ANNUAL REPORT

OF THE

MINISTER OF MINES

FOR THE

YEAR ENDING 31ST DECEMBER

1913

BEING AN ACCOUNT OF

MINING OPERATIONS FOR GOLD, COAL, ETC.

IN THE

PROVINCE OF BRITISH COLUMBIA

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1914.

ANNUAL REPORT

OF THE

MINISTER OF MINES,

1913.

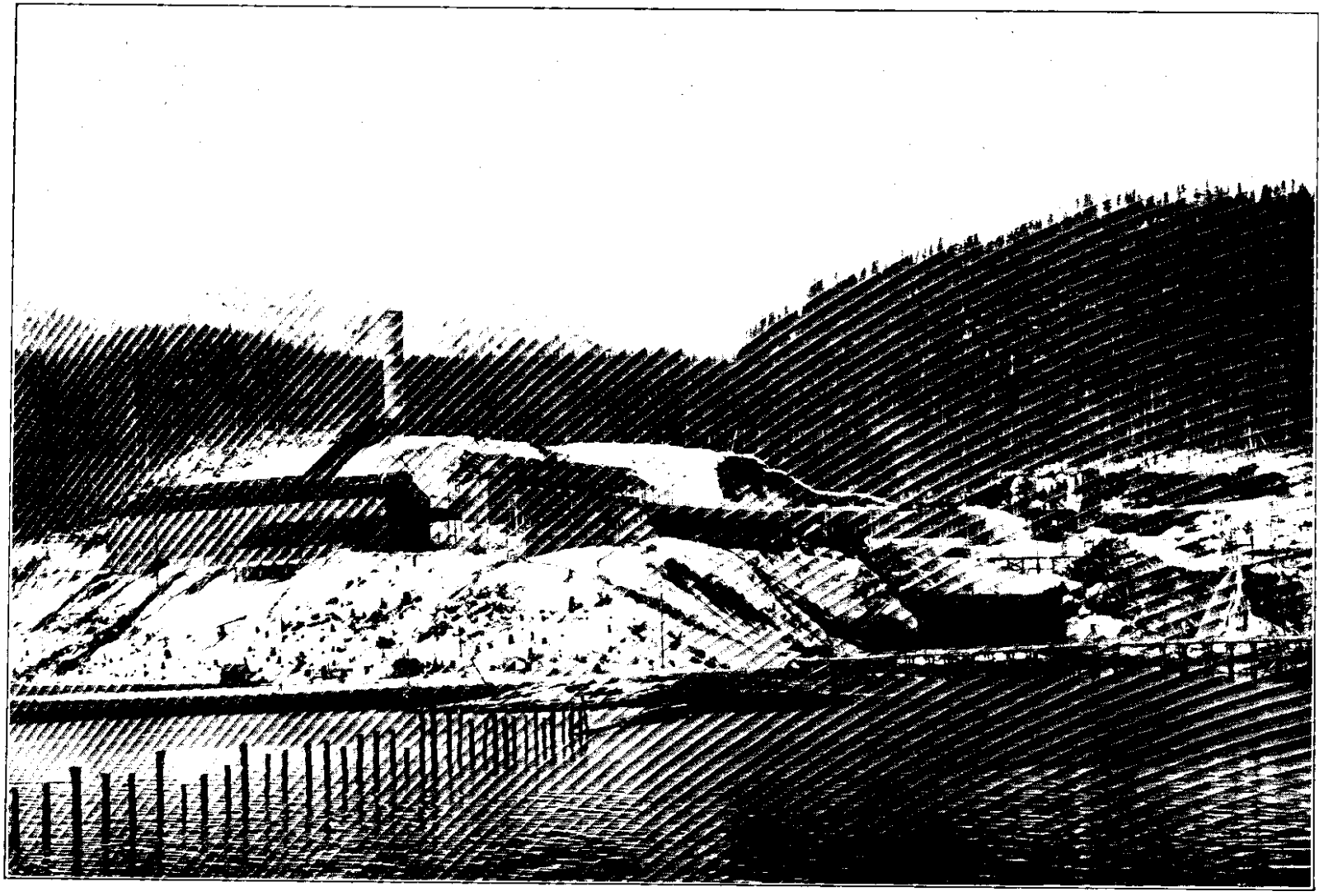
To His Honour THOMAS W. PATERSON,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Provincial Mineralogist upon the Mining Industry of the Province for the year 1913 is herewith respectfully submitted.

RICHARD McBRIDE,
Minister of Mines

Minister of Mines' Office,
March 18th, 1914.



Granby Bay Smelter.

REPORT OF THE BUREAU OF MINES

—BY—

WILLIAM FLEET ROBERTSON, PROVINCIAL MINERALOGIST.

To the Honourable Sir Richard McBride, K.C.M.G.,
Minister of Mines.

SIR,—I have the honour to submit herewith my Annual Report on the Mining Industry of the Province for the year ending December 31st, 1913.

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 smelter or mill 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.

To facilitate comparison with information previously given, I have retained, as closely as was possible, the general form already established for such tables and for the Report.

