked to 5 by 9) grinding to 25 per cent. plus 65 mesh. The tube-mills, driven by 75-horse-power motors, were designed for pebble load only and are equipped with discharge-grates. The shell lining consists of 6-inch rail sections tempered and set endwise in neat cement. Danish flint pebbles, 4½- to 6-inch diameter, were the grinding media employed at the start of operations. It was quickly discovered that the pebbles would not grind the necessary tonnage to the required degree of fineness; therefore fifteen of the pebble-mills have been converted to ball-mills. With a ball load of the same weight as pebbles the tonnage ground was almost doubled, with no increase in horse-power. The consumption of pebbles is approximately 10 lb. per ton or ore ground as against 2 lb. of balls per ton or ore ground.

"The Dorr classifier overflows 20 per cent. solids, which is laundered direct to the flotation plants, of which there are four 14-cell and two 21-cell Mineral Separation standard machines. Five of these are used as roughers and one as a cleaner unit, the latter taking the concentrates from the former and raising them approximately 4 per cent. in copper content by recleaning. The cost of fine grinding is less than 10 cents a ton.

"*Flotation.*—When the new *Britannia* was designed Hancock jigs were installed to remove a portion of the copper as a coarse concentrate ahead of the fine-grinding mills. This had been the practice in the old mill, destroyed by fire. It was presumed that the removal of a coarse concentrate would relieve the grinding machinery and lighten the burden on the flotation plant. The jigs were operated for two months and then cut out entirely. It was found that the flotation plant alone would make a satisfactory recovery, but the grade of concentrate was low, with a concentration ratio of approximately 6 tons to 1.

"About this time a microscopic study was made of the polished surfaces of various *Britannia* ores to determine whether the minerals, iron pyrite and chalcopyrite, occurred in intimate combinations or whether they could be ground free from each other.

"The conclusions arrived at from the microscopic study indicated that the pyrite was the earlier mineral. It was also evident that the minerals could be ground reasonably free from each other without resorting to extremely fine grinding. After the microscopic studies were made, sorting tests were conducted on certain sizes for the selection of reasonably pure grains of iron pyrite and chalcopyrite. Determinations indicated that the minerals possessed a reasonable degree of purity and further determinations indicated that the iron pyrite could be discarded without any appreciable loss of copper. The next problem was that of working out the application of a process in the mill that would eliminate the iron and float only the copper-bearing mineral.

"The addition of reagents to an ore-pulp for the specific purpose of eliminating iron pyrites, in the art of flotation, has only been practised commercially for a period of about three years.

"Through the research department conducted by O. Wiser the grade of concentrates has been raised from 12 to nearly 21 per cent. This has been accomplished by using reagents and oils for selective flotation, thereby dropping the iron. This iron may at some later date be a product of considerable value. Reagents used during 1924 included hydrated lime, sodium resinate, fumol, potassium anthrate, and sulphurous acid; the oils used were coal-tar, creosote, blast-furnace oil, and steam-distilled pine-oils.

"*Concentrate-handling.*—The flotation concentrates is settled in three 40-foot 2-tray Dorr tanks and pumped, at the proper consistency, by Dorrco pumps to two 8-foot 6-disk American filters.

"Before selective flotation was adopted we used the scraper and roller method for removing filter-cake, but this has been replaced by a mechanical beating device which removes the cake with minimum wear in the bags.

"The filters deliver the cake at 10.5 per cent. moisture to a 16-inch conveyor-belt a quarter of a mile in length, which conveys it to a 10,000-ton storage-bin. A weightometer is installed with the belt, giving an accurate daily record of concentrate tonnage. Shipments are also

weighed by Merrick scales in the process of loading. On the arrival of steamers, every ten days or so, a 5-ton gantry crane loads to an apron feeder distributing evenly on a 24-inch conveyor with hinged boom for tide variations, emptying into the steamer's hold. The cost of bunkering and loading *Britannia* concentrate in former years was 26 cents a ton, whereas the cost now is 6 cents a ton.

"*Milling Costs.*—The direct milling cost, including coarse-roll crushing, fine grinding, flotation, dewatering and filtering, and general mill expense, averaged 40 cents a ton during 1924, making a total cost of approximately 56 cents for all direct and indirect milling charges."

Power Plant.—Previous to 1924 the Britannia Company had relied chiefly on the electric power generated from the water-power furnished by the streams within the boundaries of the company's property. These are Britannia, Mineral, and Furry (or South Valley) creeks, from which a maximum of 6,000 horse-power is available. This power was transformed in the plant erected some years ago adjoining the old concentrating-mill and transmitted to the points of use by pole-lines. At some seasons, however, sufficient power was not available and a steam-power plant was maintained at the Beach for use in case of emergency.

The erection of the present concentrating-mill, with its larger capacity, rendered necessary the securing of greater electric power. A contract was made with the British Columbia Electric Railway Company for 6,000 horse-power, which would ensure sufficient power at all seasons and obviate the necessity of maintaining the auxiliary steam plant.

This additional electric power was available in January, 1924, by means of a transmission-line from North Vancouver direct to the Britannia Beach power plant, where it is stepped down to the required voltage and distributed to the machinery units in the mill and the mine. It is also used for electric hoists, motors, lights, heat in some of the buildings, and all haulage. The transmission-line from North Vancouver is constructed, for the most part, along the shore-line of Howe sound and is about 30 miles long.

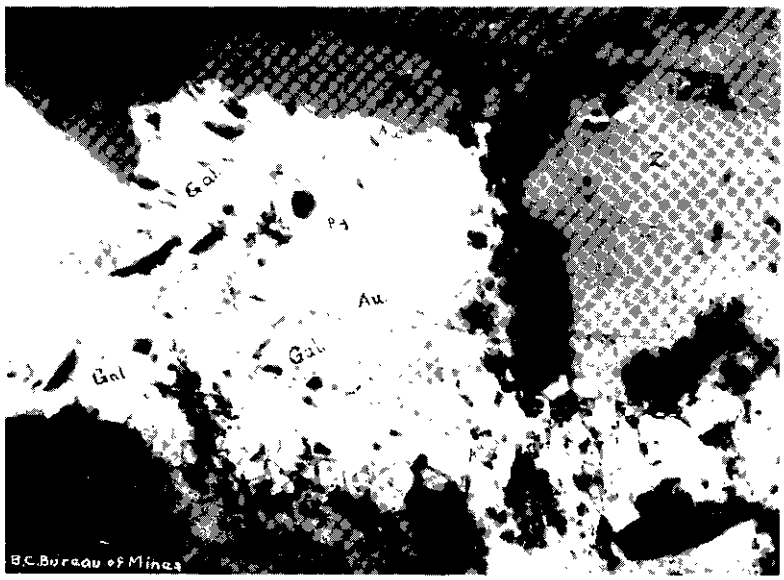
As the Britannia Company operates thirty electric locomotives ranging from 3½ tons to 40 tons for haulage purposes at the mines, on the railway, and at the townsite at Britannia Beach, some idea can be formed of the amount of power required.

Other Mineral Claims adjacent to Howe Sound.—Mining in the mountains adjacent to Howe sound and within easy reach of Vancouver is also represented by the annual assessment-work done by owners of several mineral claims not yet Crown-granted. Some of these are the *Oppergol* and *Attorney* groups a few miles from White Cliff, near the entrance to Howe sound on the easterly side; the *Horseshoe* group on the west side of Howe sound nearly opposite Britannia Beach; the *West Britannia* group, also on the west side of Howe sound near Potlatch creek; as well as several others. Probably amongst the most important is a group known as the *Crofton*, near the mouth of McNab creek on the west side of the sound opposite the north end of Gambier island, which was examined by the writer on May 15th last and is here described.

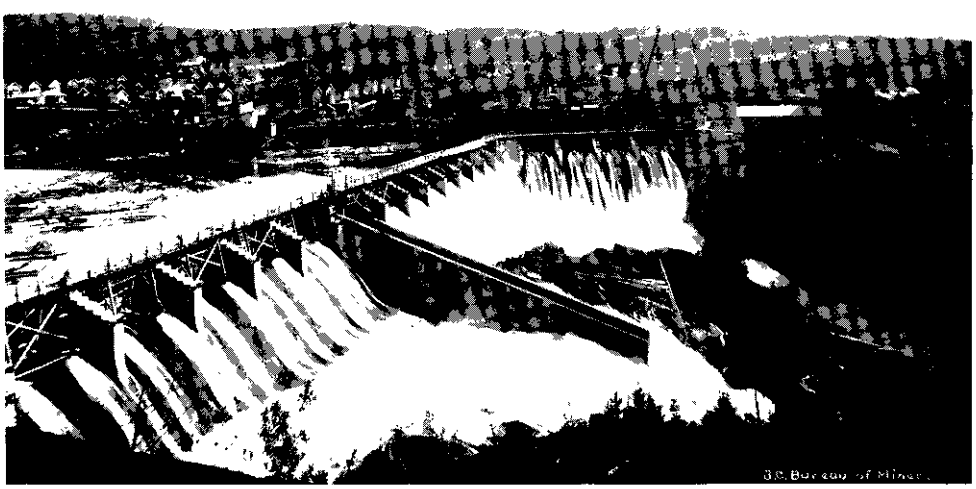
Crofton Group. This group contains the *Crofton No. 1*, *No. 2*, and *No. 3*, situated about three-quarters of a mile above the mouth of McNab creek. The group is owned by George H. Turner, Wm. Hall, and Hugh Crofton, of 2563 Oxford street, Vancouver. The group is in the granodiorite batholith of the Coast range, but there is on the group a belt of metamorphosed volcanic rocks, very much sheared and of undetermined extent, that has been intruded by the granodiorite. A fairly well-defined contact between these rocks is apparent on the *Crofton No. 1*, where a shaft has been sunk and open-cuts have been made. The volcanic rock at its contact with the granodiorite is so much sheared as to give it an appearance suggestive of slate or schist through which mineralization has taken place, as is evidenced by the particles of iron pyrite, galena, and zinc-blende disseminated through the sheared rock both at the contact and for some undetermined width near it.

Ore-deposits.—The ore on the *Crofton* group belongs to the contact-metamorphic type. The ore occurs as lenses filling fissures in the shear-zone at and near the contact, as well as being disseminated irregularly through the sheared rock, but the lenses of solid ore are not distributed with any degree of regularity and occur as fillers in gash-veins, so far as was apparent from the work done at the time the examination was made. The strike of the contact is north-westerly at the workings, but the dip is not defined.

Development-work.—A shaft was sunk 16 feet deep at the face of an open-cut about 10 feet high, and other open-cuts were made at points along the strike of the contact. This work is on



Eldorado Ore (x 100).



Powell River Power-dam.

the *Crofton No. 1*, about three-quarters of a mile by trail northerly from the mouth of McNab creek.

Samples.—One sample was taken from an outcrop near the shaft and three more were taken from the sheared volcanic rock in the sides and bottom of the shaft. These samples assayed as follows:—

No. 1, from outcrop: Gold, trace; silver, 3.4 oz. to the ton; copper, 7.8 per cent.; lead, 5 per cent.; zinc, 11 per cent.

No. 2, from bottom of shaft: Gold, trace; silver, trace; copper, *nil;* lead, *nil;* zinc, *nil.*

No. 3, from left-hand corner, collar of shaft: Gold, trace; silver, 1.2 oz. to the ton; copper, *nil;* lead, trace; zinc, 0.5 per cent.

No. 4, from shallow open-cut: Gold, trace; silver, 0.4 oz. to the ton; copper, *nil;* lead, *nil;* zinc, trace.

PACIFIC GREAT EASTERN RAILWAY SECTION.

The area adjacent to Squamish, at the head of Howe sound, the present ocean terminus of the Pacific Great Eastern Railway, and for about 40 miles along the railway to Alta lake is included in the Vancouver Mining Division and logically is considered after Howe sound.

From Alta lake the northerly boundary of the Vancouver Mining Division extends easterly a few miles to the north-westerly corner of the New Westminster Mining Division, and north-westerly about 60 miles to a point a few miles south-easterly from Chilko lake, in the Clinton Mining Division. This line is also the westerly boundary of the Lillooet Mining Division. The westerly boundary of the Vancouver Mining Division is represented by a line drawn almost due south following 124° of longitude west from Greenwich, except for a few miles towards the southerly end, where the line bears to the west to include that side of Jervis inlet.

The section is very mountainous and north from the head of Jervis inlet is practically unexplored. In fact, the entire area west from the line of the Pacific Great Eastern Railway and east from Jervis inlet, in the Vancouver Mining Division, is to-day hardly scratched so far as prospecting is concerned. It is drained by the Squamish river and its tributaries, is included in the Coast Range batholith, and until late in the season of 1923 only a few discoveries of mineral-deposits had been reported, such being within short distances from the railway. Some of these were examined by Chas. Camsell and reported on in the Summary Report, 1917, Part B, Geological Survey of Canada, under "Reconnaissance along the Pacific Great Eastern Railway between Squamish and Lillooet"; also by the writer during the season of 1918, and reported on in his annual report to the Minister of Mines for that year, pages 293 to 296.

It was Camsell who first called attention to the fact that several broad bands of stratified rocks, including schists, quartzites, argillites, and limestones, occur in the granodiorite batholith and had been intruded by it; also that these bands represented remnants of the old cover of the granodiorite batholith which were not destroyed at the time of the intrusion nor removed by later erosion. He therefore urged prospectors to explore the section. Since then some have taken his advice, with the results described hereafter. The prospects examined in 1918 are not mentioned here because the work done on them has not been sufficient to change their conditions.

Sunshine Group. This group contains the *Sunshine No. 1*, *Sunshine No. 2*, *Sunshine No. 3*, *Sunshine No. 4*, *Harding*, *Noonday*, and *Rainstorm* claims, owned by J. H. McVicar, of 2222 Stephens street, Vancouver, and J. W. Brown. The group is situated on Goat creek, a tributary of the Mamquam river, about 9 miles by trail from the town of Squamish.

On the *Sunshine* there occur two parallel bands of schist similar to the Britannia schist, separated by a dyke of igneous rock, with granodiorite on the north-westerly side of the schist and a porphyritic rock on the south-easterly. The strike of the schist is north-easterly and the dip about 70° towards the south-east. The bands of schist are mineralized on the surface by pyrite, chalcopyrite, some galena, and zinc-blende disseminated through the schist, as exposed in two trenches—one 75 feet long by 10 feet wide and the other 20 feet long by 12 feet wide.

Because of the recent discovery of the mineral-outcroppings, no work other than prospecting and constructing a trail for pack-horses with Government assistance has yet been done, but it is the intention of the owners during 1925 to do some development-work to prove the continuity and extent of the mineralization, as well as the grade of the ore.

Hillside Group.—The *Hillside No. 1* and *No. 2* claims were located by R. D. Watson and Thos. Fry, of Vancouver, in October, 1924. These claims are also on Goat creek and apparently

the conditions relative to geology and mineralization are very similar, but no work has yet been done.

ASHLOO CREEK SECTION.

During the past two years the country adjacent to Ashloo creek, a tributary of the upper Squamish river, into which it flows at a point about 9 miles north-westerly from the junction of the Cheakamus river, has been considerably prospected by Fred. Pykett and associates, residents of the Upper Squamish settlement north of the Cheakamus Indian Reserve. As a result of this prospecting one group of seven claims, besides some others, have been located and more than the required annual assessment-work done to date.

Owing to the difficulties in reaching this section, because of the lack of a pack-trail and necessity of packing supplies, tools, etc., on men's backs, assistance was authorized under the provisions of the "Mines Development Act" to construct in the fall of 1924 the necessary pack-trail and bridges up Ashloo creek. This work has been done and the route will be open for the season of 1925.

Pykett's Group. This group contains the *Grandview*, *Highlander*, *Robbie Burns*, *Devonian*, *Fonk*, *Derby*, and *Petro* claims, located *en bloc*. The group is owned by Fred. Pykett and associates, Upper Squamish Post-office. Although the writer visited the neighbourhood in August last, he was unable to examine the group; the following assays made from samples taken systematically by a reliable engineer are submitted:—

No. of Sample.	Width sampled.	Gold.	Silver.	Copper.	Location of Sample.
	Feet.	Oz.	Oz.	Per Cent.	
1	2.50	0.40	0.30	Trace	From outcrop in creek on south side of main river.
2	3.00	3.90	3.40	2.70	
3	4.50	0.32	0.40	Trace	
4	3.50	0.04	0.10	Trace	From the 30-foot drift on the north side of the main river, exclusive of 16 inches of solid sulphides which assays high in gold and silver.
5	1.00	0.16	0.50	Trace	
6	4.50	0.29	0.83	0.23	
7	4.50	0.06	0.30	Trace	
8	0.66	2.52	7.90	Trace	
9	1.00	0.06	.....	.....	From outcrop above portal of 30-foot drift.
10	1.50	0.16	0.50	Trace	Outcrop 600 feet up the creek, exclusive of sulphides.
11	2.50	0.10	.....	Trace	
12	0.50	1.00	3.90	Trace	
13	3.00	0.16	0.10	Trace	Portal of 75-foot drift.
14	4.50	0.12	0.10	Trace	From 75-foot drift at intervals along the drift.
15	3.00	0.20	0.50	Trace	
16	4.00	0.08	.....	Trace	
17	4.00	0.04	0.10	Trace	
18	4.50	0.10	0.30	Trace	
19	3.00	0.06	0.30	Trace	
20	2.50	0.08	.....	Trace	
21	0.166	4.60	2.40	22.00	From a streak of solid pyrrhotite in 75-foot drift.
22	0.66	5.44	18.60	0.83	From solid sulphides in 30-foot drift and assayed by the Henry E. Wood Assaying Co., of Denver, Colorado; sample taken by Fred. Pykett.

The above assays show clearly that the ore is of concentrating grade, but it might be possible to so mine it that the high-grade streaks of solid pyrrhotite could be extracted separately and shipped to a smelter.

This question, however, would be determined by conditions during operations. The chief consideration is that such ore occurs in this formation and provides an incentive to prospectors to search for more.

From the junction of the Squamish and Cheakamus rivers the railway is built on the east side of the latter for about 15 miles, to Daisy lake, and no mineral-deposits have yet been discovered within easy access to the railway. Beyond Daisy lake northerly, within 3 or 4 miles of the railway, there occur several wide bands of altered sedimentary rocks as roof-pendants in the granodiorite batholith, in which have been found sulphide ores.

Several mineral claims have been located on the west of the railway, many of which were described by Camsell and the writer in 1917 and 1918. During 1924 discoveries were made by Helmar Hogstrom on a small tributary of the Brandywine river, about 3 miles westerly from McGuire Siding, which are of considerable importance and promise to supply a tonnage of ore and supplies for railway-haul during the coming season of 1925.

Blue Jack Group.

This group contains eight claims known as the *Blue Jack No. 1*, *No. 2*, *No. 3*, *No. 4*, *No. 5*, *No. 6*, *No. 7*, and *No. 8*, owned by E. L. Snow; H. Hogstrom, of McGuire; and G. G. Herriott, of Alta Lake. The *Blue Jack* claims are located on a ridge about 1,000 feet above the Pacific Great Eastern Railway, which ridge forms the summit between the Brandywine river and the North fork of the Cheakamus river. The property is on the Brandywine slope of the ridge mentioned and there is a great opportunity to develop it by a series of tunnels, the lowest of which would be on the level of the Brandywine river, about 500 feet below the outcropping on which prospecting-work has been done up to the present time.

Geology.—The formation in the vicinity of the *Blue Jack* is mostly concealed by an excessive growth of brush and by fallen timber and thickness of moss, but where exposed has all the characteristics of a "roof-pendant," as described by Camsell, with the actual contact of granodiorite and altered sedimentary rocks to the west of the *Blue Jack* ore-body. One point where the formation is exposed by nature, so far as present prospecting has shown, is in a small creek which flows into the Brandywine river on the *Blue Jack No. 5* claim. This creek has crosscut diagonally a zone of mineralized schist of undetermined width, but evidently of considerable extent. The course of the creek is southerly, while the strike of the schist is N. 20° W. (mag.) and the dip is nearly vertical.

Ore-deposits.—The schist-zone is mineralized by iron pyrites, occasional crystals of galena, and carries gold and silver of commercial value as well as a little lead. Within the zone veins or zones of concentration occur, in which the vein-filler is chiefly solid ore in a gangue of quartz and crushed schist country-rock.

About 50 feet down the small creek mentioned, below the open-cut that was sampled, the mineralized zone outcrops again and there is a width of 34 feet exposed; this was not sampled because no work had been done except stripping the moss off the rock. The mineralization showed that it was equally as well disseminated through the schist as was the case in the open-cut which was sampled.

The small creek where the work has been done flows southerly (mag.) to the Brandywine river, apparently nearly along the strike of the mineralized zone, but below the points mentioned the bed-rock surface is hidden by boulders in the creek as well as brush, fallen timber, and soil on the banks, so that the mineral is not at present exposed continuously from the open-cut sampled to the Brandywine river. It would seem, however, that the mineralized zone maintains its continuity at least for that distance along its strike south-easterly. The zone appears to be persistent north-westerly along its strike for some distance. Claims have been staked for about 15,000 feet in that direction to the slope towards the North fork of the Cheakamus river.

About 50 feet to the west of the open-cut that was sampled there is another exposure of mineralized schist, but it was not sampled because no work had been done. This outcrop indicates that the mineralized zone may be 50 feet wide at this point.

Samples and Assays.—Four samples taken from an open-cut which crosscuts the mineralized zone where the mineral is exposed for a width of 28 feet assayed as follows:—

Sample No. 1, commencing at a point 5 feet from the east end of an open-cut on the east bank of a small creek and chipping across 4 feet towards the westerly, assayed: Gold, 0.24.; silver, 1.8 oz. to the ton.

Sample No. 2, across 8 feet next westerly to sample No. 1 from the same open-cut, assayed: Gold, 0.20 oz.; silver, 2.4 oz. to the ton.

Sample No. 3, across the same 8 feet, assayed: Gold, 0.36 oz.; silver, 2.6 oz. to the ton; lead, 2.5 per cent. The next 4 feet westerly in the open-cut is the bed of the creek and was not sampled.

Sample No. 4, across 7 feet on the west bank, assayed: Gold, 0.20 oz.; silver, 1.2 to the ton.

These assays, when the width of the ore-body is considered, show that as a concentrating proposition this property should prove a commercial success.

JERVIS AND SEECHELT INLETS OF MALASPINA STRAIT SECTIONS.

The mountains contiguous to Jervis and Seechelt inlets were visited during 1924 and a general reconnaissance made of the conditions with regard to lode-mining prospects in the area.

P. J. Sauson, a veteran prospector residing across Seechelt inlet from Egmont, reports that in company with George South, of Pender Harbour, he had discovered float that, assayed by Mr. Nobles, a Vancouver assayer, yielded high values in both gold and platinum. The location of the discovery, he said, was about 14 miles from near the head of Jervis inlet, behind Mount Alfred, in a section where the numerous glaciers made travel almost impossible and which has never been explored; in fact, is unknown by white men or Indians.

This reported discovery is merely referred to here in order to call attention to the fact that within such a comparatively short distance of the most populous part of the Province there are vast areas of unexplored mountain ranges within which there are mineral possibilities.

The only activity in the mining industry in the Jervis and Seechelt Inlets sections during 1924 has been the assessment-work done by Sauson and associates near the head of Narrows arm of Seechelt inlet, and some surveying in the vicinity of Clowholm lake, where the old Howe Mining Company operated a prospect, from which a limited quantity of bornite-copper ore was shipped to Swansea about 1875.

The territory near the heads of the inlets in this section of the Vancouver Mining Division is so difficult for prospectors to explore that but very few have attempted the task, and most of those have been discouraged because they could not interest the representatives of capital in their locations; consequently the temptation to restake mineral claims every year instead of doing annual assessment-work has been too great to be withstood, with the result that stagnation is the order of the day, and the names of mineral claims being changed annually makes it very difficult to keep track of either the claims or the ownership.

The old slate-quarries on Deserted bay, about 12 miles below the head of Jervis inlet, were visited. The face of the quarry is 30 feet high and more than 100 feet long, with a waste-dump covering about an acre. The ruins of a boiler-house and camp buildings still stand.

Lillie-Groven Group.

This group is located near Mount Diadem, on the west side of Jervis inlet, and is approached by a blazed trail from the mouth of Britain river. It has been acquired by Philip White and associates, of Vancouver, who, with assistance under the "Mines Development Act," constructed in 1924 a new trail from the west side of Hotham sound, an arm of Jervis inlet near its entrance. It is understood that some development will be carried out in 1925.

LYNN CREEK SECTION.

The metal-mining industry in the Lynn Creek section of the Vancouver Mining Division has been revived during the late fall of 1924 owing to the bonding, by A. B. Trites, of the eight claims and a fractional claim which have been held for some years by the Lynn Creek Zinc Mines, Limited. Extension of the old development-work is to be commenced by the bondee under the superintendence of H. G. Nichols, of North Vancouver, in 1925. Work on the claims was discontinued by the original owners owing to lack of a market for the zinc-blende ore which is the prevailing mineral on the property. It is the intention of the syndicate to carry on development in order to determine the extent of the ore-deposits, capacity of production, and whether or not the property will warrant mining operations on an extensive commercial scale, as well as the erection of a concentrating-mill.

The mineral claims contained in the property of the Lynn Creek Zinc Mines, Limited, were examined in 1913 by the then Assistant Mineralogist, John D. Galloway, also by the writer in 1917. Mr. Galloway's report was published in the Annual Report of the Minister of Mines for 1913, pages 307–309, and the writer's report in 1917, pages 280, 281. Since these reports were published there have been no essential changes.

There has been, though, a decided change in the demand for zinc in the metal markets, where that metal now commands a much higher price, and there has also been a great advance in the metallurgy of complex zinc and lead ores, so that instead of ore carrying zinc being penalized by the smelting companies, it is now sought for.

So far as the claims located some years ago are concerned on which copper ores occur, in the Lynn Creek section nothing has been done since 1919. There are full descriptions of all of these claims in the Annual Reports for 1918 and 1919.

SEYMOUR CREEK SECTION.

The Seymour Creek section of the Vancouver Mining Division has shown no appreciable progress during 1924. The annual assessment-work has been done on about twelve mineral claims located about 12 miles up the creek above the intake of the city of Vancouver's water-supply. The most important claims are the *Hydro*, *Rainy Day*, *Sunshine*, and *Sunrise*, owned by R. D. Watson and Thomas Fry, of Vancouver, who have held the group for several years.

In the Annual Report of the Minister of Mines for 1917, pages 279, 280, the group was fully described, and since then the development has been confined to the annual assessment-work.

NANAIMO MINING DIVISION.

The Nanaimo Mining Division is the largest in area of any of the Divisions in the Western Mineral Survey District No. 6. It embraces all of the east coast of Vancouver island north-westerly of the northern boundary of the Victoria Mining Division or a line drawn west from Ladysmith to the south-easterly corner of the Alberni Mining Division, near the head of Cowichan lake. Practically all of the Esquimalt & Nanaimo Railway land, as well as Strathcona Park, are included in the southerly part of the Nanaimo Mining Division, while the northerly part extends to Cape Scott, the extreme north-west point on Vancouver island, and into the island to the summit of the range of mountains that is the divide between the waters that flow into the open Pacific ocean to the south-west and those that flow into the straits separating the island from the Mainland. The easterly part of Nanaimo Mining Division is on the Mainland, with the entrance to Seymour inlet at the southerly end of Queen Charlotte strait as the north-westerly corner and the head of the Klinaklini river, about 150 miles in an easterly direction, the north-easterly corner. From the last-named point the easterly boundary follows an irregular line in a southerly direction to the north-west corner of the Vancouver Mining Division, and thence southerly to the Mainland coast at entrance to Jervis inlet; thence across the strait of Georgia. All of the islands in the straits between the Mainland and the east coast of Vancouver island north of Ladysmith are also included in the Nanaimo Mining Division.

For convenience in this report the Nanaimo Mining Division will be considered under three heads—the Mainland section, the Islands section, and Vancouver Island section.

MAINLAND SECTION.

The Mainland section of the Nanaimo Mining Division is very well mineralized; the ores that occur are copper-gold-silver, zinc-blende, lode gold (some of it free-milling), magnetite- and hæmatite-iron ores. The non-metallic minerals in this section are limestone, marble, fire-clay, building-stone, ordinary brick-clay and shale.

During 1924 there has been no production from any of the metalliferous ore-deposits in the Mainland section of the Nanaimo Mining Division, but there is considerable promise that the coming season will witness much more progress than has been the case for the past few years. The reason for this prediction is the fact that some promising prospects on the Coast in the vicinity of Powell river are being negotiated for by responsible syndicates, with the intention of extensively and systematically developing three groups to determine their commercial possibilities. Arrangements are also being made to reopen the old *Dorotha Morton* and *Monte Christo* groups, which were operated previous to 1900; also the *Alexandra* claim.

These are all located on the west side of Phillips arm of Cardero channel. The *Dorotha Morton* and *Alexandra* lie in a belt of metamorphosed shales, schists, and argillites, occurring within the granodiorite batholith of the Coast range as an inclusion, or "roof-pendant," in which are quartz veins carrying gold and silver values, with a fair proportion of the ore being free-milling.

The *Alexandra* was fully described in the Annual Report of the Minister of Mines for 1920, pages 212, 213. The *Dorotha Morton* and *Monte Christo* groups have not been examined since 1899, when work was shut down at the first named after a production of 4,434.08 oz. of fine gold and 10,222 oz. of fine silver. (*See* Annual Report of the Minister of Mines, 1899.) Work has not been resumed to date.

The closing-down of the *Dorotha Morton* mine twenty-five years ago stopped the development of a promising camp that centred around Shoal bay on Thurlow island, a short distance from Phillips arm. The news that serious efforts are being made to resurrect the old camp is glad tidings to several old-time prospectors and mining men who have been holding on to mineral claims in the neighbourhood since 1898 and 1899.

The proposal that is being worked out for 1925 contemplates the acquirement of twenty-seven mineral claims in the *Dorotha Morton* group and six claims in the *Monte Christo* group by the Glasair Mining Corporation, Limited, of Ottawa, incorporated under a Dominion charter. The mineral claims are at present held by Robert Crowe Swords as trustee for a syndicate. After the requirements with regard to organization and transfer have been complied with it is expected that the company will proceed with active mining operations.

Northerly from Phillips arm, and between it and Seymour arm at the south end of Queen Charlotte strait, there are but few locations of mineral claims along the Mainland coast, nor have prospectors extended their search for mineral-deposits in that direction to any appreciable distance from the shore-line.

Southerly from Phillips arm to the south end of Malaspina peninsula, a distance of nearly 50 miles, there are no mineral claims located until a point is reached about 5 miles below the settlement of Lund, nearly opposite Dinner rock. Here an extensive belt of volcanics and altered sedimentaries with tongues of limestone occur as inclusions in the granodiorite batholith of the Coast range.

This section has been well prospected, especially by Wm. Uzzell, a near-by resident on the Coast, who has located the *John Bull* group and the *Royal Arch* claim. These claims were bonded late in the fall of 1924 to Vancouver syndicates and were examined in August last by the writer.

Royal Arch. This claim was staked by Uzzell in 1923. It is located adjoining the *Florence* on the south, about 1,500 feet from the terminus of the auto-road connecting the *Florence* with Lund, about 70 miles northerly from Vancouver. The mine-workings are about 1 mile by trail from the shore of Malaspina strait, where there is a small bay at which scows could be loaded.

There is a well-defined contact on the property between crystalline limestone and granodiorite of the Coast Range batholith, but the extent of the belt of limestone, associated with which are such minerals as epidote and garnet, is undetermined, but apparently quite extensive. Some of the limestone is silicified and considerably sheared and fissured, in places having an almost schistose structure.

The occurrences of ore belong to the contact-metamorphic type. In one place, where work has been done, the ore fills a fissure 2 feet wide and striking north-westerly, with a vertical dip. It is developed by a shaft 16 feet deep in limestone, which is very near the contact between the crystalline limestone and a silicified limestone and not far from the granodiorite. In addition to this ore-body there is an outcrop of mineralized limestone about 30 feet wide, in which the mineralization is made up of chalcopyrite, iron pyrite, and zinc-blende. A general sample from this outcrop assayed: Gold, *nil;* silver, *nil;* copper, 0.1 per cent.; lead, *nil;* zinc, 17.5 per cent. This outcrop is on the easterly side but quite near the shaft-work.

A general sample from the dump at the collar of the shaft assayed: Gold, trace; silver, 2.2 oz. to the ton; copper, 6.9 per cent.; lead, *nil;* zinc, 5.5 per cent. Another sample from the same dump assayed: Gold, trace; silver, 2 oz. to the ton; copper, 6.9 per cent.; zinc, 6 per cent; lead, *nil.*

Since the examination made in August last Mr. Uzzell reports that he has opened up what is apparently an extension of the ore-zone described above, at a point 80 feet nearer to the beach along the strike of the zone. He could not examine bed-rock because of the inflow of water, but was able to dip up some pieces of chalcopyrite with the shovel, indicating that the ore-zone either extended to that point or that another lens of ore occurred there.

Florence. This claim is situated on the Mainland coast about three-quarters of a mile from the shore of a small bay in Malaspina strait nearly opposite Dinner rock, or about 5 miles southerly from the settlement of Lund, with an automobile-road connecting the workings with the settlement. It is owned by McNaughton Bros., loggers, of Vancouver and Jervis inlet. At the present time it is under option to W. G. Dickenson, of 576 Dallas road, Victoria.

The property was reported on in the 1917 Annual Report. New work has been done since that report was made, so another examination was made in 1924; the following, therefore, is mainly a description of the new development work. The paragraphs in the 1917 Report relative to the geology and characteristics of the ore-body are not repeated herein.

The new development-work is represented by extensions of some of the old workings, as well as some entirely new work. The most important recent work consists of open-cuts and a shaft 8 feet wide by 10 feet long by about 10 feet deep, partially filled with water. One open-cut is known as No. 2 and another as No. 3, which work, except some stripping, is at the farthest point in a south-easterly course from the older workings. At the No. 2 open-cut there is a prospect-hole, comparatively shallow, where an ore-body is exposed 5 feet wide, from which it is reported a shipment of zinc-blende ore of about 20 tons was sacked in 1923 and hauled to the Government wharf at Lund for transportation to a smelter. The wharf collapsed soon after and the ore had not been shipped at the time of the recent examination; consequently no statement can be made herein as to the values returned by the smelter. A grab sample from some sacked ore on the dump assayed: Gold, trace; silver, 0.8 oz. to the ton; copper, 1.7 per cent.; lead, *nil;* zinc, 39 per cent.

The open-cut near the first shaft mentioned is 45 feet in length along the strike of the ore-body in a south-easterly direction, in which ore is exposed. A general sample from the dump along this open-cut assayed: Gold, *nil;* silver, *nil;* copper, 0.2 per cent.; lead, *nil;* zinc, 28 per cent.

South-easterly from No. 2 open-cut stripping has exposed outcroppings for 108 feet to No. 3 open-cut, at which point ore is exposed for a width of 21 feet and a length of 10 feet, where a grab sample, not to be considered an average, was taken which assayed: Gold, *nil;* silver, *nil;* copper, 0.1 per cent.; lead, *nil;* zinc, 37 per cent.

South-easterly from No. 3 open-cut stripping has exposed considerable ore-outcroppings for a distance of about 60 feet along the strike, but no samples were taken as the work is merely superficial.

The old workings or No. 1 open-cut is about 200 feet north-westerly from No. 2 prospect-hole, from which it is reported the sacked ore was mined that was hauled to Lund for shipment to smelter.

The transportation facilities are quite good. There is an automobile-road from the mine-workings to Lund, about 5 miles distant, and Lund is a port of call for several coasting vessels of the Union Steamship Company, of Vancouver.

There is also a good chance for deep-water transportation from a small bay about three-quarters of a mile from the mineral claim and there is a good trail connecting the two points, which can quite easily be transformed into either an automobile-truck road or a surface-cable, narrow-gauge tramway laid with light rails.

John Bull Group. This group is about 8 miles in a north-westerly direction from Powell River pulp-mill on the Mainland coast. The group contains the *John Bull*, *Hematite*, and *Extension* mineral claims, owned by Wm. Uzzell, Powell River. In the Annual Report for 1922 the *John Bull* mineral claim is described on page 234, but as the *Hematite* and *Extension* claims have been added to the group it was considered advisable to make another examination of the property.

The new development-work has been done chiefly on the *Extension* claim, which adjoins the *John Bull* on the west. The work is about 700 feet from the shore-line of Malaspina strait, where there is a small bay at which scows could be loaded, except during storms on the strait. The work consists of open-cuts in a silicified tuff country-rock, very blocky and seamed. This work has exposed some mineral in a gash-vein of undetermined extent, an assay of a sample of which yielded: Gold, trace; silver, trace; copper, *nil;* zinc, 11 per cent.; lead, *nil.*

On the *John Bull* claim the new work is a shaft 21 feet deep sunk in metamorphosed lime-stone. The shaft is close timbered and with water at the bottom, which prevented a close

examination, but ore is exposed on one side of it. The mineralization is composed of pyrite, with a little chalcopyrite, and associated with garnet, epidote, and a little molybdenite. A grab sample from the dump assayed: Gold, 0.7 oz.; silver, 0.5 oz. to the ton; copper, trace; lead, *nil;* zinc, trace. This shaft is about 280 feet north-westerly from the main workings on the property described in the 1922 Annual Report.

Powell Lake.

Ophir and Shamrock.

The only activity in the section adjacent to Powell lake during 1924 has been the work done by John Shearman on Copper creek about 3 miles from the outlet of the lake, where the *Ophir* and *Shamrock* claims are situated, a short distance from the mouth of the creek, with the *Shamrock* claim on the northerly side of the creek and the *Ophir* on the southerly side. These claims were described in the Annual Reports for 1917 and 1921. Since that time the prospecting-work has been extended somewhat, so that a new face could be sampled in each of two open-cuts on the *Ophir* claim.

The No. 1 open-cut exposed lenses of solid ore a few inches wide in quartz gangue in a vein in diorite. A general sample from this assayed: Gold, 0.08 oz.; silver, 1.5 oz. to the ton; copper, *nil.* The No. 2 open-cut is 200 feet westerly from No. 1, with ore exposed in a drift-trench on the surface 20 feet long. A sample was taken from the easterly 10 feet of the trench, which represented the new work since the last examination in 1921, when the westerly 10 feet were sampled. The last sample taken assayed: Gold, trace; silver, 1.5 oz. to the ton; copper, *nil.*

On the *Shamrock* claim, which was originally known as the *Vanbert*, the prospecting-work has been extended somewhat. The ore exposed in the crosscut adit is about 5 feet wide, but the quartz vein-filler is about 7 feet wide. The mineralization is made up of pyrite, a little chalcopyrite, some particles of galena and zinc-blende. The gangue is quartz and crushed diorite, which forms the walls of the vein and is sheared and fissured, with the strike of the fissuring north-easterly and dip at about 45° north-west (mag.) underground; earlier work made it appear as though the dip was at a much steeper angle.

The vein-filler underground was too hard to sample without hammer and moil, which could not be obtained, so that no average sample could be taken. A grab sample from the dump of sorted ore assayed: Gold, 0.60 oz.; silver, 41 oz. to the ton; copper, 1 per cent.; lead, 10 per cent.; zinc, 10 per cent.

THE ISLANDS SECTION.

The Islands section of the Nanaimo Mining Division has shown less activity during 1924 than has been generally the case in past years, when there were producing metalliferous mines on Texada, Quadra, and Lasqueti islands; as well as building-stone quarries on Haddington and Newcastle islands, brickyards on Gabriola island, and limestone-quarries on Texada and Redonda islands. During 1924 the mineral production from the Islands section has been confined to the output of the limestone-quarries on Texada and Redonda islands and building-brick from Gabriola island. There have been no producing metalliferous mines, except a limited output of gold from the old *Nutcracker*, now known as the *Gem*, on Texada island, which was reopened during the past season by a syndicate headed by John McConville, of Vananda, and a small tonnage of magnetite-iron ore mined at the *Volunteer* and *Good Hope* claims on Texada island.

The ore mined at the *Volunteer* was used for experimental purposes in the manufacture of sponge iron, which experiments and results are described earlier in this report under the heading "Iron and Steel."

Gem.

This mineral claim is Crown-granted; it was originally known as the *Nutcracker*. It is near the east end of Kirk lake, Texada island, and is reached by wagon-road from Vananda, the distance being about 2½ miles. The recorded owner is A. A. Loggan, of Vancouver, but during 1924 it was operated by a syndicate headed by J. McConville, of Vananda, who pumped out the shaft, 50 feet deep, and extended the drift at the bottom of the shaft towards the east 80 feet; an open-cut on the surface, drifting along the strike of the vein, which required the removal of 15 feet of overburden to reach bed-rock was also made. It was proposed to upraise to the surface from near the then face of the east drift and sink at least 50 feet deeper than the drift.

The property is in a wide belt of porphyrite near a contact with crystalline limestone that occurs westerly from the present mine-workings. The geology is somewhat complicated owing

to the intrusion of igneous dykes and some faulting, which has left crushed zones and disturbed the continuity of the quartz veins in which the ore occurs.

The main vein averages about 2 feet wide and is fairly persistent for about 80 feet west from the shaft and 140 feet east, but the values in the vein are irregular, varying from a trace in gold to specimen ore with free gold splashed over it, and shot through it, that yields spectacular values on assaying.

Three samples were taken from points in the east drift which assayed as follows: No. 1, across 2 feet in the roof of the drift 33 feet from the face: Gold, 0.14 oz.; silver, 0.08 oz. to the ton. No. 2, across 2 feet at a point 7 feet west from No. 1: Gold, 0.28 oz.; silver, 0.12 oz. to the ton. No. 3, across 2 feet at a point 7 feet farther west: Gold, trace; silver, trace. No attempt was made to systematically sample the vein-filler the entire length of the drift.

Other Mineral Claims.—Several other mineral claims on Texada island in the porphyrite-belt, that makes up most of the interior of the island, adjacent to Surprise mountain and north of the iron-mines on the west coast were examined during 1924, that have also been examined during previous years, but the conditions had not changed materially, so no detailed reports are made herein; but for reference the following information is given:—

Retriever mineral claim, reported, page 358, 1916; page 258, 1917; page 277, 1918.
Nigger Baby mineral claim, reported, page 220, 1919.
Nancy Bell mineral claim, reported, page 223, 1921; page 237, 1922; page 257, 1923.

Lasqueti Island.

There was work done during the past year on the *Old Bill* and *Juneau* groups of mineral claims by the Kurtzals Bros.; also some extension of the old workings on the *Venus* group. The writer was unable to visit Lasqueti island until late in the fall, when the mine-workings were filled with water, and as no important changes were reported in the conditions of the various claims since they were examined and reported on in 1920 a further examination was deemed unnecessary.

VANCOUVER ISLAND SECTION.

The Vancouver Island section of the Nanaimo Mining Division has shown but little activity during 1924; in fact, except for some prospecting-work that was done on the head of Adams river, about 20 miles south-westerly from Sayward Post-office, on the Salmon river, and the reopening of some old mineral claims near Cameron lake, as well as preparatory work near Nahwitti on the north-east end of the island, there has been practically no metalliferous mining done.

One of the great difficulties to be overcome by prospectors is the great extent of the Esquimalt & Nanaimo Railway land grant, on which the Crown owns only the precious metals. There has always been trouble in making satisfactory arrangements with the land department of the railway company to obtain a title to mineral claims staked within the boundaries of the land grant, or even to get an agreement by which a prospector was justified in attempting to open up any mineral-deposits he might discover.

The group of mineral claims at the head of Adams river was examined in 1918 and the report published in the Annual Report for that year, page 270; as the writer has been reliably informed that the late development-work has not yet materially changed the conditions, it was not deemed necessary to make another examination.

Arrowsmith Group.

This group is on the northerly slope of the Beaufort range overlooking Cameron lake, Vancouver island, and about 1½ miles from the Chalet Station on the Port Alberni extension of the Esquimalt & Nanaimo Railway. The group contains the *Arrowsmith* and *Outlook* claims and occupies practically the same ground as was occupied some years ago by the *Copper King* and *Cameron* claims, on which development-work was done prior to 1901. The present owners of the property are M. L. Douglas and J. R. Palmer, of Riverside, Cowichan lake, who have organized the Arrowsmith Syndicate, of Duncan, the manager of which is E. F. Miller, Duncan.

As the past history of the mineral claims now known as the *Arrowsmith* group bears a strong similarity to that of many of the mineral claims at present idle in British Columbia, the writer will narrate some of that history: Located as two of the oldest lode locations in the Nanaimo Mining Division in 1897 by local prospectors, an attempt was made to develop the claims into shipping-mines, but although the ore in the outcroppings carried high copper values,

the lack of transportation facilities, except by wagon-haul, either to Port Alberni, 15 miles distant, or Nanaimo, 37 miles distant, was such a heavy handicap that successful operations as a producing mining property were impossible at that time. Consequently work was stopped. Although the annual assessment-work was done for some years after the Port Alberni branch was constructed, even this was finally stopped. The chief reason was that the mineral claims are within the Esquimalt & Nanaimo Railway land grant, which corporation has title to all of the base metals, such as copper, lead, zinc, etc.; the values carried by the ore are mainly in copper, and no arrangement satisfactory to the owners of the mineral claims, who have title to the precious metals in the ore, could be negotiated with the Esquimalt & Nanaimo Railway Company.

During those early days of lode-mining the only treatment for copper ores was smelting in the blast-furnace, with direct and indirect charges and penalties costing so much a ton of ore that on a fluctuating market no ore carrying less than about 10 per cent. copper could be treated at a profit, unless it also carried appreciable values in gold and silver.

To-day, with the oil-concentration method working successfully, it is possible to profitably operate mines carrying ore in which the content in copper values is around 2 per cent., especially when such extremely desirable conditions with regard to water and transportation facilities exist as is the case on the *Arrowsmith* group. An aerial tramway less than a mile long can be constructed to convey ore from the mine-workings to the Cameron river, where an ideal site for a concentrating-mill can be obtained near the railway.

The prevailing rocks in the Cameron Lake district are the Vancouver volcanics, with some schists, including representatives of the Sicker schists. The volcanics are much metamorphosed and in places considerably sheared and fissured. The fissuring is very noticeable in and along the sides of a ravine on the *Outlook* claim, where two adits have been driven with the purpose of intersecting an ore-body which outcrops about 100 feet higher elevation than the level of the upper adit.

Copper-bearing ore occurs on the northerly slope of the mountain overlooking the east end of Cameron lake, where outcroppings of chalcopyrite and bornite copper ore were responsible for the old staking having been done. In the underground workings the mineralization is chiefly chalcopyrite and some pyrrhotite and pyrite in a siliceous gangue.

The first outcropping exposed on the mountain-side is on the *Arrowsmith* claim, where in an open-cut 12 feet long there is exposed in the face mineral of a width of about 2 feet between diorite on the foot-wall and an amygdaloidal rock on the hanging-wall. The hanging-wall is not well defined and apparently the mineralization extends into the hanging-wall, which is much sheared and well within the shear-zone.

The strike of the ore is magnetic north and the dip nearly vertical, but with a slight inclination towards the west. A sample taken across 2 feet 3 inches in the face of the open-cut assayed: Gold, trace; silver, 0.6 oz. to the ton; copper, 3.7 per cent.

On the *Outlook* claim the most of the development-work on the property has been done. This claim adjoins the *Arrowsmith* claim on the southerly side and is located higher up the steep mountain-side, where, at an elevation of about 1,000 feet above the level of Cameron lake, copper ore outcrops on a steep bluff on the side of a deep ravine, where the strike of the ore-deposit is north-easterly and the dip at a high angle towards the north-west.

The extent of the ore-deposit, which occurs in a shear-zone, cannot be determined under present conditions. One sample taken across 3 feet 5 inches at the bottom of a winze 25 feet deep in a drift known as the upper drift assayed: Gold, trace; silver, 0.6 oz. to the ton; copper, 7.2 per cent. Another sample taken across 7 feet at a fault about 80 feet from the portal of the upper drift assayed: Gold, trace; silver, trace; copper, 1 per cent. Another sample across 4 feet in the roof of the upper adit, about 25 feet southerly from the fault just mentioned, assayed: Gold, trace; silver, 0.6 oz. to the ton; copper, 7 per cent. These samples, however, must not be considered to represent averages of the entire ore-body, but only general samples of the ore at the points sampled.

The development-work on the *Arrowsmith* group has been chiefly confined to the *Outlook* claim and consists of an upper and a lower adit. The upper one is a drift-adit, while the lower one is a crosscut. In the upper adit no ore was exposed from the entrance until a point about 80 feet in had been reached, where apparently a fault occurs, and the course of the adit has been turned to the left or easterly for about 8 feet; this cut was made through low-grade ore,

as shown in the second sample mentioned, which assayed only 1 per cent. copper, with traces of gold and silver.

From the end of the 8-foot crosscut the course of the adit was changed and driven as a drift known as the East drift, about 70 feet in a S. 20° W. (mag.) direction. For a distance of 42 feet 6 inches the drift is in ore and follows the strike of the ore-body to a point where a winze (full of water) has been sunk, presumably in ore. Beyond the winze the drift-adit has been driven about 25 feet farther, but being nearly full of muck could not be examined closely. It appears that the ore-body beyond the winze took a turn towards the right, because southerly from the fault mentioned the main drift has been driven altogether about 60 feet in addition to the 80 feet from the entrance to the fault referred to previously. From the fault southerly the main drift is known as the West drift, to distinguish it from the East drift driven nearly parallel. A winze has been sunk in the West drift to a depth of 25 feet, where work is at present proceeding; from the bottom of the winze 10 feet of drifting has been done towards the fault without intersecting it.

The lower adit shows a fine piece of mining-work, as it is 334 feet long and so straight that the flame from a candle held at the face can be seen at the portal. This adit is a crosscut driven from a point about 100 feet lower than and about 400 feet in a north-westerly direction from the upper adit. From a point about 40 feet from the face of the lower adit drifts have been driven in both directions, apparently to prospect a narrow gash-vein and determine whether it would develop into an ore-body of commercial value, which it has not done so far, although the drift to the left has been driven 50 feet long and that to the right 25 feet long.

This lower adit is driven in a south-easterly direction, crosscutting the country between the portal of the adit and the upper workings, but a survey is necessary to determine as to whether the adit has been driven sufficiently far to intersect the ore-body exposed in the upper mine-workings.

Under the present conditions it is impossible to determine reliably the extent of the ore body or bodies, because the actual continuation between the various showings referred to has not been proven. Nor has enough work been done to enable an engineer to systematically sample the shear-zone and determine the extent of ore of good enough grade to ship direct to a smelter and the tonnage available of milling-ore that must be treated by concentration.

Apparently the property merits further prospecting, especially when the facilities for concentrating and transporting the product are so favourable.

VICTORIA MINING DIVISION.

The metalliferous-mining industry in the Victoria Mining Division during 1924 has shown some indications of progress by reason of the fact that serious attempts have been made to infuse new life into some of the old camps, which have been inactive for several years past. This improvement is noticeable on Mount Sicker, Mount Skirt, and on the Koksilah river near the crossing of the Canadian National Railway.

The Victoria Mining Division includes all of that part of Vancouver island southerly from a line drawn across the island from Ladysmith on the south-east coast to the divide between Nitinat lake and Barkley sound on the west coast, including the Cowichan Lake section.

The mineral resources are copper-gold-silver ores; magnetite-iron ore; low-grade bauxite; limestone; clay and shale, suitable for building-brick; and talc of commercial grade.

During 1924 an attempt was made to create an excitement on account of the alleged discovery of ore containing nickel within a short distance from the boundary of the city of Victoria. An investigation was made by the writer and several samples of the so-called ore were taken in the presence of John Ableson, who claimed to be the discoverer. Assays of the samples, however, clearly demonstrated that the so-called ore contained neither nickel nor any other metal of commercial value. Three samples only, out of seven assayed in the Government Assay Office, yielded any traces of nickel, and of these, one assayed 0.1 per cent., another 0.51 per cent., and the other 0.11 per cent.; consequently the attempt to start an excitement failed utterly.

MOUNT SICKER SECTION.

The Mount Sicker section of the Victoria Mining Division comprises the mountainous area south of the Chemainus river about 3 miles west from Westholme.

The geography, history, geology, and full descriptions of the old mine-workings when the *Tyee*, *Lenora*, and *Richard the Third* mines were actively operated from 1899 to 1907 have been reported on very fully by Charles Clapp in Memoir No. 13, entitled "Southern Vancouver Island," Geological Survey of Canada, 1912; also in several of the earlier Annual Reports.

Lenora.

This property, situated on Mount Sicker, has been idle as a producer since about 1904. It was reopened during the summer of 1924 by R. G. Mellin, of Duncan, who secured a lease and bond from the present owners, for whom J. S. H. Matson, of Victoria, is trustee. It was examined June 4th and September 26th, 1924. It adjoins the *Tyee* on the west and the *Key City* group on the east.

From 1899 till about 1904 the *Lenora* produced a very considerable tonnage of copper ore carrying low values in gold and silver and employed 100 men—miners, muckers, surfacemen, engineers, firemen, and railway-hands.

During the earlier operations the ore was hauled by wagons to Westholme, but later it was shipped from the mine to the smelter of the North Western Smelting and Refining Company at Crofton by way of a narrow-gauge railway about 8 miles long.

The reopening of the *Lenora* mine is due to the fact that Mr. Mellin, having worked for the Tyee Copper Company, was very familiar with the workings in the west end of the main stope on the *Tyee*. He realized that the ore-body mined from that stope probably extended into the *Lenora* main stope. When stoping was suspended that part of the mine east from the face of the stope to the *Tyee* line remained as virgin ground. The face at the east end of the *Lenora* stope showed practically barren ground; the Sicker schist, in which the ore-body occurs, carried so much more quartz than was usually associated with the solid ore found in other parts of the stope that the operators evidently figured that the limit of the shipping-ore had been reached. After an examination of the underground workings, Mr. Mellin made an intensive study of the surface and started stripping between the east end of the *Lenora* stope and the boundary-line between the *Lenora* and *Tyee* mines.

This stripping exposed a body of ore 60 feet long and 16 feet wide, carrying an average of 5.5 per cent. copper and about $1.50 in gold and silver to the ton. An adit 142 feet long was then driven to intersect the ore exposed by the stripping at a depth of about 45 feet, which would correspond with the bottom of the west stope on the adjoining *Tyee* mine.

Another reason for reopening the old *Lenora* mine is because it is well known that there is on the Mount Sicker properties an ore-body known as the North ore-body that was never prospected to any extent on the *Lenora*, *Tyee*, or *Richard the Third* claims. The prospecting that had been done showed the ore only carried 2 per cent. copper, 7 per cent. zinc, and $1.50 combined gold and silver values, which were the results obtained from systematic sampling of the ore-body on the Tyee Copper Company's property before closing down.

Twenty years ago such ore was too low grade for profitable operation, especially when the zinc content is noted, on which a heavy penalty was charged by copper-smelters. To-day, with the oil-flotation process thoroughly perfected, the advancement in metallurgy with regard to zinc, and a good market demand for zinc concentrates, conditions have changed entirely, and ore carrying zinc in association with other metals is of some value.

From Mellin's intimate knowledge of the probable dimensions of the North ore-body, also from information from Dick Bozance, the former foreman of the *Tyee* mine, it is gathered that there are probably 50,000 tons in the North ore-body on the *Lenora*, 80,000 tons on the *Tyee*, and an unknown quantity in the *Richard the Third*. All of this ore to-day is of commercial value if concentrated. If the *Lenora*, *Tyee*, and *Richard the Third* were worked as one property the old workings could be unwatered by natural drainage through the lowest tunnel on the *Lenora* mine. This would effect a great reduction in the cost of mining as compared with the cost when active operations were being carried on twenty years ago, because no pumping plants would be necessary.

With assistance from the Government under the provisions of the "Mines Development Act," Mr. Mellin has repaired the old wagon-road from Westholme to the *Lenora*, so that automobile-trucks can be used for hauling the ore from the mine to Crofton, on Osborne bay, from which point it will be shipped by scows to the Tacoma smelter.

In addition to the adit that has been driven 142 feet for prospecting and developing, work has been done exposing a lens of ore 14 feet to the north of the ore-body, first exposed by the stripping.

Work has not been carried on sufficiently far on this second lens of ore to determine any material facts relative to its extent. Construction-work was as follows: The erection of a sorting-bin at the mine, 35 tons capacity, connecting with a shipping-bin of 220 tons capacity and connected with the portal of the adit of 150 feet of tram-track and trestle; the camp buildings put in order to accommodate as large a force of men as necessary; reconstruction of 3 miles of the wagon-road between the mine and Westholme, involving 300 feet of rock-cut construction; and a quarter of a mile of new road, as well as rebuilding three bridges. At Crofton, the shipping-point, an ore-bunker of 550 tons capacity has been erected, from which a trestle and track 290 feet long extends to the end of the Government wharf, at which scows can be loaded.

A sample that was chipped across 6 feet on the outcrop of the ore-body exposed by the first stripping assayed: Gold, 0.08 oz.; silver, 1.5 oz. to the ton; copper, 7 per cent.; zinc, 8 per cent.

Richard the Third.

During the summer of 1924 a lease and bond on the *Richard the Third*, situated on Mount Sicker and adjoining the *Tyee* mine on the east, was obtained from the Richard the Third Mining Company by H. Maynard and associates, of Victoria. Work was started to systematically and intensively prospect for an extension of the above-mentioned North ore-body from the *Tyee* into the *Richard the Third*. This work was commenced late last fall and consists of sinking a new shaft in an endeavour to intersect the North ore-body.

The work is being done by William Vastone, formerly a foreman for the Richard the Third Mining Company, but was not examined by the writer for the reason that no important discoveries had been made up to the end of 1924. A thorough examination will be made in 1925.

MOUNT SKIRT SECTION.

This section of the Victoria Mining Division comprises the mountainous area occupied by Mount Skirt and surrounding hills, 1 mile north-east of Goldstream, on the Esquimalt & Nanaimo Railway. Active mining operations were carried on in this section from 1898 until 1902, when work was suspended, and not resumed until the fall of 1924, when a local syndicate headed by S. P. Moody, of Victoria, secured a lease and bond on an old property originally known as the *Phair* mine.

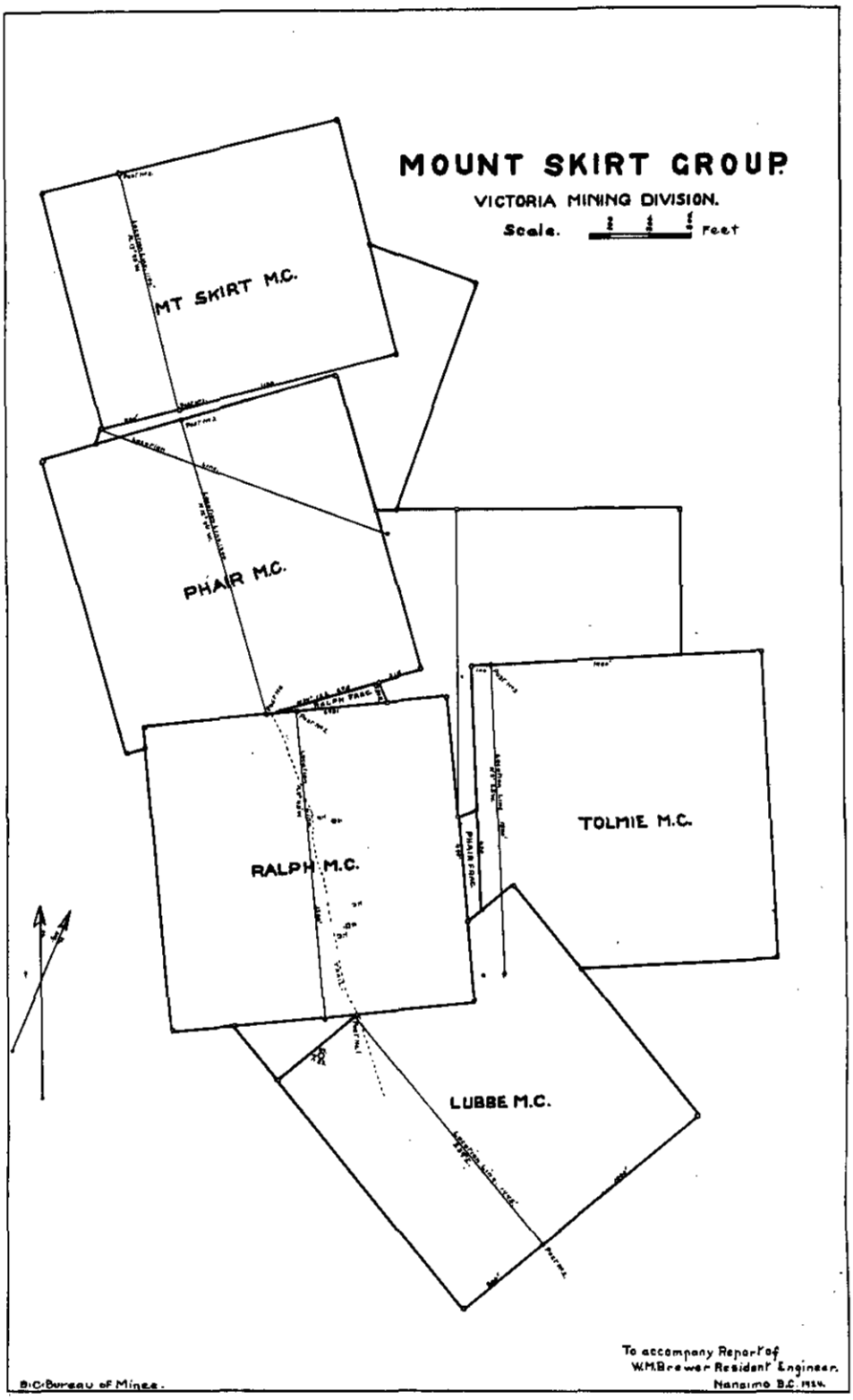
Mount Skirt Group.

This group of mineral claims, originally known as the *Phair*, contains the *Lubbe*, *Ralph*, *Phair*, *Mount Skirt*, and *Tolmie* full-sized claims, together with several fractions. Owing to the fact that this property has been idle for so many years there are no recent reports published describing either the geology or the old mine-workings. In Clapp's description of "Southern Vancouver Island" in Memoir No. 13 already referred to, he merely mentions Mount Skirt incidentally in the chapter of "Impregnated and replaced shear-zones with accompanying quartz phases," as follows: "Similar impregnated schists occur on the south slope of Mount Skirt, a mile north-east of Goldstream, in the schistose phases of the Vancouver volcanics. The mineralized zone is cut by small irregular lenses of quartz, with more or less chalcopyrite and pyrrhotite."

The impregnated schists Clapp mentions in the above paragraph evidently refer to the horizon of the schistose meta-volcanics that occur to the north of the Leech River formation from Langford lake, in Esquimalt district, to Jordan meadows. These he describes as "Greenish-grey schistose rocks varying in composition from rocks similar to the normal meta-andesites and andesite tuffs to rocks consisting of fine aggregates of actinolite and uralite with epidote and secondary quartz and albite. These rocks are also very commonly mineralized in a varying degree with pyrite, pyrrhotite, and chalcopyrite, which occur in disseminated grains and irregular veinlets."

The mine-workings carried on by Phair and Lubbe in 1898–1901 have been cleaned out by Moody and associates, preparatory to sampling the old faces to determine whether the exposures in the ore-body show sufficient values to warrant further development-work.

The old development-work consisted of a shaft on the *Ralph* claim, said to be 90 feet deep, but full of water below the main adit-level, about 30 feet below the outcrop, from which some high-grade chalcopyrite ore was shipped in 1899. On this adit-level there is an open-cut 37 feet long as an approach to a crosscut 40 feet long where the ore-body was exposed, and drifts driven 56 feet to the right and 288 feet to the left. The latter, while being mostly drifting, includes some crosscutting where the lenticular structure of the ore-body is determined, as well as the fact that


MOUNT SKIRT GROUP
VICTORIA MINING DIVISION.
Scale.
Feet
MT SKIRT M.C.
PHAIR M.C.
RALPH M.C.
TOLMIE M.C.
LUBBE M.C.
To accompany Report of
W.M. Brewer Resident Engineer.
Nanaimo B.C. 1926.
B.C. Bureau of Mines.

there are at least two lenses, and possibly three, lying *en echelon* to each other. An old stope that was opened from the adit-level is 58 feet long and opened to the surface, and continued down an undetermined depth below the adit-level. This was full of water, so could not be examined.

Other development-work was done in the early days at points to the north-west from the workings just described. These consist of a shaft (full of water) on the westerly point of Skirt, also several open-cuts and short adits.

Five samples were taken from the dumps and some of the faces at the main mine-workings, which assayed as follows:—

No. 1, from dump of sorted ore at portal of adit: Gold, trace; silver, 9.5 oz. to the ton; copper, 22 per cent.

No. 2, from same dump, but not sorted: Gold, trace; silver, 0.4 oz. to the ton; copper, 2 per cent.

No. 3, from face of drift parallel to bottom of stope: Gold, trace; silver, trace; copper, *nil.*

No. 4, from outcrop north-westerly from main workings: Gold, trace; silver, 0.6 oz. to the ton; copper, 1 per cent.

No. 5, from dump about 600 feet north-westerly from main workings: Gold, *nil;* silver, *nil;* copper, 1.2 per cent.

JORDAN RIVER SECTION.

Sunloch. There has been practically no activity during 1924 on the *Sunloch*, the majority interest in which is owned by the Consolidated Mining and Smelting Company of Canada, but worked under the Sunloch Mines, Limited. This property was quite fully described in the Annual Reports for 1917, pages 265–267; 1918, pages 300–303; 1919, page 235; and 1920, pages 220, 221.

This inactivity is not caused through any disappointment at the results from the development-work that has been done. So far as it is possible to ascertain from the officers of the Consolidated Company, the policy is to determine beyond any reasonable doubt that the ore-bodies on the *Sunloch* and *Old Sport* are of sufficient extent to warrant the initial expenditure to build a railway from the *Old Sport* on Elk lake to Quatsino sound, as well as concentrating-mills at both mines and metallurgical plant in which to treat the product.

Gabbro Group. This group, adjoining the *Sunloch*, was also inactive during 1924. In the Annual Reports for 1920, page 221; 1921, page 232; 1922, pages 254–256; 1923, pages 271, 272, the general conditions with regard to the geology, mineralization, and full description of the development-work have been reported. Information supplied by Geo. Winkler, the managing director of the Gabbro Copper Mines, Limited, is that any work done during last season has not materially changed the conditions as described in past reports.

NON-METALLIC MINERALS IN THE VICTORIA MINING DIVISION.

The non-metallic mineral industry in this Division centres near Victoria and during 1924 has shown good progress. The industry consists of mining limestone and shale for making cement; quarrying a low grade of bauxite for refining gas; mining talc; and working clay for building-brick.

B.C. Cement Co., Ltd. The most important operation is the manufacture of cement and mining limestone and shale, the raw materials which enter into that industry. The company's quarries and plant are located at Tod inlet on the east side and Bamberton on the west side of Saanich inlet. Possibly because they are so near to Victoria is one reason why so little attention is paid to the operations of a company that produces annually over $1,000,000 worth of cement and carries a yearly pay-roll of nearly $250,000.

All the raw material used in the manufacture of cement is obtained locally except the gypsum, required to mix with the limestone and shale. At present the gypsum is imported from Alaska, but on completion of the Kamloops–Kelowna branch of the Canadian National Railway it could be obtained from the large deposits at Grande Prairie.

Talc.

The production of talc from the Leech River section has been curtailed during the last part of the year by reason of delay in the negotiations that were entered into in May between the

Eagle Talc and Mining Company and the Sunbeam Mining Company, Limited. The following report on the *Sunbeam* group describes the conditions with regard to the occurrence of talc on Wolf and Deception creeks, as well as on Leech river, near Leechtown.

A full description of the *Eagle* claim on Wolf creek as well as the manufacturing plant was published in the Annual Report for 1920, page 222.

Sunbeam Group. The following mineral claims in one group, crossing Sooke river near Leechtown, are held by the Sunbeam Mining Company, Limited: *Gold Bar*, on Deception creek, 1 mile westerly from the outlet of Sooke lake; *Sun*, on Leech river, half a mile westerly from Leechtown; *Sunbeam No. 1*, situated 200 yards north-easterly from Leechtown, on Wolf creek; *Sunbeam No. 2*, on Wolf creek, the property of the Eagle Talc Mining Company; *Sunbeam No. 3*, adjoining the *Sunbeam No. 2* on the north-easterly side; *Eastern Star*, on Leech river at Leechtown; *North Star*, adjoining the *Eastern Star* on the westerly side. These claims have been acquired by the company from the original locators.

The claims being situated within the boundaries of the Esquimalt & Nanaimo Railway land-grants, the recorded owners have only title to the gold, silver, and platinum (precious metals) that may occur on these claims, while the talc and any of the base metals are owned by the Esquimalt & Nanaimo Railway Company in accordance with the provisions of the concession originally granted to that company.

The claims are situated in the Leech River slate formation, which is described by C. H. Clapp in Memoir No. 13, Geological Survey of Canada, entitled "Southern Vancouver Island," as consisting of the oldest rocks of southern Vancouver island and of probable Carboniferous age.

The Leech River formation has attracted considerable interest for more than sixty years past owing to the fact that it was the source of the placer gold which was mined in Leech river in 1862 and since. During recent years, since the placer deposits have been practically worked out, the Leech River formation has become important because associated with the slates of that formation deposits of talc have been discovered of good enough quality and sufficient in extent to possess commercial value and thereby a new mineral industry has been organized in the Province.

The original discovery of talc of commercial grade was made on the *Eagle* claim on Wolf creek north-easterly from and adjoining the *Sunbeam No. 2*. Since the discovery of talc of commercial grade and quantity on the *Eagle* prospecting for this mineral has been carried on principally by T. A. Phillips, of Victoria, whose prospecting-work has resulted in the staking and recording of the *Sunbeam* group. These claims have also been staked and recorded because of native gold which is sometimes found in the gouge material lying between the talc and the slate country-rock. This gold may represent a placer infiltration in the seams of the rock.

The mineral-deposits on the *Sunbeam* group of mineral claims appear to be confined to deposits of talc which occur on the *Sunbeam No. 1*, *Sunbeam No. 3*, *Eastern Star*, *Sun*, and *Gold Bar* claims. These deposits of talc apparently have commercial value so far as quality is concerned, but the question of quantity has not yet been determined in any of the deposits, although on the *Eastern Star* the body of talc at present exposed in an open-cut is about 8 feet wide, but the foot-wall is not yet exposed. Another outcropping of talc occurs on the *Sun* claim on the southerly side of Leech river above low-water mark, where an adit is being started for the purpose of developing it.

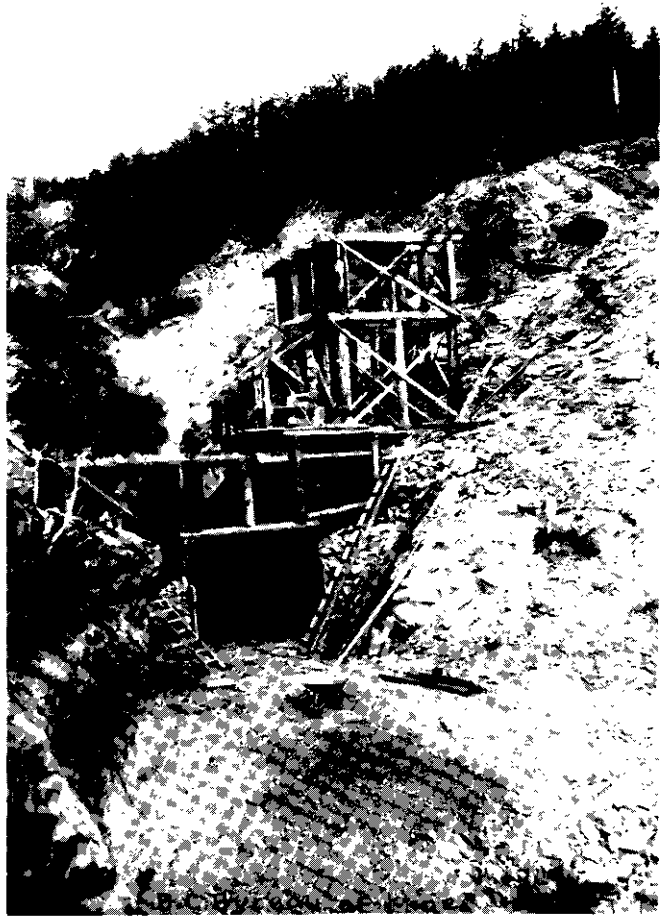
The deposit of talc on the *Gold Bar* claim, Deception creek, was described in the Annual Report of the Minister of Mines for 1922 under the name of the *Invereck* claim, but T. A. Phillips states that this claim has since been acquired by the Sunbeam Mining Company, Limited.

Since the claim now known as the *Gold Bar* (formerly the *Invereck*) was examined in 1922 some open-cutting in the bank of Deception creek under the roots of a large cedar-tree has exposed a greater width of talc than was previously exposed.

Except for any value that is possessed by the *Sunbeam* group as a source of talc, it is not considered that the group has any further value, although Mr. Phillips and his associates are laying considerable stress on the values in gold that may be recovered.

By panning some of the gouge between the slate and the talc colours of gold can be obtained, but this gold is in its metallic state and is very irregular. It is not considered to be of commercial importance, but the presence of metallic gold may justify a prospector in staking mineral claims on the ground that precious metals occur. The development-work that has been done

Lenora, Victoria M.D.—Outcrop.



Lenora, Victoria M.D.—Shipping-bins.

on the *Sunbeam* group consists of the construction of some trails down the steep banks of Wolf creek and Leech river, affording access to the points where the talc occurs; the surveying of some of the claims; making some open-cuts; the driving of an adit 12 feet long in the *Sunbeam No. 1* on the bank of Wolf creek; an open-cut 20 feet long on the *Sun;* starting an adit on the *Sun* on the southerly side of Leech river; and open-cuts on the *Gold Bar.*

The commercial value of the property lies in the deposits of talc, the mining of which has to be done under some arrangements with the Esquimalt & Nanaimo Railway Company. Mr. Phillips stated that he expected to put in a treatment plant by which the talc would be ground and prepared for market, and at the same time any contained gold would be saved by concentrating. Whether such a treatment plant as Mr. Phillips described can be successfully worked is a question that can only be decided from experience.

NEW WESTMINSTER MINING DIVISION.

During 1924 progress in the metalliferous-mining industry in New Westminster Mining Division has not been as good as the prospects promised at the beginning of the year; in fact, serious development-work has been confined to that done on the *Dolly Varden* group, owned by the Silver Chief Mining Company and situated near the head of Chilliwack lake. This property was described in detail in the Annual Report of the Minister of Mines, 1923, pages 262, 263, but was not examined during 1924.

Reliable reports as to the extension of the development have been received from time to time and the management is to be congratulated on the results attained. An excellent grade of ore has been mined and is ready for shipment when the wagon-road to connect the mine with the railway is repaired. A sample of the sacked ore assayed: Gold, trace; silver, 124 oz. to the ton; copper, 3 per cent.; lead, 1 per cent.; zinc, 2 per cent. Machinery for equipping the mine, so that machine-drills can be used in future, will be put in as early as possible during 1925, and the development-work will be extended to determine as fully as possible the tonnage and value of the ore available.

The *Lucky Four* group in the Cheam range, at the head of Wahleach (Jones) creek, has not been developed to any extent beyond the work described in the Annual Reports for 1918 and 1919. This property promises to be a mine of importance, but owing to its location and the amount of capital necessary for development it has not been taken up.

The *Viking* group, owned by the Pitt Mining Company, Limited, and situated on the mountain on the easterly side of Pitt lake near its outlet, was described in the Annual Reports for 1923, pages 260–262, and the work done during 1924 has not materially changed the situation. It is hoped that shipments of copper-sulphide ore, of which there is a considerable tonnage available for extraction, will be commenced at an early date.

NON-METALLIC MINERALS.

An important non-metallic mineral industry is carried on at Clayburn, a few miles south of the Fraser river, where extensive deposits of clay and shale occur.

These occurrences and the industry that has been built up are especially favourably commented on by Heinrich Ries and Joseph Keele in Memoir No. 24-E, Department of Mines, Geological Survey Branch, Canada, entitled "Preliminary Report on the Clay and Shale Deposits of the Western Provinces," 1912. In this report occurs the following introductory paragraph: "The most important shale-deposits are those of Sumas mountain, east of Vancouver, which, as shown by the tests given in other pages, represent one of the more important series found in Canada."

This introduction is followed by a description in full detail of the deposits of shale and fireclay; the plant of the Clayburn Company, Limited; the products manufactured; and a long list of the tests made to determine the quality of the clay and shale.

Attention is drawn to the industry built up by the Clayburn Company, as it is a most important factor in the industrial life of the New Westminster Mining Division. The successful business built up as a result of the discovery some years ago of these deposits should be an incentive to prospectors to search for other deposits of the same description in other parts of the Coast.

CONCENTRATION OF SLACK COAL BY OIL-FLOTATION.

In the fall of 1924 P. E. Peterson, of Nanaimo, a specialist in concentration methods, began the organization of a syndicate to enter into a new field of industry so far as British Columbia is concerned. After having been employed for the past five or six years by the Granby Consolidated Mining, Smelting, and Power Company and the Western Fuel Corporation of Canada in research-work relative to the concentration of slack-coal dumps, in the prosecution of which he had been quite successful and had achieved excellent results, he concluded to branch out for himself, and during the early part of last winter secured an old dump at the Granby No. 1 Colliery at Cassidy estimated to contain about 60,000 tons of slack coal and waste, with an average ash content of about 30 per cent.

Having convinced himself that he could from this material produce a product that would not carry more than 18 per cent. ash with a loss of not to exceed 50 per cent., that could be reduced to 25 per cent. according to the washing, he next succeeded in interesting J. B. Mather, of Vancouver, who agreed to furnish the necessary capital to build the plant for a half-interest in the enterprise.

The plant as designed by Mr. Peterson, and the construction of which was commenced about Christmas, 1924, includes a pump and power house and a concentrating plant, equipped with classifiers, three Wilfley concentrating-tables, one Deister slimer (to be converted into a concentrating-table by adding riffles), one large 12- by 4-foot Peterson flotation-cell, and a semi-Diesel engine.

The slack coal is to be sluiced from the main dump with the aid of a 4-inch centrifugal pump worked by the power in the mill—a 30-horse-power semi-Diesel Vickers-Petter engine—to a pond near the pump-house, which is 80 feet lower elevation than the mill. From this pond the slack is pumped through a pipe-line of wood-stave pipe, 400 feet long, 6 inches in diameter, by a 5-inch centrifugal pump, run by a 25-horse-power Vickers semi-Diesel engine.

The fresh water used in the mill is chiefly waste from the coal-washery at the colliery that filters through the dumps and is collected in a pond on the same level as the pump-house, where it is held in storage by a dam and then pumped to the mill by a 4-inch centrifugal pump through a pipe-line 900 feet long. The power to run this pump is furnished by a 20-horse-power semi-Diesel engine. The water will be brought to the mill at the rate of 400 gallons a minute, maximum. In case of an emergency fresh water can also be obtained from Haslam creek, which flows near the base of the dumps from the colliery washer.

The slack is delivered into a classifier on the second story of the mill, where it is separated into coarse and fine; the coarse goes on to the concentrating-tables by gravity through wooden flumes and the fine material, including all clay, goes directly to the flotation-cell. The products from both the tables and flotation-cell are drawn off into a dewatering classifier, from which the coal is transported by a paddle-conveyor 80 feet long to the stock-pile, where it drains; from this it is loaded into cars by a belt-conveyor 56 feet long, constructed under the stock-pile, but elevated at the outlet, to a height necessary to dump directly into railway coal-cars.

The classifiers and flotation-cell are made according to Peterson's own design. In flotation a mixture of pine and fuel oil will be used and the oil and pulp will be mixed in a rectangular box 2 feet square by 30 feet deep, equipped with a paddle on a shaft.

The air used with the flotation-machine is furnished by a Root blower, 8 to 10 horse-power, at a pressure of from 3 to 4 lb. a square inch. The air passes from the blower into a series of twelve pipes, each 2 inches in diameter.

It is expected that the plant will be started up early in 1925, as already contracts have been made for delivery of coal for powdered fuel.

ALBERNI DISTRICT.

ALBERNI MINING DIVISION.

REPORT BY A. G. FREEZE, GOLD COMMISSIONER, ALBERNI.

I have the honour to submit the office statistics of the Alberni Mining Division for the year ended December 31st, 1924.

Mineral claims recorded	11
Certificates of work recorded	20
Free miners' certificates issued	40
Bills of sale recorded	2
Placer leases issued	4

Revenue.

Free miners' certificates	$175 00
Mining receipts, general	288 25
Total	$463 25

CLAYOQUOT MINING DIVISION.

REPORT BY W. T. DAWLEY, MINING RECORDER, CLAYOQUOT.

I have the honour to submit the office statistics of the Clayoquot Mining Division for the year ended December 31st, 1924.

Mineral claims recorded	29
Certificates of work recorded	9
Free miners' certificates issued	11
Bills of sale, agreements, etc.	3
Grouping notices filed	3
Miscellaneous	4

Revenue.

Free miners' certificates	$ 50 75
Mining receipts, general	169 75
Total	$220 50

QUATSINO MINING DIVISION.

REPORT BY ED. EVENSON, MINING RECORDER, QUATSINO.

I have the honour to submit the office statistics of the Quatsino Mining Division for the year ended December 31st, 1924.

Mineral claims recorded	18
Certificates of work recorded	63
Bills of sale recorded	5
Certificates of improvements	2
Free miners' certificates	35
Total revenue collected	$315 50

NANAIMO DISTRICT.

NANAIMO MINING DIVISION.

REPORT BY L. A. DODD, GOLD COMMISSIONER, NANAIMO.

I have the honour to submit the office statistics of the Nanaimo Mining Division for the year ended December 31st, 1924.

Free miners' certificates issued	140
Mineral claims recorded	102
Certificates of work	129
Bills of sale, etc., recorded	11
Permission to relocate	1

Revenue.

Free miners' certificates	$ 741 75
Mining revenue	1,066 00
Total	$1,807 75

VICTORIA DISTRICT.

VICTORIA MINING DIVISION.

REPORT BY R. J. STEENSON, GOLD COMMISSIONER, VICTORIA.

I have the honour to submit the office statistics of the Victoria Mining Division for the year ended December 31st, 1924.

Free miners' certificates issued (individual)	299
Free miners' certificates issued (company)	33
Free miners' certificates issued (special)	7
Mineral claims recorded	13
Certificates of work recorded	43
Placer claims recorded	2
Certificates of improvements issued	2
Reverted Crown-granted mineral claims leased	6
Grouping notices filed	3
Bills of sale, etc., recorded	5

Revenue.

Free miners' certificates	$3,693 25
Mining receipts, general	453 90
Total	$4,147 15

VANCOUVER MINING DIVISION.

REPORT BY A. P. GRANT, MINING RECORDER, VANCOUVER.

I have the honour to submit the office statistics of the Vancouver Mining Division for the year ended December 31st, 1924.

Free miners' certificates issued	1,760
Free miners' certificates issued (company)	56
Free miners' certificates issued (special)	9
Quartz claims recorded	84
Certificates of work issued	224
Receipts issued for money in lieu of work	21
Grouping notices and documents filed	65
Conveyances recorded	34
Certificates of improvements recorded	6

Revenue.

Free miners' certificates	$11,523 75
Mining receipts	2,999 75
Total	$14,523 50

NEW WESTMINSTER MINING DIVISION.

REPORT BY I. WINTEMUTE, MINING RECORDER, NEW WESTMINSTER.

I have the honour to submit the office statistics of the New Westminster Mining Division for the year ended December 31st, 1924.

Free miners' certificates issued	188
Mineral claims recorded	106
Certificates of work issued	70
Conveyances, etc., recorded	26
Grouping notices filed	4
Receipts issued for money in lieu of work	5
Leases of reverted mineral claims	2

Revenue.

Free miners' certificates	$ 863 50
Mining receipts	1,051 15
Total	$1,914 65

INSPECTION OF MINES.

REPORT BY GEORGE WILKINSON, CHIEF INSPECTOR OF MINES.

I have the honour to submit my annual report as Chief Inspector of Coal and Metalliferous Mines, covering the year ended December 31st, 1924.

Appended hereto are the reports of the District Inspectors relative to production of coal and coke, the number of persons employed, lists of fatal accidents and prosecutions, and brief descriptions of the mines in the several inspectorates, and also reports of the Secretary to the Board of Examiners for coal-mine officials.

PERSONNEL OF STAFF OF INSPECTORS AND INSTRUCTORS.

Inspectors.

George Wilkinson	Chief Inspector, Victoria.
Robert Strachan	Senior Inspector (Kootenay and Boundary Districts), Fernie.
John MacDonald	Inspector (East Kootenay District), Fernie.
H. H. Johnstone	Inspector (West Kootenay District), Nelson.
Henry Devlin	Inspector (Vancouver Island District), Nanaimo.
Thomas R. Jackson	Inspector (Vancouver Island District), Nanaimo.
John G. Biggs	Inspector (Nicola-Princeton District), Merritt.
Thomas J. Shenton	Inspector (Northern District), Prince Rupert.

Instructors, Mine-rescue Stations.

John D. Stewart	Nanaimo Station.
John Thomson	Cumberland Station.
J. T. Puckey	Fernie Station.
W. C. Stone	Middlesboro Station.

By amendment to the "Coal-mines Regulation Act" during 1919 the Board of Examiners for coal-mine officials and miners was placed under the jurisdiction of the Inspection Branch.

The personnel of the Board of Examiners for coal-mine officials is as follows:—

George Wilkinson, Chairman.

James Dickson, Secretary, member of Board, and Acting Inspector of Mines.

H. E. Miard, member of Board and Acting Inspector of Mines.

Messrs. Dickson and Miard and the District Inspector of the district in which an examination is being held form the Board for granting certificates of competency to coal-miners.

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

There have been no changes in the inspection staff during the year 1924.

COAL-MINES OF THE PROVINCE.

TONNAGE OF COAL PRODUCED.

The total gross tonnage produced by the coal-mines of the Province for the year ended December 31st, 1924, was 1,987,533 long tons, being a decrease of 555,454 long tons from the production of 1923.

The Coast District, which includes Nicola-Princeton, Vancouver island, and Telkwa coalfields, produced 1,714,015 long tons, a decrease of 88,441 tons as compared with the previous year.

The Vancouver Island collieries produced during the year 1,486,332 long tons, a decrease of 88,331 long tons as compared with the previous year.

The Telkwa and Peace River mines in the Northern District produced 1,228 long tons, an increase of 828 long tons over the production of the previous year.

The Nicola-Princeton District produced 226,445 long tons, a decrease of 938 tons as compared with the previous year.

The Crowsnest Pass District produced 273,518 long tons, a decrease of 467,013 tons as compared with the previous year.

There has been a decrease in production in all the inspection districts, except the Northern District, which shows a small increase.

The decline in production in the Coast District is no doubt due to the fuel-oil competition, which is having a destructive effect on the coal market.

The decrease in the production in the Crowsnest Pass District is mostly due to a strike which lasted from April 1st until October 20th, 1924. After resumption of operations the market was so poor that Coal Creek mines were closed down indefinitely, and the Michel and Corbin Collieries were only able to work part time until the end of the year.

FUEL-OIL COMPETITION.

To show the keen competition of fuel-oil against coal in the Pacific Coast markets during the last eleven years, 1913 to 1923, inclusive, the following figures are quoted on production, consumption, and price at the wells:—

California Oil Statistics.

Year.	Production.		Consumption.		Price at Wells.
	Total Barrels.	Monthly Average of Barrels.	Total Consumption of Barrels.	Monthly Average of Barrels.	
1913	98,867,183	8,155,598	97,083,728	8,083,728	35c.
1914	102,871,907	8,572,658	94,470,987	7,827,582	45c.
1915	89,725,766	7,477,148	92,007,715	7,667,309	33c. to 40c.
1916	91,926,019	7,660,501	101,312,905	8,442,742	40c. to 73c.
1917	97,781,574	8,148,464	108,764,872	9,063,739	73c. to 98c.
1918	102,643,415	8,553,618	106,155,043	8,846,253	98c. to $1.23
1919	101,907,729	8,492,311	103,248,706	8,604,059	$1.23
1920	105,618,706	8,801,559	113,804,251	9,483,687	$1.23 to $1.60
1921	114,566,901	9,547,249	102,629,470	8,552,456	$1.60 to $1.10
1922	139,626,876	11,635,573	119,370,518	9,947,543	$1.10 to 60c.
1923	263,660,000	21,971,666	237,062,500	19,755,208	60c.

From the above figures it is seen the production jumped from 97,867,183 barrels in 1913 to 263,660,000 barrels in 1923, an increase of nearly 270 per cent.

The maximum monthly production was reached in July, 1923, with a total production of 25,000,000 barrels.

Production over consumption during the year 1923 was 26,597,500 barrels.

All production figures for the year 1924 are not yet available, but for the first six months the monthly production was 2,283,600 barrels less than the average monthly production for the last six months of 1923.

The price per barrel at the wells averaged 60 cents during 1923. On February 1st, 1924, it advanced to 85 cents and on February 5th to $1. Practically speaking, the price at the wells has been 40 cents higher during the first six months of 1924 than it was during the whole of the year 1923.

The last production figures available are for the month of October, 1924; this shows a production of 18,696,559 barrels for that month, which is 7,303,441 barrels less than the production of July, 1923.

This decline in the production of fuel-oil during the year makes a more favourable outlook for the coal trade, but large stocks are carried. The quantity in stock on October 31st, 1924, was 121,491,292 barrels.

ACCIDENTS IN AND AROUND COAL-MINES.

During 1924 there were 5,418 persons employed in and around the coal-mines. Eight fatal accidents, causing nine deaths, occurred during the year, as compared with forty-five for the previous year.

There were 731 less employees employed in and around the coal-mines during 1924 than there were in 1923.

The ratio of fatal accidents per 1,000 persons employed was 1.66, compared with 7.32 in 1923; in 1922 the ratio was 4.66; in 1921, 1.45; in 1920, 2.67; in 1919, 2.10; in 1918, 5.15; in 1917, 8.51; in 1916, 5.53; in 1915, 10.42; averaging for the ten-year period 4.75.

The number of fatal accidents per 1,000,000 tons produced during 1924 was 4.52. During 1923 the number of fatalities per 1,000,000 tons produced was 17.6; in 1922 the number was 12.01; in 1921, 3.89; in 1920, 6.30; in 1919, 4.98; in 1918, 10.86; in 1917, 18.34; in 1916, 11.27; in 1915, 26.36; the average for ten years being 10.98 per 1,000,000 tons produced.

The following table shows the collieries at which fatal accidents occurred during 1924 and comparative figures for 1923:—

Name of Company.	Name of Colliery.	1924.	1923.
Canadian Collieries (D.), Ltd.	Comox, No. 4 mine	..	37
" "	" No. 5 mine	2	..
Western Fuel Corporation of Canada, Ltd.	Nanaimo, No. 1 mine	..	5
" " "	" Reserve mine	..	2
" " "	" Wakesiah mine	1	..
Granby Cons. Mining, Smelting & Power Co., Ltd.	Granby, No. 1 mine	1	1
East Wellington Coal Co., Ltd.	East Wellington, No. 1 mine	2	..
Nanoose-Wellington Coal Co., Ltd.	Nanoose mine	1	..
Crow's Nest Pass Coal Co., Ltd.	Coal Creek Colliery	1	..
" "	Michel Colliery	1	..
Totals		9	45

The following table shows the various causes of fatal accidents and their percentage of the whole, with corresponding figures for the previous year:—

Cause.	1924.		1923.	
	No.	Per Cent.	No.	Per Cent.
Falls of rock	4	44.45	7	15.56
Falls of coal	1	11.11	..	.....
Mine-cars and haulage	2	22.22	4	8.89
Explosions of gas and coal-dust	..	.. ..	33	73.33
Miscellaneous (underground), mining machinery	1	11.11	..	.....
Miscellaneous (surface)	1	11.11	1	2.22
Totals	9	100.00	45	100.00

The following table shows the number of tons of coal mined for each fatal accident in their respective classes in the years 1924 and 1923:—

Cause.	1924.		1923.	
	No. of Fatal Accidents.	No. of Tons of Coal mined per Fatal Accident.	No. of Fatal Accidents.	No. of Tons of Coal mined per Fatal Accident.
Falls of rock	4	496,888	7	363,141
Falls of coal	1	1,987,533	..	....
Mine-cars and haulage	2	993,766	4	635.747
Explosions	..	....	33	77,060
Miscellaneous (underground), mining machinery	1	1,987,533	..	....
Miscellaneous (surface)	1	1,987,533	1	2,542,987
Totals	9	220,837	45	56,510

The number of tons of coal mined per fatal accident during 1924 was 220,837 tons, compared with 56,510 tons for 1923; the average for the last ten years was 84,066 tons.

The following table shows the fatalities from various causes in coal-mines during the year 1924, and comparisons with 1923, classified according to Inspection Districts:—

District.	Number of Deaths from Accidents.						Total.		Accident Death-rate.	
	Explosions of Fire-damp.	Falls of Ground.	Shaft Accidents.	Haulage and Mine-cars.	Miscellaneous (Underground).	On Surface.	1924.	1923.	Per 1,000 Persons employed.	Per 1,000,000 Tons of Coal mined.
Vancouver Island	..	4	..	2	1	..	7	45	1.87	4.70
Nicola-Princeton	..	..	..	..	..	..	None	..	None	None
Crowsnest Pass	..	1	..	..	..	1	2	..	1.74	7.31
Northern	..	..	..	..	..	..	None	..	None	None
Totals in 1924	..	5	..	2	1	1	9	45	1.66	4.52
" 1923	33	7	..	4	..	1	..	45	7.32	17.69

The following table shows the ratio of accidents per 1,000 employees and per 1,000,000 tons of coal mined in the Coast and Crowsnest Pass Districts for the ten-year period ended December 31st, 1924:—

District.	No. of Fatalities.	Accident Death-rate.	
		Per 1,000 Employees.	Per 1,000,000 Tons of Coal mined.
Coast District	208	4.96	11.90
Crowsnest Pass District	68	4.51	10.07
For Province	276	4.75	10.98

Details surrounding the occurrence of the fatal accidents in coal-mines during 1924 are as follows:—

The fatal accident which occurred to Carlo Olivero Genovise on January 17th in the mine operated by the East Wellington Coal Company at East Wellington was caused by being squeezed between a car and post. The deceased was on his way out of the mine at the end of the afternoon shift, between 10 and 11 p.m. When he reached the foot of the slope from the lower to the upper seam a loaded trip was being pulled away from the siding. He was standing on the track waiting for the trip to go up the slope, when the rope broke and the trip started to run back and he got caught between a car and a post. Deceased had been warned to keep back from the foot of the slope until the trip was hoisted. The place where the accident occurred was from 12 to 14 feet wide and there was lots of room to get clear, but in some unaccountable manner he went to the rib side on the loaded track and got caught as described above. The accident was avoidable and would not have occurred if the deceased had obeyed instructions.

The fatal accident which occurred to Chan Chung Chap on January 29th, 1924, in the mine operated by the East Wellington Coal Company at East Wellington was caused by being thrown out of a mine-car on the main hoisting slope. The deceased was riding down the slope on an ordinary trip, contrary to rules. A draw-bar on one of the cars broke and the trip ran away. He was thrown out of the car, his head striking the rock, causing a fractured skull, from which injury he subsequently died. The accident was avoidable and, if deceased had obeyed rules, would not have occurred.

The fatal accident which occurred to Andrew Dougall on March 4th, 1924, in the Wakesiah mine, operated by the Western Fuel Corporation of Canada, was caused by being crushed by

cutter-bar of mining-machine. Deceased was engaged taking the cutter-bar out of the mining cut to change picks, and almost got the bar clear of the coal, when he turned round to push the air-hose back; while turned away from the machine the cutter-bar caught his trousers and dragged him underneath, inflicting injuries from which he died thirty hours later. The accident was avoidable and had the deceased shut off the air and stopped the machine while pushing the hose back the accident would not have occurred.

The fatal accident which occurred to R. Proudlock on March 14th, 1924, in the Michel Colliery, operated by the Crow's Nest Pass Coal Company, Limited, was caused by a fall of coal which caught him while he was mining for a shot. If the coal had been properly spragged the accident might have been avoided.

The fatal accident which occurred to James Branch on March 27th, 1924, in the Nanoose mine, operated by the Nanoose-Wellington Collieries, Limited, was caused by a small fall of roof-rock and coal mixed. Deceased apparently had been taking a thin slab of roof-rock and coal down at the outside end of a car standing near the face, and for some unknown reason he was passing the car on the left side going into the face, when the roof fell, with the result that he received injuries to his spine (cervical region), from which he died. It would appear the accident could have been avoided if more care had been exercised.

The fatal accident which occurred to Robert H. Bamford on April 29th, 1924, in the Granby No. 1 mine, operated by the Granby Consolidated Mining, Smelting, and Power Company, was caused by a fall of a piece of cap-rock. Deceased was in a kneeling position sawing a prop, when a piece of cap-rock fell and caught him on the small of the back, knocking him forward and turning him half around, causing injuries from which he died two days later. Indications point to the fact that if a careful examination of the cap-rock had been made by the official in charge and the workmen, in all probability the accident would have been avoided, as the place had a splendid roof and the cap-rock that fell just existed in a small pot-hole immediately above, where deceased was sawing the prop.

The fatal accident which occurred to William J. Jones on May 22nd, 1924, in No. 5 mine, Comox Colliery, operated by the Canadian Collieries (Dunsmuir), Limited, was caused by a large fall of rock. The deceased was operating a coal-cutter at the face of the slope when a cave some 30 feet in length occurred. Witnesses close to the scene say there was no warning given, the collapse of the timbers being instantaneous. The place was well timbered, but apparently they were too small to carry the weight put on them. If the stringers had been centre-posted it would no doubt have had a beneficial effect.

The fatal accident which occurred to John Joseph Kirkbride was simultaneous with and under the same circumstances as the previous-described accident to William J. Jones. Deceased was laying track in the place when the cave occurred.

The fatal accident which occurred to Thomas Puckey on December 8th, 1924, on the tipple at Coal Creek Colliery, operated by the Crow's Nest Pass Coal Company, Limited, was caused by being squeezed between two cars. A trip of cars was being pulled off the tipple. It appears one of the cars had jumped the track, and when it was approaching a car-replacing switch he attempted to slew it or guide it towards the replacer, when the front swung around and crushed him against a trip of cars standing on a parallel tipple-track. Deceased should have kept away from the car which was off the track, and if he had done so the accident would have been avoided.

There were two other deaths to miners not mentioned above, or classified as fatal accidents. One the jury brought in a verdict of "Died from heart-failure." The other was a death of a party three months after sustaining a broken leg. Death was due to a shock from an operation the doctors were performing to reset the leg.

EXPLOSIVES USED IN COAL-MINES.

The following table shows the quantity of explosives used in coal-mines during 1924, together with number of shots fired, how shots were fired, tons of coal produced per pound of explosive

used, and the average pounds of explosive per shot fired (these quantities include all explosives used for breaking coal and for rock-work in coal-mines) :—

District.	Quantity of Explosive used in Pounds.	Tonnage for District.	Total No. of Shots fired.	Tons of Coal per Pound of Explosive used.	Average Pounds of Explosive per Shot fired.
Vancouver Island	412,462	1,486,332	518,980	3.36	0.794
Nicola-Princeton	50,823	226,445	69,689	4.46	0.728
East Kootenay	14,283	273,518	19,206	19.15	0.743
Northern	150	1,228	126	8.12	1.190
Totals	477,718	1,987,533	608,001	4.16	0.786

Quantities of Different Explosives used.

	Lb.
CXL-ite	48,210
Monobels of different grades	363,800
Dynobel	3,952
Coalites of different grades	913
Miner's Friend, different grades	58,481
Polar Permitite	2,362
Total	477,718

The following is a list of permitted explosives on a new explosive order being prepared under the direction of the Honourable the Minister of Mines, to supersede all existing orders:—

Coalite "A" L.F.
Coalite "C" L.F.
Coalite "E" L.F.
Gelpermite No. 1.
Miner's Friend No. 6.
Miner's Friend No. 9.
Polar CXL-ite.
Monobel No. 3.
Monobel No. 4.
Monobel No. 6.
Monobel.

MACHINE-MINED COAL.

During the year mining-machines produced 142,921 tons of coal, or 9 per cent. of the total. Of the total machine-mined coal, Vancouver Island District produced 128,255 tons, or 89.7 per cent.; Nicola-Princeton District produced 13,460 tons, or 9.4 per cent.; and the East Kootenay District 1,204 tons, or 0.9 per cent.

The following tables give the district, number of machines, how driven, tons of coal produced, and type of machine used:—

District.	No. driven by		Tons of Coal produced.		Total Tons (2,240 lb.).
	Electricity.	Compressed Air.	Electricity.	Compressed Air.	
Vancouver Island	4	23	11,754	116,501	128,255
Nicola-Princeton	..	7	.....	13,462	13,462
East Kootenay	..	2	.....	1,204	1,204
Totals	4	32	11,754	131,167	142,921

TYPES OF MACHINES IN USE.

Type.	District.				Totals.
	East Kootenay.	Nicola-Princeton.	Vancouver Island.	Northern.	
Pick-quick cutter-bar	..	..	7	..	7
Siskol's punchers	..	..	9	..	9
Radialaxe punchers	..	..	2	..	2
Sullivan chain-cutters and bar	..	..	8	..	8
Ingersoll-Rand punchers	..	7	1	..	8
Hardy punchers	1	..	..	..	1
Sullivan Post punchers	1	..	..	..	1
Totals	2	7	27	..	36

The machine-mined coal produced by the different companies during 1924 was as follows:—

	Tons.
Western Fuel Corporation of Canada, Nanaimo	87,721
Canadian Collieries, Comox	11,754
Nanoose-Wellington Collieries	13,392
East Wellington Coal Co.	15,388
Princeton-B.C. Colliery	9,862
Coalmont Collieries	3,600
Crow's Nest Pass Coal Co., Michel	1,004
Corbin Coal and Coke Co.	200
Total	142,921

There has been a steady decrease in the quantity of machine-mined coal for several years.

SAFETY-LAMPS.

There were 4,988 safety-lamps in use in the coal-mines of the Province. Of this number, 407 were flame-lamps of the Wolf type and 4,581 were electric lamps of various makes, as follows: Edison, 3,996; Wheat, 585. No naked lights are allowed in the coal-mines of British Columbia.

The following table shows the distribution of lamps by district, method of locking, and the illuminant used:—

District.	Method of locking Lamp.		Illuminant used.	
	Magnetic Lock.	Screw or Automatic Clip.	Naphtha.	Electricity.
East Kootenay	124	1,089	124	1,089
Nicola-Princeton	28	442	28	442
Vancouver Island	234	3,062	246	3,050
Northern	9	....	9	....
Totals	395	4,593	407	4,581

The following is a list of safety-lamps permitted for use in the coal-mines of British Columbia:—

Approved (Electric) Safety-lamps.

No. 1.—The electric lamp manufactured by the Edison Storage Battery Co., Orange, N.J., U.S.A., under approval No. 10 of the United States Bureau of Mines. This lamp shall be used with a flexible cord identified by the Bureau's specification CD–17. The only bulbs approved for

use with this lamp are the symbol BM–10 bulbs, manufactured by the National Lamp Works of the General Electric Co., Cleveland, Ohio; the symbol BM–10 bulbs, manufactured by the Edison Works of the General Electric Co., Harrison, N.J.; the symbol 26–V bulbs, manufactured by the Miniature Incandescent Lamp Corporation, 95 Eighth avenue, Newark, N.J.; and the symbol BM–10 bulbs, manufactured by the Westinghouse Lamp Co., Bloomfield, N.J.

No. 2.—The Concordia approved portable electric (hand-lamp) mine-lamp, manufactured by the Concordia Electric Co., Pittsburgh, Pa., under approval No. 12 of the United States Bureau of Mines. The only bulbs approved for use with this lamp are the symbol Osram, 08510 bulbs, sold by the Concordia Electric Co.

No. 3.—The Wico approved portable electric mine-lamp, manufactured by the Witherbee Igniter Co., Springfield, Mass., under approval No. 14 of the United States Bureau of Mines. This lamp shall be used with a flexible cord identified by the Bureau's specification CD–43. The only bulbs approved for use with this lamp are the symbol BM–14 bulb, manufactured by the Edison Lamp Works of the General Electric Co., Harrison, N.J.

No. 4.—The Concordia approved permissible portable electric mine-lamp, manufactured by the Concordia Electric Co., Pittsburgh, Pa., under approval No. 12 of the United States Bureau of Mines. This lamp shall be used with a flexible cord identified by the Bureau's specification CD–17. The only bulbs approved for use with this lamp are the BM–15 bulbs, manufactured by the National Lamp Works of the General Electric Co., Cleveland, Ohio.

No. 5.—The Pioneer approved portable electric mine-lamp, manufactured by the Pioneer Electric Mine Lamp Co., Philadelphia, Pa., under approval No. 16 of the United States Bureau of Mines. This lamp shall be used with a flexible cord identified by the Bureau's specification No. CD–31, and with battery-plates manufactured by the Electric Storage Battery Co., Philadelphia, Pa. The only bulbs approved for use with this lamp are the BM–16 bulbs manufactured by the Edison Lamp Works of the General Electric Co., Harrison, N.J.

No. 6.—The Wheat approved portable electric mine-lamp, manufactured by the Koehler Manufacturing Co. (Inc.), Marlboro, Mass., under approval No. 17 of the United States Bureau of Mines. This lamp shall be used with a flexible cord identified by the Bureau's specification Cd–31, and with battery-plates manufactured by the General Lead Battery Co., Newark, N.J. The only bulbs approved for use with this lamp are the BM–17 bulbs, manufactured by the National Lamp Works of the General Electric Co., Cleveland, Ohio.

(Unless otherwise specified all lamps are cap-lamps.)

Approved (Flame) Safety-lamps.

No. 12.—The bonneted, double-gauze lamp, with magnetic lock, known as the Wolf lamp.

No. 13.—The flat-wick steel-frame lamp, as specified in Approval No. 201 of the United States Bureau of Mines, manufactured by the Koehler Manufacturing Co., Marlboro, Mass., U.S.A.

No. 14.—The round-wick steel-frame lamp, as specified in Approval No. 201–A of the United States Bureau of Mines, manufactured by the Koehler Manufacturing Co., Marlboro, Mass., U.S.A.

No. 15.—The flat-wick steel-frame lamp, as specified in Approval No. 202 of the United States Bureau of Mines, manufactured by Ackroyd & Best (Ltd.), Arrott Power Building, Pittsburgh, Pa., U.S.A.

No. 16.—The flat-wick aluminium-frame lamp as specified in Approval No. 203 of the United States Bureau of Mines, manufactured by the Koehler Manufacturing Co., Marlboro, Mass., U.S.A.

No. 17.—The round-wick aluminium-frame lamp, as specified in Approval No. 203–A of the United States Bureau of Mines, manufactured by the Koehler Manufacturing Co., Marlboro, Mass., U.S.A.

Approvals Nos. 201, 201–A, 203, and 203–A apply to magnetic-lock lamps that are equipped with steel gauzes. The only glasses approved for use with these lamps are marked "Macbeth No. 2100 High Speed." The only igniter approved for use with these lamps is the Koehler pyro internal igniter, 1915 model, using a cerium-zinc-copper alloy for igniter-points.

Approval No. 202 applies to a magnetic-lock lamp. The only glasses approved for use with this lamp are marked as follows:—

ACKD
BEST
A–1

This lamp is relighted electrically. The only relighter approved for this lamp is the Ackroyd & Best underground relighter.

NOTE.—*While the use of flame safety-lamps is permitted, it is the policy of the Department of Mines to encourage the use of approved electric safety-lamps for all persons underground in the coal-mines, except such flame-lamps as may be required by the officials of the mines in the carrying-out of their duty.*

ELECTRICITY.

Electric power is used for various purposes on the surface at sixteen mines and underground at eight mines. The purposes for which it was used, together with the amount of horse-power in each instance, is shown in the following table:—

Nature of its Use.	Aggregate H.P.
Above ground—	
Winding or hoisting	800
Ventilation	1,958
Haulage	611
Pumping	20
Coal washing or screening	1,263
Miscellaneous	2,147
Total horse-power	6,799
Underground—	
Haulage	1,434
Pumping	960
Coal-cutters	120
Miscellaneous	338
Total horse-power	2,852
Total horse-power above and under ground	9,651

Of the above amount, approximately 3,100 horse-power was operated as direct current and 6,551 horse-power as alternating current.

VENTILATION.

The District Inspectors find that the provisions requiring adequate ventilation were generally well observed at the different mines. In one or two instances orders were issued to increase the amount in certain splits in a few of the mines.

MINE-AIR SAMPLING IN COAL-MINES.

Mine-air sampling was carried out as usual during the year and 254 mine-air samples were taken in the coal-mines of the Province. Of this number, sixty-six were spoiled in transit, accidents in the laboratory, or by reason of incomplete records.

Much valuable information has been obtained and added to that obtained in previous years relative to the flow of methane from the various coal-seams at the different collieries.

The detailed analyses of the mine-air samples are on file in the office of the Chief Inspector of Mines.

USE OF BURRELL GAS INDICATOR.

The Burrell Gas Indicator, the approved tester to determine lower percentages of methane in the atmosphere than can be determined by the ordinary flame safety-lamp, was in general use at the mines during the year. This year, as in previous years, to test the efficiency of the above-named tester, a series of comparative tests were made by the District Inspectors of Mines by having a chemical analysis made of the air samples taken at the same time as readings of the tester were taken.