I have the honour to be,
Sir,
Your obedient servant,

WILLIAM FLEET ROBERTSON.
Provincial Mineralogist.

Bureau of Mines, Victoria, B.C.,
March 18th, 1914.

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, 1897." 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 1913.

Gold, placer	$ 72,704,603
Gold, lode	76,486,512
Silver	35,832,546
Lead	29,696,585
Copper	80,818,051
Coal and coke	142,068,615
Building-stone, bricks, etc.	20,974,184
Other metals, zinc, etc.	1,852,824
Total	$460,433,920

TABLE II.—PRODUCTION FOR EACH YEAR FROM 1852 TO 1913 (INCLUSIVE).

1852 to 1892 (inclusive)	$ 81,090,069
1893	3,588,413
1894	4,225,717
1895	5,643,042
1896	7,507,956
1897	10,455,268
1898	10,906,861
1899	12,393,131
1900	16,344,751
1901	20,086,780
1902	17,486,550
1903	17,495,954
1904	18,977,359
1905	22,461,325
1906	24,980,546
1907	25,882,560
1908	23,851,277
1909	24,443,025
1910	26,377,066
1911	23,499,072
1912	32,440,800
1913	30,296,398
Total	$460,433,920

Table III. gives a statement in detail of the quantities and value of the different mineral products for the years 1911, 1912, and 1913. It has been impossible as yet to collect complete statistics regarding building-stone, lime, bricks, tiles, and other miscellaneous products, but such figures as it has been possible to secure are given in some detail in Table V.

TABLE III.

QUANTITIES AND VALUE OF MINERAL PRODUCTS FOR 1911, 1912, AND 1913.

	Customary Measure.	1911.		1912.		1913.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer	Ounces.	.....	$ 426,000	.....	$ 555,500	.....	$ 510,000
" lode	"	228,617	4,725,513	257,496	5,322,442	272,254	5,627,490
Silver	"	1,892,364	958,293	3,132,108	1,810,045	3,465,856	1,968,606
Lead	Pounds	26,872,397	1,069,521	44,871,454	1,805,627	55,364,677	2,175,832
Copper	"	36,927,656	4,571,644	51,456,537	8,408,513	46,460,305	7,094,489
Zinc	"	2,634,544	129,092	5,358,280	316,139	6,758,768	324,421
Coal	Tons, 2,240 lb.	2,193,062	7,675,717	2,628,804	9,200,814	2,137,483	7,481,190
Coke	" "	66,005	396,030	264,333	1,585,998	286,045	1,716,270
Miscellaneous products	.....	.....	3,547,262	.....	3,435,722	.....	3,398,100
			$23,499,072		$32,440,800		$30,296,398

TABLE IV.

OUTPUT OF MINERAL PRODUCTS BY DISTRICTS AND DIVISIONS.

NAMES.	DIVISIONS.			DISTRICTS.		
	1911.	1912.	1913.	1911.	1912.	1913.
CARIBOO DISTRICT	.....	.....	.....	$ 180,000	$ 268,000	$ 226,024
Cariboo Mining Division	$ 136,000	$ 180,000	$ 131,000	.....	.....	.....
Quesnel "	34,000	80,000	55,000	.....	.....	.....
Omineca "	10,000	8,000	40,024	.....	.....	.....
CASSIAR DISTRICT	.....	.....	.....	293,442	467,579	412,748
EAST KOOTENAY DISTRICT	.....	.....	.....	2,475,056	5,723,004	5,947,935
WEST KOOTENAY DISTRICT	.....	.....	.....	4,343,912	6,165,255	7,092,107
Ainsworth Division	75,768	371,760	627,150	.....	.....	.....
Slocan and Slocan City "	798,989	1,951,315	2,258,309	.....	.....	.....
Nelson "	509,265	581,700	863,966	.....	.....	.....
Trail Creek "	2,891,866	3,214,751	3,305,771	.....	.....	.....
Other parts	68,024	45,729	36,911	.....	.....	.....
BOUNDARY DISTRICT	.....	.....	.....	5,621,109	8,716,406	7,925,336
Osoyoos, Grand Forks & Greenwood Divisions	4,763,817	7,903,006	6,833,902	.....	.....	.....
Similkameen, Nicola, Vernon	814,386	748,900	1,019,340	.....	.....	.....
Yale, Ashcroft, Kamloops	42,906	64,500	72,094	.....	.....	.....
LILLOOET DISTRICT	.....	.....	.....	6,467	5,000	71,445
COAST DISTRICTS (Nanaimo, Alberni, Clayoquot, Quatsino, Victoria, Vancouver)	.....	.....	.....	10,579,086	11,095,556	8,620,803
				$23,499,072	$32,440,800	$30,296,398

TABLE V.

MISCELLANEOUS PRODUCTS AND TOTALS OF PRODUCTION, 1913.