The following statistical table shows the results obtained:—

District.	Gas Sample taken and submitted by Inspector.	No. of Samples tested.	Average Percentage of Methane.	
			By Chemical Analyses.	By Burrell Gas Indicator.
			Per Cent.	Per Cent.
Crowsnest Pass (Coal Creek)	J. MacDonald	26	0.77	0.76
Crowsnest Pass (Michel)	J. MacDonald	6	0.60	0.75
Nicola-Princeton	John G. Biggs	7	0.067	0.058
Vancouver Island	T. R. Jackson and Jas. Dickson	46	0.72	0.60

The above comparative analyses show the practical utility and accuracy of the Burrell Gas Indicator as used in the Province.

The details of all the individual tests from which these averages are made up are on file in the office of the Chief Inspector of Mines.

COAL-DUST.

The reports of the District Inspectors show that considerable progress has been made during the year in mines which are not naturally wet towards rendering coal-dust on the roads harmless.

At some of the mines the dust is taken care of by loading it out and copiously watering the roof, sides, and floor of the roadways. At other mines the roadways are liberally treated with incombustible dust. Taffenel barriers are erected at the entrances of districts for the purpose of trying to localize any ignition that may take place. Various methods are adopted locally at the mines for the treatment of dust; some mines have a combination treatment of incombustible dust and water, the main roads being treated with incombustible dust and water-spraying being done at the face to keep down the dust from coal-breaking operations. At one mine the intake air is heated by exhaust steam passing through radiators, and very fine fog sprays are placed about 150 feet apart on the main intake; these operate automatically for twenty minutes out of every hour.

Details of the treatment of dust are given in the District Inspectors' reports. Arrangements are under way to have samples of coal-dust collected regularly and tested for the inflammable range, to ascertain the necessary amount of incombustible dust to be added to prevent ignition and propagation.

EXPLOSIONS.

There were no explosions or ignitions of gas or coal-dust during the year.

SULPHUR-POISONING.

Investigations have been carried out throughout the year with a view of trying in some manner to minimize the effect of this painful infliction on the workmen.

The most of the information available on this subject from those supposed to be authorities on the matter is more along the lines of treatment of the victim after an attack than along the lines of prevention. Good ventilation is recommended as being the best means of reducing the number of cases. Investigations are being continued, with the hope that some measure of success will be obtained.

INSPECTION COMMITTEES.

Generally, throughout the Province, the workmen have taken advantage of their privilege granted under General Rule 37, section 101, "Coal-mines Regulation Act," chapter 171, to appoint one or two of their own number to inspect the mines. These inspections have been made once a month. There have been no reports received from these committees of the existence or apprehended existence of any danger. These committees have shown a spirit of co-operation with District Inspectors and have usually furnished them with a copy of their reports.

DANGEROUS OCCURRENCES.

By amendment to the "Coal-mines Regulation Act" during 1923 it was made compulsory to report dangerous occurrences, whether personal injury or disablement is caused or not; heretofore it was only necessary to report in case of fatal accident or serious personal injury.

There were reported under this new clause during the year: Thirty-two blow-outs of coal and gas; five cases of mine fires and heating; one case of shaft-lining breaking and debris falling down the shaft; one case of crank-pin breaking in hoisting-engine.

Of the thirty-two blow-outs reported, none of them were violent and they all gave plenty of warning. There were several that displaced upwards of 125 tons of coal and the most of them averaged from 30 to 80 tons.

None of the mine fires reported assumed serious proportions, except the one in No. 1 East mine, Coal Creek Colliery. Details of these fires are given in the District Inspectors' reports.

ORDERS STOPPING WORK UNDER AUTHORITY OF SECTION 89.

In several cases stoppage of work was ordered by the District Inspectors in districts of various mines until proper remedies were applied for safeguarding those employed. Usually a willing spirit of co-operation was shown by the various managements at the different collieries to apply remedies when requested.

PROSECUTIONS.

During the year there were thirteen prosecutions made, six of which were convicted and seven dismissed with a caution by the Magistrate. Details of the cases are given in the list published at the end of this report.

MINE-RESCUE TRAINING.

The interest in mine-rescue work has not been maintained during the present year, as in former years. Four certificates of competency for mine-rescue work have been granted during the year—two at Cumberland and two at Fernie.

Considerable practice-work was carried out at the stations by regular trained crews.

Additional testing was carried out at the stations of the small apparatus known as the "Self Rescuer," and from the tests made it appears the apparatus will give the protection the manufacturers claim.

This apparatus has now been approved by the United States Bureau of Mines, and the following is an extract taken from Serial No. 2591, United States Bureau, investigation of this apparatus:—

"'Carbon-monoxide Self Rescuers,' or simply 'Self Rescuers,' are pocket-size gas respirators which protect the wearer from air contaminated with poisonous carbon-monoxide gas. On March 6th, 1924, the Bureau of Mines approved the M.S.A. 'Self Rescuer' manufactured by the Mine Safety Appliance Company, Pittsburgh, Pa., after the M.S.A. Self Rescuer had passed all the tests and requirements of the Bureau's Schedule.

"The purpose of the Self Rescuer is to help miners to escape from mines in which fires are burning or explosions have occurred, by providing protection from carbon monoxide for at least one-half hour. The Self Rescuer can be used similarly by workers above ground who may through accident become surrounded or entrapped by atmospheres containing carbon monoxide.

"Two hazards threaten the miner who escapes serious injury by fire or violence in a large mine fire, namely: (1) Asphyxiation by poisonous carbon-monoxide gas; and (2) suffocation by insufficient oxygen to support life. In order to save himself the miner must either erect a barricade against after-damp and await restoration of ventilation and rescue, or take a long chance of getting out of the mine through entries not permeated by after-damp. The Self Rescuer removes the hazard of carbon-monoxide poisoning for one-half hour or more, and accordingly greatly increases the miner's chance of saving his life."

It is disappointing to see the lack of interest displayed by both the operators and miners regarding this type of apparatus. It is indisputable that the most effective mine-rescue apparatus is one that can immediately be brought into service. This can only be done by some type of portable apparatus that the miner can carry with him, immediately ready for use, and which can be donned quickly by him, similar to the method adopted at the Front when soldiers donned gas-masks to prevent injurious effects from poisonous gas attacks. It would have been a ridiculous situation if rescue operations had been conducted from the base in war operations in the case of a gas attack, yet an almost similar condition obtains in the case of rescue operation from the stations after a mine explosion has occurred. There is small chance of

rescuing a person uninjured by an explosion through operations from the outside of the mine, who is probably overcome by after-damp within from ten to thirty minutes after the explosion occurs, but if they were equipped with Self Rescuers they would have a fighting chance.

Good work is sometimes done by persons equipped by self-contained rescue apparatus in working ahead of the ventilation and finding out conditions, but generally too long a time has elapsed for saving any persons who may have been uninjured by the explosive blast, unless by chance they may have barricaded themselves in from the after-damp.

In addition to giving protection from the after-damp of a mine explosion, the Self Rescuer would also give the wearer some protection against smoke from a mine fire if cut off by same in a mine.

The All Service Gas Mask is steadily finding favour, it being much lighter than the self-contained apparatus. Its use is, as is the case of the Self Rescuer, limited to conditions where the oxygen content of the atmosphere is sufficient to sustain life, and in all cases where worn the wearer should carry a flame safety-lamp for testing the atmosphere. This type of apparatus has been used to good advantage at several mine fires in the Province.

In the field of resuscitating devices the H.H. Inhalator, invented by Henderson & Haggard, has during the last year come to the front, and is the accepted principle of resuscitation adopted by the American Gas Association. The principle is briefly described as follows:—

"A victim of gas asphyxiation, smoke suffocation, etc., is or at the time deprived of the power to transport oxygen from the air through the lungs to the tissues of the body.

"Theoretically, oxygen inhalation is the obvious method for overcoming asphyxia. Practically, however, the inhalation alone does not fulfil its theoretical promise. An auxiliary agent is needed.

"The breathing of a normal man or animal, as is well known, is largely regulated by the carbonic-acid gas (CO_2) produced in the muscles and organs and carried by the blood to the respiratory centre in the brain. Carbonic acid is the natural stimulus to this centre and thus regulates normal breathing.

"The supplying of enough carbonic-acid gas mixed with oxygen has been found to serve as an immediate stimulus to spontaneous breathing by the patient, thus drawing oxygen in and washing the poisonous gases out of the tissues.

"Carbogen is the trade-name of the correct mixture of oxygen and carbon dioxide to produce normal stimulation and the maximum absorption of oxygen.

"Carbogen, by causing full ventilation of the lungs, rapidly eliminates poisonous gas from the blood and thus terminates the condition of asphyxia. It is composed of ($5\%CO_2$—95% O)."

In an experiment made by Doctors Henderson and Haggard on a patient whose blood was saturated 50 per cent. with CO, it was found, after thirty minutes' treatment with H.H. Inhalator, the CO content had been reduced to 15 per cent. and the entire elimination of CO from the blood was accomplished in sixty minutes.

The annual field-day of the Vancouver Island Mine Safety Association for mine-rescue and first-aid competitions was held at Cumberland on Labour Day. This annual event is made possible by a substantial cash grant from the Mines Department; the use of all the Government apparatus from the Nanaimo and Cumberland Stations is granted to the association, together with assistance of the Instructors from the stations.

The attendance of mine-rescue teams was poor, only two collieries being represented by five teams.

The winners of the Mines Department trophy were a team from the Comox Colliery, captained by William Woods. The second team was captained by J. Williams and was from the same colliery.

There was kept ready for use in the stations of the companies and the Government Mine-rescue Stations eighty-five sets of mine-rescue apparatus and resuscitating devices. There have been issued a total of 566 certificates of competency in mine-rescue training.

There were employed in and about the coal-mines of the Province during the year 5,418 persons, and there was a mine-rescue or resuscitating device for every fifty-one persons employed.

Certificates of competency in mine-rescue work were issued to the following persons during the year: Joseph D. Davis, Cumberland; James Mutter, Cumberland; Thomas J. Sadler, Fernie; Robert Alstead, Fernie.

FIRST-AID WORK.

Great interest was manifested in all the coal-mining sections of the Province in this work.

The Montizambert Cup competition, embracing all Canada, was again won by Captain Barton's team from Nanaimo. This is the second time this team has been successful in carrying off this trophy and they are to be congratulated for the splendid showing they made. This same team also captured the British Columbia Provincial Shield. Many other honours were also won by other teams from different collieries of the Province.

It is gratifying to notice the interest that is taken by the younger people in this work, details of which will be found in the District Inspectors' reports.

EXAMINATIONS FOR CERTIFICATES OF COMPETENCY.

Two examinations for certificates of competency for coal-mine officials were held during the year; details of these examinations are dealt with in the report of the Secretary to the Board.

Examinations for certificates of competency as coal-miners were held regularly during the year.

SUPERVISION OF COAL-MINES.

During the year fifteen coal companies operated seventeen collieries, with forty-two mines, employing 3,888 men underground.

In the supervision of underground employees there were twenty managers, three safety engineers, thirty-four overmen, and 165 firebosses and shotlighters, a total of 222 officials, or one official for seventeen persons employed underground.

METALLIFEROUS MINES.

TONNAGE.

The output from the metalliferous mines for 1924 was 3,397,105 tons, being an increase of 975,266 tons over the tonnage for 1923. This tonnage was produced from eighty-six shipping mines, of which thirty-seven shipped over 100 tons.

ACCIDENTS IN METALLIFEROUS MINES.

There were ten fatal accidents in and around the metalliferous mines during the year, causing the death of ten persons, a decrease of two in the number of fatalities compared with the figures for 1923.

There were 4,033 persons employed in and around the metalliferous mines, an increase of 350 persons compared with the figures for 1923.

The ratio of fatal accidents per 1,000 persons employed was 2.48, compared with 3.03 for 1923. The ratio for the last ten-year period was 2.82.

The tonnage mined per fatal accident was 339,710, compared with 201,811 tons per fatal accident during 1923.

The following table shows the mines at which fatal accidents occurred during 1924 and comparative figures for 1923:—

Mining Division.	Mine.	No. of Accidents.	
		1924.	1923.
Vancouver	Britannia	2	4
Skeena	Surf Inlet	..	4
Portland Canal	Premier	2	1
Fort Steele	Sullivan	1	1
Nass River	Hidden Creek	3	1
Trail Creek	Le Roi	1	1
"	Centre Star	1	..
West Kootenay	Slocan Star	..	..
Totals		10	12

The following table gives the cause and percentage to the whole of the fatal accidents, with corresponding figures for 1923:—

Cause.	1924.		1923.	
	No.	Per Cent.	No.	Per Cent.
Falls of ground	2	20.00	2	16.67
Mine-cars and haulage	2	20.00	2	16.67
Explosives and blasting	3	30.00	2	16.67
Shafts and hoisting	..	.....	1	8.33
Falling down raises and stopes	2	20.00	4	33.33
Electrocuted	..	.....	1	8.33
Miscellaneous (machinery on surface)	1	10 00	..	.....
Totals	10	100.00	12	100.00

Details surrounding the occurrence of fatal accidents in and around the metalliferous mines during 1924 were:—

The fatal accident which occurred to James Bryan in the *Hidden Creek* mine at Anyox, operated by the Granby Consolidated Mining and Smelting Company, on January 7th, 1924, was caused as follows: Bryan, who was employed as brakeman, was riding on the rear end of a train proceeding into No. 60 drift, 150 level. Instead of stepping off at No. 65 chute, which is customary, he stayed on. As he passed No. 65 chute he was without a light. Chuteman Haeder offered to give him a light from his lamp and Bryan answered his was not working. Motorman Currie watched at chute for Bryan's signal to stop, but when he received none, and seeing he had gone too far, he immediately shifted into reverse, and a moment later heard Bryan's whistle and a shriek. Upon investigation the motorman found Bryan had been crushed between rear end of train and guard-rail, which was placed about 3 feet from the end of the drift, receiving injuries from which he died three days later. This accident was avoidable if deceased had exercised ordinary care and got off at No. 65 chute, as was customary; more especially was this necessary when he had no light.

The fatal accident which occurred to Griff Foulkes on January 9th in the *Le Roi* mine at Rossland, operated by the Canadian Consolidated Mining and Smelting Company of Canada, Limited, was caused by him falling through a scaffolding. The deceased, along with partners, was building a timber-slide in above the working-place. He stepped on a section of the floor, which broke, allowing him to fall a distance of 16 feet, receiving injuries from which he died two days later.

The fatal accident which occurred to P. D. Connelly in the *Hidden Creek* mine, Anyox, on February 6th, 1924, was caused by being run over by cars. Deceased was employed as a brakeman, and when in an attempt to step on his train at the junction of 40, 50, and 60 drifts, 150 level, he either slipped or misjudged his step and was caught by the wheels of the cars, which were moving slowly towards him. Two miners were standing at the junction of the drifts at the time of the accident; they say they saw the deceased throw his block lights, throw his switch, and signal the motorman ahead. They also saw him prepare to take his train, but did not see him fall. He died from injuries received, seven hours later.

The fatal accident which occurred to Hardy Shaw on April 18th, 1924, in the *Slocan Star* mine at Sandon, operated by the Silversmith Mines, Limited, was caused by a fall of ground. A V-shaped block of ground in the hanging-wall, weighing about a ton or more, slipped out and fell on the deceased, who was shovelling just below. A substantial stull had been placed under this block of ground the day before and the place was apparently made safe thereby.

The fatal accident which occurred to K. Leeder on May 9th, 1924, in the *Premier* mine near Stewart, operated by the Premier Gold Mining Company, was caused by a blast. Deceased was apparently spitting holes (lighting fuses). He probably had some trouble with the spitting and stayed too long. An accident of this nature can be avoided with ordinary care.

The fatal accident which occurred to J. D. McDiarmid on June 16th, 1924, in *Hidden Creek* mine, Anyox, operated by the Granby Consolidated Mining and Smelting Company, was caused

by him being crushed by the finger chute, air-operated, at No. 4 pocket chute, loading-station, 150 level. At the time of the accident deceased had placed a bulldoze to blow out a temporary bulk-head that was holding the ore back. After the shot he went back up on the loading-platform, lifted the fingers up by opening the air-valve, and as apparently the ore did not come, he must have put his head and shoulders in under these fingers and looked up to determine the trouble. While he was in this position an air-hose connected with the air-lift broke and the fingers dropped, catching deceased between them and the chute. The loading-boss, hearing hose break, went up on the platform, but the blow had been fatal. Provision had been made so that it was not necessary to work under these fingers, and no explanations can be given why deceased took the chance he did, which was contrary to practice. This accident was avoidable and was entirely due to carelessness on the part of the deceased.

The fatal accident which occurred on August 6th, 1924, to Fred Dahl in the *Britannia* mine, operated by the Britannia Mining and Smelting Company, was caused by a fall of ground. Deceased was taking down rock on foot-wall with a pick when ground fell from foot-wall, crushing deceased and carrying him to the floor below. It was part of deceased's duty as a miner to attend to the barring-down of the roof and sides of his working-place, and had he used a bar in this instance, as is customary, he would have been at a safe distance when this rock fell. All bars and tools are provided free of charge for this work and the deceased had a bar on his floor when the accident happened. This accident could have been avoided if ordinary care had been exercised.

The fatal accident which occurred to J. Garner Hadfield on October 8th, 1924, at the *Centre Star* mine, Rossland, operated by the Consolidated Mining and Smelting Company, was caused by being crushed with a conveyor-belt which conveys ore to the sorting-belt. Deceased was applying belt-dressing to a pulley to prevent the conveyor-belt from slipping; his left arm was caught and drawn in between the belt and pulley, drawing him beneath the pulley and the ground, with above results. More care on the part of the deceased would have prevented the accident.

The fatal accident which occurred to Fritz Stromberg on November 19th, 1924, in the *Sullivan* mine, Kimberley, operated by the Consolidated Mining and Smelting Company, was caused by drilling into a missed hole. Deceased was plugging a large boulder with a Rand plugger when he drilled into a missed hole, which exploded, causing injuries which proved fatal.

The fatal accident which occurred to Aldo Lazzarotto on December 29th, 1924, in *Premier* mine, operated by the Premier Gold Mining Company, was caused by blasting. Deceased was spitting holes and had stayed too long and was killed by a blast. The accident was avoidable had deceased exercised ordinary care.

Six out of the ten fatal accidents were avoidable if care had been exercised by the victims themselves.

It does not matter how many regulations are made to safeguard operations, these fatal accidents keep on occurring. It is deplorable, as a great many of them could be avoided with a little care. Certain responsibilities rest upon the individuals and the prevention of accidents in a good many cases is in the workman's own hands. The "safety-first" movement will never attain the success it deserves until the hearty co-operation of officials and workmen is secured.

VENTILATION.

The District Inspectors report that the ventilation of the metalliferous mines was fairly well maintained during the year. Complaints were received in one or two instances about the smoke hanging after blasting. These complaints were investigated and, where necessary, remedies ordered.

MINE-AIR SAMPLING IN METALLIFEROUS MINES.

During the year mine-air samples were frequently taken in the metalliferous mines of the Province. Much valuable information has been obtained from these samples in reference to the hydrogen, carbon-monoxide, and carbon-dioxide contents

MINE-RESCUE WORK.

During the year three sets of Paul breathing apparatus were installed by the Granby Consolidated Mining and Smelting Company at *Hidden Creek* mine, Anyox. All-service masks were

installed by the Britannia Mining and Smelting Company and the Canadian Consolidated Mining and Smelting Company during the year. The total number of sets of mine-rescue apparatus kept at the metalliferous mines of the Province is twenty-five and resuscitating devices fourteen.

FIRST-AID WORK, METALLIFEROUS MINES.

First-aid work at the metalliferous mines of the Province has been well maintained during the year and great interest shown by the larger companies in the safety-first movement and welfare of their employees. Details of the work accomplished on these lines are given by the District Inspectors in their annual reports.

I desire to express my appreciation of the faithful co-operation and assistance afforded me during the year by the District Inspectors and Instructors in mine-rescue work.

I am much indebted to Eugene Haanel, Director of the Mines Branch, Ottawa, for co-operation in the work of mine-air sampling, the Dominion Department furnishing the sample-bottles and making all analyses without charge of any kind.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS.

FIRST-, SECOND-, AND THIRD-CLASS CERTIFICATES AND MINE-SURVEYING CERTIFICATES.

Report of James Dickson, Secretary of Board.

I have the honour to submit herewith the annual report of the transactions of the above Board for the year ended December 31st, 1924.

The Board of Examiners, which was formed on July 1st, 1919, at present consists of George Wilkinson, Chief Inspector of Mines, as Chairman; Harry Ernest Miard, member; and James Dickson, member and Secretary of the Board. The meetings of the Board are held in the office of the Board, Mines Department, Victoria.

The examinations are held in accordance with rules made by the Provincial Board of Examiners and approved by the Minister of Mines, July 16th, 1919. As these rules were published in the Report of 1922 there is no need to publish them again.

Two examinations for candidates for certificates of competency were held during 1924; the first was held on May 20th, 21st, and 22nd, and the second on November 19th, 20th, and 21st.

The total number of candidates at these examinations was as follows: For First-class Certificates, 11 (3 passed and 8 failed); for Second-class Certificates, 4 (3 passed and 1 failed); for Third-class Certificates, 25 (14 passed and 11 failed); for Mine Surveyor Certificates, 1 (failed).

The following is a list of the candidates who successfully passed the examinations in the various classes:—

First-class Candidates.—Edward Morrison, Thomas C. Vincent, and John Gillham.

Second-class Candidates.—Jas. S. Webster, Robt. Alstead, and William K. Hodge.

Third-class Candidates.—Emil Blas, Thos. Parkinson, Wm. H. Cartwright, John Morgan, John J. Kirkbride, Arthur Roberts, Joseph Tennant, Harry Jackson, Charles Thomson, Howard Yeowart, Joseph Wilson, Alexander B. Quayle, Wm. Strang, and Thomas Chapman.

The work of many of the candidates, particularly in the First-class Examination, shows a decided lack of fundamental knowledge of the practical subjects dealt with. The wide margin between many of the answers submitted by candidates and the actual practical solution and practice of the same problems in mining goes to show that many candidates fail to appreciate the advantage of combining practice and theory in their studies.

EXAMINATIONS FOR CERTIFICATES OF COMPETENCY AS COAL-MINERS.

In addition to the examinations and certificates already specified as coming under the Board of Examiners, the Act further provides that every coal-miner shall be the holder of a certificate of competency as such. By "miner" is meant "a person employed underground in any coal-mine to cut, shear, break, or loosen coal from the solid, whether by hand or machinery."

The work of the Board of Examiners in examining candidates for coal-miners' certificates has been carried on in all mining districts at intervals of less than sixty days, as required by the amendment of the Act.

No certificates have been granted in any case where the candidate failed to satisfy the Board as to his general fitness, experience in a coal-mine, and a working knowledge of the English language.

During 1924 forty-eight examinations were held for candidates for certificates of competency as coal-miners in the various coal-mining districts of the Province and 220 certificates issued; in addition to above, a number of duplicate certificates were issued to coal-miners who had lost their original certificate of competency.

The Board of Examiners desires to thank the different coal-mining companies for the use of their premises in holding these examinations.

The Inspector of Mines in each district has authority under the amendment (1919) to the "Coal-mines Regulation Act" to grant, after a satisfactory examination, a provisional certificate of competency as a coal-miner to applicants, which entitles the holder to follow the occupation of a coal-miner for a period not exceeding sixty days or until the date of the next regular examination before the Board.

REGISTERED LIST OF HOLDERS OF CERTIFICATES OF COMPETENCY AS COAL-MINE OFFICIALS.

FIRST-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL-MINES REGULATION ACT, 1897."

Name.	Date.	Name.	Date.
Shepherd, Francis H.	Mar. 5, 1881	Stockett, Thomas, Jr.	Aug. 3, 1901
Honobin, William	May 1, 1882	Cunliffe, John	Aug. 3, 1901
Little, Francis D.	May 1, 1882	Evans, Daniel	Aug. 3, 1901
Chandler, William	Dec. 21, 1883	Browitt, Benjamin	Aug. 3, 1901
Priest, Elijah	Dec. 21, 1883	McEvoy, James	Oct. 17, 1902
Randle, Joseph	Jan. 18, 1888	Wilson, A. R.	Oct. 17, 1902
Matthews, John	Jan. 8, 1889	Simister, Charles	Oct. 17, 1902
Norton, Richard Henry	Aug. 26, 1889	Budge, Thomas	Oct. 17, 1902
Kesley, John	Mar. 4, 1892	Richards, James A.	Oct. 17, 1902
Wall, William H.	May 30, 1896	McLean, Donald	Jan. 21, 1904
Wilson, David	May 30, 1896	Wilkinson, Geo.	Jan. 21, 1904
Smith, Frank B.	May 30, 1896	Wright, H. B.	Jan. 21, 1904
Bradshaw, George B.	June 12, 1899	Coulthard, R. W.	Jan. 21, 1904
Simpson, William G.	June 12, 1899	Roaf, J. Richardson	Jan. 21, 1904
Hargreaves, James	Feb. 5, 1901	John, John	Jan. 21, 1904
Drinnan, Robert G.	Feb. 5, 1901	Manley, H. L.	Jan. 21, 1904

FIRST-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT," 1904–1911–1919.

Name.	Date.	Name.	Date.
Baxter, Andrew	June 10, 1911	McDonald, John	Oct. 3, 1919
Battey, Richard	May 27, 1913	McGuckie, Thomas	July 22, 1908
Biggs, J. G.	July 22, 1908	McKendrick, Andrew	May 27, 1913
Bonar, Robert	Oct. 28, 1911	McMillan, J. H.	Sept. 10, 1910
Brace, Tom	May 13, 1915	McVicar, Samuel	May 1, 1909
Bridge, Edward	July 22, 1908	Mazey, William John	Oct. 31, 1912
Brown, David	May 21, 1914	Miard, Henry Ernest	May 9, 1912
Brown, Robert Joyce	May 13, 1915	Millar, John K.	Nov. 22, 1906
Caufield, Bernard	May 1, 1909	Miller, Andrew Anderson	Oct. 31, 1912
Church, James A. H.	June 10, 1911	Montgomery, John W.	May 1, 1909
Cox, Richard	May 13, 1915	Moore, Wm. H.	May 17, 1917
Crowder, James	June 10, 1911	Mordy, Thomas	Sept. 10, 1910
Cunningham, John Howard	May 9, 1912	Morrison, Edward	June 24, 1924
Davidson, W. A.	May 1, 1909	Mottishaw, Sam. K.	Nov. 15, 1917
Davies, David	June 10, 1911	Murray, George	June 21, 1921
Davies, Stephen	Nov. 15, 1917	Newbury, Arthur	June 21, 1920
Davies, Thos. Owen	May 21, 1914	O'Brien, George	May 21, 1914
de Hart, J. B.	May 17, 1917	Ovington, John	May 27, 1913
Derbyshire, James	Nov. 9, 1907	Peacock, Frank David	Oct. 28, 1911
Devlin, Henry	May 1, 1909	Penman, Hugh	May 21, 1914
Dickson, James	Oct. 31, 1912	Phelan, Arthur	May 27, 1913
Elliott, Daniel	Nov. 9, 1907	Powell, J. W.	June 10, 1911
Emmerson, Joseph	Nov. 9, 1907	Quinn, John Graham	July 8, 1916
Ewart, William	May 19, 1922	Ramsay, Peter Millar	May 16, 1918
Fairfoull, Robert	June 10, 1911	Roper, William	May 13, 1915
France, Thos.	Nov. 22, 1906	Russell, John	May 21, 1914
Fraser, Norman	Mar. 4, 1905	Scott, Thomas Wright	Dec. 22, 1921
Freeman, H. N.	May 1, 1909	Shanks, John	May 1, 1909
Galloway, C. F. J.	July 22, 1908	Shenton, T. J.	Sept. 10, 1910
Garman, Morris W.	Nov. 15, 1917	Shone, Samuel	May 1, 1909
Gascoyne, Rowland B.	May 21, 1914	Smith, A. E.	Oct. 28, 1911
Gillham, John	Jan. 5, 1925	Smith, Joseph	July 22, 1908
Glover, Francis	Oct. 31, 1912	Smith, Thos. Edwin	Dec. 19, 1918
Graham, Charles	Nov. 14, 1905	Spicer, J. E.	Oct. 28, 1911
Graham, Thomas	Nov. 9, 1907	Spruston, T. A.	Nov. 27, 1909
Gray, James	Nov. 27, 1909	Stevens, L. C.	Nov. 27, 1909
Henderson, Robert	Nov. 27, 1909	Stewart, R. T.	Sept. 10, 1910
Hewlett, Howe	May 27, 1913	Strachan, Robert	Mar. 4, 1905
Higgins, Alexander	Dec. 19, 1918	Strang, James	June 10, 1911
Holden, James	May 1, 1909	Taylor, James	May 16, 1918
Howden, Archibald	May 27, 1913	Thomas, J. D.	Sept. 10, 1910
Howells, Nathaniel	Oct. 28, 1911	Thorne, B. L.	Sept. 10, 1910
Hughes, John C.	May 17, 1917	Touhey, James	May 21, 1914
Humphries, Clifford	June 10, 1911	Vincent, Thomas C.	June 24, 1924
Hunter, Alex. B.	July 8, 1916	Walker, William	May 16, 1918
Huntrods, Eustace S. F.	May 19, 1922	Wallbank, J.	Sept. 10, 1910
Jackson, Thos. R.	Nov. 9, 1907	Warburton, Ernest Leonard	July 8, 1916
James, William	July 22, 1908	Wark, Samuel David	Oct. 3, 1919
Jaynes, Frank	May 13, 1915	Wesnedge, William	Dec. 19, 1918
Jemson, Jas. W.	May 27, 1913	Whittaker, John	Dec. 19, 1918
Kellock, George	June 10, 1911	Williams, Jahn Samuel	Dec. 19, 1918
Knox, T. K.	July 27, 1909	Williams, Thos. B.	May 17, 1917
Laird, Robert	Nov. 15, 1917	Williams, Thos. H.	Nov. 22, 1906
Leighton, Henry	May 9, 1912	Wilson, Ridgeway R.	Nov. 15, 1917
Mackinnon, Hugh G.	May 19, 1922	Wilson, William	May 16, 1918
Macauley, D. A.	June 10, 1911	Wylie, John	July 22, 1908
McCulloch, James	Sept. 10, 1910		

SECOND-CLASS CERTIFICATES OF SERVICE.

Name.	Date.	No.	Name.	Date.	No.
Lee, John S.	Mar. 4, 1905	B 9	Walker, David	Mar. 4, 1905	B 14
Millar, J. K.	Mar. 4, 1905	B 10	Powell, William Baden	Mar. 4, 1905	B 16
McCliment, John	Mar. 4, 1905	B 11	Bryden, Alexander	Mar. 4, 1905	B 18
Hunt, John	Mar. 4, 1905	B 13			

SECOND-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."

Name.	Date.	No.	Name.	Date.	No.
Adamson, Robert	Sept. 10, 1910	B 120	Dickenson, Clifford	May 13, 1915	B 189
Allan, Alex. McDiarmid	May 27, 1913	B 167	Dunsmuir, John	Nov. 14, 1905	B 26
Almond, Walter	Nov. 15, 1917	B 213	Duncan, James	Nov. 21, 1923	B 255
Alstead, Robert	June 24, 1924	B 257	Dykes, J. W.	May 1, 1909	B 77
Archibald, William	Nov. 22, 1922	B 250	Eccleston, Wm.	May 1, 1909	B 87
Ball, Benjamin	June 21, 1920	B 235	Fairfoull, James	May 21, 1914	B 186
Barclay, Andrew	July 29, 1905	B 25	Fairfoull, R.	May 1, 1909	B 83
Barlow, Benjamin Robt.	Dec. 19, 1918	B 229	Finlayson, James	July 29, 1905	B 21
Bastian, Albert	Nov. 21, 1923	B 256	Ford, Allan	May 27, 1913	B 171
Baybutt, Thomas	July 8, 1916	B 206	Foster, W. R.	Nov. 27, 1909	B 102
Bell, John	May 17, 1917	B 212	France, Thos.	May 14, 1905	B 27
Beveridge, William	June 21, 1920	B 233	Francis, David M.	May 21, 1914	B 182
Bevis, Nathaniel	Sept. 10, 1910	B 123	Francis, Enoch	May 1, 1909	B 86
Biggs, John	May 1, 1909	B 94	Francis, James	July 22, 1908	B 63
Biggs, John G.	Nov. 2, 1907	B 40	Frater, George	July 8, 1916	B 204
Blair, James	May 13, 1915	B 197	Freeman, Henry N.	Nov. 2, 1907	B 45
Brace, Tom	Nov. 27, 1909	B 96	Garbett, Richard	Oct. 31, 1912	B 161
Bridge, Edward	Oct. 23, 1906	B 33	Garman, Morris Wilbur	Oct. 31, 1912	B 155
Brown, David	Sept. 10, 1910	B 108	Gilham, John	June 21, 1920	B 237
Brown, George	Dec. 19, 1918	B 225	Gillespie, Hugh	July 29, 1905	B 24
Brown, James L.	Oct. 28, 1911	B 136	Gillespie, John	Oct. 23, 1906	B 36
Brown, John C.	Oct. 23, 1906	B 39	Gould, Alfred	May 13, 1915	B 190
Brown, John Todd	May 9, 1912	B 150	Gourlay, Robert	Dec. 19, 1918	B 227
Brown, R. J.	Oct. 28, 1911	B 134	Graham, Chas.	Mar. 4, 1905	B 1
Brown, Robert	May 21, 1914	B 183	Gray, David	May 1, 1909	B 76
Brown, Robert Sneddon	May 13, 1915	B 196	Gray, George	July 8, 1916	B 207
Brown, William Gold	Dec. 19, 1918	B 228	Greenwell, Archibald	May 16, 1918	B 220
Brownrigg, John H.	May 17, 1917	B 124	Hamilton, Robert N.	May 21, 1914	B 175
Bushell, J. P.	May 1, 1909	B 81	Hastings, Andrew P.	Dec. 19, 1918	B 223
Carroll, Henry	July 22, 1908	B 62	Henderson, Robert	July 22, 1908	B 60
Caufield, Bernard	Oct. 23, 1906	B 30	Hodge, William K.	Jan. 5, 1925	B 259
Caufield, John	July 8, 1916	B 199	Holliday, William	Dec. 19, 1918	B 230
Cawthorne, L.	May 1, 1909	B 93	Horrocks, Abner G.	June 10, 1911	B 130
Challinor, Jno. Thomas	May 27, 1913	B 169	Howells, Nathaniel	Nov. 27, 1909	B 97
Challoner, Jno. Arthur	May 21, 1914	B 178	Hudson, George	Sept. 10, 1910	B 121
Churchill, James	July 22, 1908	B 65	Hughes, John C.	Sept. 10, 1910	B 109
Clark, Robt.	June 21, 1921	B 242	Hutton, Isaac	May 21, 1914	B 185
Clarkstone, Wm. W.	May 21, 1914	B 180	Hutton, John	May 9, 1912	B 154
Commons, Wm.	Sept. 10, 1910	B 115	Hynds, William	Dec. 14, 1920	B 240
Coupland, George	May 16, 1918	B 217	Hynds, John	May 18, 1922	B 247
Courtney, A. W.	Oct. 28, 1911	B 138	Jackson, Thos. R.	Mar. 4, 1905	B 5
Cox, Richard	May 9, 1912	B 143	James, David	Nov. 2, 1907	B 58
Crawford, David	May 1, 1909	B 88	Jarrett, Fred	May 1, 1909	B 84
Cunliffe, Thomas	May 1, 1909	B 78	Jaynes, Frank	Sept. 10, 1910	B 111
Dando, John	May 27, 1913	B 164	John, Francis	July 8, 1916	B 200
Daniels, David	Nov. 2, 1907	B 53	John, Howell	Sept. 10, 1910	B 122
Derbyshire, James	Oct. 23, 1906	B 32	Johnson, Moses	May 1, 1909	B 75
Davidson, Hugh	May 27, 1913	B 165	Jones, Samuel	May 16, 1918	B 221
Davies, Stephen	Sept. 10, 1910	B 113	Jones, William T.	July 22, 1908	B 66
Dennis, Fred. W.	May 21, 1914	B 174	Jordon, Thos.	Nov. 27, 1909	B 104
Devlin, Ernest H.	May 21, 1914	B 179	Joyce, Walter	May 27, 1913	B 168
Devlin, Henry	Nov. 2, 1907	B 44	Kirkwood, John R.	Oct. 31, 1912	B 160
Dewar, Alexander	Oct. 31, 1912	B 162	Knowles, James E.	Oct. 28, 1911	B 137

SECOND-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904"—*Continued.*

Name.	Date.	No.	Name.	Date.	No.
Laird, Robert	May 17, 1917	B 210	Rankin, Geo.	Nov. 27, 1909	B 103
Lander, Frank	May 13, 1915	B 195	Raynes, M. T.	Oct. 28, 1911	B 139
Lane, Joseph	May 9, 1912	B 142	Reid, Wm.	Oct. 28, 1911	B 132
Lee, Robert John	Sept. 10, 1910	B 110	Renny, James	Oct. 28, 1911	B 140
Littler, Matthew	Oct. 31, 1912	B 157	Richards, Thomas	Nov. 2, 1907	B 57
Luck, George	June 10, 1911	B 128	Richards, Samuel	May 9, 1912	B 152
Manifold, Albert	May 9, 1912	B 145	Rigby, John	July 29, 1905	B 29
Marsh, John	Nov. 15, 1917	B 216	Roberts, Ebenezer	Sept. 10, 1910	B 117
Mason, Joseph	May 13, 1915	B 193	Robinson, William	July 22, 1908	B 69
Massey, H.	Nov. 27, 1909	B 99	Rogers, George	May 1, 1909	B 79
Mather, Thomas	June 10, 1911	B 127	Roper, William	May 9, 1912	B 141
Matusky, A.	May 1, 1909	B 91	Rowbottom, Thomas	May 16, 1918	B 222
Mayer, Ralph Waldo	May 9, 1912	B 144	Russell, John	Nov. 2, 1907	B 47
Mazay, W. J.	Nov. 27, 1909	B 101	Rutherford, Jasper	May 16, 1918	B 219
Menzies, Fred	Dec. 22, 1921	B 244	Scarpino, Francis	Dec. 19, 1918	B 226
Merryfield, William	July 22, 1908	B 61	Scott, Thomas Wright	June 21, 1921	B 241
Miard, Hy. E.	Sept. 10, 1910	B 107	Shanks, David	Oct. 31, 1912	B 159
Michek, John	May 17, 1917	B 188	Shaw, Thomas John	May 27, 1913	B 166
Middleton, Robert	July 22, 1908	B 72	Smith, John	Oct. 3, 1919	B 231
Mitchell, Henry	July 8, 1916	B 201	Smart, Robert K.	Nov. 22, 1922	B 248
Monks, James	Nov. 2, 1907	B 55	Somerville, Alex.	Mar. 4, 1905	B 4
Moore, Wm. H.	May 21, 1914	B 173	Spruston, Robert Lecce	July 8, 1916	B 202
Morgan, John	Nov. 2, 1907	B 43	Spruston, Thos. A.	Nov. 2, 1907	B 46
Morgan, William	Dec. 19, 1918	B 224	Stafford, Matthew	June 10, 1911	B 131
Morgan, Daniel	Nov. 21, 1923	B 254	Stewart, J. M.	May 1, 1909	B 95
Morris, John	July 22, 1908	B 67	Stobbart, Jacob	May 9, 1912	B 153
Morrison, Edward	Nov. 21, 1923	B 253	Stockwell, William	Nov. 2, 1907	B 56
Morton, Robert W.	July 22, 1908	B 59	Strang, Thomas	Oct. 31, 1912	B 158
Mottishaw, S. K.	Oct. 28, 1911	B 135	Stubbs, Clement	May 18, 1922	B 245
Murray, George	Oct. 3, 1919	B 232	Sutherland, John	May 16, 1918	B 218
Musgrave, J.	May 1, 1909	B 90	Taylor, James	May 13, 1915	B 194
Myers, Peter	May 9, 1912	B 149	Taylor, Thomas	July 8, 1916	B 203
MacKinnon, Hugh G.	Dec. 22, 1921	B 243	Thomas, J. B.	Nov. 27, 1909	B 105
McLaughlin, Alex	May 13, 1915	B 191	Thomas, Joseph D.	Oct. 23, 1906	B 38
McDonald, J. A.	Oct. 28, 1911	B 133	Thomas, Daniel W.	Nov. 22, 1922	B 249
McDonald, John	May 27, 1913	B 172	Thompson, Joseph	Sept. 10, 1910	B 114
McFegan, W.	Nov. 31, 1909	B 106	Touhey, James	May 9, 1912	B 147
McFegan, Robert	May 18, 1922	B 246	Touhey, William	July 8, 1916	B 205
McGarry, Martin	Oct. 31, 1912	B 156	Tonge, Thomas	July 22, 1908	B 71
McGuckie, Thomas M.	Oct. 23, 1906	B 35	Tully, Thomas	Nov. 15, 1917	B 214
McKelvie, J.	May 1, 1909	B 92	Vanhulle, Peter	Nov. 2, 1907	B 54
McKendrick, And.	Sept. 10, 1910	B 112	Virgo, John	May 1, 1909	B 89
McLean, Michael D.	June 21, 1920	B 234	Walker, William	May 13, 1915	B 192
McMillan, D.	June 10, 1911	B 125	Warburton, Ernest L.	May 27, 1913	B 170
McNay, Carmichael	May 9, 1912	B 151	Watson, Adam G.	Nov. 14, 1905	B 28
McPherson, James E.	July 22, 1908	B 73	Watson, Arthur W.	May 17, 1917	B 211
Neen, Joseph	June 10, 1911	B 129	Webber, John Frank	Mar. 4, 1905	B 3
Newbury, Arthur	May 21, 1914	B 184	Webster, James S.	June 24, 1924	B 258
Newton, Wm.	Sept. 10, 1910	B 116	Wesnedge, William	Nov. 27, 1909	B 98
O'Brien, Charles	May 9, 1912	B 148	White, John	Nov. 2, 1907	B 48
O'Brien, George	May 1, 1909	B 82	Whitehouse, William	Oct. 31, 1912	B 163
Osborne, Hugh	Dec. 14, 1920	B 239	Williams, John Samuel	Nov. 15, 1917	B 215
Ovington, John	Nov. 2, 1907	B 52	Williams, Watkin	Sept. 10, 1910	B 118
Park, William	June 21, 1920	B 238	Wilson, Robinson	May 21, 1914	B 177
Parkinson, T.	May 1, 1909	B 80	Wilson, Thomas	July 22, 1908	B 74
Parnham, Charles	Nov. 2, 1907	B 49	Wilson, William	July 22, 1908	B 70
Quinn, James	May 21, 1914	B 181	Wood, Thos. James	May 21, 1914	B 176
Quinn, John	May 9, 1912	B 146	Worthington, Joseph	May 1, 1909	B 85
Ramsay, Peter Millar	May 17, 1917	B 209	Yates, Frank	Nov. 22, 1922	B 251

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."

Name.	Date.	No.	Name.	Date.	No.
Adamson, Robert	May 1, 1909	C 323	Cairns, Robert	May 27, 1913	C 539
Adamson, Wm.	Dec. 22, 1921	C 721	Caldwell, Daniel	May 17, 1917	C 639
Ainsworth, Edward	May 16, 1918	C 674	Caldwell, Peter	June 21, 1921	C 715
Allan, Alexander	Oct. 28, 1911	C 430	Calverly, Joseph	Sept. 10, 1910	C 375
Almond, Alex	Oct. 1, 1907	C 252	Camamile, Hollis	Oct. 28, 1911	C 443
Almond, Walter	July 22, 1908	C 286	Campbell, Samuel	Nov. 15, 1917	C 662
Alstead, Robt.	June 21, 1921	C 719	Campbell, Andrew	Nov. 27, 1917	C 651
Anderson, John	Oct. 28, 1911	C 437	Carroll, George	Nov. 21, 1922	C 746
Anderson, Peter Blane	Nov. 15, 1917	C 660	Carr, Peter	Oct. 31, 1912	C 497
Anderson, Robt.	Oct. 14, 1914	C 599	Carson, George	Mar. 17, 1917	C 663
Angell, William	May 21, 1914	C 591	Cartwright, Wm. H.	June 24, 1924	C 768
Arbuckle, John	May 13, 1915	C 622	Catchpole, Charles	July 29, 1905	C 227
Archibald, Geo.	May 21, 1914	C 569	Caufield, Edward	May 16, 1918	C 670
Archibald, Thomas	Oct. 28, 1911	C 454	Caufield, John	May 1, 1909	C 321
Ball, Alfred	May 17, 1917	C 635	Challoner, Arthur	Oct. 28, 1911	C 433
Bann, Thomas	Oct. 31, 1912	C 494	Chambers, Ralph H.	Dec. 14, 1920	C 709
Baggaley, J.	July 22, 1908	C 300	Chapman, Wm.	Dec. 22, 1921	C 720
Bain, James	May 27, 1913	C 546	Chapman, John	May 30, 1923	C 753
Bainbridge, James	Nov. 21, 1922	C 744	Chapman, Thomas H.	Jan. 5, 1925	C 779
Ball, Benjamin	May 21, 1914	C 583	Charnock, John	Nov. 15, 1917	C 653
Barker, Robert	June 10, 1911	C 415	Cheetham, Ben	July 22, 1908	C 311
Barlow, B. R.	May 1, 1909	C 337	Chester, John	Oct. 28, 1911	C 440
Bastian, Albert	May 30, 1923	C 750	Clark, Lewis	June 10, 1911	C 405
Bateman, Joseph William	Oct. 28, 1913	C 551	Clark, Walter Pattison	May 9, 1912	C 480
Bauld, Wm.	June 10, 1911	C 422	Clarkson, Robert	June 21, 1920	C 696
Baxter, Robert	Oct. 28, 1911	C 450	Clarkstone, Wm. W.	Oct. 28, 1911	C 431
Baybutt, Thomas	May 27, 1913	C 548	Clarkstone, Hugh	May 17, 1922	C 736
Beard, Henry C.	May 30, 1923	C 751	Cleaves, Walter	May 9, 1912	C 475
Beeton, D. H.	May 1, 1909	C 338	Clifford, William	July 22, 1908	C 313
Bell, Fred	May 27, 1913	C 514	Colgrove, Charles Henry	Dec. 19, 1918	C 679
Bell, John	May 9, 1912	C 477	Commons, William	July 22, 1908	C 304
Bennett, Andrew M.	Nov. 15, 1917	C 661	Coupland, David	June 21, 1921	C 713
Bennett, John	Oct. 14, 1914	C 597	Cooke, Joseph	Mar. 4, 1905	C 209
Bennie, John	June 10, 1911	C 411	Coomb, Alexander	May 27, 1913	C 533
Beveridge, Wm.	June 10, 1911	C 396	Cooper, John Andrew	Dec. 19, 1918	C 689
Biggs, John	Mar. 4, 1905	C 210	Cope, Frank	Oct. 28, 1913	C 549
Biggs, Thomas	Oct. 28, 1911	C 449	Coulthard, James	June 10, 1911	C 407
Birchell, Richard	Oct. 1, 1907	C 266	Crawford, David	Mar. 4, 1905	C 208
Blair, James	Oct. 31, 1912	C 502	Cunningham, G. F.	Nov. 11, 1905	C 229
Blas, Emil	June 24, 1924	C 774	Cunliffe, Thos.	Oct. 1, 1907	C 265
Blewett, Ernest	July 22, 1908	C 298	Dabb, Owen	May 21, 1914	C 578
Blinkhorn, Thomas	Dec. 19, 1918	C 681	Dando, John	May 9, 1912	C 465
Bradley, William	July 22, 1908	C 291	Davey, George	June 21, 1921	C 718
Bradley, Wilfred	May 17, 1922	C 733	Davidson, Hugh	May 9, 1919	C 464
Bridge, Edward	July 29, 1905	C 223	Davies, Alfred	Oct. 3, 1912	C 691
Briscoe, F.	July 22, 1908	C 309	Davies, Evan Thomas	May 9, 1912	C 463
Broderick, Matthew	Jan. 21, 1913	C 525	Davies, John H. C.	May 17, 1922	C 729
Brown, Arthur A.	Oct. 14, 1914	C 596	Davis, John David	May 16, 1918	C 669
Brown, David	Nov. 1, 1909	C 348	Davis, William	May 1, 1909	C 339
Brown, George	July 8, 1916	C 626	Dean, Andrew	Dec. 19, 1918	C 688
Brown, George A.	Dec. 14, 1920	C 706	Dean, Joseph	May 13, 1915	C 611
Brown, James	Sept. 10, 1910	C 364	Derbyshire, A.	June 10, 1911	C 401
Brown, James	June 10, 1911	C 412	Dewar, Alex.	Sept. 10, 1910	C 369
Brown, James	July 8, 1916	C 625	Devlin, Edward	Oct. 23, 1906	C 241
Brown, Jas. Millie	May 13, 1915	C 615	Devlin, Ernest Henry	May 27, 1913	C 538
Brown, John	Sept. 10, 1910	C 392	Devlin, John	Oct. 3, 1919	C 693
Brown, Robert	Oct. 28, 1911	C 451	Devoy, William	May 17, 1917	C 638
Brown, Robert D.	June 10, 1911	C 423	Dickenson, Clifford	May 27, 1917	C 532
Brown, Robert S.	June 10, 1911	C 408	Dickie, Leslie	Nov. 20, 1923	C 762
Brown, Wm. A.	May 21, 1914	C 576	Dingsdale, Geo.	Oct. 28, 1911	C 459
Brown, William Gold	July 8, 1916	C 629	Dobie, Thomas	Dec. 22, 1921	C 726
Bruce, Preston	Dec. 14, 1920	C 712	Doherty, J. J.	May 1, 1909	C 340
Bullen, Thomas	Sept. 10, 1910	C 379	Doney, John	Mar. 4, 1905	C 211
Bushell, Jas. P.	Oct. 1, 1907	C 264	Donnachie, John	June 10, 1911	C 425
Bysouth, Thomas	May 16, 1918	C 673	Doodson, Robert	Oct. 28, 1911	C 455
Cairns, Andrew	June 10, 1911	C 420	Dorrance, Orlin William	Jan. 21, 1913	C 517

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904"—*Continued.*

Name.	Date.	No.	Name.	Date.	No.
Douglas, D. B.	Oct. 23, 1906	C 235	Heyes, Edward	May 1, 1909	C 320
Dow, And. Y.	May 21, 1914	C 587	Hilley, Fred	July 22, 1908	C 290
Drybrough, Robert	June 21, 1920	C 701	Hilton, Mathias	Dec. 19, 1918	C 677
Dunn, Wm.	Oct. 14, 1914	C 606	Hilton, R. G.	Sept. 10, 1910	C 376
Dunnigan, Richard	June 21, 1921	C 716	Hindmarsh, Peter	May 30, 1923	C 755
Dykes, Isaac	June 10, 1911	C 409	Hodson, R. H.	Mar. 4, 1905	C 216
Dykes, Joseph W.	Oct. 1, 1907	C 248	Hodge, William K.	Nov. 20, 1923	C 761
Eccleston, Thomas	May 17, 1917	C 482	Holdsworth, William	May 16, 1918	C 671
Eccleston, John I.	May 30, 1923	C 757	Holliday, William	July 8, 1916	C 634
Edwards, John	May 27, 1913	C 542	Horbury, Joseph W.	June 10, 1911	C 406
Elliott, John	May 27, 1913	C 541	Horrocks, A. G.	May 1, 1909	C 324
Elmes, George	Oct. 31, 1912	C 511	Horwood, S.	July 22, 1908	C 312
Evans, D.	July 22, 1908	C 284	Houston, Robert	July 8, 1916	C 631
Ewing, Robert	May 13, 1915	C 608	Howells, Nathaniel	May 1, 1909	C 316
Fairfoull, James	Oct. 28, 1911	C 453	Hutchison, Ben	Nov. 14, 1905	C 232
Farrow, John William	Dec. 19, 1918	C 683	Hutchison, Fred	Nov. 27, 1909	C 358
Ferryman, Henry	June 21, 1920	C 697	Hynd, John	Dec. 14, 1920	C 707
Fitzpatrick, T. J.	Oct. 2, 1911	C 452	Hynds, William	July 8, 1916	C 632
Flockart, David	Jan. 21, 1913	C 531	Ireson, John	Oct. 31, 1912	C 507
Ford, Allen	Oct. 28, 1911	C 445	Irvine, David	June 10, 1911	C 413
Fowler, Robert	Oct. 31, 1912	C 495	Jack, John	May 21, 1914	C 582
Francis, David Morgan	Oct. 28, 1913	C 558	Jackson, Harry	June 24, 1924	C 776
Francis, James	Oct. 1, 1907	C 250	James, Thos.	May 21, 1914	C 588
Frater, George	May 13, 1915	C 616	Jardine, Geo. Edward	Jan. 21, 1913	C 521
Freeman, H. N.	Nov. 14, 1905	C 230	Jarrett, Fred. J.	Oct. 1, 1907	C 256
Frew, William M.	May 30, 1923	C 752	Jaynes, Frank	July 22, 1908	C 277
Frew, Andrew	Nov. 27,1909	C 360	Jemson, J. W.	Mar. 4, 1905	C 205
Frodsham, Vincent	July 22, 1908	C 282	Jenkins, John	Sept. 10, 1910	C 390
Furbow, John	Jan. 21, 1913	C 528	John, Howel	July 22, 1908	C 305
Gabriel, Ernest P.	May 17, 1922	C 739	Johnson, Moses	Oct. 1, 1907	C 258
Garbett, Richard	Sept. 10, 1910	C 377	Johnston, Robert	May 9, 1912	C 479
Gascoyne, Rowland B.	Jan. 21, 1913	C 513	Jones, Alf. Geo.	May 21, 1914	C 584
Geater, Jas. Gordon	May 21, 1914	C 573	Jones, Samuel	May 27, 1913	C 518
Gemmell, James	Oct. 31, 1912	C 505	Jones, William C.	Jan. 21, 1913	C 556
Gillham, John	May 13, 1915	C 623	Jones, William Ernest	Oct. 28, 1913	C 221
Gillies, William	May 16, 1918	C 668	Jones, W. T.	Mar. 4, 1905	C 544
Glenn, James	Oct. 28, 1911	C 435	Joyce, Walter	Nov. 27, 1909	C 361
Gordon, Davis John	May 9, 1912	C 474	Judge, Peter	Sept. 10, 1910	C 391
Gourley, Robert	May 9, 1912	C 470	Keenan, Wm. James	June 10, 1911	C 426
Gray, George	May 9, 1912	C 467	Kelly, Ernest	May 17, 1917	C 646
Gregory, William	May 30, 1923	C 756	Kemp, Wm.	Oct. 14, 1914	C 594
Green, William	Nov. 15, 1917	C 659	Kingham, Alfred	Oct. 28, 1913	C 559
Greenhorn, John	May 21, 1914	C 575	Kirkeberg, H. S.	Nov. 27, 1909	C 350
Groat, Ed. Murray	Nov. 20, 1923	C 764	Klejko, Steve	Dec. 14, 1920	C 703
Griffiths, Edward	Oct. 31, 1914	C 508	Lane, Joseph	Oct. 1, 1907	C 254
Gunniss, Matthew	May 9, 1912	C 460	Lavin, Joseph	June 21, 1920	C 700
Haile, Joseph G.	May 17, 1922	C 731	Leeman, T.	May 1, 1909	C 345
Hallinan, William	May 1, 1909	C 343	Lester, Frank	May 17, 1922	C 734
Hall, Joseph	May 17, 1922	C 742	Lewis, Benj. J.	Sept. 10, 1910	C 386
Halsall, J.	July 22, 1908	C 307	Leynard, Paul	May 17, 1917	C 637
Hamilton, John	Oct. 28, 1911	C 444	Liddle, John	July 29, 1905	C 228
Hamilton, Robert Nesbitt	Oct. 28, 1913	C 550	Lindsay, William	May 17, 1917	C 642
Hampton, Samuel	Nov. 15, 1917	C 650	Linn, George Y.	May 17, 1922	C 737
Hancock, Arthur	Nov. 15, 1917	C 656	Littler, John	June 10, 1911	C 410
Hardy, Edward	June 21, 1920	C 694	Littler, Matthew	June 10, 1911	C 417
Hartley, Thomas	Oct. 31, 1912	C 510	Littler, Robert	June 10, 1911	C 418
Hart, Daniel M.	May 17, 1922	C 730	Livingstone, Alex	Oct. 28, 1911	C 436
Harwood, Fred	Sept. 10, 1910	C 384	Loxton, George	June 10, 1911	C 428
Harvey, Thomas	May 9, 1912	C 466	Loxton, John	June 10, 1911	C 416
Harvie, George	Sept. 10, 1910	C 378	Lloyd, Thomas	May 17, 1922	C 740
Heaps, Robert	Sept. 10, 1910	C 373	Luck, George	May 1, 1909	C 318
Hemer, Herbert	Oct. 14, 1914	C 595	Lynch, Stewart	Oct. 28, 1911	C 432
Henney, Jonathan	June 10, 1911	C 424	Mackie, John	June 10, 1911	C 421
Hendry, James	May 9, 1912	C 471	Makin, J. Wm.	Sept. 10, 1910	C 385
Herd, William	Dec. 19, 1918	C 682	Malone, John	May 21, 1914	C 585

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904"—*Continued.*

Name.	Date.	No.	Name.	Date.	No.
Malone, Patrick	Oct. 1, 1907	C 247	Mottishaw, Samuel K.	Oct. 23, 1906	C 237
Maltman, James	Oct. 31, 1912	C 501	Murdock, Jno. Y.	May 21, 1914	C 564
Mansfield, A.	May 1, 1909	C 336.	Myers, Peter	Oct. 28, 1911	C 446
Marrs, John	May 17, 1917	C 640	Nanson, T. H.	July 22, 1908	C 280
Marsh, Daniel Parks	May 27, 1913	C 543	Nash, George William	May 17, 1917	C 565
Marsh, John	Oct. 1, 1907	C 270	Nash, George F.	Dec. 22, 1921	C 727
Martin, James	June 10, 1911	C 398	Nee, Wm. R.	Dec. 22, 1921	C 724
Mason, Joseph	July 22, 1908	C 297	Neen, Joseph	Nov. 27, 1909	C 352
Massey, Henry	May 1, 1909	C 317	Nelson, Horatio	Oct. 1, 1907	C 263
Mather, Thomas	July 22, 1908	C 293	Neilson, William	May 9, 1912	C 481
Matusky, Andrew	Oct. 1, 1907	C 259	Newman, John	Oct. 14, 1914	C 603
Mawson, J. T.	Nov. 27, 1909	C 359	Nicholson, James	May 9, 1912	C 469
Maxwell, Geo.	May 21, 1914	C 571	Nimmo, James	May 9, 1912	C 461
McAlpine, John	Mar. 4, 1905	C 217	Norris, Joshua	Oct. 28, 1913	C 557
McArthur, John Malcolm	May 17, 1917	C 648	Oakes, Robert	Oct. 31, 1912	C 498
McArthur, Robert	Dec. 22, 1921	C 723	O'Brien, Charles	Nov. 27, 1909	C 349
McBroom, Al.	July 2, 1908	C 287	Odgers, Eli	Jan. 21, 1913	C 523
McCourt, John	Oct. 14, 1914	C 605	Orr, Alexander	Oct. 28, 1911	C 434
McCulloch, James	May 1, 1909	C 315	Osborne, Hugh	Oct. 28, 1913	C 555
McDonald, John	Oct. 28, 1911	C 448	Oswald. Geo. L.	Sept. 10, 1910	C 370
McFagen, Alexander	May 9, 1912	C 490	Owen, Thomas	May 1, 1909	C 347
McFegan, Robert	June 21, 1920	C 698	Park, William	Dec. 19, 1918	C 684
McFegan, W.	May 1, 1909	C 319	Parks, Alexander	Jan. 21, 1913	C 519
McGarry, Martin	May 1, 1909	C 326	Parker, L.	May 1, 1909	C 341
McGrath, James	July 8, 1916	C 630	Parkinson, James Wm.	Nov. 15, 1917	C 655
McGuckie, Jno. M.	May 21, 1914	C 562	Parkinson, T.	July 22, 1908	C 289
McGuckie, Thomas	July 29, 1905	C 226	Parkinson, Thomas	June 24, 1924	C 769
McGuire, Thomas	Oct. 28, 1913	C 553	Parrott, Jas. E.	May 21, 1914	C 590
McIntyre, Neil	May 21, 1914	C 574	Parson, Herbert	May 13, 1915	C 621
McKay, Walter	Nov. 20, 1923	C 763	Pearson, Jonathan	May 9, 1912	C 473
McKelvie, J.	July 22, 1908	C 285	Penman, Hugh	Oct. 28, 1913	C 552
McKenzie, Peter	June 10, 1911	C 427	Perry, Geo. Harewood	May 17, 1917	C 643
McKibben, Matthew	May 21, 1914	C 580	Phillips, Richard S.	May 17, 1917	C 620
McKinley, John	Oct. 28, 1914	C 442	Phillips, James	Nov. 21, 1922	C 749
McLaren, John	May 30, 1923	C 754	Pickup, A.	July 22, 1908	C 310
McLaughlin, James	May 9, 1912	C 485	Picton, W.	May 1, 1909	C 333
McLachlan, Alex	June 10, 1912	C 419	Plank, Samuel	Nov. 14, 1905	C 233
McLean, M. D.	Sept. 10, 1910	C 389	Pollock, John	May 30, 1923	C 760
McLellan, William	Mar. 4, 1905	C 219	Poole, Samuel	May 27, 1913	C 536
McLeod, James	July 22, 1908	C 296	Price, Walter	Sept. 10, 1910	C 371
McLeod, John	May 13, 1915	C 609	Puckey, John Thomas	Dec. 19, 1918	C 687
McMeakin, James	May 13, 1915	C 612	Quayle, Alex. B.	Jan. 5, 1925	C 778
McMillan, D.	Sept. 10, 1910	C 363	Quinn, James	Oct. 28, 1911	C 441
McMillan, Edward	Oct. 31, 1912	C 493	Quinn, John	Oct. 28, 1911	C 429
McMillan, Neil	Nov. 15, 1917	C 654	Radford, Albert	May 21, 1914	C 579
McNay, Carmichael	July 22, 1908	C 306	Rallison, R.	July 22, 1908	C 279
McNeill, Adam L.	July 22, 1908	C 281	Rallison, James	May 30, 1923	C 759
McNeill, Robert	Sept. 10, 1910	C 387	Rankin, George	July 22, 1908	C 275
Meek, Matthew	May 9, 1912	C 484	Rankin, Wm. Shaw	May 9, 1912	C 489
Meikle, Harry Alexander	July 8, 1916	C 627	Ratcliffe, Thomas	Oct. 1, 1907	C 253
Menzies, Frederick	Dec. 14, 1920	C 704	Raynor, Fred	Oct. 1, 1907	C 257
Merrifield, George	Oct. 23, 1906	C 239	Reid, Robert	Sept. 10, 1910	C 383
Merrifield, William	Oct. 23, 1906	C 236	Reid, Thos.	May 21, 1914	C 592
Michek, John	May 21, 1914	C 563	Reid, Wm.	June 10, 1911	C 403
Miles, John	June 10, 1911	C 414	Reilly, Thomas	July 22, 1908	C 303
Mitchell, Charles	May 1, 1909	C 322	Renney, Jas.	Nov. 27, 1909	C 354
Mitchell, Henry	Sept. 10, 1910	C 366	Richards, James	Nov. 1, 1907	C 249
Monks, James	Nov. 14, 1905	C 234	Richards, Samuel	Oct. 23, 1906	C 244
Moore, George	Oct. 23, 1906	C 242	Richardson, J. H.	Oct. 28, 1911	C 458
Moore, John	May 1, 1909	C 335	Rigby, John	July 29, 1905	C 225
Moreland, Thomas	July 22, 1908	C 299	Roberts, Arthur	June 24, 1924	C 772
Morgan, John	July 29, 1905	C 224	Roberts, Ebenezer	May 1, 1909	C 327
Morgan, William	May 17, 1917	C 636	Robinson, Michael	May 1, 1909	C 332
Morgan, Cornelius	Dec. 22, 1921	C 725	Robson, Thomas	May 21, 1914	C 566
Morgan, John	June 24, 1924	C 773	Rogers, Ellis	May 13, 1915	C 624
Morris, David	May 9, 1912	C 472	Roper, William	July 22, 1908	C 274

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904"—*Continued.*

Name.	Date.	No.	Name.	Date.	No.
Ross, William	June 21, 1920	C 702	Tennant, Joseph	June 24, 1924	C 770
Rowan, Alexander	Oct. 31, 1912	C 500	Thacker, Geo.	May 27, 1913	C 537
Rowan, John	Oct. 14, 1914	C 602	Thomas, Thomas	Sept. 10, 1910	C 365
Rowbottom, Thomas	Oct. 31, 1914	C 492	Thomas, John B.	Nov. 14, 1905	C 231
Royle, Edward	Oct. 31, 1912	C 506	Thomas, Joseph	Mar. 4, 1905	C 220
Russell, Robert	Nov. 27, 1909	C 351	Thomas, Warriett	Oct. 1, 1907	C 273
Rutherford, Jasper	May 17, 1917	C 644	Thomason, Charles	Nov. 15, 1917	C 657
Rutledge, Edwin	July 22, 1908	C 302	Thompson, Charles	June 24, 1924	C 765
Scales, Joseph	May 17, 1922	C 738	Thompson, Thomas	Oct. 1, 1917	C 267
Scott, Henry	July 22, 1908	C 294	Thompson, John	Oct. 31, 1912	C 509
Saunders, Eustace L.	Jan. 21, 1913	C 520	Thompson, Joseph	Oct. 1, 1907	C 269
Scarpino, Francis	May 17, 1917	C 649	Thomson, Duncan	Mar. 4, 1905	C 218
Seddon, James	Oct. 3, 1919	C 692	Tolley, John	Dec. 19, 1918	C 678
Shanks, David	Sept. 10, 1910	C 372	Touhey, William	May 27, 1913	C 547
Sharp, James	May 1, 1909	C 325	Travis, Joseph	June 21, 1920	C 699
Sharples, J. T.	Sept. 10, 1910	C 380	Tully, Thomas	May 9, 1912	C 468
Shea, Thomas J.	Dec. 22, 1921	C 722	Tune, Elijah	May 9, 1912	C 476
Shearer, L.	May 1, 1909	C 330	Vardy, Robt.	May 21, 1914	C 570
Shields, Thomas	May 16, 1918	C 667	Vaughan, John Henry	Oct. 28, 1913	C 560
Shipley, John W.	Oct. 28, 1911	C 456	Vincent, Thomas C.	Nov. 21, 1922	C 745
Shooter, Joseph	Oct. 1, 1907	C 261	Walker, George	July 8, 1916	C 633
Shortman, J.	May 1, 1909	C 331	Walker, Jas. Alexander	Oct. 31, 1912	C 496
Simister, J. H.	Nov. 27, 1909	C 353	Walker, Robert C.	May 17, 1922	C 728
Simister, W.	May 1, 1909	C 334	Walker, Wm.	May 21, 1914	C 586
Sim, James	Dec. 14, 1920	C 711	Wallace, Fred	Oct. 1, 1907	C 260
Simms, Hubert Allan	Jan. 21, 1913	C 526	Walls, John	Dec. 14, 1920	C 710
Sinclair, William	Jan. 21, 1913	C 527	Warburton, Ernest L.	June 10, 1911	C 399
Skelton, Thos.	May 1, 1909	C 344	Ward, Ernest Hedley	May 17, 1917	C 641
Smith, A. E.	Sept. 10, 1910	C 367	Wardrop, James	Oct. 31, 1912	C 504
Smellie, John	May 29, 1923	C 755	Watson, Adam G.	Mar. 4, 1905	C 212
Smith, John Watterson	May 16, 1918	C 665	Watson, Arthur W.	May 27, 1913	C 535
Smith, Joseph	Mar. 4, 1905	C 207	Watson, George	July 22, 1908	C 288
Smith, Richard Beveridge	Oct. 28, 1913	C 561	Watson, Joseph	Jan. 21, 1913	C 515
Smith, Thos. J.	Oct. 1, 1907	C 271	Watson, William	Oct. 22, 1906	C 246
Smith, Thomas	May 9, 1912	C 486	Watson, William	May 17, 1917	C 645
Smith, Thomas	Dec. 14, 1920	C 705	Watson, John	May 17, 1922	C 743
Snow, Aubrey	June 15, 1918	C 675	Weaver, William	Nov. 17, 1922	C 748
Sopwith, Reginald Scott	Jan. 21, 1913	C 512	Webb, Herbert	Oct. 28, 1911	C 457
*Sparks, Edward	Oct. 1, 1907	C 255	Webster, James Stewart	Dec. 19, 1918	C 685
Spencer, G.	May 1, 1909	C 329	Weeks, John	Mar. 4, 1905	C 214
Spruston, R. L.	Nov. 27, 1909	C 355	West, James Gloag	May 16, 1918	C 676
Spruston, Thomas A.	Mar. 4, 1905	C 206	Whalley, William	Dec. 19, 1918	C 686
Stafford, M.	Sept. 10, 1910	C 382	White, James	Oct. 31, 1912	C 499
Starr, Wallace	May 9, 1912	C 488	White, John	Oct. 22, 1906	C 245
Staton, Edward	May 21, 1914	C 581	Wilkinson, Edward	Oct. 28, 1911	C 438
Steele, Walter	Oct. 28, 1911	C 439	Williams, John Sam.	June 10, 1911	C 404
Stewart, George	May 27, 1913	C 534	Williams, Watkin	June 22, 1908	C 301
Stewart, James M.	Oct. 23, 1906	C 240	Wilson, Joseph	June 24, 1924	C 767
Stockwell, William	Oct. 23, 1906	C 238	Wilson, Robinson	June 10, 1911	C 397
Stone, Wm. C.	June 21, 1921	C 714	Wilson, Thomas M.	Oct. 1, 1907	C 272
Strachan, John	Oct. 14, 1914	C 604	Wilson, William	Oct. 1, 1907	C 262
Strang, James	May 13, 1915	C 614	Wilson, William	May 17, 1917	C 674
Strang, Thomas	June 10, 1911	C 400	Winstanley, Robert	Nov. 21, 1922	C 747
Strang, Wm.	June 10, 1911	C 395	Winstanley, Oliver	May 17, 1922	C 741
Strang, William L.	Jan. 5, 1925	C 777	Winstanley, H.	July 22, 1908	C 283
Sutherland, John	May 27, 1913	C 545	Wintle, Thomas A.	July 29, 1905	C 222
Sweeney, John	May 17, 1922	C 735	Witherington, George	Oct. 28, 1913	C 554
Taylor, Charles M.	Mar. 4, 1905	C 213	Wood, Thos. James	Oct. 31, 1912	C 491
Taylor, Hugh	Jan. 21, 1913	C 530	Worthington, J.	July 22, 1908	C 295
Taylor, James	May 21, 1914	C 567	Wright, John	May 21, 1914	C 593
Taylor, Jonathan	Dec. 19, 1918	C 680	Wright, Robert	May 21, 1914	C 589
Taylor, J. T.	Oct. 28, 1911	C 447	Wright, William	Jan. 21, 1913	C 522
Taylor, Leroy	Sept. 10, 1910	C 381	Yates, Frank	May 17, 1922	C 732
Taylor, Robert	June 21, 1920	C 695	Yeowart, Hudson	June 24, 1924	C 771
Taylor, Thomas	May 21, 1914	C 577	Young, Alexander	May 16, 1918	C 666

* C 314 issued in lieu of C 255 destroyed by Fernie fire.

COAL-MINE OFFICIALS.

Third-class Certificates issued under "Coal-mines Regulation Act Further Amendment Act, 1904," sec. 38, subsec. (2), in exchange for Certificates issued under the "Coal-mines Regulation Act Amendment Act, 1901."

Name.	Date.	No.	Name.	Date.	No.
Adam, Robert	Oct. 12, 1904	C 42	Lewis, Thos.	Oct. 11, 1904	C 35
Addison, Thos.	Dec. 10, 1904	C 52	Marsden, John	May 3, 1904	C 21
Aitken, James	Oct. 24, 1904	C 44	Miard, Harry E.	Mar. 3, 1905	C 76
Allsop, Harry	Oct. 11, 1904	C 34	Middleton, Robt.	Feb. 11, 1905	C 71
Ashman, Jabez	Feb. 5, 1907	C 131	Miller, Thos. K.	Feb. 21, 1905	C 74
Auchinvole, Alex	Mar. 29, 1905	C 89	McKenzie, John R.	Oct. 12, 1904	C 40
Barclay, Andrew	April 27, 1904	C 19	McKinnon, Arch'd	April 3, 1905	C 102
Barclay, James	April 27, 1904	C 20	McMillan, Peter	Mar. 29, 1905	C 94
Barclay, John	April 17, 1905	C 111	McMurtrie, John	Mar. 29, 1905	C 96
Bickle, Thos.	Oct. 11, 1904	C 37	Moore, Wm. H.	June 17, 1905	C 119
Bowie, James	May 13, 1905	C 116	Morris, John	Dec. 27, 1904	C 57
Briscoe, Edward	Oct. 10, 1906	C 129	Myles, Walter	April 3, 1905	C 100
Campbell, Dan	Mar. 29, 1905	C 93	Nash, Isaac	June 1, 1904	C 120
Carr, Jos. E.	Oct. 11, 1904	C 36	Neave, Wm.	Oct. 12, 1904	C 43
Carroll, Harry	Mar. 29, 1905	C 98	Nelson, James	April 27, 1904	C 16
Clarkson, Alexander	April 27, 1904	C 18	Nimmo, Richard E.	April 18, 1911	C 133
Collishaw, John	Feb. 7, 1905	C 68	O'Brien, Geo.	Feb. 6, 1905	C 66
Comb, John	Mar. 23, 1904	C 2	Pearse, Thomas W. H.	April 14, 1916	C 138
Courtney, A. W.	Nov. 2, 1904	C 45	Power, John	Sept. 8, 1920	C 142
Crawford, Frank	*April 6, 1904*	C 7	*Price, Jas.*	Nov. 8, 1904	C 50
Daniels, David	April 27, 1904	C 12	Rafter, Wm.	Mar. 29, 1905	C 95
Davidson, David	April 3, 1905	C 106	Reid, James	Mar. 23, 1904	C 1
Davidson, John	Mar. 29, 1905	C 87	Richards, Thos.	April 27, 1904	C 14
Devlin, Henry	Oct. 12, 1904	C 41	Ross, John	April 3, 1905	C 101
Dobbie, John	Nov. 27, 1905	C 126	Roughead, George	Jan. 30, 1907	C 130
Dudley, James	Mar. 22, 1905	C 114	Ryan, John	Dec. 28, 1904	C 59
Duncan, Thomas	Aug. 29, 1906	C 128	Sanders, John W.	April 3, 1905	C 107
Dunlap, Henry	Nov. 21, 1904	C 51	Shenton, Thos. J.	July 25, 1904	C 30
Dunn, Geo.	Dec. 19, 1904	C 56	Shepherd, Henry	June 13, 1904	C 26
Dunsmuir, John	Mar. 29, 1905	C 90	Smith, Geo.	Mar. 29, 1905	C 84
Eccleston, Wm.	Mar. 15, 1905	C 80	Somerville, Alex.	Mar. 24, 1904	C 3
Fagan, David	April 6, 1905	C 109	Stauss, Chas. F.	Feb. 9, 1905	C 69
Farquharson, John	April 27, 1904	C 17	Steele, Jas.	Mar. 29, 1905	C 92
Findlayson, James	June 6, 1904	C 25	Steele, John	June 4, 1913	C 4
Fulton, Hugh T.	April 3, 1905	C 105	Stewart, Duncan H.	Mar. 28, 1904	C 137
Gibson, Edward	May 30, 1905	C 118	Stewart, John	April 3, 1904	C 104
Gilchrist, Wm.	Mar. 29, 1905	C 85	Stewart, Daniel W.	May 16, 1904	C 23
Gillespie, Hugh	April 6, 1904	C 8	Stoddart, Jacob	Feb. 21, 1905	C 73
Gillespie, John	April 6, 1904	C 5	Strachan, Robt.	April 27, 1904	C 15
Gould, Alfred	April 17, 1906	C 112	Strang, James	April 27, 1904	C 10
Green, Francis	Oct. 11, 1904	C 38	Sullivan, John	July 4, 1916	C 139
Handlen, Jas.	June 16, 1904	C 122	Summers, Joseph	May 17, 1920	C 141
Harmison, Wm.	Feb. 3, 1905	C 65	Thomas, John	Mar. 29, 1905	C 97
Hescott, John	Jan. 16, 1905	C 62	Vass, Robt.	Dec. 12, 1904	C 53
Hoggan, Wm.	June 6, 1911	C 134	Vater, Charles	April 6, 1904	C 66
John, David	Nov. 8, 1904	C 49	Webber, Chas.	Sept. 13, 1904	C 32
*John, Evan	July 25, 1916	C 140	Webber, Charles F.	Sept. 13, 1904	C 33
Johnson, Geo.	May 9, 1904	C 124	Whiting, Geo.	May 29, 1905	C 117
Johnson, Wm. R.	Mar. 1, 1905	C 75	Wilson, Austin	Feb. 7, 1905	C 67
Jones, Evan	April 30, 1913	C 136	Wilson, Thos.	April 27, 1904	C 11
Lander, Frank	Jan. 9, 1905	C 61	Woodburn, Moses	Mar. 29, 1905	C 83
Lanfear, Herbert	Jan. 27, 1905	C 63	Yarrow, Geo.	Nov. 3, 1904	C 46

* Issued in lieu of No. C 132, lost.

MINE SURVEYOR CERTIFICATES ISSUED UNDER THE "COAL-MINES REGULATION ACT AMENDMENT ACT, 1919."

Name.	Date.	No.	Name.	Date.	No.
Anderson, Harry C.	May 19, 1922	59	Miard, Harry Ernest	Oct. 3, 1919	2
Baile, Wynne Jeffreys	Oct. 3, 1919	16	McCulloch, Robert	Oct. 3, 1919	6
Bowerman, Everard S.	Dec. 14, 1920	39	Owen, Wm. Arthur	Oct. 3, 1919	10
Boyce, Joseph Patrick	Oct. 3, 1919	5	Priest, Elijah	May 19, 1922	53
Caufield, Bernard	May 19, 1922	54	Rafter, Wm.	May 19, 1922	51
Corbett, Garnett S.	May 19, 1922	49	Reger, Frederick Wm.	Oct. 3, 1919	7
Cox, Richard	May 19, 1922	57	Richards, Chas. Clifton	Oct. 3, 1919	19
Crosscombe, James S.	May 31, 1923	60	Ridley, James	Oct. 3, 1919	18
Daniell, Geo. W. B.	Oct. 3, 1919	29	Roaf, Jos. R.	Oct. 3, 1919	14
Davis, Gerald D.	Oct. 3, 1919	28	Richards, James A.	Oct. 3, 1919	15
Delaney, James	Oct. 3, 1919	21	Scott, Thos. Wright	Oct. 3, 1919	4
Dickson, James	Oct. 3, 1919	3	Strachan, Robert	June 21, 1920	36
Devlin, Henry	May 19, 1922	44	Spruston, Thos. A.	May 19, 1922	52
Drewry, Wm. Stewart	May 19, 1922	56	Strachan, Robert	May 19, 1922	45
Freeman, Harry N.	May 19, 1922	49	Sandland, Joseph	May 31, 1923	61
Garman, Maurice W.	Oct. 3, 1919	11	Stewart, R. T.	Nov. 17, 1923	62
Gregory, P. W.	Nov. 17, 1919	32	Townsend, Neville F.	Nov. 17, 1919	31
Graham, Charles	May 19, 1922	50	Vallance, Wm. Dixon	Oct. 3, 1919	8
George, Frank J.	May 19, 1922	48	Verkirk, Lucas	June 21, 1921	42
Hargreaves, James	Nov. 29, 1920	33	Waddington, Geo. W.	June 21, 1920	35
Hepburn, James T.	Dec. 14, 1920	37	Wark, Samuel David	Oct. 3, 1919	20
Holdsworth, William	Oct. 3, 1919	9	White, Harold	Oct. 3, 1919	25
Hughes, Edward	Dec. 14, 1920	38	Wilson, R. Robinson	Oct. 3, 1919	12
Hunter, George	Oct. 3, 1919	30	Wilson, Arthur Rupert	Oct. 3, 1919	13
Howden, Archibald	May 19, 1922	55	Wilson, Chas. Jas.	Oct. 3, 1919	22
Jackson, Thos. R.	May 19, 1922	43	Wilson, Hartley Paul	Oct. 3, 1919	24
King, Alfred Geo.	Oct. 3, 1919	27	Wilton, Douglas D.	May 19, 1922	59
Lancaster, Peter	Oct. 3, 1919	23	Wilkie, Octavius B. N.	Oct. 3, 1919	26
Lindoe, Luke	June 21, 1921	41	Wilkinson, George	Oct. 3, 1919	1
Lymn, Albert Crompton	Oct. 3, 1919	17	Wright, Austin	Dec. 14, 1920	40
MacDonald, John	May 19, 1922	46			

INSPECTION OF METALLIFEROUS MINES.

NOTE.—Inspections of metalliferous mines are made under the "Metalliferous Mines Inspection Act," and under the terms of such Act the duties of the Inspector are limited to matters relating to or having an influence on the health or safety of the workman employed in any metalliferous mine.

Under section 3 of such Act, the Inspector is prohibited from revealing any information in regard to ore-bodies or character of underground workings, or to give any information or opinion respecting any mine, obtained or formed by him in making such inspection.

NORTHERN INSPECTION DISTRICT.

REPORT BY T. J. SHENTON, INSPECTOR.

I have the honour herewith to submit my annual report for the No. 1 Northern Inspection District for the year 1924, including the following Mining Divisions: Atlin, Portland Canal, Nass River, Omineca, and Queen Charlotte.

ATLIN MINING DIVISION.

Engineer. This Division was not visited during the year, but a report received from the manager of the *Engineer* mine, Andrew Sostad, states that an average of four men has been employed in the mine and some fifty-five men on the surface. The chief work carried on during the year was the erection of machinery, bunk-houses, etc., for the accommodation of the employees.

PORTLAND CANAL MINING DIVISION.

SALMON RIVER SECTION.

Premier. Owned by the Premier Gold Mining Company, Limited; D. L. Pitt, general manager; B. Smith, assistant manager; H. MacDonald, mine superintendent. The mine was worked continuously throughout the current year, its operation being very successful, reflecting great credit on the management. Better accommodation for the employees was effected during the year, a spacious dry-room and wash-house combined having been erected at No. 4 camp. It is 45 by 40 feet, having two stories, and is furnished with hangers for the employees' clothes, shower-baths, wash-basins, and laundries.

Percentage of nationality employed is as follows: Canadian and Newfoundland, 18.15; British—Great Britain, 35; United States, 7.32; French, 0.32; Australasia, 0.64; Italian, 3.50; Norway and Sweden, 10.19; Russian and Slav, 10.82; other European, 10.19; Japanese, 3.82.

First-aid work is cared for by the following officers of the company: Dr. Carson, medical attendant; H. MacDonald, mine superintendent; A. Drysdale, head mechanic; J. Asseltine and F. Mustard.

The average number of men employed daily during the year was 313. In all inspections made by me I have found a strict adherence to mine regulations as directed by the "Metalliferous Mines Inspection Act."

B.C. Silver Mines, Ltd. C. A. Banks, general manager; C. B. North, mine superintendent; G. Crighton, mine foreman. This company's mine is in close proximity to the *Premier*. First-aid work is supervised by Dr. Carson, medical attendant; C. B. North, mine superintendent; G. Crighton, mine foreman. Percentage of nationality: British, 80; Swedish, 20.

Operations consisting of tunnel-work and diamond-drilling were carried on continuously throughout the year, with an average of twenty-two men employed. In all inspections made the management has always co-operated with me in the full enforcement of the "Metalliferous Mines Inspection Act."

Indian. Owned by Indian Mines Corporation, Limited; F. J. Ritchie, general manager; W. S. Orr, mine superintendent. Dr. Carson, of the *Premier* mine, is the medical attendant for the employees of the *Indian* mine, which is situated west of the *Premier* mine, a distance of 6 miles. The average number of men employed daily for the year was twelve.

Except for a very short interval early in the beginning of the year, the mine was continuously operated, the work consisting of development in tunnel, crosscut, and diamond-drilling. In my inspections I have found the work conducted by the management to be in accord with the "Metalliferous Mines Inspection Act."

BEAR RIVER SECTION.

Dunwell. Owned by Dunwell Mines, Limited; R. Stewart, general manager; H. J. Thomey, mine superintendent. The mine operated from the first of the year until December 23rd, when it was found necessary to close down owing to the freezing of the source of water-supply which operated the compressor. First-aid work is cared for by Dr. H. A. Whillans, of Stewart, and H. J. Thomey, mine superintendent.

Ample provision in camp buildings and other conveniences on the surface has been made by the management for the accommodation of the employees. An average of twelve men was employed daily during the year. The management in all my visits of inspection have evinced a willingness in the application of the "Metalliferous Mines Inspection Act" and I have found at such times the operation to be in strict compliance with the Act.

Glacier Creek. Owned by Dunwell Mines, Limited; R. Stewart, general manager; J. Haahti, mine superintendent. This mine is situated very close to the *Dunwell* and was operated throughout the year until December 23rd, when it closed down for the same reason as above mentioned—namely, loss of power due to freezing of water-supply.

An average of eight men was employed on tunnel-work. I found on my visits of inspection that the operations were in accordance with the "Metalliferous Mines Inspection Act."

Lakeview. Owned by Stewart B.C. Mines, Limited; R. F. Hill, general manager; J. Marshall, mine foreman. Ample provision in bunk-houses was made for the accommodation of the employees, and all matters respecting timbering, powder-magazine, etc., were properly cared for by the management.

Dr. H. A. Whillans, of Stewart, is medical attendant for the camp. In my inspection I found matters of operation to comply with the directions of the "Metalliferous Mines Inspection Act."

Prince John.—Owned by James Nesbitt and Andy Archie and under bond to C. A. MacKenzie. This property was not operated during 1924.

Mobile.—Owned by Mobile Mines, Limited. This mine was closed down during the year 1923 and has not been reopened since.

MARMOT RIVER SECTION.

Idaho. Owned by the Porter-Idaho Mines Company, Limited; Clay Porter, general manager. This mine is situated on the west side of the North Fork glacier at an elevation of 2,700 feet. In visiting the mine, which was at the time shipping ore, I found the accommodation to consist of tents of poor construction and the arrangements not satisfactory. The reason given for the condition was that the transportation over the roads of lumber to make necessary improvements was practically out of the question at the time. The management advised that necessary improvements would be made as soon as practicable.

Six men were employed at the mine. Work for the winter was suspended on October 15th owing to unfavourable weather and falling snow. Conditions about the mine otherwise and in the mine I found to be fairly satisfactory.

PORTLAND CANAL SECTION.

Outsider. Owned by the Granby Consolidated Mining, Smelting, and Power Company. For the first nine months of the present year the mine was operated directly by the Granby Company, with Palmer Cook as manager. At the end of September the manager left the service of the company and the mine has subsequently been operated under contract. V. Bengtson, manager and contractor.

First-aid work is cared for by J. Sutherland, who is proficient as a first-aid man. Arrangements are also made whereby injured men can be quickly sent by boat to Anyox for medical and hospital treatment.

The average number of men employed daily for the year was thirty-five. The camp possesses very good accommodation for the workmen in bunk-houses, etc. In my visits of inspection I have found a willingness upon the part of the company and its officers to comply with the "Metalliferous Mines Inspection Act."

NASS RIVER MINING DIVISION.

CASSIAR SECTION.

Hidden Creek. Owned by the Granby Consolidated Mining, Smelting, and Power Company; H. Munro, general manager; J. B. Haffner, assistant manager; J. A. Swanson, mine superintendent; J. Coulter, assistant superintendent; S. Stephen Swanson, mine foreman. The mine was continuously operated throughout the year. First-aid work is energetically carried out by the management; all shiftbosses are required to carry a St. John Ambulance certificate.

Three sets of the Paul breathing apparatus are located in a central station underground and kept in readiness for an emergency. In addition, first-aid lockers equipped with splints, bandages, iodine, stretchers, etc., are kept on each level, and a system of telephone communication with doctor's office and all officials is provided. The safety-first officers are: J. A. Swanson, superintendent; J. Coulter, assistant superintendent; surface foreman; and secretary.

Meetings of the men are called continuously throughout the year to emphasize the importance of the work, to get the opinion of the men relative to the best means to be used under all circumstances encountered in preventing accident, and minimizing risk to life.

Percentage of nationality: British, 27; Canadian, 24; Swedish, 9; Italian, 6; Russian, 5; Finn, 4; Serbian, 4; American, 4; Norwegian, 3; Ukranian, 3; Polish, 3; Austrian, 2; Jugoslav, Danish, Roumanian, Argentine, Chinese, Croatian, Greek, Bulgarian, and Japanese, 6.

The average number of men employed daily for the year was 330. In all of my inspections during the year I have found all matters of operation to be carried on under the direction of the "Metalliferous Mines Inspection Act."

Rambler. Owned by the Granby Company; J. Anderson, manager. This mine is also situated within the locality of Anyox and lies about a mile to the west of the smelter. Operation was continued through the year until about the last of September, when it closed down. An average of twelve men was employed during the time of operation.

Not many accidents occurred at this mine and great credit is due to the careful manner in which the work was carried on. In all inspections made I found operations being conducted in accordance with the "Metalliferous Mines Inspection Act."

Golskeish. Owned by the Golskeish Mines, Limited; J. Heidman, manager. Operations at this mine were resumed in September, a new contract having been secured by the company from the Granby Company to supply the product of the mine, which is silica, for fluxing purposes. The condition and inclination of the vein offer a fairly safe arrangement for operation, which is worked on the shrinkage system. In my inspection I found operations to be in accordance with the "Metalliferous Mines Inspection Act."

ALICE ARM SECTION.

Esperanza. Owned by J. Fraser, A. Armour, and five other shareholders, of Anyox; J. Fraser, manager; A. Armour, director. The mine, which is situated about 1 mile north of the town of Alice Arm, was operated continuously throughout the year, the product being shipped to the Anyox smelter. An average of five men was employed during the year. In my inspection of this mine I found operating conditions to be in fair keeping with the spirit and direction of the "Metalliferous Mines Inspection Act."

Toric. Owned by the Consolidated Homestake Mining and Development Company, Limited; A. C. Gerhardi, general manager. This mine is situated opposite the *Dolly Varden* mine and 20 miles from Alice Arm. The management has

provided fairly good accommodation for the employees in bunk-house, mess-house, and other camp conveniences.

Crosscutting operations at the *Toric* were commenced in September and continued until the end of the year, eight men being employed. In my inspection I found operating conditions to be in fair keeping with the spirit and direction of the "Metalliferous Mines Inspection Act."

OMINECA MINING DIVISION.

SMITHERS SECTION.

Henderson. Owned by Duthie Mines, Limited; E. E. Wethered, manager; J. Dean, mine superintendent. This property was operated during the first half of the year and then closed down. The average number of men employed daily for the year was seventy-five. In all visits of inspection I have found conditions of operation to be in accordance with the "Metalliferous Mines Inspection Act."

Dome Mountain. Owned by the Dome Mountain Gold Mining Company; H. Lee, manager; J. Wiley, mine foreman; H. Powell, mining engineer. Operation of this property was stopped at the end of June. The average number of men employed during operation was thirty. In my inspections I found matters of operation to be in accordance with the "Metalliferous Mines Inspection Act."

DOBREEN SECTION.

Fiddler Group. This property is under bond to J. F. Duthie, Seattle; J. R. Turner, manager; J. Beaman, mine foreman. Operation began in the early part of August and stopped temporarily in October. The number of men employed daily during such period was ten. I visited the mine and found matters of operation to be consistent with the spirit and direction of the "Metalliferous Mines Inspection Act."

SKEENA MINING DIVISION.

COAST SECTION.

Drum Lummon.—Owned by the Drum Lummon Mines, Limited. This mine was not operated during 1924.

PRINCESS ROYAL ISLAND SECTION.

Surf Inlet and Pugsley. Owned by the Belmont-Surf Inlet Mines, Limited; F. H. Penn, manager; P. W. Racey, superintendent; J. Matson, mine foreman. The mine was continuously operated throughout the year and the average number of men employed daily was 238. Percentage of nationality is as follows: British, 46; Canadian, 23; Swedish, 7; American, 5; Norwegian, 4; Finn, 4; Russian, 2; Polish, 2; Italian, 1; Roumanian, 1; Danish, 1; German, Austrian, Serbian, and Belgian, 4. First-aid work is taken care of by the mine officials and Alan Beach, resident doctor.

Both the *Surf Inlet* and *Pugsley* mines I have found in all my inspections to be in accord with the "Metalliferous Mines Inspection Act."

QUEEN CHARLOTTE MINING DIVISION.

I have not visited this part of my field because very little real mining has been carried on during the year, and in my opinion not sufficient to justify the time it would take to make such visit.

KOOTENAY AND BOUNDARY DISTRICTS.

REPORT BY ROBERT STRACHAN, SENIOR INSPECTOR.

I have the honour to submit my annual report on the inspection of metalliferous mines in the Kootenay-Boundary District during the year 1924.

This district is in charge of Robert Strachan, Senior Inspector, while H. H. Johnstone acts as Inspector in the West Kootenay and Boundary District and John MacDonald in the East Kootenay.

TRAIL DISTRICT.

The principal mines operating in this district are those belonging to the Consolidated Mining and Smelting Company of Canada at Rossland, and include the *War Eagle, Centre Star, Le Roi,* and *White Bear,* and *Le Roi No. 2.* These were worked steadily during the year and were regularly inspected every month, when the general conditions were found good and the "Metalliferous Mines Inspection Act" very well adhered to.

The *I.X.L.* worked a small number of men steadily during the year, amounting to about eight, and in the latter part of the year work was commenced to drive a long drift to strike below the shaft in the *Velvet-Portland.* At both of these places the conditions were fairly good and attention paid to the "Metalliferous Mines Inspection Act."

At the Rossland mines fairly good change-rooms are maintained for the workmen and kept in a sanitary state, while at the other places the workmen generally change at home.

All the employees in and around the Rossland and other mines in this district reside in their own homes; therefore there are no bunk or cook houses.

The metals mined in the Trail district are gold at the *I.X.L.* and gold and copper at the others.

NELSON DISTRICT.

In this district there were four mines operating the year or a part thereof—the *Emerald* at Salmo, with about twenty men; the *Granite-Poorman,* with about ten; the *Molly Gibson* and *Golden Age,* with seven each. Conditions with regard to safety and sanitation were found very favourable at all these mines, bunk and cook houses in good condition, and the "Metalliferous Mines Inspection Act" well complied with.

The metals mined in this district are gold, silver, and lead.

AINSWORTH DISTRICT.

This includes Kootenay lake, Ainsworth, and Kaslo, and eight mines were operated during the year, all on a small scale.

At Ainsworth the *Highland, United, Florence,* and *Silver Bear* had forces of twenty, ten, and nine men working, while on Kootenay lake the *Kirby* worked four and the *Blue Bell* thirteen. At all of these mines the conditions were found fairly good and sanitation, bunk and cook houses in good condition.

In the Kaslo district the *Cork-Province* had a force of twenty-one men working and the *Lucky Jim,* which commenced operations during the year, had seven men. Conditions with respect to safety and health were very good at both these places.

The metals mined at all these mines are silver, lead, or zinc, or in some cases two or even the three of them.

SLOCAN DISTRICT.

In this district is included New Denver, with two mines working, Silverton with four and Sandon with three, or, including Alamo and Three Forks, four.

In New Denver the *Bosun* worked steadily all year with a force of twenty-three men; the *Molly Hughes* with seven.

Silverton includes the *Lucky Thought* with eight men working, the *Hewitt* with eight, *Standard* with fourteen, and the *Van Roi* with seventeen men.

In Sandon the largest producing mine is the old *Slocan Star,* operated by the Silversmith Mines, Limited, which worked steadily all year with a force of seventy-three men, the *Ruth-Hope* with twenty-five, *Wonderful* with six, and the *McAllister* at Three Forks with twenty-one men.

The general conditions in and around these mines were found to be very good and the "Metalliferous Mines Inspection Act" very well complied with. Bunk and cook houses as well as the change-rooms were kept in very good condition, both with respect to sanitation and cleanliness.

TROUT LAKE DISTRICT.

In this district only one mine was visited, the *True Fissure,* where five men were working underground. Conditions both in the mine and the accommodation for the men were found to be very good.

In all of these mines the metal worked is silver, lead, or zinc, or probably two or three of these.

BOUNDARY DISTRICT.

In this is included Beaverdell, where the *Sally* and *Bell* both operated during the entire year; the first with a force of fifteen and the other with twenty-two men.

In Greenwood three mines were operating—the *Providence* with twenty-four men, the *Combination* with four, and the *Strathmore* with eleven.

At all of these mines the conditions with regard to health and safety were very good and every attempt made to comply with the rules and laws covering the mines. Where bunk and cook houses are maintained, these were kept both clean and sanitary and everything done to make the conditions congenial for the workmen.

At all of these mines the mineral mined is silver.

EAST KOOTENAY.

In this district four mines were in operation, the largest, and probably the largest in the whole district, being the *Sullivan*, where we generally call the Upper or old workings a separate mine as compared with the lower or Tunnel mine.

The *Stemwinder*, on which operations were commenced for reopening late in the year, is situated about a mile farther up Mark creek than the *Sullivan* mine, and the *Paradise* at Invermere.

The *Paradise* is situated about 20 miles from Invermere and employs about twenty-five men. The mine worked steadily all year, the ore, lead and silver, being hauled by sled in the winter and auto-truck during the summer to Invermere, from where it is shipped by rail to Trail smelter. The conditions in the mine were very good, despite the difficult nature of the ground met, requiring very close timbering, and all the requirements of the "Metalliferous Mines Inspection Act" well complied with. The accommodation for the workmen, both bunk-house, cook-house, and change-room, was good, being sanitary and clean.

The *Stemwinder*, which has been idle for about eighteen years, was being put in shape for operating, the force of men working, about twelve, all being engaged in repair-work outside on head-gear and installing a compressor. The power is obtained from the East Kootenay Power Company and the present intention is to use compressed air for hoisting, pumping, and drilling. One shaft, about 64 feet, and several drifts have been opened on this property, the ore being lead and zinc, similar to the *Sullivan* mine.

The *Sullivan* mine worked steadily all year, both at the Upper mine and the Tunnel, the total working-days amounted to 341, and 1,033,714 tons of ore was produced.

A fairly good description of this mine was given in last year's report, and during the year improvements and extensions have been made in many directions, with a view to greater safety and comfort to the workmen, as well as to provide for a greater production with greater economy.

Additions have been made to the bunk-houses, still keeping in view the general principle of small bunk-houses rather than large ones, thus providing greater comfort for the workmen. All the bunk-houses are heated from a central power plant and fitted with hot and cold water and inside lavatory accommodation.

Many new houses have been built for the married employees, these all being well equipped and laid off in streets, which are being provided with boulevards planted with trees. The change-rooms have been improved and almost doubled in size, without any sacrifice of the high standard previously set.

The power used at the *Sullivan* mine is obtained from the East Kootenay Power Company, with power plants on Bull river and the Elk at Elko.

Addition has been made to the power-house at the mine, which now consists of five compressors; one 2-stage Rand with a capacity of 6,548 cubic feet of free air a minute, driven by a 1,010-horse-power synchronous motor; two Nordberg compressors, each with a capacity of 2,940 cubic feet of free air a minute, each driven by a 531-horse-power synchronous motor; two steam-driven compressors, one with a capacity of 3,000 cubic feet of air a minute and the other with a capacity of 1,000 cubic feet of air a minute. The total capacity of compressed air is now 16,542 cubic feet a minute; the electrical horse-power required to drive the compressors is 2,072.

Other sources of power held in reserve at the mine are: Two return-tubular boilers of 126 horse-power each; two Babcock & Wilcox water-tube boilers of 120 horse-power each; and

three Pelton wheels, each 168 horse-power. Two motor-generating sets, one of 75 and the other of 90 kw., provide direct current for the electric railway.

During the year we have found the conditions in and around the mine very good, and considering the large increase in operations, involving the employment of a greater number of workmen, it is pleasing to report that the endeavours of the management to comply with the "Metalliferous Mines Inspection Act" and other measures tending to greater safety and health have kept pace with the development.

INSPECTION.

The number of workmen engaged in and around the metalliferous mines which have come under inspection during the year was 1,416, of which 964 are employed underground and 452 above ground.

In the West Kootenay and Boundary District 785 men are employed and in the East Kootenay District 631.

Of the total workmen employed in the West Kootenay District, 342, or 43 per cent., are employed in the Rossland mines, operated by the Consolidated Mining and Smelting Company of Canada, the other 57 per cent. being scattered over about thirty mines. In the East Kootenay District 601, or 95 per cent., are employed in the *Sullivan* mine, also owned by the Consolidated Mining and Smelting Company of Canada.

In the larger mines an attempt is made to inspect these every month; in the smaller less frequently; and during the year thirty-eight mines were visited and 156 visits of inspection made. All serious accidents were investigated and four inquests out of five were attended.

I might point out that the "Metalliferous Mines Inspection Act" makes no provision for notice to be sent to the Inspector of Mines of the time and place where the inquest is to be held. This explains the reason why the other inquest was not attended, and on drawing the Coroner's attention to this he promised to notify us in future. We are very much indebted to the Coroners for their courtesy in this matter, both for notice and permission to examine witnesses in endeavouring to find the cause of the accident.

ACCIDENTS.

As provided for by section 19 of the "Metalliferous Mines Inspection Act," we received notice of twenty-six accidents, each involving injury or death to an equal number of workmen. Twenty-three of these came under subsection (*a*) and three under subsection (*b*). It is to be noted that only a small percentage of the total accidents is reported to the Inspectors. Of the twenty-six accidents, five proved fatal, as compared with two last year, and shows a death-rate of 3.5 per 1,000 as compared with 2.35 for the previous year.

The causes of the fatal accidents were: A timberman falling through a rotten plank in the floor; fall of hanging rock; being squeezed between a moving car and a post; getting caught and pulled in between a conveyor-belt and the pulley, which was guarded; and drilling into a cut-off or miss-hole.

While a certain number of accidents may be unavoidable, after investigation we find that about 90 per cent. of our accidents can be avoided if the workmen will take average precautions. Despite every safeguard, warning-signs, or rules, it seems that workmen will take a chance, all too often with unfortunate results.

A great number of accidents in the *Sullivan* mine are due to muck rolling down and injuring the workmen about the feet or legs. A careful watch on the part of the workmen with regard to the angle of slope will avoid many of these, and greater care in selecting means of supporting planks or scaffolding will also tend to reduce the accident-list. In this mine the workmen in the lower tunnel are taken in and out in passenger-coaches, and despite the fact that the men are delivered outside five minutes before quitting-time, in the rush to get to the change-room men have been injured.

In mines where the hanging-wall is tender, such as in the *Slocan*, if sets of timber are not being used, all posts should have good and substantial head-boards.

In welfare-work, the only mine where such is carried on is the *Sullivan*, where classes in first aid to the injured have been conducted during the past two years, both at the mine and the concentrator.

During the past winter classes in mining, geology, electricity, and other subjects have also been organized at the *Sullivan* mine, and the action of the company and officials in this direction is very much to be commended and followed by other mines.

A new hospital was being built at Kimberley, providing better accommodation for sick or injured workmen.

In many of the small mines situated far from medical aid first-aid men and supplies are almost a necessity, and it seems pitiful how little attention is paid to this great work of humanity.

We again wish to thank the workmen and officials for their assistance in carrying out our duties during the year, and look forward to a continuation of the same in the year we are now entering upon, 1925, realizing that it is only through their co-operation that the list of accidents, both fatal and non-fatal, can be reduced and kept down to a minimum.

NICOLA-PRINCETON INSPECTION DISTRICT.

REPORT BY JOHN G. BIGGS, INSPECTOR.

I have the honour to submit my annual report as Inspector of Metalliferous Mines for the Nicola-Princeton District for the year ended 1924.

Windpass.

Byron Wilson, superintendent. This mine is located near Chu Chua, a small settlement situated 60 miles north of Kamloops, on the Canadian National Railway, and is accessible by a pack-trail winding around the side of the mountain from the Thompson River flats below. The mine is situated at an elevation of 5,400 feet. The work done on this property has been chiefly tunnelling; the main adit follows the vein a distance of about 900 feet, with raises driven to the surface, which greatly assists the ventilation. The ground is hard and as a result very little timbering is required, and conditions appear very favourable for economical mining.

The present plant, which is of a temporary character, consists of a 25-horse-power oil-engine used for driving a small compressor and used for power to drive the air-drills. During my last visit to this mine fourteen men were employed—seven underground and seven on the surface. I found the general conditions in and around this mine to be very good and the provisions of the "Metalliferous Mines Inspection Act" well adhered to.

Nickel Plate.

G. P. Jones, general manager; Wallace Knowles, superintendent. This mine is situated on Nickel Plate mountain, in Osoyoos Mining Division. The entrance to the main level is at an altitude of 5,500 feet, 3,800 feet above and 3 miles from Hedley, where the mill is situated. The present operations are to the dip of the main level and developed by a well-timbered 16 by 8, 30° slope, about 1,300 feet in length, and known as the Dixon slope. It is provided with two tracks and a well-maintained travelling-way at the side of the slope. The method of work adopted is underhand stoping and working the ground downwards in stopes or steps.

The ore-bodies and the country-rock are very hard and as a result very little timber is used in the operations. The roof is well barred down and cleaned in the early stages of mining before the lower portion of the vein-matter is removed. The ore is loaded into small cars at the faces and trammed by hand to ore-pockets situated immediately above the slope, where it is again drawn off into 2-ton skips as required and hoisted to the top of the slope by a double-drum compressed-air engine and dumped into a large ore-bin, loaded into a train of cars, and hauled by an electric trolley-motor to the top of the surface incline, and again dumped into a large ore-bin, where it is again drawn off as required into 5-ton skips operated on 10,000 feet of gravity-plane worked in two sections to the mill situated at Hedley.

A 2,000-horse-power hydro-electric power plant, situated on the Similkameen river a little below Hedley, is used for providing power for operating the mine and mill, while an auxiliary steam plant is situated near the mill, consisting of three return-tube boilers and a single Goldie-Corliss engine directly connected to a 375-kw. generator.

Sixty-per-cent. Polar Forcite is used for blasting and all shots fired by caps and fuse immediately upon the afternoon shift leaving the mine. During my inspections I have found the mine to be in good condition and the provisions of the "Metalliferous Mines Inspection Act" well complied with, the mine well supervised, and every precaution taken to protect the workmen.

Iron Mask.

A. E. Wallinder, superintendent. This mine was owned and operated by the Kamloops Copper Company and consists of the *Iron Mask* and the *Erin* shafts, situated in the hills above the Kamloops–Ashcroft road, 7 miles southwest of Kamloops, and at an elevation of 3,600 feet. The mineral consists of copper in the form of sulphides. The *Iron Mask* shaft was used as the working-shaft and is provided with skips on guides. The ore is hoisted from an ore-pocket situated below the 750-foot level by means of a 1-inch steel cable and a 125-horse-power electric hoist, the mill being in close proximity to the shaft. The *Erin* shaft is provided with a ladder-way and is only used as an air-shaft.

Electricity is used for all purposes and is transmitted over high-tension wires from Kamloops at 11,000 volts and transformed to 440 volts for use at the mine, mill, and pumping-station. Two air-compressors, having a joint capacity of 1,100 feet of air a minute, are used for supplying power for driving the drilling-machines. During my inspections of this mine I found the mine to be well timbered and precautions taken to ensure the safety of the workmen, with a fairly good current of air circulating around the workings and the provisions of the "Metalliferous Mines Inspection Act" well adhered to.

During the last few years considerable improvements have been made at this plant. Owing to financial troubles an assignment was made during the month of March and as a result the mine has not been in operation during the remainder of the year.

SOUTHERN COAST INSPECTION DISTRICT.

REPORT BY JAMES DICKSON, INSPECTOR.

I have the honour to submit my annual report as Inspector of Mines for the above district during the year ended December 31st, 1924.

Britannia Mining & Smelting Co.

C. P. Browning, general manager; Jas. I. Moore, superintendent; H. L. Batten, assistant superintendent; Thos. McCulla, mine foreman; V. M. Brennan, superintendent (*Victoria* mine). The mines operated by this company are situated near Howe sound, about 28 miles from Vancouver, and are several miles inland. The ore is transported between the main tunnel of the mine (2,200-foot level) and the mill, which is on tide-water, by means of electric-locomotive haulage; the difference in elevation is overcome partly by the grade on 3½ miles of haulage and partly by a 1,400-foot transfer-shaft, into which the ore is discharged and reloaded on another electric-haulage train at the bottom. This bottom tunnel is 4,000 feet long and emerges a few hundred feet from the mill and at an elevation which permits the ore being discharged into the storage-bins of the mill.

One of the main features of the year's work was the connecting of the *Victoria* mine with the older parts of the operation by means of a 5,000-foot extension of the 2,200-foot tunnel, so that all the ore mined at the *Victoria* is crushed and loaded on this level instead of, as formerly, being hauled up the mountain-side and haulage through the workings of the old mine. The older part of the operation is mined on the shrinkage-stope system and owing to the strong nature of the ground very little timber is required for the safe operation of the mine.

In the *Victoria* mine the ground is not so strong and all the stoping is carried out from square timber sets; a sawmill at the mine and an abundant natural growth of timber ensures a plentiful supply of timber for this purpose.

Two years ago a "safety-first" organization was inaugurated; this has been maintained and is without doubt an important factor in lowering the number of preventable accidents.

During the year 1924 one fatal accident (of an easily preventable nature) occurred among a total daily average of 858 men employed.

Seventy per cent. of the men employed in the mines are on a bonus system, which appears to give general satisfaction; this bonus is given according to the work done as compared to a predetermined amount of work usually accomplished in one day. Some of the miners, in addition to a bonus for extra cutting, also receive an extra bonus for all explosives saved beyond a fair average amount per foot of drivage. This gives an incentive to be careful both in the handling and use of explosives, and the efficiency of the system is reflected in the almost entire absence of accidents due to explosives.

Early in 1924 a contract was entered into between the Britannia Company and the B.C. Electric Railway Company for the supply of electric power, as an auxiliary to the Britannia plant, for the mill and mine. This is transmitted at 32,000 volts to Britannia, where it is stepped down to 6,600 volts, the working voltage of the *Britannia* plant. This power arrangement has given such satisfaction that the auxiliary steam plant at Britannia Beach has been dismantled.

The ore mined in the year 1924 amounted to 780,948 tons, from which was produced 23,829,329 lb. copper, 113,810 oz. silver, and 4,090 oz. gold.

On my visits of inspection I have found the above mines to be well ventilated and well timbered where timbering was necessary and the provisions of the "Metalliferous Mines Inspection Act" well adhered to.

Tidewater Copper Co.—The mines of this company are situated at Sidney inlet, on the west coast of Vancouver island. No mining operations were carried on at this property during 1924.

Sunloch Mines, Ltd.—George Kilburn, superintendent. The *Sunloch* mine is situated on Jordan river, on the west coast of Vancouver island. These mines are in good general condition. No mining operations were carried on during 1924.

Clayburn Brick Co., Ltd.

William Ball, general manager; Edward Wilkinson, mine foreman. The mines operated by this company are situated at Stratton and Kilgard; the material mined is the various clays required in the manufacture of the different products of this company. The mines are worked on the pillar-and-stall system and are well timbered. The different seams of fireclay are worked from 6 to 12 feet in thickness. The mines were found to be well ventilated and in safe condition.

COAL-MINING IN BRITISH COLUMBIA.

BY JOHN D. GALLOWAY, PROVINCIAL MINERALOGIST.

During the year 1924 there was mined in the various collieries of the Province 1,987,533 gross tons (2,240 lb.) of coal, a decrease from the preceding year of 555,454 tons, equivalent to about 21.8 per cent.

The output of coke was 30,615 tons, as compared with 58,919 tons in 1923, a decrease of 28,304 tons, or 48.03 per cent.

The following table shows, for the past eleven years, the output and the *per capita* production of the various districts:—

OUTPUT AND PER CAPITA PRODUCTION OF VARIOUS DISTRICTS.

Year.	District.	Gross Tons of Coal mined during Year.	Total No. of Employees at Producing Collieries.	Tons of Coal mined per Employee for Year.	Number of Men employed Underground in Producing Collieries.	Tons of Coal mined per Underground Employee for Year.
1914	East Kootenay District	955,183	2,397	399	1,749	547
	Coast District	1,211,245	3,335	363	2,518	481
	Whole Province	2,166,428	5,732	379	4,267	508
1915	East Kootenay District	852,572	1,748	488	1,183	721
	Coast District	1,120,008	3,230	347	2,512	446
	Whole Province	1,972,580	4,978	396	3,695	534
1916	East Kootenay District	882,270	1,674	527	1,125	784
	Coast District	1,603,310	3,386	474	2,569	624
	Whole Province	2,485,580	5,060	491	3,694	673
1917	East Kootenay District	551,751	1,481	372	944	584
	Coast District	1,846,964	3,689	501	2,816	656
	Whole Province	2,398,715	5,170	463	3,760	638
1918	East Kootenay District	732,864	1,327	552	814	900
	Coast District	1,845,860	4,100	450	2,844	645
	Whole Province	2,578,724	5,427	475	3,658	705
1919	East Kootenay District	558,806	1,369	409	1,000	559
	Coast District	1,850,142	4,597	402	3,145	588
	Whole Province	2,408,948	5,966	404	4,145	581
1920	East Kootenay District	847,389	1,582	536	1,062	798
	Coast District	1,849,385	4,767	388	3,129	591
	Whole Province	2,696,774	6,349	425	4,191	643
1921	East Kootenay District	759,755	1,774	428	1,207	629
	Coast District	1,809,884	5,111	354	3,515	515
	Whole Province	2,569,639	6,885	373	4,722	544
1922	East Kootenay District	554,361	1,538	360	1,063	521
	Coast District	2,026,554	5,106	396	3,649	551
	Whole Province	2,580,915	6,644	388	4,712	547
1923	East Kootenay District	740,531	1,434	516	965	767
	Coast District	1,802,456	4,556	395	3,299	546
	Whole Province	2,542,987	6,149	413	4,342	585
1924	East Kootenay District	273,518	1,147	238	797	343
	Coast District	1,714,015	4,271	401	3,097	553
	Whole Province	1,987,533	5,418	366	3,894	510

While no figures can be given as to the actual cost of mining in the different fields, the *per capita* production of these fields is of interest, as having a bearing upon the working costs and as indicating the mining facilities existing and the improvement made in these conditions from year to year.

The *per capita* production varies from year to year and this variation is very often caused by different conditions which last for a longer or shorter time. For example, explosions, new developments, and the opening-up of new mines or closing of old ones are variable factors which affect the *per capita* production from year to year.

The market of the East Kootenay field is provided primarily by the railways of the south-eastern part of the Province and of the northern parts of the adjoining States of Montana and Washington, approximately three-quarters of the coal, sold as such, being exported to those States, while the remainder went to supply the demands of the south-eastern part of the Province —its domestic needs, its railways, steamboats, mines, and smelters.

Coke, a product of the coal-mines, is sold in the same markets, with the difference that the local consumption—chiefly by the smelter at Trail—took about 73 per cent. of the product, while 27 per cent. was exported to the States mentioned.

As regards marketing conditions in this field, the East Kootenay collieries are, however, brought into direct competition with the collieries of Alberta, just over the Provincial boundary-line, all these collieries being in the same coalfield, with practically the same grade of coal and working under similar conditions.

The Coast District may be subdivided into two fields—the Nicola-Princeton field and the Vancouver Island field—in which the markets differ considerably.

The coalfield on the Telkwa river, in Omineca Division, this year produced 1,228 tons of coal which was sold locally; the production of this field has been included in the Coast District.

In the Nicola-Princeton field the consumption is chiefly by the local railways, while a small amount finds its way to Vancouver, even under the handicap of what seems to be an excessively high freight charge.

The Vancouver Island coal market is provided by the domestic and manufacturing requirements of the Coast cities, and of the ocean-going steamers calling at these ports.

The larger coasting steamers and railways still use much California crude oil as fuel, which lessens the market for the production from Coast collieries.

As in former years, the greater proportion of the coal production was made by three larger companies—the Crow's Nest Pass Coal Company, with two collieries in East Kootenay; and by the Western Fuel Corporation of Canada, Limited (formerly Canadian Western Fuel Company), at Nanaimo, and the Canadian Collieries (Dunsmuir), Limited, the latter two operating on Vancouver island.

In addition to these large collieries, shipments have been made by the Corbin Coals, Limited, in East Kootenay; by the Middlesboro Collieries and Keystone Coal Company, Limited (formerly the Fleming Coal Company), in the Nicola valley; Coalmont Collieries, Limited, on Tulameen river; by the Princeton-B.C. Colliery, Limited, of Princeton; by the East Wellington Coal Company (formerly British Columbia Coal Mining Company, which was the Vancouver Nanaimo Coal Company) and Nanoose Collieries, Limited, near Nanaimo; by Granby Colliery No. 1 at Cassidy and the Old Wellington mines, operating on Vancouver island; and the Telkwa Collieries Company, of Telkwa.

Two new producers this year are the Tulameen Valley Coal Mine and the Clear Mountain Coal Company, in the Nicola Valley section.

The details of the shipments made by each of these companies will be found in reports of the Inspectors of the various districts.

During the year 1924 about 86.82 per cent. of the coal, sold as such by the collieries of the Province, was consumed in British Columbia; and the remainder, 13.18 per cent., was exported to the United States, including Alaska. Of the coke sold, about 73 per cent. was consumed in British Columbia, and the remaining 27 per cent. was exported to the United States.

COLLIERIES OF THE COAST DISTRICT.

The gross output of the Coast District collieries, including the Nicola valley and Telkwa fields, for the year 1924 was 1,714,015 tons (2,240 lb.) of coal actually mined, while some 3,299 tons was added to "stock," making the actual consumption of coal 1,710,716 tons.

Of this gross consumption, 1,392,317 tons was sold as coal, 145,459 tons was consumed by the producing companies as fuel, and 171,940 tons was lost in washing. Some of the coal mined at the Granby Colliery of the Granby Company smelter is made into coke in by-product ovens by the Smelting Company at Anyox for its own use.

Formerly, in 1902, the Coast collieries exported to the United States 75 per cent. of the coal they sold, but later these conditions changed very much, as is shown by the following table:—

TABLE SHOWING PERCENTAGE SALES DISTRIBUTION OF COAST DISTRICT COAL.

Year.	Used in Canada.	Exported to U.S.	Exported to other Countries.
	Per Cent.	Per Cent.	Per Cent.
1910	71.30	24.50	....
1911	76.10	21.60	2.30
1912	71.25	21.25	7.47
1913	89.80	10.20	....
1914	77.30	22.70	....
1915	67.00	33.00	....
1916	63.00	37.00	....
1917	60.00	37.00	3.00
1818	66.00	30.00	4.00
1919	72.00	28 00	....
1920	79.00	20.00	1.00
1921	78.47	21.53	....
1922	74.60	25.40	....
1923	86.81	13.19	....
1924	90.01	9.98	....

COLLIERIES OF THE EAST KOOTENAY DISTRICT.

The gross output of the collieries of the East Kootenay District for the year 1924 was 273,518 tons (2,240 lb.) of coal actually mined, while 720 tons was added to stock, making the actual consumption of coal 272,798 tons. Of this gross consumption of coal, 199,535 tons was sold as coal, 25,256 tons was consumed as fuel by the producing companies, while 48,007 tons was converted into coke, producing 30,615 tons of coke; 304 tons of coke was taken from stock, making the coke sales for the year 30,919 tons.

The East Kootenay collieries exported to the United States about 35 per cent. of the coal sold and about 26 per cent. of the coke.

The following table gives complete details of the coal and coke production of the Province for 1924, with the output figures for each colliery and district totals:—

COLLIERIES OF BRITISH COLUMBIA—PRODUCTION, 1924.

Mine.	Sold.			Total Sales.	Lost in Washing.	Used in making Coke.	Used under Co.'s Boilers, etc.	Total for Colliery Use.	Stocks.		Difference.		Output for Year 1924.
	In Canada.	In U.S.	Elsewhere.						First of Year.	Last of Year.	Added to.	Taken from.	
Vancouver Island.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons (2240 lb.).
Canadian Collieries (D.), Ltd.—S. Wellington.	13,701	.....	.....	13,701	5,829	.....	1,660	7,489	.....	.....	.....	.....	21,190
Extension	137,131	42,082	....	179,213	41,241	.....	18,208	59,449	6,426	4,567	.....	1,859	236,803
Comox	235,176	2,754	.....	237,930	51,155	.....	9,736	60,891	5,634	9,663	4,029	.....	302,850
Western Fuel Corp. of Can.—No. 1, Nanaimo	223,493	28,051	.....	251,544	15,001	.....	31,705	46,706	7,324	8,602	1,278	.....	299,528
Reserve	102,976	12,924	.....	115,900	8,922	.....	17,012	25,934	1,349	1,347	498	.....	142,332
Wakesiah	77,040	9,669	.....	86,709	5,179	.....	20,145	25,324	742	794	52	.....	112,085
Nanoose-Wellington Coll., Ltd.—Lantzville	58,087	5,918	.....	64,005	14,045	.....	10,759	24,804	1,368	2,022	654	.....	89,463
East Wellington Coal Co.—East Wellington	46,006	.....	.....	46,006	3,581	.....	4,054	7,635	.....	85	85	.....	53,726
Old Wellington (King & Foster)	15,787	.....	.....	15,787	.....	.....	98	98	.....	.....	.....	.....	15,885
Granby Cons. M. S. & P. Co., Ltd.—Cassidy	152,172	17,156	.....	169,328	26,987	.....	16,639	43,626	1,949	1,465	.....	484	212,470
Totals, Vancouver Island	1,069,569	118,554	.....	1,180,123	171,940	.....	130,016	301,956	24,792	29,045	6,596	2,343	1,486,332
Nicola-Princeton District.													
Middlesboro Collieries, Ltd.	54,591	.....	.....	54,591	.....	.....	5,885	5,885	448	380	.....	68	60,408
Princeton-B.C. Colliery Co., Ltd	7,365	410	.....	7,775	.....	.....	2,033	2,033	12	66	54	.....	9,862
Coalmont Collieries, Ltd.	121,665	20,048	.....	141,713	....	.....	7,367	7,367	.....	.....	.....	.....	149,080
Tulameen Valley Coal Mine	1,050	.....	.....	1,050	.....	.....	.....	.....	.....	25	25	.....	1,075
Keystone Coal Co., Ltd	4,737	.....	.....	4,737	.....	.....	158	158	.....	35	35	.....	4,930
Clear Mountain Coal Co.	1,100	.....	.....	1,100	.....	.....	.....	.....	.....	.....	.....	.....	1,100
Totals, Nicola-Princeton District	190,508	20,458	.....	210,966	.....	.....	15,443	15,443	460	506	114	68	226,455
Telkwa-Peace River District.													
Telkwa Collieries, Ltd.	1,228	.....	.....	1,228	.....	.....	.....	.....	.....	.....	.....	.....	1,228
Peace River Coal Property	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals, Telkwa-Peace River District	1,228	.....	.....	1,228	.....	.....	.....	.....	.....	.....	.....	.....	1,228
Grand Totals, Coast District	1,253,305	139,012	.....	1,392,317	171,940	.....	145,459	317,399	25,252	29,551	6,710	2,411	1,714,015
Crowsnest Pass District.													
Crow's Nest Pass Coal Co., Ltd.—Coal Creek	40,124	43,643	.....	83,767	.....	1,555	13,049	14,604	743	397	.....	346	98,025
Michel	85,488	7,897	.....	93,385	.....	46,452	7,968	54,420	.....	.....	.....	.....	147,805
Corbin Coals, Ltd.—Corbin	3,249	19,134	.....	22,383	.....	.....	4,239	4,239	362	1,428	1,066	.....	27,688
Totals, Crowsnest Pass District	128,861	70,674	.....	199,535	.....	48,007	25,256	73,263	1,105	1,825	1,066	346	273,518
Coal.													
Total Coal for Province	1,382,166	209,686	.....	1,591,852	171,940	48,007	170,715	390,662	26,357	31,376	7,776	2,757	1,987,533
Coke.													
Crow's Nest Pass Coal Co.—Michel	22,687	8,232	.....	30,919	.....	.....	.....	.....	714	410	.....	304	30,615
Canadian Collieries (D.), Ltd.—Comox	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total Coke for Province	22,687	8,232	.....	30,919	.....	.....	.....	.....	714	410	.....	304	30,615

COLLIERIES OF BRITISH COLUMBIA—MEN EMPLOYED, 1924.

Mine.	White Men.																		Indians.			Japanese and Chinese.									Total Men employed.		
	Supervision and Clerical.			Miners.			Helpers.			Labourers.			Mechanics and Skilled.			Boys.			Labourers.			Miners.			Helpers.			Labourers.					
	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.			
Vancouver Island.																																	
Canadian Coll. (D.), Ltd.—S. Wellington	3	2	5	30	..	30	..	..	..	12	7	19	1	7	8	..	6	6	..	..	..	..	..	..	..	..	..	..	..	..	..	46	22	68
Extension	31	19	50	342	..	342	13	..	13	126	32	158	20	35	55	..	22	22	..	..	..	..	..	..	..	..	..	..	6	57	63	538	165	703
Comox	42	20	62	110	..	110	3	..	3	58	42	100	81	71	152	..	7	7	..	..	..	115	..	115	97	39	136	70	..	70	576	179	755
Western Fuel Corp. of Canada—																																	
No. 1, Nanaimo	25	29	54	218	..	218	..	..	..	154	67	221	81	46	127	43	23	66	1	..	1	..	..	..	..	..	..	..	73	73	522	238	760
Reserve	12	12	24	102	..	102	..	..	..	57	31	88	18	28	46	22	16	38	1	..	1	..	..	..	..	..	..	..	40	40	212	127	339
Wakesiah	8	6	14	103	..	103	..	..	..	56	28	84	29	20	49	14	9	23	..	..	..	..	..	..	..	..	..	..	22	22	210	85	295
Nanoose-Wellington Collieries, Ltd.—																																	
Lantzville	11	9	20	111	..	111	..	..	..	57	8	65	10	19	29	11	5	16	..	..	..	..	..	..	..	..	..	..	22	22	200	63	263
East Wellington Coal Co	2	3	5	72	..	72	..	..	..	48	..	48	8	11	19	8	5	13	..	..	..	..	..	..	..	..	..	..	17	17	138	36	174
Old Wellington (King & Foster)	3	2	5	24	..	24	12	..	12	..	8	8	..	7	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	39	17	56
Granby C. M. S. & P. Co., Ltd.—Cassidy	14	6	20	153	..	153	..	..	..	..	46	46	68	30	98	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	235	82	317
Totals, Vancouver Island	151	108	259	1265	..	1265	28	..	28	568	269	837	316	274	590	98	93	191	2	..	2	115	..	115	97	39	136	76	231	307	2716	1014	3,730
Nicola-Princeton District.																																	
Middlesboro Collieries, Ltd	11	5	16	64	..	64	18	..	18	45	22	67	..	11	11	..	6	6	..	..	..	..	..	..	..	..	..	..	..	..	138	44	182
Princeton-B.C. Colliery Co., Ltd	2	4	6	9	..	9	3	..	3	..	5	5	3	5	8	1	1	2	..	..	..	..	..	..	..	..	..	..	..	..	18	15	33
Coalmont Collieries, Ltd	12	11	23	123	..	123	..	..	..	64	53	117	1	15	16	..	4	4	..	..	..	..	..	..	..	..	..	..	1	1	200	84	284
Tulameen Valley Coal Mine	1	1	2	5	..	5	..	..	..	..	3	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	4	10
Keystone Coal Co., Ltd.	2	1	3	3	..	3	3	..	3	..	3	3	..	2	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	6	14
Clear Mountain Coal Co	..	2	2	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	3	2	2	4	..	..	..	6	4	10
Totals, Nicola-Princeton District	28	24	52	205	..	205	24	..	24	109	86	195	4	33	37	1	11	12	..	..	..	3	..	3	2	2	4	..	1	1	376	157	533
Telkwa-Peace River District.																																	
Telkwa Collieries, Ltd	5	..	5	..	..	..	..	..	..	..	2	2	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	3	8
Peace River Coal Property	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals, Telkwa-Peace River Dist.	5	..	5	..	..	..	..	..	..	..	2	2	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	3	8
Grand Totals, Coast District	184	132	316	1470	..	1470	52	..	52	677	357	1034	320	308	628	99	104	203	2	..	2	118	..	118	99	41	140	76	232	308	3097	1174	4,271
Crowsnest Pass District.																																	
Crow's Nest Pass Coal Co., Ltd.—																																	
Coal Creek	19	6	25	220	..	220	..	..	..	27	35	62	155	94	249	9	8	17	..	..	..	..	..	..	..	..	..	..	..	..	430	143	573
Michel	14	9	23	163	..	163	..	..	..	35	100	135	88	50	138	1	6	7	..	..	..	..	..	..	..	..	..	..	4	4	301	169	470
Corbin Coals, Ltd	5	9	14	32	..	32	22	..	22	..	10	10	7	19	26	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	66	38	104
Totals, Crowsnest Pass District	38	24	62	415	..	415	22	..	22	62	145	207	250	163	413	10	14	24	..	..	..	..	..	..	..	..	..	..	4	4	797	350	1,147
Grand Totals for Province	222	156	378	1885	..	1885	74	..	74	739	502	1241	570	471	1041	109	118	227	2	..	2	118	..	118	99	41	140	76	236	312	3894	1524	5,418

NOTE.—U = underground; A = above ground; T = total.

INSPECTION OF COAL-MINES, 1924.

The coal-producing areas of the Province are divided into the Coast District, which includes the Vancouver Island, the Nicola-Princeton, and the Telkwa coalfields, and the East Kootenay District.

COAST DISTRICT.

This district includes the coalfields of Vancouver island, Nicola and Similkameen valleys, and the Telkwa River field.

The coal-mines in the Vancouver Island field are inspected by two Inspectors, who have headquarters at Nanaimo. One Inspector stays at headquarters while the other is inspecting.

The Nicola-Princeton field is inspected by one Inspector, with headquarters at Merritt.

The Telkwa field is inspected by the District Inspector, with headquarters at Prince Rupert.

VANCOUVER ISLAND INSPECTION DISTRICT.

HENRY DEVLIN AND THOMAS R. JACKSON, INSPECTORS (OFFICE, NANAIMO).

The Canadian Collieries (Dunsmuir), Limited—Nos. 1, 2, and 3 mines, all worked from what is known as the No. 1 tunnel, and No. 5 mine at South Wellington.

Granby Colliery No. 1 at Cassidy—3 slopes.

Nanoose Collieries, Limited—No. 1 mine.

Western Fuel Corporation of Canada (formerly Canadian Western Fuel Company)—Reserve and Wakesiah.

East Wellington Coal Company.

Adit mine, Old Wellington Colliery (King & Foster).

Western Fuel Corporation of Canada (formerly Canadian Western Fuel Company)—Protection and No. 1 mines.

The Canadian Collieries (Dunsmuir), Limited—Nos. 4 and 7 slopes and No. 5 shaft.

Pacific Coast Coal Mines, Limited—The Morden Colliery and Suquash Colliery.

NORTHERN INSPECTION DISTRICT.

T. J. SHENTON, INSPECTOR (OFFICE, PRINCE RUPERT).

The Telkwa Collieries—Mine on Telkwa river; and the Aveling Colliery, also on Telkwa river.

The Peace River Canyon Coal Property.

NICOLA-PRINCETON INSPECTION DISTRICT.

JOHN G. BIGGS, INSPECTOR (OFFICE, MERRITT).

The collieries operating during the year in this Inspection District, including the new mines that have been started, were:—

The Middlesboro Colliery of the Middlesboro Collieries, Limited, Merritt—Nos. 2, 3, 4, 5, 6, and 7 mines.

Princeton-B.C. Colliery Company's Princeton Colliery—No. 1 slope.

Coalmont Collieries, Limited.

Chu Chua Colliery.

Tulameen Valley Coal-mine.

Keystone Coal Company, Limited.

Clear Mountain Coal Company.

EAST KOOTENAY DISTRICT.

The East Kootenay District is subdivided into two Inspection Districts—i.e., Northern Inspection District and Southern Inspection District. Both these districts are inspected by Robert Strachan as Senior Inspector, and John MacDonald, Inspector with headquarters at the Mine-rescue Station at Fernie.

The collieries operating during the year were Coal Creek Collieries, Michel Colliery, and Corbin Colliery.

NANAIMO INSPECTION DISTRICT.

REPORT BY HENRY DEVLIN, INSPECTOR.

I have the honour to submit my annual report for the year ended December 31st, 1924, on the various coal-mines in my inspectorate, consisting of the Reserve, Harewood, and Wakesiah mines of the Western Fuel Corporation of Canada, Limited, Nanaimo (formerly Canadian Western Fuel Company); Nos. 1, 2, and 3 mines, Extension, and No. 5 mine, South Wellington, Wellington-Extension Colliery of the Canadian Collieries (Dunsmuir), Limited; Granby No. 1 Colliery of the Granby Consolidated Mining, Smelting, and Power Company, operating at Cassidy; Lantzville mine of the Nanoose-Wellington Collieries, operating at Nanoose; and the Old Wellington Colliery, Wellington, operated by King & Foster.

Western Fuel Corporation of Canada, Ltd.

Head Office—Nanaimo, B.C.

Capital, $1,500,000.

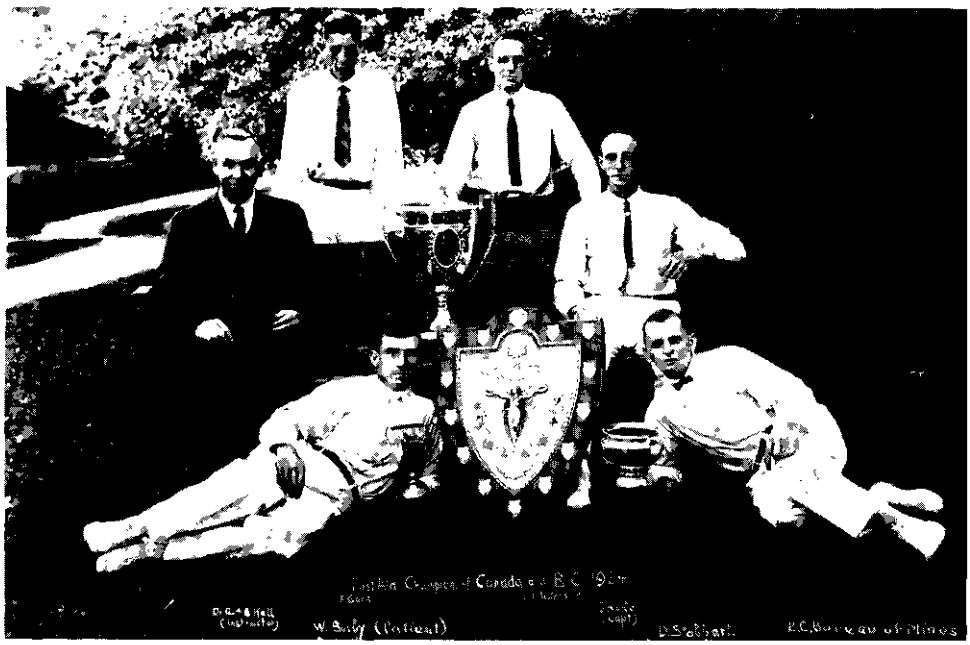
Officers.	*Address.*
H. J. McClung, President,	Flagstaff, Arizona.
G. W. Bowen, Vice-Chairman,	Nanaimo, B.C.
Mark Bate, Jr., Secretary-Treasurer,	Nanaimo, B.C.
John Hunt, General Manager,	Nanaimo, B.C.
Arthur Newbury, Mine Manager, No. 1 Mine,	Nanaimo, B.C.
Thos. Williams, Mine Manager, Reserve Mine,	Nanaimo, B.C.

The above company operated the following collieries at Nanaimo during 1924, namely: No. 1 or Esplanade shaft, Nanaimo; Reserve; and Wakesiah.

The following returns show the combined output of all the company's mines for the past year:—

AGGREGATE RETURNS FROM WESTERN FUEL CORPORATION'S MINES FOR YEAR 1924.

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	403,509			
" export to United States	50,644			
" " other countries				
Total sales		454,153		
Used in making coke				
Lost in washing	29,102			
Used under colliery boilers, etc.	68,862			
Total for colliery use		97,964		
		552,117		
Stocks on hand first of year	9,415			
" last of year	11,243			
Difference added to stock during year		1,828		
Output of colliery for year		553,945		



No. 1 Nanaimo, First-aid Team, 1924.

No. 1 Comox, Mine-rescue Team, 1924.

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
Supervision and clerical assistance	45		47		92	
Whites—Miners	423				423	
Miners' helpers						
Labourers	267		126		393	
Mechanics and skilled labour	128		94		222	
Boys	79		48		127	
Japanese						
Chinese			135		135	
Indians	2				2	
Totals	944		450		1,394	

REPORT BY THOS. R. JACKSON, INSPECTOR.

I have the honour to submit herewith my annual report for the year ended December 31st, 1924, on the various coal-mines in my inspectorate, consisting of No. 1, Protection, and Reserve mines belonging to the Western Fuel Corporation of Canada, Limited, Nanaimo; Granby No. 1 Colliery of the Granby Consolidated Mining, Smelting, and Power Company, operating at Cassidy; Comox mines, belonging to the Canadian Collieries (Dunsmuir), Limited; Nos. 4, 5, and 6, Cumberland; also Pacific Coast Coal Mines, Limited, Suquash Colliery.

NANAIMO COLLIERY.

No. 1 AND PROTECTION SHAFTS.

Arthur Newbury, Manager; Edward Courtney, Overman, Protection Mine. Robert Adam, Shiftboss; John Sutherland, Overman, No. 1 Shaft. Matthew Broderick, Shiftboss; William Halliday, William Neave, James Dudley, Alex. Coombs, George B. Bradshaw, John Weeks, John Devlin, John Marrs, John McArthur, Jas. McMeakin, George Perry, Andy Bennett, Joseph Dean, Neil McMillan, J. M. Brown, Thomas Woods, G. E. Jardine, Josh Norris, Fred Nash, George Moore, and Wm. Bradley, Firebosses.

No. 1 SHAFT, ESPLANADE.

This mine is situated at the south end of the Esplanade and adjacent to the bay shore-line. It is the oldest working-pit in Nanaimo district and has a large submarine area. The mine has three openings; two of them are in daily operation—namely, No. 1 and Protection shafts. The latter is situated on Protection island. The third opening is Newcastle shaft. A ladder extends from top to bottom of this shaft, so that one can enter or leave the mine. It is used only for inspection and necessity; it also forms the exit for the return air of Newcastle airway. The men working in Protection are conveyed by scow to and from there. No. 1 shaft provides passageway for the persons employed in the South side of mine.

Firebosses and shotlighters use the Wolf safety-lamp; other workmen use the Edison cap electric safety-lamp. Douglas and Newcastle seams are worked. On the South side of the mine Douglas seam is worked exclusively; on the North side of mine coal is taken from both seams. In blasting nothing but permitted explosives are used and fired by cable and electric battery. Compressed air and electricity are used as motive power for haulage and drainage purposes. Hoisting-engines are driven by steam, so are the three Prescott pumps and main haulage-engine situated at the shaft-bottom. A new type of pump has been installed with sufficient pumping capacity to equal the three Prescott pumps. When this pump is ready it will be used instead of the Prescotts.

The North side haulage system consists of heavy steel rails and copper trolly-wire on the Main level, approximately 3 miles in length, extending from No. 1 shaft to near the foot of Lamb's incline. The South side system consists of motor and direct haulage. Drivers and horses are employed for the purpose of getting the cars to and from the working-faces.

Development-work, North Side of No. 1 Mine.

The old Motor level beyond Lamb's incline has been reopened and heavy steel rails laid for a distance of 3,000 feet. From this point to the dip a pair of slopes have been driven down for a distance of 350 feet. To the high side of the level a large area of low coal is being opened up on the long-wall system; this coal runs up to Newcastle shaft. A long-wall section has been opened up between Nos. 2 and 3 walls with good results.

During the year a new single-inlet Sirocco fan has been installed, 90 inches diameter by 48 inches wide, speed 180 r.p.m., producing 75,000 cubic feet of air a minute. The fan is rope-driven by an engine 14 by 18 inches, running at 90 r.p.m. The engine-speed can be increased to 130 r.p.m. if necessary when more air is required. This fan has greatly improved the ventilation on this side of the mine.

Development-work, South Side of Mine.

During the past year No. 5 slope has been driven down 800 feet. This slope is expected to open up quite an area of coal. In No. 3 Motor level the old No. 3 dip has been reopened for a distance of 1,200 feet and development-work done on each side of the slope, with very good results.

In the rock tunnel off No. 2 East level a drift has been put down in to the bottom of Cook's hill and connected up with Handlon's level for ventilation purposes. Bradshaw's old level has been opened up through caved ground a distance of 300 feet, with very good results.

The big pump at the shaft-bottom, and referred to in a former paragraph of this report, is a high-lift turbo-centrifugal 4-stage mechanism, with a capacity of 1,000 gallons a minute against a 750-foot head and a speed of 1,650 r.p.m.; suction, 8 inches; discharge, 7 inches. It is direct-connected through running-gears to an Allan-Axid flow impulse turbine developing 320 b.h.p. when supplied with steam (dry) at 80 lb. a square inch, exhausting against a vacuum of 28 inches; speed of turbine, 6,500 r.p.m.

North Side, No. 1 Shaft.

In the Douglas seam the work done is chiefly the extraction of pillars; the thickness of the seam varies from 3 to 7 feet. The Newcastle seam averages 3 feet in thickness and is worked by the long-wall system. The sections now being worked in this seam are Nos. 3 and 4 long-walls. Lately, the extent of available working-face of this seam has been considerably reduced.

The machines used are Pick-quick and Siskoll. Where the ground is faulty or the face is not extensive the mining is done by the Siskoll machine; where there is sufficient length of face to warrant it the Pick-quick machine is used. Both machines give good results. Compressed air is the motive power. Both machines undercut the coal to a depth of 6 feet, after which it is drilled and shot down. The brushing is taken off the floor to admit the car to the face; car carries about 16 cwt. of coal. Regulation size of place equals 12 yards, with roadway in centre. Loaders load out the coal into cars. Eight loaders are supervised by one shotlighter, or fireboss. Four loaders are supervised by one faceman, who is a certificated miner. A loader does not need a miner's certificate to load coal. Portions of the long-wall face are worked by diggers.

At present coal from the pillars in the Douglas seam is being taken from the following sections of the North side of mine: No. 1 wall, No. 2 wall, Protection slope, and beyond Lamb's incline. Solid measures: The Douglas seam is being operated by machines on the long-wall method in No. 2½ and No. 5 levels.

Owing to the installation of the new Sirocco fan the ventilation generally in this mine has been much improved. During my last visit of inspection I measured 52,000 cubic feet of air a minute passing up Protection slope, and in the various splits I found as follows:—

No. 1 Wall Split.—There was 10,000 cubic feet of air a minute passing for the use of thirty men and six horses. Ventilation generally good. Timbering good and roadways in fairly good condition. Got no explosive gas and no trace of gas.

No. 5 Long-wall and Lamb's Incline Split.—There was 9,200 cubic feet of air a minute passing for the use of forty-six men and eight mules. Ventilation generally good. Timbering fair and roadways good. Found no explosive gas and no trace of gas.

No. 2 Wall Split.—There was 13,000 cubic feet of air a minute passing for the use of thirty-four men and six horses. Ventilation, roads, and timbering good. Got no gas. All of these sections are fairly free from coal-dust owing to natural dampness, the presence of water on roadways up to the rail, or where a little dust is generated and which is attended to by the following means: Water, or load it out.

No. 3 Wall Split, Newcastle Seam.—There was 16,000 cubic feet of air a minute passing for the use of fifty-four men and nine mules. The general condition of this section, so far as roads, timbering, and ventilation, was good. Found no explosive gas. This section is generally wet.

The percentage of methane obtained by Burrell gas-detector test in the various returns averages from nothing to 0.3 per cent.

South Side, No. 1 Shaft.

The workings are all in the Douglas seam and consist of pillar-and-stall work and extraction of pillars.

The ventilation is produced by a 72- by 90-inch double-inlet Sirocco fan, rope-driven, ratio 3½ to 1, capable of producing 195,000 cubic feet of air a minute at a 4-inch water-gauge, driven by an engine of 350 horse-power. Another fan capable of producing the necessary ventilation of the mine stands ready to substitute should necessity require.

During my last visit of inspection I measured 62,000 cubic feet of air a minute passing down the slope, dividing into three splits.

Diagonal Split.—There was 18,000 cubic feet of air a minute passing for the use of thirty-two men and nine mules. Ventilation and timbering good. Roadways in good condition generally, except in dip off Hanlon's level, where a few sets of timber are broken, but are being repaired by the diggers. Sections fairly free from coal-dust.

No. 5 North Slope Split.—Measured near the face there was 3,600 cubic feet of air a minute passing for the use of seven men and a mule. This slope is in rock. Found no explosive gas in both sections, but got a quantity of nitrogen in Booth's place, off Right incline. It was fenced off.

No. 1 Dip Split.—There was 10,500 cubic feet of air a minute passing for the use of seven men and two mules.

No. 2 Dip Split.—There was 16,500 cubic feet of air a minute passing for the use of forty-five men and eight mules. No explosive gas was found and generally the roadways, timbering, and ventilation was good. The sections were also fairly free from coal-dust owing to natural dampness and water.

In the various return air-currents the D.G.D. test showed not higher than 0.3 per cent of CH_4.

ACCIDENTS.

I am pleased to report that no fatal accidents occurred throughout the year in Protection or South side of No. 1 shaft.

DANGEROUS OCCURRENCES.

In the matter of reporting "dangerous occurrences" as required under the provisions of section 71 of the "Coal-mines Regulation Act," I have received the following: Mine fires due to spontaneous combustion—one in the month of February in No. 1 dip and one in the month of May in No. 2 dip; crank-pin of No. 1 main hoisting-engine broke in February; debris broke through Protection shaft air-compartment in the month of February. These occurrences were attended to immediately and made safe.

INSPECTION ON BEHALF OF WORKMEN.

Full advantage was taken, under the provisions of Rule 37 of section 101 of the "Coal-mines Regulation Act," for the workmen to appoint their own "gas committee" for the purpose of examining the mine. This has been consistently adhered to and the reports of inspection furnished have been generally satisfactory.

COAL-DUST.

No new methods of dealing with coal-dust have been introduced during the year. The principal methods of dealing with this source of underground trouble in the South side of the

mine are by means of water, and loading the dust into cars and sending it above ground. Owing to the great reduction of working area in the South side of the mine the coal-dust question does not amount to a great deal. In the North side of the mine the treatment of coal-dust is much similar to the South side. The sections are generally more damp and in many instances the water covers the rails.

GOB-FIRES IN DOUGLAS SEAM, SOUTH SIDE.

These disturbances occur in the South side of No. 1 shaft only and have been more or less active in the past, covering a period of years, and unfortunately are still with us. They were encountered in the different panels as the mine-workings advanced and were stopped off as necessity demanded.

When the boundary-line was reached and the retreat commenced, the trouble during the extraction of the pillars was considerably augmented by the source under question. However, so far success has crowned the management's efforts and most of the coal from these pillars has been obtained, but it required hard work, care, and attention on the part of the miner, in addition to diligence, strategy, and everlasting attention on the part of the officials, to accomplish what has been done.

From the early experience gained in the extraction of these pillars a method of procedure has grown into a "system," whereby a sufficient supply of air is produced for the miner to work in at the face and an insufficiency of air mixed with other deleterious gases is maintained in the gobs for the purpose of suppressing altogether these sources of danger. It has been found that, while this system does not prevent fires from occurring, it tends to lessen their number; their activity is not so great and therefore they can be more easily combated.

MINE-RESCUE AND FIRST AID.

The Government Mine-rescue Station is under the supervision of J. D. Stewart; assisting him is George Yarrow, representing the Western Fuel Corporation of Canada.

The station has complete sets of approved Gibbs and Paul breathing apparatus with all necessary supplies and equipment. The machines are kept in good order, ready for use should any emergency arise which would require them.

In the matter of teams training for this class of work there has been a slackening-off this year, and also in the number of certificates issued by the combined stations.

Mr. Wilson, the safety engineer, continues to inspect the underground workings and all workshops, wharves, pit-head, etc., of the company in the interests of safety first. He is also in constant attendance with the company's first-aid organization, the activities of which are thus described:—

A large number of boys were induced to join the class. In the senior group twenty-one were served with either a medallion, label, or voucher, and in the junior group fourteen successfully passed the examination for certificates.

In the Montizambert Cup competition, embracing all Canada, the A team, Captain Barton, carried the highest honours by winning the trophy. This is the second time this cup has been won by the Barton team. This team also captured the prize known as the British Columbia Provincial Shield, and consists of, in addition to the captain, D. Stobbart, E. H. Patterson, F. Good, and W. Bailey.

The Department of Mines Cup for British Columbia was won by J. Barton (captain), D. Stobbart, C. Nicholls, J. Scott, and E. H. Patterson.

The Coulson Cup—Canadian Collieries Trophy—was won by C. Warton (captain), W. Wharton, G. Cottle, W. Logan, and A. Bennett.

The juniors won the following prizes: The Wallace Nisbet Provincial Trophy and the V.M.S.A. Juvenile Cup—E. Randle (captain), T. Marrs, W. Fraser, L. Wharton, and D. Kilner.

In connection with the first-aid competition held in July at the company's picnic the following trophies were won: The Western Fuel Novice Shield, won by C. Randle (captain), T. Marrs, W. Fraser, W. Wharton, and D. Kilner; the Niven Cup (class event of team in six events), W. Wharton (captain), A. R. Wilson, E. Randle, D. Galloway, and A. Bennett.

In connection with the Coderre Cup the following team took second place: C. Nicholls (captain), J. Scott, J. Kay, A. N. Mason, and W. Beattie.

The following are the official returns for the Nanaimo Colliery for the year ended December 31st, 1924:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	223,493			
" export to United States	28,051			
" " other countries				
Total sales		251,544		
Lost in washing	15,001			
Used under colliery boilers, etc	31,705			
Total for colliery use		46,706		
		298,250		
Stocks on hand first of year	7,324			
" last of year	8,602			
Difference added to stock during year		1,278		
Output of colliery for year		299,528		

AVERAGE NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		
Supervision and clerical assistance	25		29		54	
Whites—Miners	218	7.45			218	
Miners' helpers						
Labourers	154	4.61 - 5.15	67	4.68 - 5.13	221	
Mechanics and skilled labour	81	5.15 - 5.82	46	5.22 - 6.48	127	
Boys	43	2.38 - 4.61	23	1.74 - 3.69	66	
Japanese						
Chinese			73	2.42 - 3.30	73	
Indians	1	4.61			1	
Totals	522		238		760	

RESERVE MINE.

Thomas Williams, Manager; Clifford Dickinson, Overman; John McCourt, Richard Rallison, Ernest Kelly, Jacob Stobbart, Fred Bell, George Frater, Albert Manifold, William Neilson, James McGrath, and Harry Allsopp, Firebosses.

This mine is situated in the Cranberry district, about 5 miles south of Nanaimo. The coal is reached by two shafts at a depth of 950 feet, from which a rock tunnel 7 by 12 feet in section is driven across the measures on a 1-per-cent. grade a distance of 180 feet.

The seam worked in this mine is the Douglas, the thickness of which varies from 1 to 30 feet. The pitch varies from 10° to 50° and is generally dipping north or north-east. The coal is fairly hard, with a fairly good roof.

The seam is very much troubled with "folds" or "overlaps," which tend to make operations difficult. At times the seam pinches out and may be found under or over lapping.

The output of coal from the mine has fallen, compared with last year, on account of "pinch-outs" and a fire occurring in No. 10 Dip section. This section was producing considerable coal when, unfortunately, a gob-fire started to the right of above dip, necessitating a complete stoppage of all work and the introduction of water to flood the section.

Several attempts have been made to open up the section for coal production, but these efforts, though slightly successful, were of more or less short duration. The management finally decided to abandon it for some time and agreed to pump into the section sufficient water to reach a higher level than had been heretofore attained for the purpose of thoroughly extinguishing the fire, which seemingly had not been done on former occasions.

The method employed by this company for dealing with such cases of heating that cannot be dealt with by means of water is to work the seam in a sort of "panel system," bearing in mind to have as few openings into the panel as possible, and these openings reduced to the minimum size for airway or haulage-road by wood-block stoppings, or completely stopping off in the crosscuts.

The blocks are generally 3 feet long by 1 foot square and placed at right angles to the sides of roadway or airway. The roof, floor, and sides of the opening are cut fairly deep (to the solid) for the blocks to fit snugly in, and by means of wood wedges and plaster they are firmly cemented together, making a comparatively tight stopping, which can be further air-tightened by plastering the joints of the face of the stopping.

This system is employed whether a fire takes place in the panel or not, the idea—safety first—being that should a fire occur in the panel it can be sealed off in quick time and without disorganizing other parts of the mine, which in the past, in much older mines, has all too frequently occurred. The seam being much faulted makes it rather difficult to carry out the panel system as is generally recommended.

Considerable trouble to the management, with pain, suffering, and unpleasantness to quite a number of the workmen throughout the year, developed through sulphur being emitted while the miners were winning the coal. Quite a number of the miners had to indulge in a "lay-off" for a few days, pending their recovery from "sore eyes" especially; and other forms of ailments as well, such as stomach-trouble, etc. The principal palliative treatment for this very annoying trouble is good ventilation. Other forms of treatment may be effective, but, generally speaking, I consider a good supply of fresh air breaking on the face where sulphur emission occurs is the most effective remedy, for two reasons: the air is more invigorating to the miner and the sulphur is got rid of quicker.

The ventilation of this mine is produced by a pair of 90-inch Sirocco fans, connected to a 20- by 30-inch engine, rope-driven. On the engine is a drive-wheel 17 feet in diameter and on the fan-shaft a drive-wheel 5 feet in diameter. These fans, running with a speed (engine) of 16 r.p.m., are capable of producing 100,000 cubic feet of air a minute, against a 3-inch water-gauge.

Development-work.—A new return airway 320 feet in length was made in No. 10 Dip section. This provided an entirely separate intake and return for this district. A rock tunnel 600 feet long was driven in the Rock Tunnel district. This struck a 10-foot seam of good coal which is at present being developed. About 300 feet of diamond-drilling was done during the year in this mine, and in one hole in No. 10 Dip section the coal was found 7 feet in thickness. The policy of building block stoppings has been continued, a large number having been built.

The surface plant consists of four return-tubular boilers, 16 by 24 inches, each 908 horse-power, with a steam-pressure of 125 lb.; one hoisting-engine, 30 by 60 inches, built by Barclay & Sons, Kilmarnock, Scotland. The drum is 12 feet in diameter and carries a 1½-inch galvanized steel-wire rope. Hoisting-engines are fitted with an automatic winding device. One cross-compound Canadian Rand compressor with a capacity of 22,000 cubic feet of air a minute at 90 r.p.m.; one 14- by 14-inch single engine built by Robert Armstrong, which supplies the light (electric) above and below ground, coupled by means of a belt drive to d.c. generator, 250 volts, 120 amperes.

The underground mechanical haulage is all carried on by means of compressed-air-driven hoists, of which there are twelve in number.

Edison electric head-lights are used exclusively by all the workmen except the firebosses and shotlighters, who use the Wolf type of flame safety-lamp.

During my last inspection visit to this mine I measured 32,600 cubic feet of air a minute passing up main heading, divided into two splits.

No. 1 Split Section.—There was 29,600 cubic feet of air a minute passing for the use of sixty-two men and eight horses.

No. 8 Split Section.—There was 3,000 cubic feet of air a minute passing for the use of eighteen men.

The general conditions were satisfactory and the mine fairly free from coal-dust. Found no explosive gas, but got a small gas-cap about 1½ per cent. close to the roof and near the face of Nos. 2 and 3, left road, off new slope, in rock tunnel. All other places were found clear. This mine has kept very free from methane gas during the year, the Burrell gas-detector readings in the main return air-current averaging about 0.2 per cent. methane.

I am pleased to report that no fatal accident occurred at this mine during the year.

Dangerous Occurrences.—Under section 71 of the "Coal-mines Regulation Act," in connection with dangerous occurrences, I have to record two mine fires arising from spontaneous combustion in No. 10 Dip section, one happening in the month of February and the other in the month of September, and which were duly reported to me. No other occurrence was reported.

Gas Committee.—Under the provisions of Rule 37 of section 101 of the "Coal-mines Regulation Act," advantage was taken by the workmen to appoint their own "gas committee" for the purpose of examining the mine. This has been, during the year, duly carried out and these reports of inspection, generally satisfactory, were submitted to this office for examination and file record.

I examined all report-books as required under Rules 4 and 36 of section 101 of the "Coal-mines Regulation Act" and found the rules being complied with.

The following are the official returns from the Reserve Colliery for the year ended December 31st, 1924:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	102,976			
" export to United States	12,924			
" " other countries				
Total sales		115,900		
Lost in washing	8,922			
Used under colliery boilers, etc.	17,012			
Total for colliery use		25,934		
		141,834		
Stocks on hand first of year	1,349			
" last of year	1,847			
Difference added to stock during year		498		
Output of colliery for year		142,332		

Average Number of Hands employed, Daily Wages paid, etc.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		
Supervision and clerical assistance	12		12		24	
Whites—Miners	102	7.48			102	
Miners' helpers						
Labourers	57	4.61 - 5.15	31	4.68 - 5.13	88	
Mechanics and skilled labour	18	5.15 - 5.82	28	5.22 - 6.48	46	
Boys	22	2.38 - 4.61	16	1.74 - 3.69	38	
Japanese						
Chinese			40	2.42 - 3.18	40	
Indians	1	4.61			1	
Totals	212		127		339	

REPORT BY JAS. DICKSON, ACTING INSPECTOR OF MINES.

WAKESIAH MINE.

Robt. Laird, Manager; Nathaniel Bevis, Overman; A. C. Challinor, George Gray, Harry Carroll, John Weber, and Andrew Dean, Firebosses.

This mine operates in the Wellington seam and is practically worked in two districts, the thicker coal being mined by the pillar-and-stall system and the thin coal area by the long-wall method.

Practically all the long-wall districts are undercut by machines, using the Mavor & Coulson and Sullivan long-wall machines. The coal so cut is loaded by the miners directly on to face conveyors, which deliver the coal to mechanical loaders in the main gateways. The face conveyors and loaders are built by Mavor & Coulson, Glasgow, Scotland, and have given great satisfaction while operating in very thin coal and under a comparatively weak roof.

The conveyors and loaders have operated for a considerable time where the seam is 15 to 20 inches thick, and made possible the recovery of coal which would otherwise have been commercially impossible. The conveyor and loader take a working-face from 250 to 350 feet long and, with very few exceptions, due to ordinary mining disabilities, has enabled the management to realize a daily advance of 6 feet. This is a distinct advance in mining in this country and there is no doubt that many other mining companies will follow such a successful lead.

A new 90-inch Sirocco fan has been installed and will be in operation early in 1925, which will greatly increase the air-current in this mine.

Both Wheat and Edison electric safety-lamps are in use at this colliery, the firebosses using the Wolf flame safety-lamp.

On my last inspection in December there was 36,000 cubic feet of air a minute passing into this mine, dividing into three splits.

In Lewis's Heading section there was 10,100 cubic feet of air a minute passing for the use of thirty men and four horses.

In the Slope section there was 13,500 cubic feet of air a minute passing for the use of fifty men and three horses.

In Gavin's Dip section there was 6,000 cubic feet of air a minute passing for the use of fifteen men and one horse.

The above workings are fairly free from coal-dust and no gas was found during this inspection.

The following are the official returns from the Wakesiah Colliery for the year ended December 31st, 1924:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	77,040			
" export to United States	9,669			
" " other countries				
Total sales		86,709		
Lost in washing	5,179			
Used under colliery boilers, etc.	20,145			
Total for colliery use		25,324		
		112,033		
Stocks on hand first of year	742			
" last of year	794			
Difference added to stock during year		52		
Output of colliery for year		112,085		

AVERAGE NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		
Supervision and clerical assistance	8		6		14	
Whites—Miners	103	7.02			103	
Miners' helpers						
Labourers	56	4.61-5.15	28	4.42-5.13	84	
Mechanics and skilled labour	29	5.15-5.82	20	5.22-6.48	49	
Boys	14	2.38-4.61	9	1.74-2.95	23	
Japanese						
Chinese			22		22	
Indians						
Totals	210		85		295	

Pacific Coast Coal Mines, Ltd.

MORDEN AND SUQUASH COLLIERIES.

Tehese collieries, situated at Morden and Suquash, the latter near Alert Bay, respectively, have been inactive during the year. (*See* former reports.)

REPORT BY J. DICKSON, ACTING-INSPECTOR.

The Nanoose-Wellington Collieries, Ltd.

Head Office—Lantzville, B.C.

Capital, $3,000,000.

Officers.	*Address.*
Alvin W. Defiel, Chairman,	St. Paul, Minn.
Jno. A. Coleman, Managing Director,	Lantzville, B.C.
Russell H. Phinney, Secretary,	St. Paul, Minn.
N. B. Roy, Assistant Secretary,	Lantzville, B.C.
M. N. Olsen, Treasurer,	Lantzville, B.C.

LANTZVILLE MINE.

James W. Jemson, Manager; Joseph Neen, Overman; W. H. Moore, Shiftboss; H. M. Davidson, John Michek, Charles Simister, Peter Hindmarch, William Angell, James Handlen, and Alexander Derbyshire, Firebosses.

This mine operates in the Wellington seam, which here varies from 3 to 9 feet in thickness, including several bands of slate and rock of varying hardness, the greater part of this rock being stowed in the workings.

This system of mining is varied to suit local conditions, some of the thick coal being won by pillar-and-stall methods, while the thinner coal is mined by the long-wall method. Under-

cutting is done in some districts by the Sullivan long-wall chain-machine; the "puncher" is also used with good results. The seam here is subject to numerous local faults and dislocations, which make rapid development by cutting-machines somewhat difficult.

Several of the main places which had been abandoned for some time have recently been driven ahead with promising results. If the developments prove satisfactory it is the intention of the management to install some system of conveyor underground to eliminate some of the brushing in the long-wall places.

This mine is ventilated by a Keith 60-inch fan, producing at present a water-gauge of 0.9 inch. During my last inspection in December there was 35,000 cubic feet of air a minute passing into this mine, dividing into two splits.

No. 1 Split.—There was 10,000 cubic feet of air a minute passing for the use of twenty-three men and four horses.

No. 2 Split.—There was 16,000 cubic feet of air a minute passing for the use of sixty-three men and five horses. This mine is practically free from coal-dust.

A small quantity of explosive gas was found in one working-place during the inspection.

The following are the official returns from the Lantzville Colliery for the year ended December 31st, 1924:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	58,087			
" export to United States	5,918			
" " other countries				
Total sales		64,005		
Used in making coke				
Lost in washing	14,045			
Used under colliery boilers, etc.	10,759			
Total for colliery use		24,804		
		88,809		
Stocks on hand first of year	1,368			
" last of year	2,022			
Difference added to stock during year		654		
Output of colliery for year		89,463		

Number of Hands employed, Daily Wages paid, etc.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	11	6.87	9	6.91	20	6.89
Whites—Miners	111	5.58			111	5.58
Miners' helpers						
Labourers	57	4.78	8	4.12	65	4.69
Mechanics and skilled labour	10	5.40	19	5.47	29	5.41
Boys	11	3.71	5	2.79	16	3.42
Japanese						
Chinese			22	2.70	22	2.70
Indians						
Totals	200	5.31	63	4.32	263	5.07

REPORT BY THOS. R. JACKSON.

Granby Consolidated Mining, Smelting and Power Co. Colliery at Cassidy.

Officers.	*Address.*
J. T. Crabbs, President,	25 Broadway, New York.
H. S. Munroe, Vice-President and General Manager,	Anyox, B.C.
Edward Everett, Secretary,	25 Broadway, New York.
Valentine Quinn, Treasurer,	813 Birks Bldg., Vancouver.
J. B. Touhey, Resident Manager,	Cassidy, B.C.

GRANBY No. 1 COLLIERY.

James B. Touhey, Resident Manager; Wm. P. Touhey, Overman; Albert Radford, Matthew Meek, Alexander McLaughlin, John Wright, Joe Lavin, Owen Dabb, Tom Cunliffe, William Harmison, J. W. Smith, and Tom Lloyd, Firebosses.

Granby Colliery No. 1 mine is situated some 10 or 11 miles in a southerly direction from Nanaimo. The Douglas seam is worked and averages about 10 feet thick, except where silted areas occur and reduce the thickness of the coal. These silted areas sometimes extend for acres and make the relocating of the seam costly.

The Main slope, which is down about 1 mile from the surface, is standing in rock, it not being deemed advisable to penetrate the rock for the small area of property remaining to the east.

The coal hoisted during the year was 212,470 tons and was lower than the output for the previous year, owing to one shift only being at work since early in March. During the year a large section of the refuse-bank was retreated and made saleable.

Outbursts of gas have lessened considerably during the year, mainly owing to the area in which the outbursts were prevalent being reduced to a few places. Pilot-holes are still bored ahead in the affected area, but to date have not liberated any gas-pressure.

Safety-first methods and equipment were maintained and added to during the year. All main roads and travelling-ways are liberally treated with incombustible dust, in addition to Taffenel barriers, consisting of from 90 to 100 shelves in each barrier, each shelf containing 5 cubic feet of incombustible dust, 75 per cent. of which will pass through a 100-mesh screen. Incombustible dust is also distributed by hand on the timbers, sides, and floor.

On the Main slope and manway, both intakes, the air is heated by exhaust steam passing through radiators and allowed to travel in the air, thus preventing the drying-out of the mine. Very fine fog sprays are placed about 150 feet apart on the Main slope and these operate automatically for twenty minutes out of every hour.

Edison electric head-lamps are used for underground lighting to the exclusion of flame safety-lamps, which are only used by officials for testing purposes.

Hydraulic stowing, the first in the Dominion of Canada, has been in operation for several months and is giving good results. A 6-inch borehole was put down from the surface and connected with a heading underground. All washery refuse is flumed through this borehole, using about four parts of water to one of solids, and is being conducted to the old workings underground, which are gradually being filled up. The great benefit to be derived from stowing is too obvious to need further explanation. In addition to the added safety, such as freedom from spontaneous combustion, filling up old voids that might contain gas, there is the greater safety to the miners in the later extraction of the pillars and subsequent support of the surface.

A rock-crusher is also being installed, so that all the rock coming out of the mine will be crushed to minus 1 inch and, added to the washery refuse, will increase the volume of solids going back into the mine.

Mine Development.—This has been chiefly confined to two rock tunnels which have been driven about 2,200 feet, with the necessary crosscuts. No. 1 tunnel is on a grade of 14° and No. 2 tunnel 11°. A diamond-drill was employed in No. 1 tunnel in December and coal 10 feet thick was located 50 feet below the pavement. Two other holes were put down and the continuation of the seam definitely established. It is estimated, based on the recovery from the

present workings, that considerably over 4,000,000 tons of coal will be available for development about April, 1925, in addition to the coal at present blocked out.

During my last inspection of this mine I measured 136,000 cubic feet of air a minute passing into the mine.

No. 4 North Level Split.—There was 32,000 cubic feet of air a minute passing for the use of twenty-six men.

No. 7 North Level Split.—There was 11,700 cubic feet of air a minute passing for the use of thirteen men.

No. 7 South Level Split.—There was 21,600 cubic feet of air a minute passing for the use of thirty-three men.

No. 6 North Level Split.—There was 16,560 cubic feet of air a minute passing for the use of twenty-five men.

Generally speaking, the ventilation, roadways, and timbering have been well maintained throughout the year. Found no explosive, and the main coal-producing section—namely, No. 4 North level—the Burrell gas-detector test showed 0.3 per cent. methane.

Tests showed an average of from 0.3 to 0.5 per cent. of CH_4 in main return air-current at fan. The South side of the mine keeps consistently free from methane in the air-current, the tests showing never more than 0.15 per cent.

The North side of the mine is where the blow-outs occur, but these occurrences have diminished considerably this year, the sequence being a great reduction in the quantity of methane produced.

Occurrences.—Under section 71 of the "Coal-mines Regulation Act," in connection with dangerous occurrences, I have to record twenty-eight blow-outs as being the number reported to me and which have occurred during the year. These blow-outs were generally of small dimensions and had no great effect in disorganizing the work of the men, as the resumption of work was generally quickly followed. No other occurrence was reported.

Advantage was taken, under the provisions of Rule 37 of section 101 of the "Coal-mines Regulation Act," for the workmen to appoint their own "gas committee" for the purpose of examining the mine. This has been consistently held to and the reports of inspection furnished have been generally satisfactory.

I regret to report that a fatal accident occurred at this mine, due to a fall of rock.

Examined all report-books as required under Rules 4 and 36 of section 101 of the "Coal-mines Regulation Act" and found them being complied with.

The following are the official returns for the Granby Colliery for the year ended December 31st, 1924:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	152,172			
" export to United States	17,156			
" " other countries				
Total sales		169,328		
Lost in washing (Tons. 35,921)				
Less recovered from dump (8,934)				
	26,987			
Used under colliery boilers, etc.	16,639			
Total for colliery use		43,626		
		212,954		
Stocks on hand first of year	1,949			
" last of year	1,465			
Difference taken from stock during year		484		
Output of colliery for year		212,470		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employd.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	14	7.55	6	6.27	20	7.16
Whites—Miners	153	7.19	.....	.....	153	7.19
Miners' helpers	.....	.....	.....	.....	.....	.....
Labourers	.....	.....	46	4.54	46	.....
Mechanics & skilled labour.	68	4.90	30		98	4.71
Boys	.....	.....	.....	.....	.....	.....
Japanese	.....	.....	.....	.....	.....	.....
Chinese	.....	.....	.....	.....	.....	.....
Indians	.....	.....	.....	.....	.....	.....
Totals	235	6.55	82	4.67	317	6.06

REPORT BY H. DEVLIN, INSPECTOR, AND J. DICKSON, ACTING-INSPECTOR.

King & Foster.

Head Office—Herald Building, Nanaimo, B.C.

Officers.

A. G. King, Jr., Partner,
E. R. Foster, Partner.
A. G. King, General Manager.

Address.

Box 655, Nanaimo, B.C.

NOS. 2, 5, AND 6 MINES.

Harry Shepherd, Superintendent; John White, Overman; S. K. Mottishaw and George Stewart, Firebosses.

These mines operate in the Wellington seams, Nos. 5 and 6 mines being in the main Wellington seam and are recovering the outcrop pillars left from the original mining operations of the Wellington Colliery Company. No. 2 and No. 2 Extension mines operate in the thinner seam, which overlies the main seam at a distance of 30 feet. This seam is known to extend over a considerable area and will likely produce for a long time. No. 2 and No. 2 Extension are worked by the long-wall method.

During my last inspection in December there was 5,400 cubic feet of air passing into No. 2 mine for the use of nineteen men and two horses.

Nos. 2 Extension, 5, and 6 mines are ventilated by natural means, which is adequate for the present operation. No explosive gas has been found in the operations.

The following returns show the output of the firm's mine for the year 1924:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	15,787			
" export to United States				
" " other countries				
Total sales		15,787		
Used in making coke				
" under colliery boilers, etc	98			
Total for colliery use		98		
		15,885		
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of colliery for year		15,885		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	3	6.75	2	6.75	5	6.75
Whites—Miners	24	6.00			24	6.00
Miners' helpers	12	4.90			12	4.90
Labourers			8	4.15	8	4.15
Mechanics and skilled labour			7	5.27	7	5.27
Boys						
Japanese						
Chinese						
Indians						
Totals	39	5.71	17	4.91	56	5.47

REPORT BY H. DEVLIN, INSPECTOR, AND J. DICKSON, ACTING-INSPECTOR.

East Wellington Coal Company.

Officers.	*Address.*
H. G. S. Heisterman, President,	Victoria, B.C.
P. S. Fagan, Secretary-Treasurer,	Victoria, B.C.

EAST WELLINGTON COLLIERY.

William Wilson, Manager; William Roper, Overman; George Oswald, James Rallison, Dan McMillan, Charles Weber, and J. W. Shipley, Firebosses.

This mine operates in the Wellington seams, which are reached by means of two slopes which also serve as the main intake and return airways.

During the year the Main slope has been extended down to the lower seam a distance of 75 feet, making the total length of the Main slope 1,210 feet on a pitch of 25°.

The coal is practically all mined by the long-wall system, the greater part being mined by two Sullivan long-wall chain-machines driven by compressed air.

The area opened up so far has presented many difficulties to successful machine-mining owing to numerous local faults and dislocations in the seams.

It is planned to make the permanent development from the bottom of the Main slope and ultimately cut off the present working-faces by a barrier pillar, prospect-levels being at present driven for this purpose.

The employees are all provided with Wheat electric lamps and the firebosses use the Wolf flame safety-lamp.

The mine is ventilated by a Sheldon fan, producing at present a 1.75-inch water-gauge.

During my last inspection in December there was 17,500 cubic feet of air a minute passing into this mine for the use of fifty-one men and five horses. Explosive gas was found in four working-places during this inspection and precautions taken to deal with same.

The following are the official returns for the East Wellington Colliery for the year ended December 31st, 1924:—

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	46,006			
" export to United States				
" " other countries				
Total sales		46,006		
Lost in washing	3,581			
Used under colliery boilers, etc.	4,054			
Total for colliery use		7,635		
		53,641		
Stocks on hand first of year				
" last of year	85			
Difference added to stock during the year		85		
Output of colliery for year		53,726		

AVERAGE NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	2	8.00	3	4.90	5	6.45
Whites—Miners	72	5.87			72	5.87
Miners' helpers						
Labourers	48	4.49			48	4.49
Mechanics and skilled labour	8	6.00	11	5.50	19	5.75
Boys	8	3.00	5	2.34	13	2.67
Japanese						
Chinese			17	2.75	17	2.75
Indians						
Totals	138		36		174	

Canadian Collieries (Dunsmuir), Ltd.

Head Office—Montreal, Que.

Capital, $15,000,000.

Officers.	*Address.*
F. Perry, President,	Montreal, Que.
Lieut.-Col. C. E. Villiers, General Manager,	Victoria, B.C.
H. S. Adlington, Secretary,	Montreal, Que.
P. S. Fagan, Assistant Secretary,	Victoria, B.C.
Thomas Graham, General Superintendent,	Cumberland, B.C.
T. A. Spruston, District Superintendent,	Ladysmith, B.C.

The Canadian Collieries (Dunsmuir), Limited, in 1910 acquired all the holdings of the Wellington Colliery Company, Limited, and since then has been operating the following mines:—

The Extension Colliery, in the Cranberry District (Extension); T. A. Spruston, manager.

The Comox Colliery, in the Comox District; Charles Graham, district superintendent; William Walker, John L. Williams, J. G. Quinn, managers at the several mines.

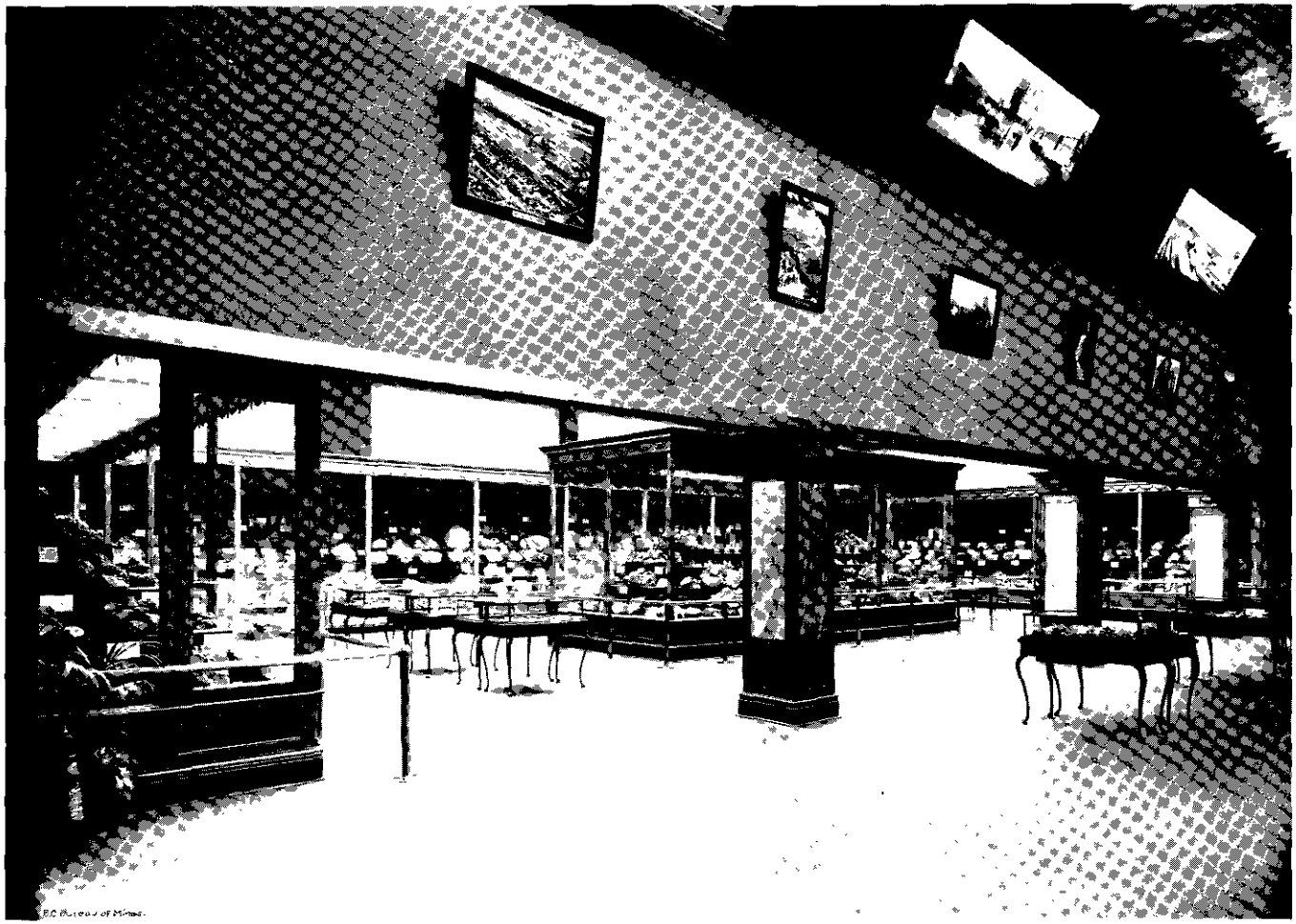
The following table shows the combined output of all this company's collieries during the past year:—

AGGREGATE RETURNS FROM THE CANADIAN COLLIERIES (D.), LTD., MINES FOR YEAR 1924.

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	386,008			
" export to United States	44,836			
" other countries				
Total sales		430,844		
Lost in washing	98,225			
Used in making coke				
" under colliery boilers, etc.	29,604			
Total for colliery use		127,829		
		558,673		
Stocks on hand first of year	12,060			
" last of year	14,230			
Difference added to stock during year		2,170		
Output of collieries for year		560,843		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
Supervision and clerical assistance	76		41		117	
Whites—Miners	482				482	
Miners' helpers	16				16	
Labourers	196		81		277	
Mechanics and skilled labour	102		113		215	
Boys			35		35	
Japanese—Miners	35				35	
Helpers	27				27	
Chinese—Miners	80				80	
Helpers	70		39		109	
Labourers	76		57		133	
Totals	1,160		366		1,526	



Canadian Mineral Exhibit, Wembley, 1921.

REPORT BY H. DEVLIN, INSPECTOR, AND J. DICKSON, ACTING-INSPECTOR.

WELLINGTON EXTENSION COLLIERY.

Thomas A. Spruston, Superintendent.

This colliery, operated by the Canadian Collieries (Dunsmuir), Limited, is composed of Nos. 1, 2, 3, and 6 mines at Extension and No. 5 mine at South Wellington, all situated in the Cranberry district. The Extension mines are connected to Ladysmith, on Oyster harbour, by the Wellington Colliery Railway, 11 miles long, over which the entire output from these mines is hauled for shipment.

The No. 5 mine is situated at South Wellington, about 9 miles from Ladysmith, the output being hauled over the Esquimalt & Nanaimo Railway to the shipping-point, Ladysmith, where it is either loaded in vessels or taken to Mainland points by transfer-barge in railway-cars. The coal is a very high-grade domestic fuel and is in great demand in the Coast cities.

The Nos. 1, 2, 3, and 6 mines are opened up in the Wellington seam, which varies in thickness from 2 to 6 feet. The major portion of the seam being worked at present is very much disturbed and dislocated by "folds," "steps," and "barren ground." In some of these "wants" or "barren patches" silt-fills have taken the place of the coal, while in others the roof and floor have met, completely "pinching" the coal out. These "wants" vary from 50 to 500 feet in extent.

The Nos. 1, 2, and 3 mines, which were originally opened up by separate slopes on the outcrop of the seam, are now connected by a rock tunnel driven 14 by 7 feet in the clear on a 1-per-cent. grade, and a little over a mile in length, to the intersection of the Nos. 2 and 3 mines, and tapping the No. 1 mine at a distance of three-quarters of a mile from the surface. Electric-motor haulage is maintained along the tunnel and continues into No. 2 mine, a distance of 1¼ miles, and half a mile into No. 3 mine. The underground employees are taken to and from their work in each respective mine along this tunnel by means of a "riding-trip" of cars hauled by a 13-ton Baldwin-Westinghouse electric locomotive.

The No. 6 mine is opened up on the Wellington seam, about 1¼ miles to the north-west of the Main tunnel, and connected to the tipple by a narrow-gauge railway about 1 mile in length, which is operated by a 5-ton General Electric haulage-locomotive. A gravity-incline 3,000 feet long connects this railway up with the mine.

POWER-HOUSE.

The boiler plant consists of four Goldie & McCulloch return-tubular boilers of 163-horse-power capacity each. Electric power is supplied by three 250-volt d.c. generators. No. 1 is a Cracken-Wheeler generator of 112.5-kw. capacity, direct-coupled to a 15 by 14 Ideal engine; No. 2 is a Westinghouse 150-kw. capacity, connected direct to a Fleming-Harrisburg compound engine, size 14 by 14 by 32; and No. 3 is a General Electric 150-kw. capacity, direct-connected to a 16 by 16 Robb-Armstrong engine. A Blake fire and supply pump, 12 by 8 by 10, is maintained in good order in the boiler-house.

TIPPLE.

The mine-cars are handled over a Phillips crossover dump, which is cut off and fed to the dump by means of a steam-ram. The coal is dumped over a bar-screen chute on to a perforated shaker screen, which in turn feeds the coal to a 50-foot picking-table. An elevated rock-dump 160 feet in height is used in conjunction with the tipple, with a self-dumping skip operated by a 100-horse-power Ottumwa steam-driven hoist. The usual repair-shops for underground service are in close proximity to the tipple, consisting of machine, blacksmith, car-repair, and electric shops, with standard mine-gauge tracks running into each of them. There is also a railway-car repair and carpenter shop equipped with rip-saw, circular, boring-machine, and lathes.

THE WASH-HOUSE.

The main building is 120 by 40 feet and consists of four separate changing-compartments, providing 100 lockers to each compartment. The bath-room is situated in the centre of the building, giving easy access to the four compartments, and consists of thirty-six spray-baths

and eight hot- and cold-water taps over a 3- by 30-foot bench containing wash-basins. A dry-room is provided for extra-wet clothes; here the men may turn their wet garments over to the attendant and have them thoroughly dried for the next day. Two large rooms with lockers and shower-baths are attached to the main building, providing ample room for the firebosses and officials. A landing-platform, 120 by 40 feet, is laid along the front of the wash-house where the workmen's train arrives, thus giving ample room to the men in getting on and off the train.

FIRST-AID AND MINE-RESCUE TRAINING.

During the year first-aid and mine-rescue classes have been maintained and the following number passed examinations and received certificates: First year, 20; second year, 7; third year, 6; fourth year, 9; total passed examinations during the year, 42. Total certificated men in the Wellington Colliery, 170; total certificated mine-rescue men in the colliery, 54. A competent staff of first-aid men is always on hand ready for any emergency.

A modern ambulance (railway) car supplied with steam heat, hot and cold water, and fitted with bed, blankets, sterilizing outfit, and an adequate amount of bandages, splints, and the regular first-aid material, is constantly maintained in readiness within a short distance from the mine entrance. There is also fitted up first-aid rooms at Extension and South Wellington, with all the necessary equipment to provide for any emergency.

Rescue-training is carried out in an imitation mine-gallery which is maintained on the mine plant, with all the equipment that goes to make up the timbered roadways, caves, overcasts, and smoke-chamber. Bench-work is carried out in a separate building. The equipment consists of six 2-hour sets of the "Paul" breathing apparatus, one oxygen-pump, six oxygen-tanks, one pulmotor, and safety-lamps of the Wolf and Edison types.

LADYSMITH.

The shipping-point for the output of this colliery is at Ladysmith, where the coal is either shipped by vessel or railway-car by means of transfer-barge to the Mainland points.

The coal-washery is also situated at this point and consists of three washers of the following dimensions: Nos. 1 and 2, diameter 8 feet 9 inches; No. 3, diameter 8' feet 3 inches, depth 5 feet 9 inches; computed capacity of each washer, 200 tons for twelve hours. Six compartment jigs are situated on the lower floor and three Mascoe tables, 14 by 7 feet, which take care of the finer grades of coal, which produces a high-grade coal for steam, coking purposes, and foundry use.

Power for the washery is supplied by a Pelton wheel which is operated from the mountain water source. A 40-kw., 240-volt Allis-Chalmers-Bullock generator supplies power for lighting purposes in and around the washery, shipping, and wharves.

PROSPECTING.

Prospecting was carried on almost continually during the year 1924. Careful search was made along the outcrops to the south and east of Nanaimo river until contact was made with Haslam creek in the Cranberry and Bright districts. The seam was exposed principally on the southern outcrop. A good showing was made in the vicinity of Crystal lake.

The final location was made in Bright district, about three-quarters of mile from the Wellington Colliery main line, when a small slope was put down on the full dip of the seam, S. 40° W. (ast.), dip 25°, the dip retaining its regularity while seam is most irregular. The slope distance at present is about 650 feet and still advancing. Four boreholes were put down during the year, covering a total depth of 1,542 feet.

No. 1 MINE, EXTENSION.

James Strang, Manager; Thomas Wilson, Overman; John Greenhorn, David Gordon, Alex. Orr, William Bauld, and John Chester, Firebosses.

This mine is operating on what is known as the "Underlap" portion of the Wellington seam, which is very irregular in thickness and very much troubled with "folds," small faults, and "pinch-outs" or "wants." The method of mining at present is pillar and stall and the long-wall system; owing to the broken and dislocated conditions of the field, hand-mining is employed.

The development during the year has been concentrated on the West Incline and No. 6 East sections; the West incline was driven through a worked-out area to reach a territory of solid workable coal which was proven from the outcrop of the seam. This section is worked on the pillar-and-stall method, the seam averaging about 7 feet in thickness.

The No. 6 East section: This section is operated on the long-wall method, with a showing of 3 feet 6 inches of good hard coal and 2 feet 6 inches of shale. The seam is very undulating and troubled with "steps" and "rolls" in the floor of the seam. The haulage equipment consists of 100-horse-power Ottumwa electric-driven hoist situated at the top of the Main slope. Owing to the undulating ground in the No. 6 East section it is necessary to maintain a small 50-horse-power electric-driven hoist for haulage purposes. Edison storage-battery electric safety-lamps are in use throughout the mine; only firebosses use safety-lamps of the Wolf type for gas-testing purposes. All blasting is done with permitted explosives fired by electric batteries.

The mine is ventilated by a Murphy-type exhaust-fan with a capacity of 40,000 cubic feet of air a minute, against a 1.9-inch water-gauge, driven by an Allis-Chalmers-Bullock motor.

On the last inspection of this mine it was found to be free from coal-dust; the air measurements, 21,600 cubic feet of air a minute on the main intake, divided in two splits, for the use of fifty-two men and three mules.

No explosive gas was found. Timbering and roadways were in good condition throughout the mine.

Burrell gas-detector test made during this inspection at last working-place showed 0.1 per cent. methane.

No. 2 MINE, EXTENSION.

James Strang, Manager; Robert L. Spruston, Overman; Robert N. Hamilton, Joseph Watson, Jno. Davidson, Edward Heyes, William Gilchrist, Wm. Wesnedge, David Crawford, and Geo. Carson, Firebosses.

During the year all development-work has been concentrated on the No. 4 East motor-road, which turns off at the end of the Main tunnel and continues to the No. 17 incline, a distance of 2¼ miles from the mine entrance. Three incline sections are operating off this motor-road. The East incline, driven up in close proximity to the outcrop of the seam, has Nos. 1 and 2 East levels developing on the pillar-and-stall system, the seam varying in thickness from 6 to 10 feet. Stalls are driven to the rise side of these levels, while some of the coal is recovered by the dip-slants. Pillar-extraction is carried out on the west side of this incline. The No. 2 Incline section (a distance of 3,500 feet from the East incline) is operated jointly on the long-wall and pillar-and-stall methods owing to the fluctuating conditions of the seam. At the present time there are the Nos. 1 and 2 East levels and the West levels operating. The No. 17 Incline section (a distance of 3,000 feet from the No. 2 incline) is operated on the long-wall method throughout, the seam varying at this portion of the field from 2 to 4 feet thick. A new electric-motor haulage-road is being driven from the end of the Main tunnel to the top of No. 17 incline, a distance of 1¼ miles. To facilitate the completion of this new road it is being driven from five different points and will make a splendid haulage-road when complete.

Edison storage-battery electric safety-lamps are used throughout the mine; only firebosses use safety-lamps of the Wolf type for gas-testing purposes. All blasting is done with permitted explosives fired by electric battery.

The mine is ventilated by a Murphy-type exhaust-fan with a capacity of 40,000 cubic feet a minute, against a 1.9-inch water-gauge.

On the last inspection of the mine 39,500 cubic feet of air a minute was measured passing into the mine, divided into two splits.

In the No. 1 split there was 20,400 cubic feet of air a minute passing for the use of forty-four men and seven mules.

In No. 2 split there was 18,900 cubic feet of air passing for the use of thirty-two men and four mules.

No explosive gas was found. Timbering and roadways were in good condition and the mine free from coal-dust.

Burrell gas-detector tests were made at regular intervals in the various airways, showing from nothing to 0.2 per cent. methane.

No. 3 MINE, EXTENSION.

James Strang, Manager; Thomas Strang, Overman; Harry Mitchell, David Davidson, Daniel Campbell, James Nimmo, Patrick Malone, George Smith, and Andrew Campbell, Firebosses.

This mine is connected on to the Main tunnel at a point opposite No. 2 mine, where the motor haulage-road is continued into the slope, a distance of half a mile. Pillar-extraction is chiefly carried out in this mine; several small recovery developments are being extended with a view of recovering small areas of pillars that were abandoned in previous operations.

The haulage equipment consists of a 50-horse-power Ottumwa electric-driven hoist. The Main level haulage is operated by a Baldwin-Westinghouse 13-ton locomotive.

The mine is ventilated by a Guibal-type exhaust-fan with a capacity of 50,000 cubic feet of air a minute, against a 1.5-inch water-gauge.

This mine, like the Nos. 1 and 2 mines, is equipped with the Edison storage-battery electric safety-lamp; only firebosses use safety-lamps of the Wolf type for testing purposes.

All blasting is done with permitted explosives fired by electric battery. The quantity of air measured on the last inspection registered 26,000 cubic feet of air a minute passing into the mine, divided into two splits.

In No. 1 split there was 22,300 cubic feet of air a minute passing for the use of forty-three men and eight mules.

In No. 2 split there was 3,900 cubic feet of air a minute passing for the use of ten men and three mules.

No explosive gas was found. Timbering and roadways were in good condition and the mine free from coal-dust.

Burrell gas-detector tests were made at regular intervals in the various return airways, showing nothing to 0.2 per cent. methane.

No. 6 MINE, EXTENSION.

Thomas Wilson, Overman; Walter Joyce, Shiftboss; Robert Houston and Jno. McLeod, Firebosses.

This mine is opened up on the Wellington seam, about 1½ miles north-west of the Main tunnel, and is operating a small area of coal beyond the west boundary of the old workings of No. 1 mine. The Main slope, which follows the full pitch of the seam, is down a distance of 80 feet, with two pairs of levels on each side.

The method of work is pillar and stall, the seam varying in thickness from 4 to 9 feet. The method of haulage is by a 100-horse-power steam-hoist situated 600 feet from the mine entrance and a main rope.

During the last inspection 5,200 cubic feet of air a minute was measured passing into this mine for the use of thirty-two men and four mules.

No explosive gas was found. Timbering and roadways were in good condition and the mine fairly free from coal-dust.

The Burrell gas-detector failed to show any trace of methane.

The following are the official returns from the Wellington-Extension Colliery for the year ended December 31st, 1924:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	137,131			
" export to United States	42,082			
" " other countries				
Total sales		179,213		
Lost in washing	41,241			
Used under colliery boilers, etc.	18,208			
Total for colliery use		59,449		
		238,662		
Stocks on hand first of year	6,426			
" last of year	4,567			
Difference taken from stock during year		1,859		
Output of colliery for year		236,803		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
Supervision and clerical assistance	31		19		50	
Whites—Miners	342				342	
Miners' helpers	13				13	
Labourers	126		32		158	
Mechanics and skilled labour	20		35		55	
Boys			22		22	
Japanese						
Chinese	6		57		63	
Indians						
Totals	538		165		703	

REPORT BY H. DEVLIN, INSPECTOR, AND J. DICKSON, ACTING-INSPECTOR.

No. 5 MINE, SOUTH WELLINGTON.

Thomas A. Spruston, Manager; William Brown, Overman; Robert Ewing and Neil McIntyre, Firebosses.

This mine is situated at South Wellington, in the Cranberry district. It is operating in the Douglas seam, adjacent to the old Alexandria mine. The coal is shipped to Ladysmith and Mainland points over the Esquimalt & Nanaimo Railway, a small spur connecting the mine with the main line.

This mine was closed down on March 4th, 1924, owing to a slackness in the coal markets due to the extensive use of fuel-oil, and reopened again on November 13th for the purpose of operating the South Diagonal Slope district, where some very good coal is being mined on the pillar-and-stall method. A staff of men are engaged cleaning up and timbering the North side of the mine with a view of carrying on operations in the near future. (At time of writing this mine is again in full operation.)

The haulage equipment consists of a direct-driven steam-hoist, 18 by 36, situated on the surface and operating the Main slope. A 100-horse-power Ottumwa hoist hauls the output from the North Diagonal slope. The South side slope is operated by a 50-horse-power compressed-air-driven hoist. There are several smaller hoists situated throughout the mine to assist in local developments. A 6-ton Jeffery electric-driven locomotive handles the output from the South Diagonal slope to the Main slope.

The ventilation is produced in the mine by a No. 60 Keith-type exhaust-fan of 60,000-cubic-feet-a-minute capacity, against 1.9-inch water-gauge.

Power is supplied by four Goldie & McCulloch return-tubular boilers of 163-horse-power capacity each; one 250-volt d.c. Cracken-Wheeler generator of 112-kw. capacity, direct-coupled to a 15 by 14 Ideal engine; one 250-volt d.c. Allis-Chalmers generator, 112-kw. capacity, direct-coupled to 16 by 16 Skinner engine; one Sullivan air-compressor and supply-pump.

The tipple consists of a revolving dump, chain car-haul, shaker screens, picking-table, loading-boom, and suitable arrangements for conveying the boiler-fuel automatically when required.

The mine is equipped with the Edison storage-battery electric safety-lamps, with the Wolf-type safety-lamps used by firebosses only for gas-testing purposes. All blasting is done with permitted explosives fired by electric battery.

On the last inspection there was measured 35,000 cubic feet of air a minute passing for the use of thirty-three men and four horses.

No explosive gas was found. Timbering in good condition, excepting parts at present being repaired.

The Burrell gas-detector tests have been made taken at regular intervals in the various return airways, showing nothing to 0.3 per cent. methane.

The following are the official returns from the No. 5 South Wellington Colliery for the year ended December 31st, 1924:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	13,701			
" export to United States				
" " other countries				
Total sales		13,701		
Lost in washing	5,829			
Used under colliery boilers, etc.	1,660			
Total for colliery use		7,489		
		21,190		
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of colliery for year		21,190		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
Supervision and clerical assistance	3		2		5	
Whites—Miners	30				30	
Miners' helpers						
Labourers	12		7		19	
Mechanics and skilled labour	1		7		8	
Boys			6		6	
Japanese						
Chinese						
Indians						
Totals	46		22		68	

REPORT BY THOS. R. JACKSON, INSPECTOR.

COMOX COLLIERIES.

Charles Graham, District Superintendent.

These mines are situated in the Comox district, about 17 miles from Union Bay. A railway about 20 miles in length connects the separate mines to a shipping-point at Union Bay, over which the whole output of coal is conveyed. The mines in operation are Nos. 4, 5, and 6; the latter is a shaft acting as a means for drainage and intake air for No. 5 mine. No. 4 mine is located at the east end of Comox lake and is about 3 miles distant from the city of Cumberland. No. 5 mine is about a mile from the city. No. 6 is close to the city.

The mine ventilation of Nos. 1 and 2 slopes, of which No. 4 mine is comprised, is produced by two ventilating units. No. 1 slope fan consists of a 108-inch double-inlet reversible Sirocco fan on concrete base, with half-housing in steel, and connected to the mine by a reinforced-concrete tunnel fully equipped with explosion-doors. Fan running at 250 r.p.m. will deliver 200,000 cubic feet of air a minute, against a 6-inch water-gauge. The primary unit has a synchronous motor, 2,200 volts, equipped with self-starting unit. The motor runs 500 r.p.m. and is connected to the main shaft of the fan through a jack-shaft with silent chain-drive in two sections, each 15 inches wide; motor and fan-speed ratios, 2 to 1. The distance between centres of drive is 106 inches.

In addition to the primary drive there is an emergency unit, 350-horse-power induction-motor, speed 250 r.p.m., which can be connected by a coupling direct to the main shaft. This induction-motor is a duplicate of the motor now in use on the ventilating units of Nos. 4, 5, and 6 mines and can be used on any one of the three units. The power unit is housed in a fire-proof concrete building with asbestos roofing, making one of the most complete and efficient ventilating plants in the Province.

No. 2 slope consists of a Sullivan reversible fan, double-inlet, having a capacity of 180,000 cubic feet of air a minute, against a 6-inch water-gauge. This fan is also electrically driven by a 350-horse-power induction-motor, 2,200 volts, speed 250 r.p.m., and is directly connected to the fan-shaft.

ELECTRIC PLANT.

The hydro-electric plant of this company has been in constant operation during the year. Sufficient electricity is generated at this plant to supply motive power to all the collieries, the wharf at Union Bay, and for the lighting of Union Bay and Cumberland.

DIAMOND-DRILLING.

The year passed without any diamond-drilling being done.

DEVELOPMENT-WORK, NO. 4 MINE, COMOX.

All development-work in this mine has been abandoned. The extraction of the available pillars is being carried out in the various sections of the mine.

NO. 5 MINE, COMOX.

The Upper seam has been abandoned and all material withdrawn.

NEW DEVELOPMENT IN NO. 2 SEAM, NO. 5 MINE, COMOX.

Four slopes are being driven in this seam. These slopes are now down about 2,400 feet. A development-level has been turned off on each side of the slopes. A pillar 150 feet in thickness is being left between the return airways and the long-wall operations. Three of the four faces which it is proposed to open have been started and the fourth will be ready shortly. When these faces are completed an output of about 600 tons a day will be possible.

ACCIDENTS.

I am pleased to report that no fatal accidents occurred in either of the slopes of No. 4 mine, Comox, during the year.

DANGEROUS OCCURRENCES.

Regarding No. 4 mine, Comox, no report was brought to me in the matter of "dangerous occurrences" as required under the provisions of section 71 of the "Coal-mines Regulation Act."

I regret to report a "dangerous occurrence" which took place in No. 2 seam of No. 5 mine, Comox. This seam is in the course of development. In the month of May a large cave occurred in the West main slope, causing the instant death of two men and seriously injuring another, while one other got off with very slight injury.

From all the evidence adduced at the inquest no one was even partially aware of any existing danger in this portion of the slope. The two men injured were employed timbering where the upper end of the cave terminated. They are positive in their assurance that no signs of warning were given; that it came suddenly; and that they received their injuries due to the falling debris of the cave.

The place was seemingly well stringered and probably there would have been no accident had the precaution of carrying the centre props farther to the face of the slope been executed sooner. There being no appearance of immediate danger, the centre propping of this particular part of the slope was left to a future period.

INSPECTION ON BEHALF OF WORKMEN.

Advantage was taken, under provisions of Rule 37 of section 101 of the "Coal-mines Regulation Act," for the workmen to appoint their own "gas committee" for the purpose of examining the mine. This has been consistently adhered to and the reports furnished been generally satisfactory.

MINE-RESCUE AND FIRST-AID WORK.

I am pleased to report the following in connection with the above work:—Thirty-four members in the ambulance class qualified as follows: One for medallion, seven for labels, and twenty-six for vouchers and certificates.

At the Colliery Company's annual picnic held at Royston in the month of July two trophies were competed for—namely, the Sloan Shield and the Forcimmer Cup.

Wm. Beveridge's team was successful in winning the Sloan Shield and Jonathan Taylor won the Forcimmer Cup. The V.I.M.A. field meet was held in July at Cumberland and the following prizes were secured by the Cumberland contestants: The Mine-rescue Shield was won by Wm. Wood's team (captain), including J. Mutters, Tom Eccleston, Jr., J. Pinfold, H. Jackson, and H. Bates. J. Williams's team won second prize.

First-aid prizes were won by the following: Coulson Cup, Wm. Beveridge's team, second place; one-man event, Robert Reid, Beveridge patient; two-man event, J. Taylor and J. Williams, Davis patient.

The mine-rescue station is under the supervision of John Thomson and is equipped with ten sets of Paul mine-rescue breathing apparatus of the approved type. Other equipment necessary for the tear and wear in the upkeep of the machines in use is constantly on hand ready for use. No emergency calls for the machines were given during the year.

Two mine-rescue teams keep attending weekly at the station for training. They are recompensed by the company for this.

No. 4 MINE, COMOX.

William Walker, Manager; John S. Williams, Overman, No. 1 Slope; Charles Parnham, Overman, No. 2 Slope; Hugh McKinnon, Shiftboss, No. 1 Slope; Charles O'Brien, Shiftboss, No. 2 Slope; Sam Horwood, John Binnie, Richard Hodson, Wm. Devoy, Harry Jackson, D. P. Marsh, A. W. Watson, R. Reid, John Davis, Fred Hutchison, Tom Shields, Dan Morgan, Wm. Herd, Tom Lewis, J. H. Vaughan, William Beveridge, Robert Walker, Wm. Keenan, Jont. Taylor, Watkin Williams, and A. Jones, Firebosses.

This mine consists of two slopes with but one main entrance. There is also a manway part of the way. No. 1 slope is 7,000 feet in length, running due north. No. 2 slope is 9,000 feet long and runs N. 45° E. These slopes diverge at a point about 75 feet from the main portal. The electric haulage-engine is so connected that trips can be run simultaneously on both slopes to a point where they converge to the main entrance.

The men are conveyed from the bottom of these slopes in a man-trip at the end of each working-shift. A safety-car is connected to the rear of the empty trip, which ensures the workmen's safety while riding up the slope. As a precaution against trips breaking away on these slopes the car is now used behind all trips ascending the slopes.

The mine has been in continuous operation during the year, although not working full time. Safety-lamps of the Wolf type are used by the firebosses; electric lamps of the Edison storage-battery type are used by all other employees.

No. 1 Slope.

Electricity is used as the motive power to operate all pumps, winches, and motors. The extraction of pillars is general throughout the mine. Seam varies from 3 to 7 feet.

During my last visit of inspection in December I found the ventilation good generally, except in No. 5 East level and counter, where a through connection was required. Got no explosive gas and no gas-cap. Roadways in fairly good condition and timbering good. Sections fairly free from coal-dust owing to natural dampness. Many of the roads muddy. Some of the roadways contain water all over and as high as the rail.

Measured 119,120 cubic feet of air a minute passing into this mine through Main slope and manway portals.

Old Slope Split Section.—There was 10,000 cubic feet of air a minute passing for the use of fifteen men.

East Side Split Section.—There was 30,000 cubic feet of air a minute passing for the use of sixty-five men and eight horses.

Re fencing off abandoned places, No. 14 West level: To comply properly with the law of fencing off such places, the fence must be "securely," not "poorly," constructed and have a "danger" board attached.

This mine is remarkably clear of methane gas in the various return airways. In the lower levels the Burrell gas-detector tests show an average of 0.2 per cent. methane. At the fan the tests show an average of from 0.2 to 0.4 per cent. methane. In December the test was 0.3 per cent. methane. The report of analysis showed 0.24 per cent. methane. The quantity of air flowing into the fan was, according to my measurement, 56,000 cubic feet of air a minute.

No. 2 Slope.

Since the abandonment of advancing the mine-workings was decided upon, the lower level pillars have been extracted, the big pump withdrawn, and the water allowed to fill the voids until it reaches the proximity of No. 19 West level, where the water will be held by means of the big pump which will be installed a little way above this point on the slope, and the surplus drainage pumped away out of the mine.

This mine is also remarkably free from methane gas at the present time, due to the retreating system of working employed and also owing to the water filling the abandoned workings.

During my last visit of inspection in December I found the ventilation good generally. The roadways and timbering in fairly good condition, though the spragging of coal was a little bit under the standard. About 2 cubic feet of explosive gas was found in roof-hole above timbers on No. 19 East roadway. Curtain below hole to deflect air into it.

Coal-dust.—This mine is fairly free from coal-dust owing to natural dampness with water on many of the roadways.

No. 7 West Level Split.—There was 20,500 cubic feet of air a minute passing for the use of fifteen men and two mules.

West Side Split.—There was 11,500 cubic feet of air a minute passing for the use of twenty men and four mules.

East Side Split.—There was 11,500 cubic feet of air a minute passing for the use of twelve men and two mules.

No. 15 East Level Split.—There was 14,300 cubic feet of air a minute passing for the use of thirty-four men and five mules.

I measured at the fan 78,000 cubic feet of air a minute passing, and after making a Burrell gas-detector test I found the following reading: Test equals 0.5 per cent. methane; report of analysis mine-air sample, 0.5 per cent. methane.

I examined all reports as required under Rules 4 and 36 of section 101 of the "Coal-mines Regulation Act" and found the rules being complied with.

No. 5 MINE, COMOX.

Charles Graham, Manager; Robert Brown, Overman; Sam Jones, E. H. Devlin, and Robert McNeil, Firebosses.

The workings of this mine are reached by a shaft 280 feet deep and known as No. 1 seam. Not far from the shaft-bottom a slope has been driven down to another vein of coal called the Farm seam, officially known as No. 2 seam, and found at a depth of 115 feet below No. 1 seam.

The whole of the West side workings in No. 1 seam have been abandoned.

No. 2 seam, about 40 inches high, is still in the course of development. Sullivan type of coal-cutting machine is used at present in the narrow work. When the walls are opened up sufficiently to allow of a fair output of coal being made, the coal-cutting machines—at present idle, but equipped in conformity with the British electrical mining laws—will be put in operation.

The Edison electric safety-lamp is used for lighting. Firebosses use flame safety-lamps of the Wolf type for testing for methane. Only permitted explosives are allowed. No blasting is done without the use of cable and battery.

During my last inspection of this mine I found the ventilation, roadways, and timbering generally good. Sections practically free from coal-dust. Got from 10 to 15 cubic feet of explosive gas at face of No. 1 Main level and about 10 cubic feet at face of No. 3 slope.

There were twenty-eight men engaged in this seam. Measured 78,000 cubic feet of air a minute passing in the return slope of this seam.

Notice *re* explosive gas mentioned: "Brattice disordered on account of timbering and slightly behind. Arrangements made to have brattice repaired and gas removed immediately."

In the report of analysis on mine-air samples excess oxygen has been determined on three different occasions. So far I am unable to offer any solution to the phenomenon.

No oxygen apparatus, tanks, etc., are in the vicinity and so it becomes rather puzzling to understand how this excess oxygen comes to be in the mine air.

The average reading of the monthly reports of mine-air sample analysis is about 0.25 per cent. methane. For December the report is 0.24 per cent. methane.

No. 6 MINE, COMOX.

Charles Graham, Manager; Thomas Mordy, Overman.

No coal has been hoisted from this mine during the year. Practically all the water entering Nos. 5 and 6 mines is hoisted from No. 6 shaft by specially constructed tanks capable of delivering 1,200 gallons a minute.

During my last inspection I measured 24,000 cubic feet of air a minute passing into the mine. Got no gas. The general condition of the mine is fair.

The following are the official returns for the year ended December 31st, 1924, of the aggregate output of all the Comox Collieries:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	235,176			
" export to United States	2,754			
" " other countries				
Total sales		237,930		
Lost in washing	51,155			
Used under colliery boilers, etc	9,736			
Total for colliery use		60,891		
		298,821		
Stocks on hand first of year	5,634			
" last of year	9,663			
Difference added to stock during year		4,029		
Output of colliery for year		302,850		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
Supervision and clerical assistance	42		20		62	
Whites—Miners	110				110	
Miners' helpers	3				3	
Labourers	58		42		100	
Mechanics and skilled labour	81		71		152	
Boys			7		7	
Japanese—Miners	35				35	
Miners' helpers	27				27	
Labourers						
Chinese—Miners	80				80	
Miners' helpers	70		39		109	
Labourers	70				70	
Totals	576		179		755	

NORTHERN INSPECTION DISTRICT.

FROM REPORT BY T. J. SHENTON, INSPECTOR.

TELKWA COLLIERY, TELKWA DISTRICT.

Broughton & McNeil, Telkwa, Agents; R. Adamson, Mine Foreman.

Operation for the current year at this mine began January 26th and was suspended for the summer at the end of February. Operation was resumed on December 3rd and continued until the end of the year. The average number of men employed was eight.

Fair accommodation in bunk-house, dry-room, and mess-house is provided for the men, and the timbering, ventilation, and all other conditions of the operation are carried on under the directions of the "Coal-mines Regulation Act."

In my inspections during the first period of operation in January and February a violation of the "Coal-mines Regulation Act" took place in the refusal to obey the Act with reference to the exclusion of open lights and exclusive operation with safety-lamps.

J. Gillespie, mine foreman; J. Wilson, contractor; and J. McNeil, agent and operator, were prosecuted. The cases against Gillespie and Wilson were dismissed on the grounds stated by the Magistrate that operations had been carried out "in accord with the Act, as far as reasonably practicable," and the case of McNeil was sustained, he pleading guilty.

The resumption of operation, which took place in December, was under the competent management of R. Adamson, mine foreman, and on my visits of inspection I have found the law properly complied with.

The following are the official returns from the Telkwa Colliery for the year ended December 31st, 1924:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	1,228			
" export to United States				
" " other countries				
Total sales		1,228		
Used in making coke				
Used under colliery boilers, etc.				
Total for colliery use				
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of colliery for year		1,228		

Number of Hands employed, Daily Wages paid, etc.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		
Supervision and clerical assistance						
Whites—Miners	5	5.00			5	5.00
Miners' helpers						
Labourers			2	4.00	2	4.00
Mechanics and skilled labour			1	5.00	1	5.00
Boys						
Japanese						
Chinese						
Indians						
Totals	5		3		8	

NICOLA-PRINCETON INSPECTION DISTRICT.

REPORT BY JOHN G. BIGGS, INSPECTOR.

I have the honour to submit herewith my annual report as District Inspector of Mines for the Nicola-Princeton District during the year 1924.

The coal-mining companies operating in this district during the present year were as follows: The Coalmont Collieries, Limited; Middlesboro Collieries, Limited; Keystone Collieries, Limited; Princeton-B.C. Colliery Company, Limited; Tulameen Valley Coal Mine Company, and the Clear Mountain Coal Company, all of which were operating at the end of the present year, with the exception of the Clear Mountain Coal Company. The Keystone Coal Company is operating the property of the former Fleming Coal Company, while the Princeton Coal and Land Company was reorganized during the present year and is at present known as the Princeton-B.C. Colliery Company, Limited. The Tulameen Valley Coal Company is a new one mining coal near the town of Princeton.

The Coalmont Collieries, Limited, is again the largest producing company in this district and has operated with very little lost time during the year, while the rest of the mines have operated rather intermittently owing to the vagaries of trade.

ACCIDENTS.

It is a pleasure to report that no fatal accident occurred at the operating mines in this district during the present year.

MINE FIRES.

Spontaneous heating of the gobs has been one of the greatest sources of trouble encountered in operating coal-mines in this district, as these gobs are ready at all times to stimulate heating. They require very careful attention and provision should at all times be made to deal with them should they heat. Fortunately during the present year we have been very free from this source of trouble and in no case have we had any pronounced heating at the mines to deal with. Inspection of mines on behalf of workmen as provided by Rule 37 of section 101 of the "Coal-mines Regulation Act" has been taken advantage of at the large mines, while no attempt has been made at the smaller mines, which I presume is owing to the cost of making this inspection; in all cases these inspection reports have been very favourable and no danger has been reported.

I have found the general conditions of the mines to be fairly good during the year and only on rare occasions have I been able to find any trace of methane showing at the working-faces. A general use of the Burrell gas-detector is being made by the firebosses at the mines to test the return air-currents of the different splits. The percentage of methane is found to be rather low, most of the tests showing *nil* and in no case more than 0.2 of 1 per cent. I have taken samples in the return air at the different mines during the year and have forwarded them to the Department of Mines at Ottawa for analysis, and the percentage of methane in the returns have been found to range from *nil* to 0.12 of 1 per cent. methane.

Middlesboro Collieries, Ltd.

Head Office—Vancouver, B.C.

Capital, $1,107,700.

Officers.	*Address.*
E. W. Hamber, President,	P.O. Box 500, Vancouver, B.C.
G. S. Raphael, Vice-President,	P.O. Box 500, Vancouver, B.C.
Thos. Sanderson, Managing Director and Sec.,	P.O. Box 500, Vancouver, B.C.
C. M. O'Brian, Treasurer,	P.O. Box 500, Vancouver, B.C.
Robert Fairfoull, Mine Manager,	Middlesboro, B.C.

Value of plant, $250,000.

MIDDLESBORO COLLIERY.

Robert Fairfoull, Manager.

This colliery is situated 1 mile west of the city of Merritt and connected by a branch line of the Kettle Valley Railway. This portion of the field rises from the valley to a height of about 400 feet, the measures having a general pitch west of about 40°, with the various seams of coal cropping near the top of the hill. With the exception of the No. 4 East mine, all work at present is conducted in the measures lying above the level of the mine-tipple by slopes and levels driven into the side of the hill. The No. 4 mine is the largest and most important.

During March, 1924, the pillars in the No. 7 mine were drawn back to the surface croppings and as a result this mine, which has been operated for a number of years, was finished.

The No. 5 West mine, situated on the west side of Coal gully and operated in the No. 1 seam of this property, was drawn back to the entrance of the Main level and as a result was exhausted during the latter part of the year.

Two new openings have been developed during the year; the one known as "Dennison's mine" is situated 1,000 feet south of the entrance of No. 4 East by a Main level driven into the side of the hill a distance of 500 feet in a good seam of coal having a thickness of 5 feet. It lies at a steep angle of inclination, with chutes driven from the Main level to the surface croppings above for ventilation purposes.

A new mine is also being developed near the north boundary of this property to the west of Coal gully by a large well-timbered level and developing a seam of coal having a thickness of about 6 feet, overlain with a sand-rock roof. It lies immediately below the No. 1 seam, which was developed by the No. 5 West mine and is at present known as the No. 5 South.

No. 4 Mine.

James Fairfoull, Overman; William Halliman, Robert Drybrough, and Thomas Rowbottom, Firebosses.

This is the largest and most extensive mine operated by the Middlesboro Collieries and is developed by a well-maintained level 2,000 feet in length entering the foot of the hill on the same elevation as the mine-tipple and generally following the measures adjacent to and running parallel with the measures. It develops the Nos. 4, 5, 6, 8, and 9 seams, which are found generally to be lying at an inclination of 26° S.W., by means of branch drifts cutting across the measures to the different seams, which are from 5 to 6 feet thick and overlain with a shale roof.

All the work at present is to the raise of the No. 4 level. It is worked by a modification of the pillar-and-stall system, with headings driven from the Main level to the surface croppings, which are generally reached at a distance of 1,000 feet, where openings are made to the surface to facilitate the handling of timber and the ventilation. Owing to the high inclination of the seams the mine-cars are not taken off the Main level. Chutes are laid in the headings from the Main level, with bogie roads or small levels driven above and following the strike of the seams. The coal is loaded into small dump-cars at the faces and trammed by hand to the headings, where it is dumped into chutes, by means of which it is conveyed to the Main level and loaded into the mine-cars; these are drawn by mules to a landing, where the cars are collected into trips and hauled to the surface by main- and tail-rope haulage.

During the present year the pillars of the No. 9 section have been drawn back to the Main level and as a result this section of the mine has been abandoned. Operations in the No. 8 section of this mine are in close proximity to the Main level and as a result limited to a few months. The No. 4 Rock tunnel in No. 6 section has been extended a further distance of 200 feet during the year and a section of coal is being developed near the face of this level. With this exception all the work consists of the extraction of pillars.

The coal is somewhat friable and little blasting is required; "permitted explosives" are used and all shots fired by electric detonators under the supervision of certified officials appointed for that purpose.

Ventilation is produced by an 8.5 Sheldon steam-driven fan situated near the entrance to the mine and is so constructed as to be reversible when required; the great difference in elevation between the Main level and the surface outlets at the top of the hill produces a natural ventilation which greatly assists the mechanical ventilator.

During my last visit to this mine ventilation measured showed 30,000 cubic feet of air a minute passing into this mine, divided into two splits. No. 6 split was passing 13,000 cubic feet of air a minute for the use of thirty-one men; the No. 8 split was passing 13,500 cubic feet of air a minute for the use of seventeen men. Speed of fan, 120 r.p.m.; water-gauge, 0.6 inch.

The stoppings, doors, and brattice were in good order and the air well conducted around the working-faces, which were free from any trace of explosive gas. Burrell gas-detector tests made in the returns were as follows: No. 6 split, *nil;* No. 8 split, 0.06 of 1 per cent. methane.

The working-places were well timbered and a sufficient supply of suitable timber was provided for the use of the workmen. The headings and bogie roads were well timbered and in fairly good condition, while the Main level was well timbered and in good condition and, being naturally wet, was free from dangerous coal-dust.

No. 4 EAST MINE.

A. D. Allen, Overman; Lewis Clark, Fireboss.

This mine is situated 1,500 feet east of the entrance to No. 4 mine and has been developed by a pair of 15-per-cent. slopes driven to the dip and operating the No. 4 seam.

The measures in the lower section of this mine are irregular and "pockety," with some small sections of the seam attaining unusual thickness, while other sections will be practically pinched out. The area of the mine is somewhat limited and all the work done during the year has consisted of extraction of pillars in close proximity to the Main slope from the Nos. 5 and 6 West levels, the lowest being 1,200 feet from the entrance to the mine. The coal is trammed by hand from the faces to landings situated near the entrance to the Main slope and hauled to the surface in six-car trips by main-rope haulage.

Ventilation is produced by a small steam-driven double-inlet belt-driven fan situated near the entrance to the counter-slope, and during my last inspection was producing 11,000 cubic feet of air a minute for the use of twenty-one men. The air was well conducted around the working-faces, while the brattice and stoppings were in good order. Burrell gas-detector test showed the return air to contain 0.1 per cent. methane.

The working-places were well timbered and a sufficient supply of suitable timber provided for the use of the workmen; the roads were well timbered and in fairly good condition and, being naturally damp, were free from dangerous coal-dust.

No. 5 EAST MINE.

Andrew McKendrick, Overman; Matthew McKibben, Fireboss.

This is a small mine situated 300 feet north of the entrance to the old No. 7 mine at an elevation of 350 feet above the mine-tipple and operating the top section of the No. 5 seam by a 10-per-cent. slope driven from the surface; this follows the full pitch of the seam a distance of 600 feet, from which levels are commenced, spaced at about 100 feet, which follow the contour of the seam to the surface croppings. As a result the area of this mine is limited.

The seam is about 5 feet thick, subject to a great deal of minor faulting, with an irregular and rolling floor and overlain with a firm shale roof. Practically all the work consists of the extraction of pillars.

Ventilation measured showed 6,500 cubic feet of air a minute passing into this mine (produced naturally) for the use of thirteen men. The air is well conducted around the working-faces; the stoppings and brattice were in good order; the working-places were well timbered; a sufficient supply of suitable timber was provided for the use of the workmen; the roads were well timbered and in good condition; and a Burrell gas-detector test failed to show any trace of methane in the return air of this mine.

Main-rope haulage is used in this mine. A small compressed-air hoist is installed at the side of the slope which is used for collecting the loaded cars at the entrance to the different levels and hoisting them to a siding. They are then hoisted to the surface by means of a larger hoist situated near the entrance to the mine.

No. 5 SOUTH MINE.

Andrew McKendrick, Overman; George Walker and William Adamson, Firebosses.

This is a new prospect commenced during the present year, situated 900 feet north of the entrance to No. 7 mine on the west side of Coal gully and near the north boundary of this

property. It operates a seam of coal lying immediately below the workings of the No. 5 West mine, which is about 6 feet thick, overlain by a sand-rock roof, with a general pitch east of 30°. This mine is entered by a well-maintained 8 by 12 level, a short distance away and on the same elevation as the entrance to No. 5 West mine. It is driven into the side of the hill a distance of 100 feet, at the face of which a slope has been driven to the dip a further distance of 200 feet, from which levels have been commenced, following the contour of the seam to the surface croppings, for ventilation purposes.

I found the general conditions of this mine to be good; the roads and working-places well timbered and a sufficient supply of suitable timber provided for the use of the workmen; ventilation was fairly good for the use of fifteen men; Burrell gas-detector test, *nil*.

The loaded cars are hauled from the slope by means of main-rope haulage to the Main level, where they are collected and further hauled by horses to the foot of a surface incline; at the top of this is situated a hoist which draws the cars from the Nos. 5 East and 5 South mines to the top of the incline, where the cars are collected and lowered over a gravity-plane to the mine-tipple.

The coal at these mines is mined by hand and blasted, when required, by explosives of the "permitted class," and all shots are fired by electric detonators under the supervision of certified officials appointed for this purpose. Edison electric safety-lamps are used by the workmen underground and safety-lamps of the Wolf type are used by the officials for inspection purposes. The coal from the various mines is hauled in cars having a capacity of 1.5 tons to a common tipple, where it is dumped by a Phillips crossover dump; a switchback and car-haul brings the cars back, where they are collected and arranged into trips for whatever mine they may be required.

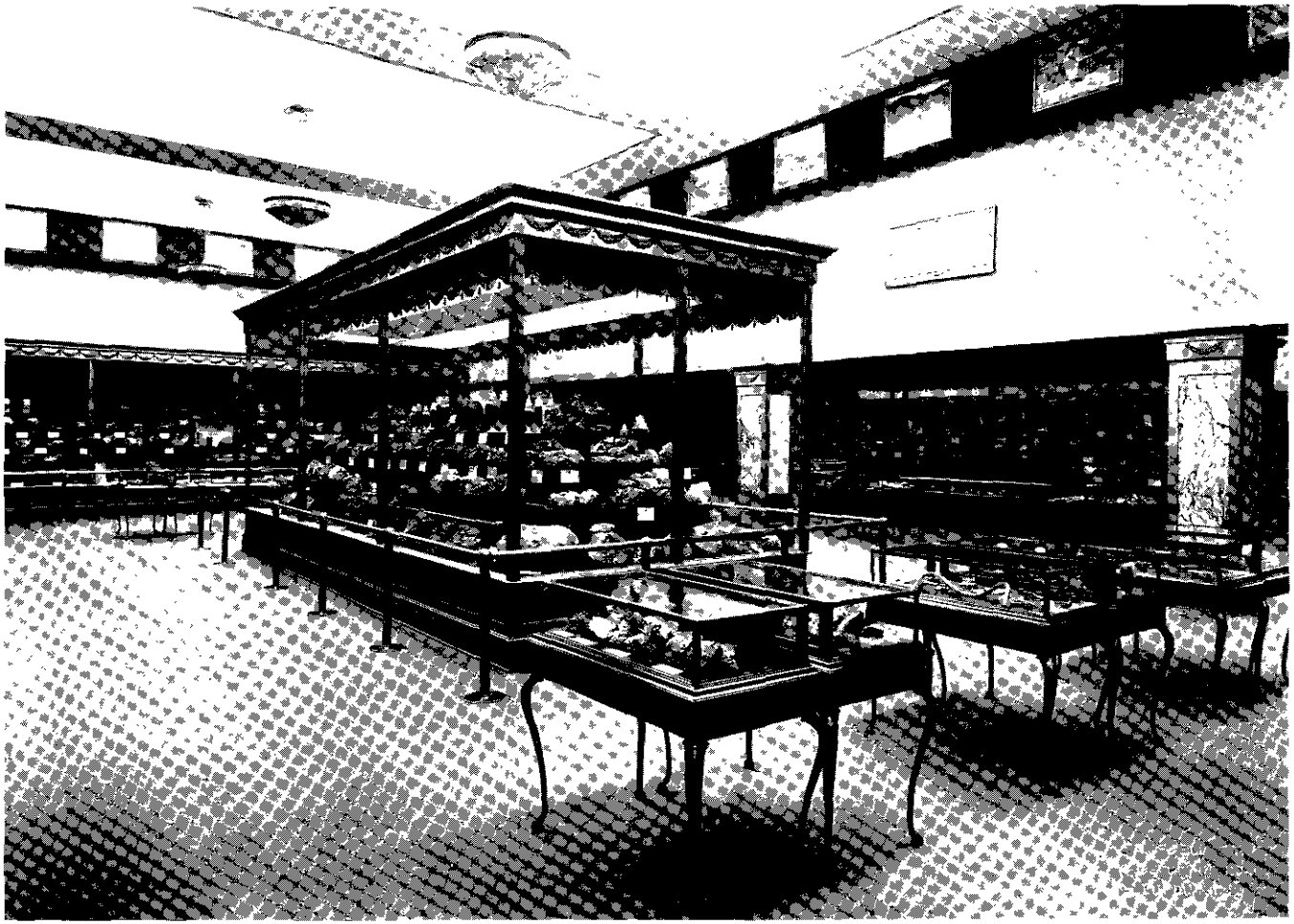
The coal passes to a shaking screen which allows the slack to pass into a hopper and the large coal passes over a picking-table 42 feet in length, where the rock and waste are extracted before loaded into the railway-cars.

To facilitate the loading of box cars a Christy box-car loader is provided. There has been no change made during the year in the power plant, which is situated near the tipple and consists of four return-tubular boilers with an aggregate of 600 horse-power. A Canadian Rand cross-compound air-compressor with a capacity of 2,000 cubic feet of free air a minute is used for providing power for driving the mine-hoists, etc., and a 2,300-volt alternating generator is in use for pumping and lighting purposes.

Copies of the "Coal-mines Regulation Act" and special rules, also plans of the mines, are posted near the entrance to the several mines.

The following are the official returns from the Middlesboro Colliery for the year ended December 31st, 1924:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	54,591			
" export to United States				
" " other countries				
Total sales		54,591		
Used in making coke				
Used under colliery boilers, etc	5,885			
Total for colliery use		5,885		
		60,476		
Stocks on hand first of year	448			
" last of year	380			
Difference taken from stock during year		68		
Output of colliery for year		60,408		



Canadian Mineral Exhibit, Wembley, 1924.

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		
Supervision and clerical assistance	11		5		16	
Whites—Miners	64	5.00 - 9.00			64	
Miners' helpers	18	4.20			18	
Labourers	45	4.00 - 5.00	22	4.30 - 4.70	67	
Mechanics and skilled labour			11	4.25 - 5.80	11	
Boys			6	2.25 - 2.75	6	
Japanese						
Chinese						
Indians						
Totals	138		44		182	

Clear Mountain Coal Company, Ltd.

A. E. Crain, Agent, Vancouver, B.C.

This company was organized and commenced operating lignite-beds situated on Hat creek, 30 miles north of Ashcroft and 15 miles from Pavilion, a small settlement situated on the Pacific Great Eastern Railway.

Underground and surface operations were carried on in a section of this field lying in the valley or flat of the creek-bed. The seam is overlain with surface drift having an average thickness of 8 to 12 feet. During the early part of the year a large amount of this overburden was cleared to the croppings of the coal-bed, which is found to stand on end and to be of considerable thickness.

A small incline trestle and a coal-bunker were erected near this open-cut and provided with mine-track and a small gas-hoist. This latter is used to haul the coal from the cut to the bunker; it, however, was never operated as the small production made was taken from the underground workings.

At the foot of the north bank of the creek a level was commenced from the surface croppings, cutting across a section of the seam of coal which stands vertically for a distance of 180 feet. It proves the seam at this point to be at least the above thickness, while the face of this level at the time work ceased was in coal.

During the present year this company shipped 123.2 tons of coal to the Coast. It was hauled by motor-trucks from the mine to Pavilion, a distance of 15 miles. The operations, however, were small and intermittent and owing to financial troubles the company ceased to operate in June, 1924.

The following are the official returns from the Clear Mountain Colliery for the year ended December 31st, 1924:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	1,100			
" export to United States				
" " other countries				
Total sales		1,100		
Used in making coke				
Used under colliery boilers, etc.				
Total for colliery use				
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of colliery for year		1,100		

Number of Hands employed, Daily Wages paid, etc.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
Supervision and clerical assistance			2		2	
Whites—Miners	1				1	
Miners' helpers						
Labourers						
Mechanics and skilled labour						
Boys						
Japanese						
Chinese—Miners	3				3	
Miners' helpers	2		2		4	
Totals	6		4		10	

Keystone Coal Company, Ltd.

John T. Brown, Manager; Richard Dunnigan, Fireboss.

This company was organized during the year 1923 to operate the property of the Fleming Coal Company, situated 2 miles from Merritt and operating in the north-west portion of the Nicola basin.

During the early part of the year work was of an exploratory nature and during April coal was shipped from an opening situated near the west portion of the basin from the No. 3 seam. This consisted of a strip of coal situated west of the stalls off the No. 1 level of the old No. 3 mine and the surface croppings known as the "big showing." The seam at this point has a thickness of about 12 feet of practically clean coal, overlain with a sandstone roof.

The operations are on a small scale and consist of the extraction of pillars, which are reached from the surface by small slopes, seven men being employed underground and operating on the single shift. The mine-cars are drawn to the surface by main-rope haulage, a small steam-hoist and a 25-horse-power vertical boiler being used for this purpose. The cars are

collected at a surface landing situated near the entrance to the slopes and lowered by main-rope haulage a distance of 2,000 feet to the top of the surface incline; then lowered a further distance of 2,000 feet over this gravity-plane in six-car trips to the tipple.

I found the ventilation to be satisfactory and no trace of methane in the working-places; the roads were well timbered and a sufficient supply of suitable timber provided for the use of the workmen; the mine, being naturally damp, is free from dangerous coal-dust.

The coal is of a friable nature and in the extraction of pillars very little blasting is required. "Permitted explosives" are used and all shots are fired by electric detonators under the supervision of certified officials appointed for this purpose. Edison electric safety-lamps are used by the workmen, while safety-lamps of the Wolf type are used by the officials for inspection purposes.

There has been no change made in the surface plant during the year. The main power plant was not used, as with the exception of a little power required to haul the cars from the mine the remainder of the haulage is by gravity to the tipple.

The following are the official returns for Keystone Colliery for the year ended December 31st, 1924:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	4,737			
" export to United States				
" " other countries				
Total sales		4,737		
Used in making coke				
Used under colliery boilers, etc.	158			
Total for colliery use		158		
		4,895		
Stocks on hand first of year				
" last of year	35			
Difference added to stock during year		35		
Output of colliery for year		4,930		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		
Supervision and clerical assistance	2	6.00	1	7.00	3	
Whites—Miners	3	5.00			3	
Miners' helpers	3	4.25			3	
Labourers			3	4.00	3	
Mechanics and skilled labour			2	4.75	2	
Boys						
Japanese						
Chinese—Labourers						
Indians						
Totals	8		6		14	

Coalmont Collieries, Ltd.

Head Office—Coalmont, B.C.

Capital, $3,000,000.

Officers.	*Address.*
W. J. Blake-Wilson, President,	Vancouver, B.C.
Gen. J. W. Stewart, Vice-President,	Winnipeg, Man.
A. H. Douglas, Secretary,	Vancouver, B.C.
D. J. McLeod, Treasurer,	Vancouver, B.C.
Donald McLean, Manager,	Coalmont, B.C.

COALMONT COLLIERY.

Donald McLean, General Manager; George Murray, Manager.

This colliery is located on the west bank of the North fork of Granite creek, 4½ miles by wagon-road from Coalmont, which is situated on the Kettle Valley Railway, 12 miles west of Princeton.

The mines are at an elevation of 3,600 feet and 1,600 feet above the mine-tipple at Coalmont, with a unique method of coal transportation adopted by way of an overhead tramway 2½ miles in length between the mine and the tipple in buckets having a capacity of 1 ton.

The coal-bed operated until the present year lies in a synclinal basin cropping on the side of the mountain to the west. The basin is approximately 3,000 feet in length and has a width of 1,800 feet of workable coal, with an aggregate thickness of 160 feet. With such a large body of coal it is natural to expect interspersed bands of foreign material in the form of bone and shale; also with such conditions prevailing it is found advisable in laying out the workings to select the cleaner section of coal to be mined, which is found in the upper section and about 12 feet thick.

This basin has been developed by two pairs of large and well-maintained, distinct, and separate adit-levels following the strike of the seam to the fault, with a pillar of coal from 100 to 150 feet thick left intact between the levels as a protection against spontaneous action taking place, and are known as the Nos. 2 and 3 mines. From the No. 2 mine all operations were conducted to the raise of the levels to the surface croppings, which were generally reached at a distance of 700 feet, while the operations in the No. 3 or Wilson tunnel are conducted to the dip of the Main level by slopes.

The prevailing tendency at Coalmont follows much the same lines as most of the mines in this district, with mining difficulties greatly increased with depth, for not only the coal but the measures are found to be much more friable, requiring the working-faces to be timbered with heavy framed sets and lagged ahead of the timbers, while in the lower portion of the mine the roads contract very quickly owing to the ground "swelling," with the result that it is hard to maintain roads as the timbers require to be changed very frequently.

No. 3 MINE.

James Webster, Overman; Thomas Leeman, William Ross, Benjamin R. Barlow, Jim Simm, Joseph Thompson, and Thomas Bysouth, Firebosses.

The entrance to this mine is situated on the same elevation as the top terminal of the overhead tramway, and has been developed by a well-maintained 8 by 12 level following the strike of the seam a distance of about 3,000 feet; it is known as the Wilson tunnel, with practically all the operations to the dip of this level, which have been developed by three sets of main slopes, known as the Nos. 1, 2, and 3 slopes, and extended a distance of 1,350, 1,650, and 800 feet respectively. They follow the pitch of the seam, with levels driven from these slopes intermittently following the strike of the seam and making the pillars unusually large as a protection to the roads.

There is very little development being done in this mine at present. The pillars in the No. 3 slope have been drawn back to the Main level during the present year, while advance operations in the No. 2 slope have reached an economic limit, and as a result preparations are

being made for the commencement of extraction of pillars. Operations in the No. 1 slope are at present advancing, while pillars to the east of this slope are being extracted.

Generally the measures to the dip are subject to "squeeze," with the floor heaving and the roof weighing heavy on the timbers, making it hard to maintain roads; the roads and working-faces are timbered with heavy framed sets. The cars are hauled from the working-faces by mules to landings situated near the entrance to the levels and hauled by main-rope haulage to the Wilson tunnel, where they are collected in large trips and again hauled by a trolly-motor to the top terminal of the overhead tramway.

Ventilation is produced by a 7-foot double-inlet Sirocco belt-driven fan driven by a 75-horse-power a.c. constant-speed motor situated near the entrance of the counter-level and so arranged as to be reversible if required. During my last inspection it was producing 37,000 cubic feet of air a minute, against a 0.9-inch water-gauge, which was divided into three splits.

Ventilation measured showed 9,450 cubic feet of air a minute passing into the No. 1 slope for the use of nineteen men. Burrell gas-detector test in the return air of this split showed it to contain 0.1 per cent. methane.

The No. 2 split was found to be passing 14,000 cubic feet of air a minute for the use of twenty-four men; Burrell gas-detector test, *nil*. The inside split was found to be passing 8,875 cubic feet of air a minute for the use of twelve men; Burrell gas-detector test in the return, *nil*. The air was well conducted around the working-places, which were free from any trace of explosive gas, while the doors and stoppings were in fairly good order.

The working-places were well timbered and a sufficient supply of suitable timber was provided for the use of the workmen, while the roads were well timbered and in fairly good condition and, being naturally damp, were free from dangerous coal-dust.

No. 4 MINE.

This is a new mine developed during the present year and situated 5,400 feet west of the entrance to No. 3 mine and operating in the Coalmont field on the west side of the "Wilson fault." It has been developed by an 8 by 12 well-timbered level entering the side of the hill on the west side of the North fork of Granite creek and at an elevation of 4,000 feet. The coal is found to be cropping and pitching into the side of the hill at an angle of about 30°. The present tunnel was commenced below and cuts across the measures and enters the seam at a distance of about 300 feet from the portal. Operations are at present in the same seam of coal on the opposite side of the fault, which is found to maintain its usual good quality, from 10 to 12 feet thick of clean coal, with the measures fairly firm, and as a result mining conditions are favourable.

Headings have been driven from the face of the Main level, following the full pitch of the seam to the surface croppings above, for ventilation purposes, and slopes have been driven to the dip a distance of about 300 feet, with a pitch north of 23°, which have been connected with the workings above and complete the ventilation system.

During my last visit to this mine ventilation measured showed 9,000 cubic feet of air a minute passing into this mine for the use of twenty men, which was well conducted around the working-places, which were free from any trace of methane. The working-places were well timbered and a sufficient supply of suitable timber was provided for the use of the workmen. The roads were well timbered and in good condition and, being naturally damp, were free from dangerous coal-dust. During the early part of December all operations at this mine were suspended for a short time and work concentrated on the No. 3 mine.

The opening of this new mine necessitated a large amount of constructive work at the surface during the year; a wagon-road was built from the entrance of the No. 2 mine, following the contour of the hill a distance of about 1 mile to the entrance of No. 4 mine, which was used for hauling material and equipment, and a small bunker was erected. The coal during the early part of the year was hauled by motor-trucks to the entrance of No. 3 mine and loaded into the mine-cars, a light railway following the contour of the hill on the same elevation as the top terminal of the overhead tramway, and about 1¼ miles in length, to the foot of a 30° surface incline 800 feet in length, by means of which the mine-cars are lowered in six-car trips to a siding on the railway, where they are again collected in larger trips and hauled by a 15-ton locomotive to the top terminal of the overhead tramway.

This mine has been provided with telephones. High-power lines and a transformer-house have been erected near the entrance to the mine. The present plant at the mine is of a temporary character and consists of two small vertical boilers used to provide power to drive a mine-hoist, small air-compressor, and a small mine-pump.

The power plant of this colliery is situated at Coalmont, 4 miles from the mining operations, and consists of two 250-horse-power water-tube boilers used for driving a 600-horse-power cross-compound Corliss engine coupled direct to a G.E. 3-phase alternator. Part of this power is used direct for lighting and driving motors at the tipple and also lighting purposes at the town. The electric power is transformed near the power-house to 10,000 volts and transmitted to the mine by high-tension wires, where it is again reduced to 550 volts for driving an air-compressor, mine-fan, mine-hoists, trolly-motor, and other power purposes at the mine. An auxiliary steam plant consisting of two Jencks return boilers is situated at the mine and is used for driving a steam-driven air-compressor and also for heating the machine-shops, rooming-house, wash-house, and offices.

There has been very little change made in this plant during the present year, which, along with the overhead tramway, has been operated successfully and caused very little trouble. The buckets are the body of the mine-car, which are lowered from the tramway by means of carrier-arms to the mine-car frame and have a capacity of 1 ton. They are hauled to the various sections of the mine and loaded and again returned to the tramway, where the body of the car is again hoisted to the tramway by compressed-air hoists and attached to the travelling cable by means of grips. The lower terminal at the tipple is provided with automatic detachers and attachers, the buckets running by gravity to the dump and emptying into a chute connected to a Marcus shaking screen. This at present produces three classes of coal. The buckets make a return trip in about an hour and a quarter and there are a total of eighty buckets on the tramway, delivering to the tipple approximately 1 ton of coal a minute.

Accommodation for Employees.—A large and commodious rooming-house is situated at the mine and is furnished to accommodate seventy-five men. This building is steam-heated and electric-lighted and all bedding and furnishings are provided by the company to assure cleanliness and comfort for the employees. This rooming-house is connected by a covered passage-way to a large combined change and wash room, steam-heated, provided with shower-baths, wash-basins, lockers, and large lavatory which includes every convenience.

A large dining-room well provided and comfortably furnished with steam heat and electric lights with accommodation for about 150 men is situated at the mine. A well-appointed doctor's office and first-aid room is provided at the mine, supplied with hot and cold water, with the doctor and a first-aid man in daily attendance.

During the year a mine-rescue station has been erected at this mine and provided with a smoke-room, which will be used for training employees in this class of work. Five sets of the latest type of Gibbs apparatus, with force-pump, pulmotor, and a supply of regenerators and oxygen, are provided.

Edison electric safety-lamps are in use by all the employees underground at this colliery, while safety-lamps of the Wolf type are used by the officials for inspection purposes. Permitted explosives of the "permitted class" are used by the miners underground and all shots are fired by electric batteries under the supervision of certified officials, while copies of the "Coal-mines Regulation Act" and special rules are posted near the entrance to the mine.

The following are the official returns from the Coalmont Colliery for the year ended December 31st, 1924:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	121,665			
" export to United States	20,048			
" " other countries				
Total sales		141,713		
Used in making coke				
Used under colliery boilers, etc.	7,367			
Total for colliery use		7,367		
		149,080		
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of colliery for year		149,080		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	12	7.41	11	7.33	23	7.37
Whites—Miners	123	9.00			123	9.00
Miners' helpers						
Labourers	64	5.27	53	4.78	117	5.04
Mechanics and skilled labour	1	6.00	15	5.59	16	5.62
Boys			4	3.48	4	3.48
Japanese						
Chinese			1	2.75	1	2.75
Indians						
Totals	200		84		284	

Princeton-B.C. Colliery Co., Ltd.

Head Office—15 Great St. Helens, London, E.C.

Capital, $1,000,000.

Officers.	*Address.*
Geo. A. Stringer, Chairman,	Wakefield, England.
R. B. Glover, Vice-Chairman,	Mossley, Manchester, England.
R. L. Taylor, Secretary,	London, England.
Francis Glover, Superintendent,	Princeton, B.C.

Value of plant, $77,000.

PRINCETON COLLIERY.

Francis Glover, Manager.

This colliery is situated at Princeton and has been operated for a number of years by the Princeton Coal and Land Company, Limited. This company was reorganized during the present year and the property is being operated now by the Princeton-B.C. Colliery Company, Limited.

The No. 1 mine, which is by far the oldest and most important on this property, has been developed from the surface by means of slopes extending a distance of about 2,400 feet in length. It was drawn back to the surface croppings during the present year and abandoned in October, 1924.

The No. 2 mine, commenced during the year 1922, is situated 1,500 feet south-east of the entrance to No. 1 mine and operating the No. 1 seam east of the workings of the No. 1 mine. It was always considered more or less as a prospect, and as the coal was found to be of an unsatisfactory character it was abandoned in December, 1924.

NEW SHAFT MINE.

Allen Ford, Overman; Frank Lester, Fireboss.

This new mine is situated in the town of Princeton, a short distance north of the Great Northern Railway bridge on the river-flats and about 300 feet from the railway. It develops the No. 1 seam of this property on the north side of the Similkameen river.

This seam of coal has been developed by a 7- by 9-foot shaft lined with reinforced concrete from the surface to the coal-seam. It will be ultimately used as an upcast or air-shaft. The seam was encountered at a depth of 98 feet, the upper section of which was found to be about 11 feet in thickness, of practically clean coal, pitching south at an angle of 12°. It has an overburden at this point of about 80 feet of sandstone and shales, with a fairly firm shale immediately above the coal-seam. On my last inspection I observed that a level had been driven to the west a distance of 75 feet, which was well timbered with heavy framed sets and well lagged above, while a short distance from the foot of the shaft a slope had been commenced which will be used as a sump and water storage.

The present equipment is of a temporary character and consists of a 35-horse-power locomotive-type boiler used for driving a small 10 by 10 steam-driven Ingersoll-Rand air-compressor, mine-pump, and small winding-engine. A small single cage is used for winding purposes and a light mine-car having a capacity of about 800 lb. Ventilation is at present produced by a 12-inch circular galvanized-iron pipe reaching from the top of the shaft to the face of the level. I found the ventilation to be fairly good, with no trace of methane. The working-faces were well timbered and a sufficient supply of suitable timber was provided for the use of the workmen, six men being employed underground.

Edison electric safety-lamps are used by the workmen, while safety-lamps of the Wolf type are used by the officials for inspection purposes.

A small dump or hopper is built from the top landing from the head-frame, into which the coal is dumped as it is taken from the mine; from this it is again loaded into a motor-truck and taken to the No. 1 mine tipple for screening and loaded into the railway-cars for shipment.

The following are the official returns from the Princeton Colliery for the year ended December 31st, 1924:—

SALES AND OUTPUT FOR YEAR. (Tons of 2,240 lb.)	COAL. Tons.	COAL. Tons.	COKE. Tons.	COKE. Tons.
Sold for consumption in Canada	7,365			
" export to United States	410			
" " other countries				
Total sales		7,775		
Used in making coke				
" under colliery boilers, etc.	2,033			
Total for colliery use		2,033		
		9,808		
Stocks on hand first of year	12			
" last of year	66			
Difference taken from stock during year		54		
Output of colliery for year		9,862		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND. No. employed.	UNDERGROUND. Average Daily Wage.	ABOVE GROUND. No. employed.	ABOVE GROUND. Average Daily Wage.	TOTALS. No. employed.	TOTALS. Average Daily Wage.
		$		$		$
Supervision and clerical assistance	2	5.50	4	5.40	6	5.45
Whites—Miners	9	5.00			9	5.00
Miners' helpers	3	4.68			3	4.68
Labourers			5	3.42	5	3.42
Mechanics and skilled labour	3	4.40	5	4.68	8	4.57
Boys	1	3.20	1	2.75	2	2.97
Japanese						
Chinese						
Indians						
Totals	18		15		33	

TULAMEEN VALLEY COAL-MINE.

Howell John, Manager.

This is a new coal property discovered during 1924, situated about 2 miles west of Princeton, on the west bank of the Tulameen river. It is accessible by a fairly good wagon-road following the north bank of the river from Princeton. The present opening is on the same elevation and about half a mile west of the Kettle Valley Railway.

These operations at present are small, yet conditions appear very favourable and there is every indication that a most important mine will be developed on this property. It is owned by Charles Hunter, who has been engaged in ranching on the river-flats for some time. A level tunnel was driven at the foot of the hill for a distance of 75 feet, which exposes a large seam of high-grade lignitic coal; the upper portion of this seam is about 11 feet in thickness and consists of practically clean coal, pitching west at an angle of about 8°. Mining operations were commenced as the coal found a ready market for domestic purposes.

On my last visit to this mine I found the Main level had been driven a distance of about 300 feet from the portal, and was well timbered with heavy framed sets 8 feet in width inside the

timbers. The counter-level was driven a distance of about 200 feet from the portal, 6 feet in width inside the timbers, leaving the pillars about 100 feet square.

I found the general conditions to be very good. Ventilation at present is produced naturally for the use of six men. The faces were well timbered and a sufficient supply of suitable timber was provided for the use of the workmen. The coal is mined by hand, the object being to get as large percentage of large coal as possible. Explosives used are of the "permitted class" and all shots are fired by electric detonators under the supervision of a certified official. Wheat electric head-lamps have been adopted for use by the workmen and Wolf lamps are used by the official for inspection purposes.

The present equipment is of a temporary character and no power plant has been installed. The coal is trammed to the surface by hand; a small bar-screen has been erected near the entrance to the counter-level, over which the coal is dumped, sized, and loaded into motor-trucks for delivery. A portion of the output is at present being hauled by motor-trucks to the depot at Princeton and loaded into railway-cars for shipment. A spur is now being laid from the main line of the Kettle Valley Railway, which is close to the present entrance to this mine. This spur will greatly increase shipping facilities and I expect it will be in operation during the early part of 1925.

The following are the official returns from the Tulameen Valley mine for the year ended December 31st, 1924:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	1,050			
" export to United States				
" " other countries				
Total sales		1,050		
Used in making coke				
" under colliery boilers, etc				
Total for colliery use				
Stocks on hand first of year				
" last of year	25			
Difference added to stock during year		25		
Output of colliery for year		1,075		

Number of Hands employed, Daily Wages paid, etc.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	1	6.50	1	4.00	2	5.25
Whites—Miners	5	6.50			5	6.50
Miners' helpers						3.65
Labourers			3	4.00 & 3.00	3	
Mechanics and skilled labour						
Boys						
Japanese						
Chinese						
Indians						
Totals	6		4		10	

EAST KOOTENAY INSPECTION DISTRICT.

REPORT BY ROBERT STRACHAN, SENIOR INSPECTOR.

I have the honour to submit the annual report covering the coal-mines in operation during the year 1924 in the East Kootenay Inspection District.

This district is directly in charge of John MacDonald, Inspector of Mines, with office in Fernie, and attached to this report is his description of the various mines in operation and the conditions which prevail in and around them.

The collieries in operation in 1924 were the same as in the previous year—namely, Coal Creek and Michel Collieries, owned by the Crow's Nest Pass Coal Company, Limited, Fernie, and the Corbin Colliery, previously owned by the Corbin Coal and Coke Company, Limited, now under the name of the Corbin Coals, Limited, with headquarters in Spokane, Washington, U.S.A.

No attempt has been made during the year to reopen either the Morrissey or Hosmer Collieries, the former owned by the Crow's Nest Pass Coal Company, Limited; the latter by the Canadian Pacific Railway.

At Coal Creek only five mines were operated during the year, and one of these (No. 9) was mostly exploratory work, producing very little coal.

At Michel three mines were maintained operating, but only two produced coal, the No. 3 East being simply maintained in a state of repair.

At Corbin a reorganization in the company took place; the Corbin Coal and Coke Company went out of existence and was replaced by the Corbin Coals, Limited; Nos. 4 and 6 mines were operated as in 1923.

Production of coal was interrupted during the year owing to the failure of the workmen and the companies to arrive at a new agreement as to wages on the termination of the old one on March 31st. While negotiations to arrive at a solution of the trouble were carried on previous to the termination of the old agreement, the failure caused the miners to walk out on April 1st and only such workmen as were required for the maintenance of the mine were left. The operators proposed a reduction equal to the cost of living bonus, amounting to $1.17 per employee per day, on an agreement for one year, while the miners through their representatives proposed a continuation of the old agreement for a period of three years, which resulted in a deadlock.

Attempts were made both by the Dominion Department of Labour and the Alberta Government, in which Province the big majority of the mines concerned in the dispute are situated, to bring about an agreement. Notwithstanding this, it was October 20th before work was resumed, practically on the agreement proposed by the coal operators. The Crow's Nest Pass Coal Company proposed a separate agreement for their workmen, based on a scale higher than the scale enjoyed by the Vancouver Island miners on a four or five years' agreement, but this was rejected. The idea of having a long-time agreement was to eliminate the continual interruptions of work, which prohibits the making of lengthy contracts with the coal consumer.

When the new agreement came into operation on October 20th the long stoppage had so disorganized the coal markets that Coal Creek mines did not reopen till the end of the month, and were closed down for an indefinite period on November 7th owing to the lack of demand for coal.

Michel and Corbin mines worked irregularly from October 20th till the end of the year.

Coal Creek mines remained idle until about the middle of December, when a local agreement was arrived at between the workmen at Coal Creek and the Crow's Nest Pass Coal Company, based on a 55-per-cent. increase over the wages paid during the year 1914. This is to last for three years and three months, or until March 31st, 1928, and work was resumed on December 22nd.

Owing to these causes, therefore, Michel and Corbin mines were idle twenty-nine weeks and Coal Creek thirty-five weeks during the year; and work during the other periods was very irregular.

The following table shows the production of coal in long tons and the number of days worked at each colliery during the years 1923 and 1924:—

Colliery.	1923.		1924.	
	Coal in Tons.	Days worked.	Coal in Tons.	Days worked.
Coal Creek	433,836	209	98,025	58
Michel	258,429	252	147,805	118
Corbin	48,266	141	27,688	90
Totals	740,531	...	273,518	...

This table shows a decrease in production due to the amount of time the mines were idle.

The following table shows the decrease in production, as well as the number of days worked, in round figures and percentages:—

Colliery.	Decrease in Coal Production.		Decrease in Number of Days worked.	
	Long Tons.	Percentage.	Days.	Percentage.
Coal Creek	335,811	77.0	151	72
Michel	110,624	42.0	134	53
Corbin	20,578	42.6	51	36
Totals	467,013	....	...	..

The following table shows the amount of coal in tons produced for each underground employee, yearly and daily, for 1923 and 1924:—

Colliery.	1923.		1924.	
	Tons per Year.	Tons per Day.	Tons per Year.	Tons per Day.
Coal Creek	776	3.7	271	4.6
Michel	795	3.1	417	3.5
Corbin	1,027	7.3	266	5.6

The amount of coal in tons for each miner employed in producing coal is shown in the following table, per year and per day, for years 1923 and 1924:—

Colliery.	1923.		1924.	
	Tons per Year.	Tons per Day.	Tons per Year.	Tons per Day.
Coal Creek	1,456	6.96	449	7.7
Michel	1,312	5.20	758	6.4
Corbin	1,304	9.20	512	5.7

The amount of slack coal used for the production of coke was 48,007 long tons and the coke produced equalled 30,615 long tons, showing a consumption of 1.57 tons of slack coal for each ton of coke produced.

During the year all the coke produced came from the Michel Colliery ovens, and included smelter, foundry, and domestic coke.

ACCIDENTS.

Three fatal accidents occurred in 1924, as compared with our freedom from fatal accidents in the preceding year. Two of these fatal accidents occurred at Coal Creek Colliery and one at Michel. Two of these fatal accidents were due to falls of roof, coal, or rock and one was connected with haulage.

In the case of one fatal accident at Coal Creek, the deceased, a fireboss, was during the time of the stoppage assisting in repair-work, holding a horse, when a slight run of roof-shale alarmed the horse, which sprang forward, knocking him down and breaking his leg. The leg was attended to in the Fernie Hospital, but eleven weeks later it had not knitted properly and a surgical operation was required to set it. The injured man was put under an anæsthetic and died.

The other fatal accident at Coal Creek was on the tipple, when a young boy acting as switchman for the locomotive hauling cars, while trying to rerail a car which was off the track, was squeezed between the moving car and a trip standing on another track, dying two days later.

The fatal accident at Michel was due to a fall of top coal at the working-face, where the coal was about 12 feet thick. More attention to the spragging, especially of the upper portion, might have prevented this accident.

A little more care on the part of the workmen, with stricter supervision, should tend to eliminate many accidents. The irregularity of employment during the year, with its tendency to a lessening of discipline, as well as fostering a less careful attitude of mind on the part of the employees, is very much to be deplored.

Under section 71, subsection (*d*), of the "Coal-mines Regulation Act," we received one notice of a "dangerous occurrence," a fire in No. 1 East mine at Coal Creek Colliery. This was first noticed on October 4th at a point on the main entry 6,200 feet from the mine portal. The original level had been driven to a fault, which showed an upthrow of about 40 feet, and the workings on the inby side of this fault had been developed by using the counter-entry. For the purpose of maintaining a grade on the main level, the old level was abandoned and the upper portion of the coal-seam allowed to fall or cave, so that a permanent road or grade could be established, and it was in this old portion of the level that the fire occurred. The coal would run almost 50 feet thick, and the flames seemed to come up through the crevices between the timbers and the caved coal.

Energetic measures were immediately taken to cope with the situation—first to extinguish the active flames, then to load out the loose coal and shale in the affected area. This was effectively accomplished within a few weeks and the area is now being filled up with non-combustible material. The cause of fire was spontaneous combustion, accelerated by timbers left in the old level and lack of an active current of air.

In this connection I might point out that the practice of stopping the fan for any length of time in such large and gaseous mines is not to be commended, when we consider the large area of workings, with caves and timbers which it is practically impossible to inspect or keep under supervision.

VENTILATION.

The general conditions of the mines with respect to ventilation are dealt with in detail by John MacDonald, Inspector of Mines, in his report which is attached, and show the conditions existing to be fairly good.

As in former years, advantage was taken of the facilities afforded by the Dominion Department of Mines to have analyses made of the mine air. Owing to the protracted stoppage of work fewer samples were taken than in the preceding year, the total amounting to ninety-six, of which twenty-seven were lost or failed to reach the laboratory in suitable condition for analysis, or a little over 28 per cent. Of the samples taken, seventy-nine were taken in the mines at Coal Creek, fourteen at Michel, and three at Corbin. Fifty-seven were taken in the mine air-currents and thirty-nine in and around the fire area in No. 1 East mine, Coal Creek, as special samples to determine percentage of methane in air-currents and other gases dangerous to the life or health of the workmen employed in and around this fire were desired.

One interesting feature of these analyses was the report of the chemist that in sample No. 1222, taken in the Rock Tunnel district of No. 2 mine, Coal Creek, 0.14 per cent. of ethane was found. A review of the previous fourteen samples taken from this district showed that twelve of these contained positive evidence of the presence of ethane in quantities varying from a trace to one-half of the above quantity.

The limits of inflammability of ethane are much lower than those of methane, and while the small quantities of ethane detected would not seriously affect the limits of inflammability of the mixture, this probably explains some of the discrepancies between our Burrell gas-detector readings and the analyses and requires careful attention.

At Coal Creek Colliery five out of fifteen show over 1 per cent. of methane; three of these are in the No. 1 East mine. The highest, 1.68 per cent., is shown in the No. 1 South split in the No. 1 East mine, and shows an increase of 0.33 per cent. over the preceding year. In this split it is interesting to note that, while the methane contents have increased, the amount of air circulated has decreased to the extent of almost 24 per cent. This is the only air-current carrying over 1.10 per cent. of methane.

In the air-currents of the Michel mines none of these are above or come up to 1 per cent. The highest percentage is shown in the main return airway of the No. 3 East mine, where no coal has been produced for two years, and shows 0.72 per cent., as compared with 0.73 per cent. during the preceding year.

In the Corbin mines the percentage of methane is very low, not exceeding 0.08 in either of the two mines working.

COAL-DUST.

The mines have been kept fairly clear from coal-dust during the year, and it is very important to their safety that this work should be maintained and even improved on. Accumulations of dust are carefully avoided, and the principal method of treating the dust, both on the haulage-roads and at the working-face, is by water supplied from the pumps through pipes laid for the purpose and distributed by hose. Second-burnt ashes and flue-dust also form a portion of the measures in attempting to deal with this danger. In Michel, towards the end of the year, experiments were being made with a car for distributing dust of a non-combustible nature on the main roadways with a fair measure of success. This is simply an ordinary car fitted with two air-pipes which are supplied from the compressed-air locomotive with air at about 200 lb. pressure. The car is run against the air-current and the compressed air discharges the dust into the current, penetrating every corner and crevice, as well as being carried with the air for a long distance.

Future tests will be made along the same lines, with air-receivers attached to timber-trucks, which will allow of the distribution of this dust on many of the roads where the compressed-air locomotive does not travel. The dust at present being used is flue-dust from the boilers, but if the experiment proves as successful as the first tests have indicated, either shale-dust or limestone may replace this in the near future. In connection with the danger from coal-dust, attention should be paid to the mine-cars, as unfortunately many of these provide too many means of escape for the fine coal-dust; this should be avoided not only when building cars, but in the reconstruction and maintenance of them.

BUMPS AND BLOW-OUTS.

No serious bumps or blow-outs have been experienced during the year, although small knocks or bumps and outbursts of coal and methane have not been uncommon. The long period of non-production of coal may account for this and inclines me to think that both these occurrences are intimately connected with the extraction of the coal.

INSPECTION ON BEHALF OF WORKMEN.

Advantage was taken of Rule 37 of section 171 of the "Coal-mines Regulation Act" to make inspections on behalf of the workmen during the period the mines were in active operation. At Coal Creek this inspection was made seventeen times in four mines, at Michel ten in two mines, while at Corbin there were no inspections made during the year. The failure to take advantage of this rule at Corbin has been brought before the workmen, and we expect the inspection will be carried out during the ensuing year.

This inspection is of great assistance to us, as well as to the workmen and the management, in maintaining safer conditions, and we feel very much indebted to the workmen for the regularity of the inspection and the interest taken in it.

PROSECUTIONS.

There was only one prosecution under either the "Coal-mines Regulation Act," or special rules provided for under the Act, during the year. This was for a workman having a pipe and matches in the mine contrary to Rule 9 of section 171 of the "Coal-mines Regulation Act"; the workman was found guilty and fined $10 and expenses. Fourteen searches were made in the mines at Coal Creek, four at Michel, and one at Corbin.

HAULAGE.

Haulage is by means of compressed air, either in hoists or compressed-air locomotives, steam-hoists situated outside the mine, endless rope or main rope to the outside, while horses are used to gather the mine-cars to the central partings. All the horses used inside the mine are brought outside at the end of the shift and both outside and inside are very well cared for.

LIGHTING.

All the workmen engaged in the mines, except a few at Corbin, use the Edison electric mine safety-lamp of the cap type, while the officials use the Wolf safety-lamp as a means of detecting or making a rapid determination of the mine air with respect to the presence of methane.

The Burrell gas-detector is used at all the mines for making a determination of lower percentages of methane than can ordinarily be detected by the Wolf safety-lamp as required by section 171, Rule 4.

Barometers, thermometers, extract of the "Coal-mines Regulation Act," special rules, and rules covering "systematic timbering" are posted at all the mines.

The following table shows the number and kind of lamps used:—

Colliery.	Electric.	Oil.	Total.
Coal Creek	650	75	725
Michel	380	24	404
Corbin	59	25	84
Totals	1,089	124	1,213

All the electric lamps have spring-locks and the oil-lamps magnetic locks.

EXPLOSIVES.

The following table shows the kind and amount of explosives used at each colliery:—

Colliery.	Monobel.	Permitite.	Polar, CXL-ite.	Total.
	Lb.	Lb.	Lb.	Lb.
Coal Creek	.....	120	109	229
Michel	10,772	1,092	.. .	11,864
Corbin	2,190	.....	.....	2,190
Totals	12,962	1,212	109	14,283

Monobel is used principally for breaking down coal; the other kinds for rock-work.

The following table shows the quantity of explosives used in pounds, the number of shots fired, and amount of explosive used per shot:—

Colliery.	Explosives.	Shots fired.	Explosives per Shot.
	Lb.		Lb.
Coal Creek	229	268	0.85
Michel	11,864	16,398	0.72
Corbin	2,190	2,540	0.86
Totals	14,293	19,196	....

No explosives are used for the production of coal at Coal Creek mines, and the amount of coal produced per shot and per pound of explosives is shown in the following table:—

Colliery.	Explosives.	Shots fired.	Coal produced in Long Tons.	
			Per Shot.	Per Pound of Explosive.
	Lb.			
Coal Creek*	....	....	....	....
Michel	11,864	16,398	9.0	12.4
Corbin	2,190	2,540	10.9	12.6

* No explosives used to produce coal.

While the use of explosives for the production of coal is permitted in Michel and Corbin mines, it should be distinctly understood that every precaution must be taken to avoid accidents. Strict attention should be given to the presence of methane, dust, and the placing of the shots.

Attention is specially directed that in no case should a second hole be drilled until the first is blasted and the place inspected. It should be remembered that it is very difficult to accurately determine the position of a second drill-hole until it is known exactly what work the hole or shot has accomplished.

Firing shots in the proximity of breaks in the roof or the coal should be avoided wherever practicable, as these often contain explosive gas which is very difficult to detect; and if these *must be fired, then this should only be done when the minimum number of workmen, preferably* only the shotlighters, are in the mine.

Coal-cutting Machines.

Little coal is produced by this means in the district at present, but at the end of the year one Sullivan Post Puncher machine, one jack-hammer rotary driller, and two Shuveloaders driven by compressed air were being experimented with at Corbin.

One Hardy Post type coal-cutting machine driven by compressed air was used in Michel Colliery and produced 1,004 tons of coal, a very small percentage of the total production.

Mine-rescue and First Aid to the Injured.

The long period of idleness seems to have affected the work of first aid to the injured, and there was no training or retraining done in this work either at Coal Creek or Corbin. At Michel a class of seventeen was conducted and at Fernie a class of twenty-five.

In the work of mine-rescue it was similar; no workmen took a course of training or retraining in either Coal Creek or Corbin, while six took a course of retraining at Michel and four took a course of training at the Government Mine-rescue Training Station at Fernie.

No teams took any part in competitions either in first-aid or mine-rescue work during the year, both the contests of the Rocky Mountain Branch of the Canadian Institute of Mining and Metallurgy and the East Kootenay Mine Safety Association being suspended owing to the labour troubles.

The majority of the workmen in and around the mine unfortunately do not seem to take the interest they should do in these humanitarian endeavours, leaving it to a few, to whom a great amount of credit is due not only for maintaining the work, but attempting to instil interest in it under adverse circumstances.

The difficulty in preventing accidents in and around our mines makes these endeavours very important and necessary, and I trust the time is not far distant when every able-bodied man will take an active interest in any work which tends to prevent accidents, or reduce the amount of human suffering when such accidents unfortunately do occur.

Mine-rescue apparatus is maintained at all the mines in very good condition, as well as at the Government Mine-rescue Station at Fernie, and that interest is being maintained is evident when I have to report that for the first time in our history it comes up to the standard that should receive the approval of all those interested in the work.

During the year the Draeger rescue apparatus at Michel Colliery has been replaced with six Gibbs and the old-type Draeger at Corbin with five Gibbs.

The five Pauls in the Government Mine-rescue Station have been transferred to the Nicola Valley Mine-rescue Station; therefore all the equipment in the district consists of Gibbs: Coal Creek, 6; Michel, 6; Corbin, 5; Government Mine-rescue Station at Fernie, 6; total, 23 Gibbs. With the co-operation of all the collieries, brought about principally through the East Kootenay Mine Safety Association, this is sufficient to provide for any emergency which may unfortunately arise.

While no competitions were held during the year under the East Kootenay Mine Safety Association, this association still remains an important factor in providing greater measures of safety in our mines, and while we have received very cordial support from the coal companies, and the Government through the Department of Mines, I should like to see a more active interest taken by the workmen in it. To those who have given their time and money to its support we feel deeply grateful, but unfortunately the great majority of the workmen do not take advantage of the many efforts put forth by the association.

We again wish to thank the workmen and officials for their assistance and support in carrying out our duties during the past year, and look forward for a continuation of the same in the year we are now entering upon, 1925, realizing more and more that it is only through the co-operative efforts of all parties that we can expect a reduction in our list of accidents and make the industry of mining a safer and more pleasant occupation.

Following is the report of John MacDonald, Inspector of Mines, which contains a brief description of the various mines, with the conditions prevailing in and around them, and the annual returns as required by section 66 of the "Coal-mines Regulation Act" for the year ended 1924.

REPORTS BY JOHN MACDONALD, INSPECTOR.

Crow's Nest Pass Coal Company, Ltd.

Capital, $3,500,000.

Officers.	*Address.*
W. R. Wilson, President,	Fernie, B.C.
A. H. MacNeill, K.C.,	Vancouver, B.C.
J. S. Irvine, Secretary,	Fernie, B.C.
A. A. Klauer, Treasurer,	Fernie, B.C.
W. R. Wilson, General Manager,	Fernie, B.C.
Bernard Caufield, Colliery Manager, Coal Creek Collieries,	Fernie, B.C.
Robert Bonar, Colliery Manager, Michel Collieries,	Michel, B.C.

The above company is now operating the following extensive collieries on the western slope of the Rocky mountains in the East Kootenay District, namely:—

Coal Creek Colliery, situated on Coal creek, about 5 miles from the town of Fernie, on a branch railway to the mines, connected at Fernie with the tracks of the Canadian Pacific Railway and also those of the Great Northern Railway.

Michel Colliery, situated on both sides of Michel creek, on the line of the Canadian Pacific Railway, being 23 miles in a north-easterly direction from Fernie.

The amount and disposition of the combined output of the company's collieries is fully shown in the following table:—

AGGREGATE RETURNS FROM CROW'S NEST PASS COAL CO.'S MINES FOR YEAR 1924.

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Total of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	125,612		22,687	
" export to United States	51,540		8,232	
" " other countries				
Total sales		177,152		30,919
Used in making coke,	48,007			
Used under colliery boilers, etc.	21,017			
Total for colliery use		69,024		
		246,176		
Stocks on hand first of year	743		714	
" last of year	397		410	
Difference taken from stock during year		346		304
Output of colliery for year		245,830		30,615

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
Supervision and clerical assistance	33		15		48	
Whites—Miners	383				383	
Miners' helpers						
Labourers	62		135		197	
Mechanics and skilled labour	243		144		387	
Boys	10		14		24	
Japanese						
Chinese—Labourers			4		4	
Indians						
Totals	731		312		1,043	

COAL CREEK COLLIERY.

Bernard Caufield, Manager; Jas. Taylor, Assistant Manager.

This colliery is situated on both sides of Coal creek and has railway connection with the Canadian Pacific and Great Northern Railways at Fernie by means of a branch line, 5 miles in length, called the Morrissey, Fernie & Michel Railway.

The mines operated during the year were No. 1 East, No. 2, No. 3, and No. 1 South on the south side of the valley, while No. 9 mine was the only one operated on the north side and that only for the first three months of the year, it being closed down temporarily on March 31st and has not yet resumed operations. No. B North mine was finally sealed off in the early part of January, while the main entry of No. 1 North mine will eventually be connected to No. 9 for ventilation purposes.

A general description of the methods of work, systems of haulage around the mines, and the surface plant has appeared in previous Annual Reports of the Minister of Mines; the only

addition to the surface plant during the year has been the erection of an electric drive for the new fan at No. 1 East mine, consisting of one a.c. squirrel-cage induction-motor, rated at 300 horse-power, 2,200 volts, 60 cycles, this unit being put in operation in April.

The lamp used exclusively by the workmen is the Edison electric cap safety-lamp, while Wolf safety-lamps are used by the officials and bratticemen for testing purposes; all lamps are cleaned and repaired in a well-equipped lamp-room located in a central position at the colliery.

A large number of houses are provided at Coal Creek for those who prefer living close to the mines, while a good train service is maintained with the town of Fernie, where the majority of the workmen reside.

Copies of the "Coal-mines Regulation Act" and special rules are posted up at all the mines. Following is a brief description of the conditions prevailing in the mines throughout the year:—

No. 1 EAST MINE.

J. Caufield, Overman; J. Worthington, Assistant Overman; T. Reid, J. Duncan, J. Maltman, and E. Rutledge, Firebosses.

This mine operates the eastern portion of the No. 1 seam, which is reached by a crosscut tunnel at a distance of 215 feet from the surface. It is ventilated by an 11- by 10-foot Sirocco fan which produced at the last inspection 106,400 cubic feet of air a minute, under a water-gauge of 3.5 inches.

The mine is divided into four splits; the quantity of air passing in each split at the last inspection measured as follows:—Tunnel split: 16,800 cubic feet of air a minute for the use of seven men and two horses; Burrell gas-detector, 0.2 per cent. methane. First South split: 16,000 cubic feet of air a minute for the use of four men; Burrell gas-detector, 0.4 per cent. methane. Second South split: 15,000 cubic feet of air a minute for the use of two men; Burrell gas-detector, 0.4 per cent. methane. North split: 13,500 cubic feet of air a minute for the use of one man; Burrell gas-detector, 0.4 per cent. methane. North return: 89,000 cubic feet of air a minute for the use of seven men; Burrell gas-detector, 0.5 per cent. methane.

Explosive gas has been found on two occasions in the course of inspection, while Burrell readings taken in the return air-currents have varied from 0.4 per cent. methane in the North return to 1.45 per cent. methane in the Second South split.

Roadways and timbering have been kept in fairly good shape, a good supply of timber generally provided for the use of the workmen, and at all our visits we found the "special timbering" rules fairly well complied with at the working-faces. Spraying systems are operated on all roads and working-places where necessary, while all main roads are treated regularly with second-burnt ashes.

The work of filling up the excavations made in the fire area in the Tunnel district is proceeding satisfactorily, rock being brought in from the other mines for this purpose.

No. 1 SOUTH MINE.

F. Landers, Overman; W. Hynds, W. Stockwell, W. Morgan, and M. Hilton, Firebosses.

This mine operates the upper and western portion of the No. 1 seam. It is ventilated by an electrically driven 8- by 4-foot Keith fan, running at a speed of 254 r.p.m., producing an average quantity of 39,500 cubic feet of air a minute, under a water-gauge of 2.8 inches.

Ventilation is divided into two splits; the quantities passing in each split at the last inspection measured as follows:—No. 1 split: 24,750 cubic feet of air a minute for the use of thirty-four men and seven horses; Burrell gas-detector, 1.1 per cent. methane. No. 2 split: 12,000 cubic feet of air a minute for the use of twenty-seven men and four horses; no Burrell reading taken. Main return: 45,500 cubic feet of air a minute for the use of sixty-one men and eleven horses; Burrell gas-detector, 0.6 per cent. methane.

Explosive gas has only been found on one occasion in the course of inspection, while the percentage of methane in the return air-currents, as determined by the Burrell gas-detector, has varied from 0.7 per cent. in No. 2 split to 1.7 per cent. in No. 1 split.

During the long stoppage of work a great number of caves occurred all over the mine, all repair-work being concentrated on keeping the main roads and airways in a good state of repair. A good supply of timber has generally been provided for the use of the workmen, while the requirements of the "systematic timbering" rules were fairly well attended to at the working-

faces. Spraying systems are in operation on all main roads and working-faces where required, while all main roads are treated regularly with second-burnt ashes.

No. 3 MINE.

J. Biggs, Overman; R. Phillips, W. Brown, and E. Caufield, Firebosses.

This mine operates the eastern and dip portion of the No. 2 seam and is ventilated by a 16- by 8-foot Wilson fan, which, running at a speed of 146 r.p.m., produced an average quantity of 58,000 cubic feet of air a minute, under a water-gauge of 3.6 inches.

Ventilation is divided into two splits; the quantities passing at the last inspection measured as follows:—Incline split: 7,000 cubic feet of air a minute; Burrell gas-detector, 0.3 per cent. methane. South Slope split: 11,000 cubic feet of air a minute for the use of eight men and one horse; Burrell gas-detector, 0.9 per cent. methane. Main return: 30,000 cubic feet of air a minute for the use of eight men and one horse; Burrell gas-detector, 0.9 per cent. methane. At the time the above quantities were measured this mine was being ventilated by No. 1 East fan.

No explosive gas was found in the course of inspection, while Burrell gas-detector readings taken throughout the year varied from 0.3 per cent. methane in the Incline split to 1.65 per cent. methane in the South Slope split.

Roadways and timbering have been kept in fairly good shape, a good supply of timber provided for the use of the workmen, while the requirements of the special rules *re* timbering have been fairly well attended to at the working-faces. Spraying systems are maintained and operated on all main roads and working-faces where necessary, while all main roads are treated periodically with second-burnt ashes.

No. 2 MINE.

C. McNay, Overman; J. Bushell, W. Clarkstone, and E. Ward, Firebosses.

This mine is situated on the same level as the tipple and operates the upper and western portion of the No. 2 seam. It is ventilated by a 16- by 8-foot Wilson fan, running at a speed of 132 r.p.m., producing an average quantity of 32,000 cubic feet of air a minute, under a water-gauge of 3 inches.

When the last inspection was made in December the ventilation was all on one split; the quantity passing measured as follows:—Main return: 28,800 cubic feet of air a minute for the use of fifty-four men and nine horses; Burrell gas-detector, 0.5 per cent. methane.

No explosive gas was found during the year in the course of inspection, while the percentage of methane found in the return air-currents, as determined by the Burrell gas-detector, varied from 0.1 per cent. in the High Line split to 0.6 per cent. in the Rock Tunnel split.

A great number of caves also occurred in this mine during the long stoppage of work; any repair-work done during this period was concentrated on the main roads and airways.

A good supply of timber has generally been provided for the use of the workmen, while the requirements of the special rules *re* timbering have been fairly well attended to at the working-faces. Spraying systems are operated on all roads and working-faces where required, while all main roads receive regular applications of second-burnt ashes.

No. 9 MINE.

J. Worthington, Overman; R. Fowler, Fireboss.

This mine only operated during the first three months of the year, all work being temporarily suspended on March 31st, and at the time of writing operations have not been resumed.

Ventilation is produced by a fan of the Guibal type, which, running at a speed of 60 r.p.m., produces an average quantity of 7,500 cubic feet of air a minute.

At the last inspection in March the quantity passing measured as follows:—Main return: 8,000 cubic feet of air a minute for the use of seven men and two horses.

Explosive gas was found on one occasion in the course of inspection, while the percentage of methane in the return air-current has always been well under 0.5 per cent.

Conditions were generally good, a good supply of timber provided for the use of the workmen, while the requirements of the "systematic timbering" rules were fairly well attended to at the working-faces.

The following are the official returns for the Coal Creek Colliery for the year ended December 31st, 1924:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	40,124			
" export to United States	43,643			
" " other countries				
Total sales		83,767		
Used in making coke	1,555			
Used under colliery boilers, etc.	13,049			
Total for colliery use		14,604		
		98,371		
Stocks on hand first of year	743			
" last of year	397			
Difference taken from stock during year		346		
Output of colliery for year		98,025		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employd.	Average Daily Wage.	No. employed.	Average Daily Wage.
Supervision and clerical assistance	19		6		25	
Whites—Miners	220				220	
Miners' helpers						
Labourers	27		35		62	
Mechanics and skilled labour	155		94		249	
Boys	9		8		17	
Japanese						
Chinese						
Indians						
Totals	430		143		573	

MICHEL COLLIERY.

Robert Bonar, Manager; M. McLean, Afternoon-shift Overman.

This colliery is situated on Michel creek, 24 miles north-east of Fernie, and has railway connections with both the Canadian Pacific and Great Northern Railways.

A general description of the method of working, system of haulage in and around the mines, and surface plant has appeared in previous Annual Reports of the Minister of Mines. As in 1923, the whole of the output for 1924 was from Nos. 3 and 8 mines, no coal being produced in No. 3 East mine; the principal work done in the latter consisted of pumping of water and repairs to main roads and airways.

The Edison electric cap safety-lamp is generally used by the workmen, while Wolf safety-lamps are used by the officials and bratticemen for testing purposes; all lamps are cleaned and repaired in a well-equipped lamp-room situated in a central position at the colliery.

Pillar-extraction was begun in two districts of No. 8 mine during the year—on the West Side district and No. 12 Incline district. Owing to the coal being of poor quality it was found necessary to discontinue work in the latter district in the early part of December.

Copies of the "Coal-mines Regulation Act" and special rules are posted up at all the mines.

Following is a brief description of the conditions prevailing in the various mines throughout the year:—

No. 3 MINE.

M. Littler, Overman; A. Davis, A. Ball, T. Owen, and J. Strachan, Firebosses; R. Littler, Shotfirer.

This mine operates two seams, Upper No. 3 and No. 2, the latter being connected to the Upper No. 3 seam by a crosscut tunnel 200 feet in length.

Ventilation is produced by a 12- by 6-foot Sullivan fan, which, running at a speed of 140 r.p.m., produced an average quantity of 94,000 cubic feet of air a minute, under a water-gauge of 2.2 inches.

At the last inspection the quantities passing in the various splits measured as follows:—West side: 17,500 cubic feet of air a minute for the use of sixty-four men and eleven horses; Burrell gas-detector, 0.7 per cent. methane. East side: 42,500 cubic feet of air a minute for the use of thirty-nine men and five horses; Burrell gas-detector, 0.8 per cent. methane. Main return: 100,000 cubic feet of air a minute for the use of 103 men and sixteen horses; Burrell gas-detector, 0.6 per cent. methane.

Explosive gas was found on two occasions during the course of inspection, while readings taken regularly with the Burrell gas-detector have varied from 0.3 per cent. methane in the Main return to 0.6 per cent. methane in the East Side district.

Conditions have been generally good throughout the year, roadways and timbering kept in good shape, and generally free from coal-dust, spraying systems being operated on all roads and working-places where required, while all main roads receive regular applications of second-burnt ashes. A good supply of timber has been provided for the use of the workmen, while the requirements of the "systematic timbering" rules were fairly well attended to at the working-faces.

No. 8 MINE.

C. Stubbs, Overman; E. Ainsworth, A. Almond, R. McFegan, R. Taylor, and R. Beard, Firebosses.

This mine operates the upper portion of the No. 8 seam and is ventilated by an 8- by 3½-foot double-inlet Jeffrey fan, which, running at a speed of 160 r.p.m., produced an average quantity of 97,900 cubic feet of air a minute, under a water-gauge of 1.3 inches.

Ventilation is divided into three splits; the quantities passing in each district at the last inspection measured as follows:—No. 1 split: 11,220 cubic feet of air a minute for the use of twenty-one men and four horses; Burrell gas-detector, 0.5 per cent. methane. No. 2 split: 13,200 cubic feet of air a minute for the use of thirty-one men and four horses; Burrell gas-detector, 0.5 per cent. methane. No. 3 split: 11,270 cubic feet of air a minute for the use of forty men and six horses; Burrell gas-detector, 0.3 per cent. methane. Main return: 110,000 cubic feet of air a minute for the use of ninety-two men and fourteen horses; no Burrell reading taken.

No trace of explosive gas has been found by us in the course of inspection, while the percentage of methane in the return air-currents, as determined by the Burrell gas-detector, has never exceeded 0.5 per cent. during the year.

Good progress has been made with the construction of the overcast from No. 4 incline to No. 1 incline, this operation being practically finished at the time of our last visit. This overcast, along with other improvements to stoppings, etc., has been the means of greatly improving the ventilating conditions in this mine during the latter part of the year.

No. 4 incline is being graded and repaired with the intention of making this roadway the main haulage for the Nos. 1 and 4 Incline districts, and when completed will eliminate the uneven grades on the haulage-roads in use at the present time.

Roadways and timbering have been kept in good shape, a good supply of timber provided for the use of the workmen, while the requirements of the "systematic timbering" rules have been fairly well attended to at the working-faces. Spraying systems are in operation on all roads and working-faces where required, while the main roads are treated with second-burnt ashes.

No. 3 EAST MINE.

A. Frew, Fireboss.

There is no change to report regarding operations in this mine, two repairmen and a fireboss being employed, their duties consisting of maintenance-work on the main roads and airways and pumping water.

This mine is ventilated by a 16- by 8-foot Wilson fan, which, running at a speed of 90 r.p.m., produced an average quantity of 88,700 cubic feet of air a minute, under a water-gauge of 1.8 inches.

Ventilation is divided into two splits; the quantities passing in each at the last inspection measured as follows:—No. 6 East split: 53,200 cubic feet of air a minute for the use of one man; Burrell gas-detector, 0.65 per cent. methane. West side: 40,000 cubic feet of air a minute for the use of two men; Burrell gas-detector, 0.9 per cent. methane. Main return: 119,700 cubic feet of air a minute for the use of three men; Burrell gas-detector, 0.7 per cent. methane.

Explosive gas was found on one occasion in the course of inspection, while the percentage of methane in the return air-currents, as determined by the Burrell gas-detector, varied from 0.4 per cent. in the No. 6 East split to 1.3 per cent. in the West Side split.

A sufficient supply of timber has been provided for the repair-work, while roadways have been kept in good shape and generally free from coal-dust.

The following are the official returns from the Michel Colliery for the year ended December 31st, 1924:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	85,488		22,687	
" export to United States	7,897		8,232	
" " other countries				
Total sales		93,385		30,919
Used in making coke	48,452			
Used under colliery boilers, etc.	7,968			
Total for colliery use		54,420		
		147,805		
Stocks on hand first of year			714	
" last of year			410	
Difference taken from stock during year				304
Output of colliery for year		147,805		30,615

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

(Includes Coke-ovens.)

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
Supervision and clerical assistance	14		9		23	
Whites—Miners	163				163	
Miners' helpers						
Labourers	35		100		135	
Mechanics and skilled labour	88		50		138	
Boys	1		6		7	
Japanese						
Chinese—Cooks			4		4	
Indians						
Totals	301		169		470	

Corbin Coals, Ltd

Head Office—Vancouver, B.C.

Capital, $5,000,000.

Officers.	*Address.*
A. W. Witherspoon, President,	Spokane, Wash.
Austin Corbin, 2nd,	Spokane, Wash.
Wm. Weaver Heaton, Treasurer,	Spokane, Wash.
A. M. Allen, Secretary,	Spokane, Wash.
G. W. Evans, General Manager,	Spokane, Wash.
E. L. Warburton, Superintendent,	Corbin, B.C.

This colliery is situated 14 miles from McGillivray Junction on the Crowsnest branch of the Canadian Pacific Railway, to which it is connected by a branch line called the Eastern British Columbia Railway. It consists of the following mines: Nos. 4, 5, and 6; the first and last named only being operated during the year.

Important additions to the surface plant consist of, at No. 4 mine tipple, a washing plant of the Elmore-jig type. This is a complete unit, consisting of one 70-horse-power steam-engine, single-compartment Elmore jig, dewatering-launders, elevators, vibrating screens, etc. This plant is designed to treat that portion of the output over ½-inch screen and through 3-inch screen, which, after exhaustive tests over a long period, was found to contain the greater amount of impurities.

The washing plant, which has been in operation from October 20th, has greatly improved the quality of the coal and has operated without undue difficulty during extremely low temperatures.

At No. 6 mine a small compressor of the Canadian Ingersoll-Rand type has been installed to provide power for loading and drilling machines introduced in this mine in December. The latter consist of one Sullivan Post Puncher machine, rotary action, with augers for drilling holes in the coal, and two Shuveloader loading-machines for loading the coal at the working-faces.

Copies of the "Coal-mines Regulation Act" and special rules are posted up at all the mines.

Following is a brief description of the conditions prevailing in the various mines throughout the year:—

Nos. 4, 5, and 6 Mines.

W. Almond, Overman; H. Osborne, J. Virgo, G. Elmes, and W. Chapman, Firebosses.

No. 4 mine is operating the No. 4 seam; the whole of the output during the year has come from the Nos. 4 and 5 levels, where the pillars are extracted by the caving system on the retreat. It is ventilated by a single-inlet fan of the Guibal type, running at a speed of 90 r.p.m., producing an average quantity of 25,400 cubic feet of air a minute, under a water-gauge of 0.6 inch.

The quantity passing at the last inspection measured as follows:—Main intake: 24,500 cubic feet of air a minute for the use of eighteen men and two horses.

No trace of explosive gas has been found by us in the course of inspection, roadways and timbering have been kept in good shape, and this mine, being naturally damp, has been free from coal-dust at all times.

No. 5 Mine.

This mine has not produced any coal during the year; any work done has consisted of repairs to the main level.

No. 6 Mine.

As in 1923, the whole of the output has come from the No. 1 level; the only work done in the Nos. 2 and 3 levels has been repairs to the main roads.

This mine is ventilated by a small, quick-running Sirocco fan, electrically driven; the quantity of air passing at the last inspection measured as follows:—No. 1 Level return: 6,000 cubic feet of air a minute for the use of twenty-two men and two horses.

No explosive gas has been found in the course of inspection, roadways and timbering kept in good shape, a good supply of timber provided at all times for the use of the workmen, while the requirements of the "systematic timbering" rules have been fairly well attended to at the

working-faces. This mine is also naturally damp and has been free from coal-dust at all our visits.

Following are the official returns from Corbin Colliery for the year ended December 31st, 1924:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	3,249			
" export to United States	19,134			
" " other countries				
Total sales		22,383		
Used in making coke				
Used under colliery boilers, etc.	4,239			
Total for colliery use		4,239		
		26,622		
Stocks on hand first of year	362			
" last of year	1,428			
Difference added to stock during year		1,066		
Output of colliery for year		27,688		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.	No. employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	5	7.69	9	5.58	14	6.64
Whites—Miners	32	7.03			32	7.03
Miners' helpers	22	6.46			22	6.46
Labourers			10	5.84	10	5.84
Mechanics and skilled labour	7	6.50	19	6.35	26	6.42
Boys						
Japanese						
Chinese						
Indians						
Totals	66		38		104	

PROSECUTIONS UNDER "COAL-MINES REGULATION ACT."

Mine and Date.	Name and Occupation.	Offence charged.	Judgment.
No. 5, South Wellington, Jan.	George Rossi, miner	Violation of General Rule 12, sec. 91, C.M.R. Act, 1911 (charging shot-hole before it was examined by competent person)	Fined $10 and costs.
Wakesiah, Feb. 28	Robert Laird, manager	Violation of special rules (permitting men to work more than eight hours in contravention of C.M.R. Act, 1911)	Case dismissed.
Wakesiah, Feb. 28	James Cochrane, machineman	Violation of sec. 19, C.M.R. Act, 1911 (working more than eight hours)	Case dismissed.
Wakesiah, Feb. 28	Wm. K. Hodge, conveyorman	Ditto	Case dismissed.
Wakesiah, Feb. 28	William Pashley, conveyorman	Ditto	Case dismissed.
Wakesiah, Feb. 28	John Christie, conveyorman	Ditto	Case dismissed.
Goat Creek, March 15	John Gillespie, overman	Violation of C.M.R. Act, chap. 39, amendment to sec. 91, chap. 160, 1911 (for using open lights underground in coal-mine)	Case dismissed.
Goat Creek, March 15	J. Wilson, contractor	Ditto	Case dismissed.
Goat Creek, March 18	J. McNeil, owner	Ditto	Fined $10.
No. 1, Princeton Colliery, Aug. 29	A. Jacobsen, labourer	Violation of General Rule 9, C.M.R. Act, 1911 (having match in his possession underground)	Fined $5 and costs.
No. 4, Comox Colliery, Sept. 27	Joi Lung	Violation of General Rule 9, C.M.R. Act, 1911 (having smoking-tobacco and cigarette-papers in his possession underground)	Fined $10 and costs.
No. 1, Granby Colliery, Sept. 30	Eino Sarkko, miner	Violation of General Rule 9, C.M.R. Act, 1911 (having matches in his possession underground)	Fined $10 and costs.
No. 1, Granby Colliery, Sept. 30	Fred Allskogg, miner	Ditto	Fined $10 and costs.
Corbin Colliery, Dec. 12	Joe Siska, miner's helper	Pipe and matches	Fined $10 and costs.

METALLIFEROUS MINES SHIPPING IN 1924.

NORTH-WESTERN DISTRICT (No. 1).

ATLIN MINING DIVISION.

Mine or Group.	Locality.	Owner or Agent.	Address.	Character of Ore.
Cherokee	Atlin	J. M. Ruffner	Atlin	Silver, lead.

SKEENA MINING DIVISION.

Belmont-Surf Inlet	Surf inlet	Belmont-Surf Inlet Mines, Ltd.	Surf Inlet	Gold, silver, copper.
Patterson	Porcher island	F. Patterson	Welcome Harbour	Gold.

NASS RIVER MINING DIVISION.

Hidden creek	Anyox	Granby Cons. M. S. & P. Co.	Anyox	Copper, silver, gold.
Golskeish	Anyox	H. W. Heidman	Anyox	Gold, silver.
Esperanza	Kitsault river	R. Armour	Anyox	Silver, gold, copper, lead.

PORTLAND CANAL MINING DIVISION.

Premier	Salmon river	Premier Gold Mines, Ltd.	Premier, B.C.	Gold, silver, lead.
Outsider	Maple bay	Consolidated M. & S. Co.	Anyox	Copper.
Porter Idaho	Marmot river	Porter Idaho Mines, Ltd.	Stewart	Silver, lead, gold.
B.C. Silver	Salmon river	B.C. Silver Mines, Ltd.	Stewart	Gold, silver, copper.
L. and L.	Glacier creek	John Hovland	Hyder, Alaska	Silver, lead.
North Fork Basin	Marmot river	William Fraser	Stewart	Silver, gold, lead.

NORTH-EASTERN DISTRICT (No. 2).

OMINECA MINING DIVISION.

Henderson	Hudson Bay mountain	Duthie Mines, Ltd.	Smithers	Silver, lead, gold.
Lucky Luke	Usk	S. A. D. Davis	Usk	Silver, copper, gold.

CENTRAL DISTRICT (No. 3).

YALE AND KAMLOOPS MINING DIVISIONS.

Windpass	North Thompson river	Windpass Gold Mining Co.	Box 1024, Fernie	Gold, silver.
Emancipation	Coquihalla river (Yale)	Emancipation Mining Company, W. M. Thompson	Box 38, Hope	Gold, silver.
Johnston	Independent creek (Yale)	J. J. Johnston	Lytton	Gold, silver.

NICOLA AND VERNON MINING DIVISIONS.

Lucky Mike	Nicola	Oscar A. Schmidt	Nicola	Gold, silver, lead.

SOUTHERN DISTRICT (No. 4).

GREENWOOD MINING DIVISION.

Bell	Wallace mountain	Duncan McIntosh	Beaverdell	Silver, gold, lead.
Combination	Greenwood	Eholt Mining Co., J. H. Goodeve, Secretary	Greenwood	Silver, gold, lead.
Defiance	Greenwood	R. Lee	Greenwood	Silver, gold, lead.
Providence	Greenwood	Mary Agnes Mining Co.	Box 452, Greenwood	Silver, gold, lead.
Sally	Beaverdell	Wallace Mt. Mines, Ltd., H. B. Morley, Secretary	Penticton	Silver, lead, gold.
Standard Fraction	Beaverdell	Mark W. Smith	Beaverdell	Silver, lead.
Strathmore	Greenwood	G. S. Walters	Greenwood	Silver, gold, lead.
Smelter	Greenwood	G. S. Walters	Greenwood	Silver, gold, copper.

GRAND FORKS, OSOYOOS, AND SIMILKAMEEN MINING DIVISIONS.

Mine or Group.	Locality.	Owner or Agent.	Address.	Character of Ore.
Smelter	Grand Forks	G. S. Walters	Greenwood	Gold, silver, copper.
Nickel Plate	Hedley	Hedley Gold Mines, Ltd.	Hedley	Gold, silver.
Horn Silver	Similkameen	British America Mining Corp., B. C. McDougal	Similkameen	Silver, gold.

EASTERN DISTRICT (No. 5).

FORT STEELE MINING DIVISION.

Sullivan	Kimberley	Consolidated M. & S. Co.	Kimberley	Silver, lead, zinc.
Copper King	Bull river	W. S. Santo	Cranbrook	Silver, copper.
St. Eugene	Moyie	Consolidated M. & S. Co.	Kimberley	Silver, lead, zinc.

GOLDEN AND WINDERMERE MINING DIVISIONS.

Monarch	Field	Manager, Field	Field	Silver, lead.
Paradise	Toby creek	R. R. Bruce	Invermere	Silver, lead.
White Cat	Slade creek	J. C. Pitts	Invermere	Silver, lead.

AINSWORTH MINING DIVISION.

Albion	Ainsworth	Leo Mining Co., Danson, Williams and Danson	Spokane	Silver, lead, zinc.
Charleston	Zincton	Charleston Silver Mines, Ltd	Zincton	Silver, lead, gold.
Cork Province	Keen creek	Cork-Province Mines, Ltd.	Kaslo	Silver, lead, zinc.
Caledonia	Blaylock	G. E. McCready	Zincton	Silver, lead.
Firebrand	Ainsworth	Alex. J. Fitch	Ainsworth	Silver, lead.
Florence	Ainsworth	Florence Silver Mining Co., D. E. Sanders	517 Hutton Block, Spokane	Silver, lead.
Highland	Cedar creek	Consolidated M. & S. Co.	Trail	Silver, lead.
Martin	Zwicky	J. A. Carter	Kaslo	Silver, lead.
No. 1	Munn creek	Consolidated M. & S. Co.	Trail	Silver, lead.
Rainbow	Johnson's Landing	D. M. Wadams	Johnson's Landing	Silver, lead, gold.
Silver Hoard	Cedar creek	Delhi Mining Co., H. Giegerich	Kaslo	Silver, lead.
Spokane Trinket	Ainsworth	H. Giegerich	Kaslo	Silver, lead.
United	Ainsworth	J. W. Smith	Ainsworth	Silver, gold, lead.
Whitewater	Retallack	J. L. Retallack	Whitewater	Silver, lead, zinc, gold.

SLOCAN MINING DIVISION.

Apex	New Denver	A. Shilland, Secretary	New Denver	Silver, gold.
Bosun	Sandon	Rosebery-Surprise Mining Co.	Sandon	Silver, lead, zinc, gold.
Canadian	Silverton creek	Joe M. Brandon.	Silverton	Silver, lead.
Cinderella	New Denver	W. E. Finch	New Denver	Silver, lead.
Galena Farm	Silverton	Roy T. Ainslie	Silverton	Silver, zinc, lead.
Hewitt	Silverton	M. S. Davys	Box 397, Kaslo	Silver, lead, zinc, gold.
Jo Jo	Kane creek	T. Trenery	Rosebery	Silver, lead, gold.
Lucky Thought	Silverton	Consolidated M. & S. Co.	Trail	Zinc, silver, lead.
Lucky Jim	Zincton	Lucky Jim Lead and Zinc Co., A. G. Larson	605 Empire State Building, Spokane	Zinc.
Mollie Hughes	New Denver	Molly Hughes Mining Co.	New Denver	Silver, gold, lead.
Monitor	Three Forks	Rosebery-Surprise Mining Co.	Sandon	Silver, gold, lead, zinc.
Mountain Chief	Alamo	John Cechelere	New Denver	Silver, gold, lead, zinc.
Queen Bess	Alamo	C. Cunningham	Sandon	Lead, silver, gold.
Rambler	Rambler	Rambler-Cariboo Mines, Ltd.	New Denver	Silver, lead, zinc.
Ruth	Sandon	Ruth Mines, Ltd., J. Anderson	Kaslo	Silver, lead, gold.
Silversmith	Sandon	Silversmith Mines, Ltd	Sandon	Silver, lead, zinc.
Sovereign	Sandon	C. Cunningham	Sandon	Lead, silver.
Standard	Silverton	Standard Silver Lead Mining Co.	Silverton	Zinc, silver, lead.
Surprise	Sandon	Rosebery-Surprise Mining Co	Sandon	Silver, lead, zinc.
Van Roi	Silverton	Van Roi Mining Co.	Silverton	Zinc, silver, lead.
Victor	Three Forks	G. Petty	Sandon	Silver, lead, gold.

SLOCAN CITY MINING DIVISION.

Anna	Springer creek	K. E. Zimmerman	Slocan	Silver.
L. T.	Springer creek	D. B. O'Neail	Slocan	Silver, lead.
Ottawa	Springer creek	P. Maguire	Slocan	Silver.
Peg Leg (formerly Neepawa)	Enterprise creek	E. Shannon	Slocan	Silver, lead.
Slocan Chief	Enterprise creek	P. Maguire	Slocan	Silver, lead.

NELSON AND ARROW LAKE MINING DIVISIONS.

Mine or Group.	Locality.	Owner or Agent.	Address.	Character of Ore.
Central	Taghum	Wm. Dumont	Blewett	Silver, lead.
Emerald	Salmo	Iron Mountain, Ltd.	Salmo	Silver, lead.
Granite	Taghum	Norcross Brothers	Blewett	Gold, silver, copper.
H. B.	Salmo	Mrs. Agnes Vellacott	Box 651, Nelson	Silver, lead.
Molly Gibson	Kokanee creek	W. A. Cameron	R.R. No. 1, Nelson	Silver, lead, gold.
Silver Reef	Anderson creek	W. J. Richards	Box 312, Nelson	Zinc, lead, silver.
Summit	Salmo	J. B. O'Brien	8 Colbourne St., Toronto	Gold, silver.
Millie Mack	Cariboo creek	H. E. Forster	Wilmer	Gold, silver, lead.

TRAIL CREEK, TROUT LAKE, REVELSTOKE, AND LARDEAU MINING DIVISIONS.

I.X.L.	Rossland	R. B. Shellady	Rossland	Gold, silver.
Centre Star	Rossland	Consolidated M. & S. Co.	Rossland	Gold, copper, silver.
Lord Roberts	Rossland	John Senkowski	Rossland	Gold, copper.
Velvet	Rossland	Rossland-Velvet Mines	Rossland	Gold, silver, copper.
Mother Lode	Trout Lake	A. G. Johnson	Poplar Creek	Silver, lead.

WESTERN DISTRICT (No. 6).

VANCOUVER MINING DIVISION.

Britannia	Howe Sound	Britannia M. & S. Co.	Britannia Beach	Copper, gold, silver.

LIST OF CROWN GRANTED MINERAL CLAIMS.

CROWN GRANTS ISSUED IN 1924.

CASSIAR.

Claim.	Division.	Grantee.	Lot.	Acres.	Date.
Edwin	Atlin	Charles Albert Eggert, executor last will Jules Eggert	4361	45.43	Mar. 26
Bowl Fraction	Omineca	Cats Mining Co., Ltd.	3315	38.65	Mar. 11
Patriotic	"	" "	3311	16.80	Mar. 11
Red Cross	"	" "	3310	18.51	Mar. 11
D. X.	"	Charles Phillips	6790	40.00	Feb. 21
Ben Ali	Portland Canal	Dunwell Mines, Ltd.	4283	50.66	Nov. 7
Beth	"	Robert Morris Thompson	4186	47.13	Aug. 13
Bluox	"	Premier Gold Mining Co., Ltd.	4140	51.65	July 15
Bonanza	"	Arthur Chester O'Neill and Roy Alexander Young	4411	24.75	May 5
Briton	"	The M.C. Mining Co., Ltd.	4414	50.42	July 16
Charles	"	James Henry Nesbitt and Andy Archie	4418	31.13	July
Charles No. 3 Fraction	"	" "	4419	49.92	July 16
Double O No. 6	"	Dunwell Mines, Ltd.	4042	46.16	Dec. 8
Dunedin Fraction	"	" "	4291	47.21	Nov. 7
Dunwell	"	" "	4286	51.65	Nov. 7
Dunwell No. 2	"	" "	4287	45.24	Nov. 7
Dunwell No. 2 Fraction	"	" "	4294	2.57	Nov. 7
Dunwell No. 3	"	" "	4288	30.73	Nov. 7
Dunwell No. 3 Fraction	"	" "	4295	48.74	Nov. 7
Dunwell No. 4	"	" "	4289	32.27	Nov. 7
Dunwell Fraction	"	" "	4290	6.29	Nov. 7
Eagle	"	Amos Bliss Trites, Roland William Wood, and William Ritson Wilson	4197	24.18	Mar. 22
Eldorada	"	Thomas Vernon Wilson	2846	51.26	Mar. 13
Extension Fraction	"	Premier Gold Mining Co., Ltd.	3692	27.66	July 15
Georgia	"	Georgia River Mining Co., Ltd. (N.P.L.), Clarence E. Jarvis, Edward Fish, and Daniel Hume	4437	49.39	Mar. 13
Georgia No. 1	"	Georgia River Mining Co., Ltd. (N.P.L.), Clarence E. Jarvis, Edward Fish, and Daniel Hume	4438	46.71	Mar. 13
Georgia No. 2	"	Georgia River Mining Co., Ltd. (N.P.L.), Clarence E. Jarvis, Edward Fish, and Daniel Hume	4439	48.55	Mar. 13
George E. No. 2	"	Dunwell Mines, Ltd.	4284	45.30	Nov. 7
Irwin	"	Douglas Robert Shewan and Newton Townley Burdick	3612	1.70	July 15
Joe Fraction	"	Premier Gold Mining Co., Ltd.	4139	46.76	July 15
Kent	"	Robert Morris Thompson	4192	48.14	Aug. 13
K. P. No. 1	"	"	4183	14.43	Aug. 13
Lucille No. 1	"	"	4185	47.77	Aug. 13
Lucky Jim	"	The M.C. Mining Co., Ltd.	4408	40.50	July 16
Lucky No. 1	"	Amos Bliss Trites, Roland William Wood, and William Ritson Wilson	4280	40.40	Mar. 22
M. C. No. 1	"	The M.C. Mining Co., Ltd.	4407	51.58	July 16
Mist No. 1	"	Premier Gold Mining Co., Ltd.	4149	51.32	July 15
Mist No. 2	"	" "	4150	26.34	July 15
Mist Fraction	"	" "	4151	51.47	July 15
Money	"	William McGrew and Joseph Raymond Kennedy	4043	12.99	Dec. 8
Montana No. 1 Fraction	"	John Angus McDonald, Edward Henry Fenald, and George Arthur Fraser	4178	30.49	Oct. 1
Montana No. 2 Fraction	"	John Angus McDonald, Edward Henry Fenald, and George Arthur Fraser	4179	25.69	Oct. 1
M. C.	"	The M.C. Mining Co., Ltd.	4406	51.65	July 16
M. C. No. 1 Fraction	"	" "	4409	14.12	July 16
M. C. Fraction	"	" "	4417	11.33	July 16
M. & D. Fraction	"	Dunwell Mines, Ltd.	4285	41.17	Nov. 7
Nine of Hearts	"	The M.C. Mining Co., Ltd.	4412	51.65	July 16
Nine of Hearts No. 1	"	" "	4413	32.95	July 16
Nine Spot Fraction	"	" "	4415	45.77	July 16
N. H. Fraction	"	" "	4416	39.91	July 16
Paul	"	Premier Gold Mining Co., Ltd.	4138	35.78	July 15
Peace	"	George Alexander Leith	4195	45.66	April 3
Penetang	"	William D. Brown	1494	51.65	Mar. 27
Premier Extension No. 1	"	Premier Gold Mining Co., Ltd.	3688	38.93	July 15
Premier Extension No. 2	"	" "	3689	24.30	July 15
Premier Extension No. 3	"	" "	3690	45.48	Dec. 3
Premier Extension No. 4	"	" "	3691	51.43	July 15
Ruby Silver	"	Premier Extension Gold Mining Co., Ltd.	4123	51.62	Feb. 21
Ruby Silver No. 1	"	" " "	4119	45.05	Feb. 21
Ruby Silver No. 2	"	" " "	4120	39.79	Feb. 21
Silver Lake	"	Dunwell Mines, Ltd.	4293	48.80	Nov. 7
Silver Thought Fraction	"	Thomas Vernon Wilson	2848	32.90	Mar. 13
Silver Thought No. 2	"	"	2849	12.45	Mar. 13
Spider No. 1 [Fraction	"	William Hamilton and Chas. Larson	4172	42.58	April 3
Spider No. 2	"	" "	4173	35.09	April 3
Spider No. 3	"	" "	4174	51.16	April 3
Sundown	"	Dunwell Mines, Ltd.	4292	28.86	Nov. 7
Tacoma	"	Robt. Morris Thompson	4184	27.43	Aug. 13
Tip Top	"	Edward Henry Fernald, George Aitken Fraser, and John Angus McDonald	4150	39.84	Oct. 1

CASSIAR—*Continued.*

Claim.	Division.	Grantee.	Lot.	Acres.	Date.
True Blue	Portland Canal	Premier Gold Mining Co., Ltd.	3693	6.69	July 15
Vancouver	"	Premier Extension Gold Mining Co., Ltd.	4121	29.35	Feb. 21
Vancouver No. 1	"	" " "	4122	28.59	Feb. 21
Vancouver No. 2	"	" " "	4142	26.82	Feb. 21
Vancouver No. 3	"	" " "	4125	7.76	Feb. 21
Virginia Fraction	"	James Henry Nesbitt and Andy Archie	4420	9.09	July 15
X. Fraction	"	Premier Extension Gold Mining Co., Ltd.	4117	1.70	Feb. 21
XX. Fraction	"	" " "	4128	8.72	Feb. 21
Moose	Skeena	Whale Channel Mines, Ltd.	1804	42.45	Dec. 2
Moose No. 2	"	" "	1805	37.45	Dec. 2
Moose No. 3	"	" "	1806	35.43	Dec. 2
Maybell No. 1	"	Mrs. Florence Tibbits	2567	46.62	July 29
Haig	Bella Coola	Thomas Mathews	1313	29 40	April 3
Haig No. 1	"	"	1314	29.40	April 3
Haig No. 2	"	"	1315	42.40	April 3
Haig No. 3	"	"	1316	32.70	April 3
Haig No. 4	"	"	1317	41.40	April 3
Haig No. 5	"	"	1318	44.20	April 3
Takush Wonder	"	Albert Francis Griffiths	760	44.64	July 15
Surprise	Nass River	Angus McLeod	4335	28.09	Feb. 21
Silver Bell Fraction	"	Alfred E. Wright, William McLean, and Robert F. McGuiness	3521	33.37	Jan. 30

EAST KOOTENAY.

Apple Fraction	Fort Steele	Consolidated Mining and Smelting Co. of Canada, Ltd.	13172	51.65	Mar. 1
Bang	"	" " "	13209	51.65	Oct. 23
Berry Fraction	"	" " "	13208	45.54	Oct. 23
Blue Fraction	"	" " "	10997	41.37	Oct. 24
Bull	"	" " "	9875	51.65	Oct. 24
Clancy	"	" " "	9389	51.65	Oct. 24
Cran	"	" " "	10138	51.65	Oct. 24
Crock Fraction	"	" " "	10140	17.28	Oct. 24
Dora Fraction	"	" " "	13202	49.37	Oct. 23
Dugan	"	" " "	9974	51.65	Oct. 24
Durham	"	" " "	8962	51.65	Oct. 24
Frisco	"	William Lawson	6126	47.19	Mar. 26
Garden	"	Consolidated Mining and Smelting Co. of Canada, Ltd.	9964	51.65	Oct. 23
Gas	"	" " "	9979	51.65	Oct. 24
Hawes Fraction	"	" " "	13207	46.97	Oct. 23
Harvey	"	" " "	13178	51.65	Mar. 1
Jiggs	"	" " "	9975	51.65	Oct. 24
Law	"	" " "	10985	51.65	Oct. 24
Lena	"	" " "	9089	51.65	Oct. 24
Little Ben	"	Patrick McGrath	7806	51.65	Oct. 7
Maggie	"	Consolidated Mining and Smelting Co. of Canada, Ltd.	9990	51.65	Oct. 24
Ozone	"	" " "	13204	51.65	Oct. 23
Paris	"	" " "	8961	51.65	Oct. 24
Plage	"	" " "	13203	51.65	Oct. 23
Plum	"	" " "	13177	51.65	Mar. 1
Sapper	"	" " "	10246	51.65	Mar. 1
Sky	"	" " "	10984	51.65	Oct. 24
Surprise	"	William Lawson	9805	50.72	May 26
Taxi	"	Consolidated Mining and Smelting Co. of Canada, Ltd.	13705	51.65	Oct. 23
Tina	"	" " "	10998	28.48	Oct. 24
V. D.	"	" " "	8960	51.65	Oct. 24
White	"	" " "	13206	51.65	Oct. 23
Whizz	"	" " "	5272	51.65	Oct. 24

WEST KOOTENAY.

Black Bess No. 3	Slocan	Hilton George Scott	3263	35.50	May 8
Ocean	"	Howard Fremont Anderson	1723	32.62	June 26
Admiral Beattie	Kamloops	Alexander Blake Hogg	4462	31.35	Mar. 31
Blizzard Fraction	"	Gilbert Lawrence	3014	10.63	July 31
Copper Star Fraction	"	Gilbert Lawrence and John T. Robinson	3015	26.12	July 31
Alamo	Lardeau	Frederick Richard Blockberger	8712	48.36	Nov. 7
Clara	"	"	5185	41.75	Nov. 25
Del Rey	"	"	9132	26.25	Nov. 7
Emerald	"	Arthur Philip Kittan	9137	24.65	Nov. 7
Excelsior	"	"	4763	16.59	Nov. 7
Excelsior Fraction	"	"	9138	0.08	Nov. 7
Gold Fly	"	Mrs. Emma Therese Blockberger	5421	24.03	Nov. 7
J. J. Davis Fraction	"	Frederick Richard Blockberger	8714	13.66	Nov. 7
Lucky Jack Fraction	"	Mrs. Emma Therese Blockberger	8715	33.17	Nov. 7
Meridian Fraction	"	"	8713	43.25	Nov. 7
Red Horse	"	"	8718	23.50	Nov. 7
Silver Wedge	"	"	9136	17.80	Nov. 7
Thelma Fraction	"	Frederick Richard Blockberger	5186	4.62	Nov. 22
Florence	Revelstoke	Hermon Bernard Morrison	7061	50.66	Dec. 8
Gold Hill	"	George Lapointe	4739	38.98	April 13
Goldsmith	"	A. Poole	4738	44.40	Mar. 11
Little Phil	"	Clarence Pool	4733	41.75	Mar. 13

WEST KOOTENAY—*Continued.*

Claim.	Division.	Grantee.	Lot.	Acres.	Date.
Lucky Jack	Revelstoke	William Bozart Pool	4731	22.13	Mar. 13
Moscow	"	A. Kittan	4500	28.23	May 8
Pilot	"	Charles Oswald Woodrow	7050	29.40	Dec. 8
Union Jack	"	Hermon Bernard Morrison	7049	45.00	July 8
Bannock	Trail Creek	Vincenca Tomich	4428	39.84	Oct. 10
Cariboo	"	J. Tomich	1205	36.43	Mar. 26
Friday	"	Consolidated Mining and Smelting Co. of Canada, Ltd.	13117	26.27	Oct. 26
Alice Fraction	Nelson	Kate Cooley Constable	4969	44.03	Sept. 29
Black Stone	"	Reno Gold Mines Co., Ltd.	9055	51.39	Nov. 4
Blue Stone	"	" "	9054	51.65	Nov. 4
Catherine	"	Michael Egan	4437	44 60	May 30
Dora	"	Herbert Porter	5152	43.04	Oct. 10
Golden Queen	"	E. C. Johnson	5284	51.65	May 8
Nugget Fraction	"	William Bozart Pool	10406	2.66	Feb. 21
Morning Star	"	Mrs. Kate Cooley Constable	4105	44.03	Sept. 29
Butte	Ainsworth	Daybreak Mining Co., Ltd.	12410	39.82	Aug. 13
Goldenville	"	Elizabeth Jean Morrison	4720	48.52	Nov. 26
Hauser	"	*Dorothy Hanman*	2008	48.43	Oct. 23
President Fraction	"	Ritchie Spurgeon Gallop	2007	11.32	Oct. 23
President	"	"	2006	51.65	Oct. 23
Two Brothers	"	Dorothy Hanman	2005	30.55	Oct. 23
Wintrop	"	Daybreak Mining Co., Ltd.	12409	44.72	Aug. 13

BOUNDARY.

Bog Iron	Clinton	James Grant Davidson, George Ackland Gillies, John Hamilton Thompson, and William John McClure	3136	51.65	April 23
Chilcotin No. 1	"	James Grant Davidson, George Ackland Gillies, John Hamilton Thompson, and William John McClure	3140	51.65	April 23
Chilcotin No. 3	"	James Grant Davidson, George Ackland Gillies, John Hamilton Thompson, and William John McClure	3137	51.65	April 23
Chilcotin No. 2	"	*William John McClure*	3138	51.65	April 23
Limonite No. 1	"	James Grant Davidson	3132	34.64	April 23
Limonite No. 2	"	John Hamilton Thompson	3133	44.25	April 23
Limonite No. 3	"	George Ackland Gillies	3134	51.65	April 23
Ola	"	William Calvert	4643	43.52	April 9
Ola Fraction	"	"	4663	0.75	April 9
Rose No. 4	"	Leonard Burley	2303	47.76	Nov. 25
Rose No. 5	"	"	2304	44.86	Nov. 25
Tin Bucket	"	William Calvert	4642	51.65	April 9
Vulcan	"	James Grant Davidson, George Ackland Gillies, John Hamilton Thompson, and William John McClure	3135	38.97	April 23
Blue Bell	Similkameen	Allenby Copper Co., Ltd.	3198	31.00	Aug. 12
Blue Bird	"	" "	2928s	30.25	Aug. 12
Dorothy	"	" "	2053s	51.65	Aug. 12
Joliette Fraction	"	Edward Albert Wanke	1885	23.96	June 25
Mountain View	"	Allenby Copper Co., Ltd.	321s	51.54	Aug. 12
Bonanza	Greenwood	Timothy Sullivan	14678	41.81	July 31
Brandon	"	William Trezona	2382	45.72	Jan. 17
Brandon Fraction	"	"	2403	3.90	Jan. 17
Idaho	"	Robert Forshaw	2362	46.48	Jan. 26
Little Burne	"	*James McNulty*	2383	51.33	Jan. 17
Little Burne Fraction	"	"	2387	0.47	Jan. 17
Lost Cayuse	"	Thomas W. Sayer	4640	51.65	Oct. 8
Washington	"	Robert Forshaw	2363	40.87	Jan. 26
City of Denver	Grand Forks	Clement Vacher	1161	23.30	Jan. 17
Lexington	"	"	645	20.66	Jan. 17

VANCOUVER ISLAND AND COAST.

Copper King	Nanaimo	William H. Grieve	149	49.78	Jan. 8
Francis	"	W. H. R. Collister	122	9.70	May 13
Potosa	"	George Frederick Strong	121	32 73	July 8
Rainbow	"	Alaska Mining Co., Ltd.	1216	40.14	Mar. 28
Thundercloud	"	" "	1215	41.61	Mar. 28
Surprise	"	William H. Grieve	67	51.65	Jan. 8
Independent No. 2	Quatsino	Arthur William Corker and Laura Elizabeth Gray	1555	26.35	June 12
Independent No. 5	"	Frederick William Kenmuir, Egerton George Brown, and Laura Elizabeth Gray	1558	43.16	June 12
Constance Fraction	Alberni	W. P. Marchant	357	5.34	Jan. 5
Bee Fraction	Victoria	Gabbro Copper Mines, Ltd.	837	45.72	Mar. 3
Cour de Line	"	Sunloch Mines, Ltd.	846	47.70	Feb. 16
Hill 60	"	B.C. Manganese Co., Ltd.	126	40.00	Mar. 5
Hill 60 No. 2	"	" "	136	38.40	Mar. 5
Hornet Fraction	"	Gabbro Copper Mines Ltd.	836	40.95	Mar. 17
Leroy	"	Sunloch Mines, Ltd.	849	40.22	Feb. 16
Pauper	"	Joseph Pearce Tomlinson	316	51.65	Aug. 14
Richard III.	"	*Mabel E. Martin*	396	51.65	April 3
Rossland	"	Sunloch Mines, Ltd.	845	48.88	Feb. 16
Viking 1	"	Gabbro Copper Mines, Ltd.	858	48.31	Mar. 1
Viking No. 2	"	" "	859	51.65	Mar. 1
Viking 3	"	" "	860	45 32	Mar. 1
Viking 4 Fraction	"	" "	861	51.15	Mar. 1

DEPARTMENT OF MINES.

VICTORIA, B.C.

HON. WM. SLOAN, *Minister of Mines.*

ROBT. DUNN, *Deputy Minister.*

JOHN D. GALLOWAY, *Provincial Mineralogist.*

D. E. WHITTAKER, *Provincial Analyst and Assayer.*

GEO. WILKERSON, *Chief Inspector of Mines.*

HENRY DEVLIN, *District Inspector*, Nanaimo.

T. R. JACKSON, *District Inspector*, Nanaimo.

ROBERT STRACHAN, *District Inspector*, Fernie.

JOHN MACDONALD, *District Inspector*, Fernie.

JOHN G. BIGGS, *District Inspector*, Merritt.

THOS. J. SHENTON, *Dist. Inspector*, Prince Rupert.

H. H. JOHNSTONE, *Inspector*, Nelson.

J. DICKSON, *Acting Inspector*, Victoria.

H. E. MIARD, *Acting Inspector*, Fernie.

Resident Mining Engineers

GEO. A. CLOTHIER, No. 1 District, Prince Rupert.

J. D. GALLOWAY, No. 2 District, Hazelton (to February 28th, 1925).

A. W. DAVIS, No. 3 District, Kamloops.

P B. FREELAND, No. 4 District, Grand Forks.

A. G. LANGLEY, No. 5 District, Revelstoke.

W. M. BREWER, No. 6 District, Nanaimo.

R. F. Tolmie, Deputy Minister of Mines since the year 1902, retired on December 31st, 1924. Robert Dunn was appointed to the position on January 1st, 1925.

GOLD COMMISSIONERS AND MINING RECORDERS.

Mining Division.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-Recorder.
Atlin Mining Division..	Atlin	C. L. Monroe	C. L. Monroe	Miss N. M. Mearing
Sub-office	Telegraph Creek			H. W. Dodd.
"	Haines (U.S.)		(Com. for taking Affidavits)	Risdon M. Odell.
"	Juneau (U.S.)		Ditto	Harold E. Brown.
Stikine Mining Division	Telegraph Creek	H. W. Dodd	H. W. Dodd	
Sub-office	Boundary	"	"	John Wynne.
Liard Mining Division	Telegraph Creek.	"	"	
Sub-office	Porter			Chas. H. Smith.
"	Hd. of Dease Lake			H. B. Campbell.
"	McDame Creek			Mike Larsen.
"	Fort St. John			F. W. Beatton.
Skeena Mining Division	Prince Rupert	N. A. Watt	N. A. Watt	
Sub-office	Kitimat			G. L. Anderson.
"	Swanson Bay			E. Clough.
"	Copper City			L. G. Skinner.
"	Terrace			L. H. Kenny.
"	Rosswood			Mrs. C. Warner.
"	Stewart (Portland Canal)			J. P. Scarlett.
Nass River	Anyox	N. A. Watt	J. Conway	
Sub-office	Aiyansh	"		A. F. Priestly.
"	Alice Arm			Mrs. L. Cummings.
Portland Canal M.D.	Stewart	N. A. Watt (at Prince Rupert)	J. P. Scarlett.	
Bella Coola Mining Div.	Prince Rupert	N. A. Watt	N. A. Watt	
Sub-office	Bella Coola			Brynild Brynildsen.
"	Bella Bella			
"	Ocean Falls			Geo. H. Hill.
Queen Charlotte Min'g D.	Queen Charlotte	N. A. Watt	John L. Barge	
Sub-office	Jedway			Isaac Thompson.
"	Masset			J. C. S. Dunn, M.D.
"	Lockeport			William Morgan.
Omineca Mining Division.	Smithers	Stephen H. Hoskins	Jas. E. Kirby	
Sub-office	Fort Grahame			H. Ravenal.

GOLD COMMISSIONERS AND MINING RECORDERS—*Continued.*

Mining Division.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-Recorder.
Omineca M.D.—*Con.*				
Sub-office	Finlay Forks			H. M. Gibson.
"	Fort St. James			Alex. C. Murray.
"	Manson Creek			W. B. Steele.
"	Telkwa			T. J. Thorp.
"	Fort George			Geo. Milburn. [ing).
"	Hudson Hope			J. L. Ruxton (Act-
"	Fort St. John			F. W. Beatton.
"	Copper City			L. G. Skinner.
"	Terrace			L. H. Kenny.
"	Fort Fraser			J. D. Moore.
"	Pacific			T. H. McCubbin.
"	Hazelton			Sperry Cline.
"	Burns Lake			L. Mulvaney.
"	Usk			Jas. L. Bethurem.
"	Tatla Landing			R. C. McCorkell.
Peace River Mining Div.	Fort St. John	S. H. Hoskins (at Smithers)	F. W. Beatton	
Sub-office	Fort George			G. Milburn.
"	Finlay Forks			H. M. Gibson.
"	Hudson Hope			J. L. Ruxton (Act-
"	Pouce Coupe			Fred. Fraser. [ing).
Cariboo Mining Division	Barkerville	H. Beech	H. Beech	Mrs. H. Beech.
Sub-office	Quesnel	"		E. C. Lunn.
"	Fort George	"		Geo. Milburn.
"	McBride	" [Acting		S. Service.
Quesnel Mining Division	Williams Lake	R. M. McGusty	R. M. McGusty	
Sub-office	Quesnel			E. C. Lunn.
"	Likely			A. B. Campbell.
"	Barkerville			H. Beech.
Clinton Mining Division	Clinton	R. J. A. Dorrell	R. J. A. Dorrell	
Sub-office	Williams Lake			R. M. McGusty.
Lillooet Mining Division	Lillooet [River	John Dunlop	John Dunlop	
Sub-office	South Fork Bridge			W. Haylmore.
Kamloops Mining Division	Kamloops	E. Fisher	L. S. Brown	L. J. Price.
Sub-office	Chu Chua			George Fennell.
"	Vavenby			A. McDonald.
"	Albas			C. O. Sjouquist.
Ashcroft Mining Division	Ashcroft	E. Fisher (at Kam.)	W. C. Adams	Miss Ada E. Astell.
Sub-office	Lytton			W. Greenwood.
Nicola Mining Division	Merritt	E. Fisher (at Kam.)	W. H. Boothroyd	
Yale Mining Division	Yale	" "		
Sub-office	Hope	" "	D. A. Hazelton	Mrs. D. A. Hazel- [ton.
Similkameen Mining Div.	Princeton	Hugh Hunter	Hugh Hunter	
Sub-office	Hedley			R. E. Baxter.
Vernon Mining Division	Vernon	L. Norris	M. S. Morrell	
Greenwood Mining Div.	Greenwood	P. H. McCurrach	P. H. McCurrach	
Sub-office	Vernon			M. S. Morrell.
"	Rock Creek			Owen Wheeler.
"	Beaverdell			E. F. Ketchum.
Grand Forks Min. Div.	Grand Forks	Chas. Mudge	Chas. Mudge	
Osoyoos Mining Division	Penticton	W. R. Dewdney	W. R. Dewdney	
Sub-office	Olalla			R. W. Northey.
"	Hedley			R. E. Baxter.
"	Fairview			J. R. Brown.
Golden Mining Division	Golden	G. E. Sanborn	G. E. Sanborn	H. C. Moore.
Windermere Mining Div.	Wilmer	" (at Golden)	E. M. Sandilands	
Fort Steele Mining Div.	Cranbrook	F. A. Small	F. A. Small	
Sub-office	Fernie			E. T. Cope.
"	Yahk			W. A. Walker.
Ainsworth Mining Div	Kaslo	Ronald Hewat	A. McQueen	A. W. Anderson.
Sub-office	Howser			W. Simpson.
"	Trout Lake			Roy V. Jacobson
"	Poplar			Arthur G. Johnston.

GOLD COMMISSIONERS AND MINING RECORDERS—*Continued.*

Mining Division.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-Recorder.
Slocan Mining Division...	New Denver	Ronald Hewat (at Kaslo)	Angus McInnes ...	
Sub-office	Sandon	.....	.....	W. J. Parham.
Slocan City Mining Div...	Slocan.....	Ronald Hewat.....	T. McNeish.....	
Trout Lake Mining Div..	Trout Lake	Ronald Hewat ...	Roy V. Jacobson..	
Nelson Mining Division ..	Nelson	J. Cartmel.	J. Cartmel.....	
Sub-office	Creston.....	....	.....	H. W. McLaren.
"	Ymir.....	....	.....	Wm. Clark.
"	Sheep Creek	.....	....	Geo. Leece.
"	Salmo	.....	.....	M. C. Donaldson.
Arrow Lake Min. Division	Nakusp.....	J. Cartmel (at Nelson)	Walter Scott	
Sub-office	Vernon.....	....	.....	M. S. Morrell.
Revelstoke Mining Div...	Revelstoke.....	Wynfield Maxwell.	C. J. Aman	Newton R. Brown.
Lardeau Mining Division.	Beaton	" (at Revelstoke)	Ernest Roberts....	
Trail Creek Mining Div...	Rossland	W. H. Reid.....	W. H. Reid... ...	
Nanaimo Mining Division	Nanaimo	L. A. Dodd	L. A. Dodd	
Sub-office	Ladysmith.....	.....	.....	J. A. Knight.
"	Alert Bay	.....	....	Ernest H. Robinson
"	Vananda	.....	.....	Leonard Raper.
"	Granite Bay.....	... .	.....	Henry Twidle.
Alberni Mining Division..	Alberni.....	A. G. Freeze	A. G. Freeze	
Clayoquot Mining Division	Clayoquot	" (at Alberni)	F. W. Towler	
Quatsino Mining Division	Quatsino	" "	Ed. Evensen	
Victoria Mining Division..	Victoria	R. J. Steenson	R. J. Steenson	
New Westminster Min. D.	New Westminster.	F. C. Campbell....	I. Wintemute.....	
Sub-office	Harrison Lake....	.....	.....	L. A. Agassiz.
"	Chilliwack	.....	....	J. Pelly.
Vancouver Mining Div...	Vancouver	John Mahony	A. P. Grant.....	

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Victoria, Government Printing Office, 1925.

Author.

Galloway, John D. *(Provincial Mineralogist.)*

Annual Report of the Minister of Mines of British Columbia for the year ended 31st December 1924, being an account of mining operations for gold, coal, etc., in the Province. (British Columbia, Bureau of Mines.) 388 pp., plates, maps, 1924.
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