DISTRICT AND DIVISION.	DETAILS OF MISCELLANEOUS PRODUCTS.										SUMMARY OF TOTALS OF PRODUCTION.				
	Cement.	Lime and Limestone.	Building-stone.	Riprap.	Crushed Rock.	Sand and Gravel.	Pottery and Tile.	Red Brick.	Fire, Face, Silica Brick.	Clay, Gypsum, etc.	Total Miscellaneous Products.	Total Output of Collieries.	Total of Metalliferous Mines.	Totals for Divisions.	Totals for Districts.
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
CARIBOO															226,024
Cariboo													131,000	131,000	
Quesnel					8,000	17,000					25,000		30,000	55,000	
Omineca													40,024	40,024	
CASSIAR															412,748
Atlin													343,008	343,008	
Liard-Stikine															
Skeena, Portland C'l			15,000	20,000	8,000	10,000					53,000		16,740	69,740	
Queen Charlotte															
EAST KOOTENAY															5,947,935
Fort Steele			8,000	8,000		10,000		4,500			30,500	4,860,838	935,829	5,827,167	
Windermere-Golden			5,000	5,000		10,000					20,000		100,768	120,768	
WEST KOOTENAY															7,092,107
Ainsworth			700		5,000	5,000					10,700		616,450	627,150	
Slocan & Slocan City													2,258,309	2,258,309	
Nelson		5,000	12,000	6,000	10,000	7,000		5,000			45,000		818,966	863,966	
Trail Creek		5,000			10,000	5,000		3,000	1,000		24,000		3,281,771	3,305,771	
Other Divisions													36,911	36,911	
YALE															7,925,336
Grand Forks Greenwood Osoyoos		50,000	20,000	10,000	25,000	25,000		15,000			145,000		6,688,902	6,833,902	
Similkameen Nicola Vernon	10,500		20,000	10,000	20,000	20,000		5,000			85,500	929,397	4,443	1,019,340	
Yale Ashcroft Kamloops			5,000	10,000	20,000	15,000		15,000			65,000		7,094	72,094	
LILLOOET					35,000	5,000					40,000		31,445	71,445	71,445
COAST DISTRICT	1,280,000	102,500	190,000	205,000	115,000	325,000	154,400	321,000	153,000	8,500	2,854,400	3,407,225	2,359,178	8,620,803	8,620,803
	1,290,500	162,500	275,700	274,000	256,000	454,000	154,400	368,500	154,000	8,500	3,398,100	9,197,460	17,700,838	30,296,398	30,296,398

TABLE VI.—PLACER GOLD.

Table VI. contains the yearly production of placer gold to date, as determined by the returns, sent in by the banks and express companies, of gold transmitted by them to the mints, and from returns sent in by the Gold Commissioners and Mining Recorders. 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 PER YEAR TO DATE.

1858	$ 705,000	1872	$ 1,610,972	1886	$ 903,651	1900	$ 1,278,724
1859	1,615,070	1873	1,305,749	1887	693,709	1901	970,100
1860	2,228,543	1874	1,844,618	1888	616,731	1902	1,073,140
1861	2,666,118	1875	2,474,004	1889	588,923	1903	1,060,420
1862	2,656,903	1876	1,786,648	1890	490,435	1904	1,115,300
1863	3,913,563	1877	1,608,182	1891	429,811	1905	969,300
1864	3,735,850	1878	1,275,204	1892	399,526	1906	948,400
1865	3,491,205	1879	1,290,058	1893	356,131	1907	828,000
1866	2,662,106	1880	1,013,827	1894	405,516	1908	647,000
1867	2,480,868	1881	1,046,737	1895	481,683	1909	477,000
1868	3,372,972	1882	954,085	1896	544,026	1910	540,000
1869	1,774,978	1883	794,252	1897	513,520	1911	426,000
1870	1,336,956	1884	736,165	1898	643,346	1912	555,500
1871	1,799,440	1885	713,738	1899	1,344,900	1913	510,000
						Total	$72,704,603

TABLE VII.—PRODUCTION OF LODE MINES.

YEAR.	GOLD.		SILVER.		LEAD.		COPPER.		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	5,662,523	169,375	324,680	16,234	.....	.....	781,342
1895	39,264	785,271	1,496,522	977,229	16,475,464	532,255	952,840	47,642	.....	.....	2,342,397
1896	62,259	1,244,180	3,135,343	2,100,689	24,199,977	721,384	3,818,556	190,926	.....	.....	4,257,179
1897	106,141	2,122,820	5,472,971	3,272,836	38,841,135	1,390,517	5,325,180	266,258	.....	.....	7,052,431
1898	110,061	2,201,217	4,292,401	2,375,841	31,693,559	1,077,581	7,271,678	874,781	.....	.....	6,529,420
1899	138,315	2,857,573	2,939,413	1,663,708	21,862,436	878,870	7,722,591	1,351,453	.....	.....	6,751,604
1900	167,153	3,453,381	3,958,175	2,309,200	63,358,621	2,691,887	9,997,080	1,615,289	.....	.....	10,069,757
1901	210,384	4,348,603	5,151,333	2,884,745	61,582,906	2,002,733	27,603,746	4,446,963	.....	.....	13,683,044
1902	236,491	4,888,269	3,917,917	1,941,328	22,536,381	824,832	29,636,057	3,446,673	.....	.....	11,101,102
1903	232,831	4,812,616	2,996,204	1,521,472	18,089,283	689,744	34,359,921	4,547,535	.....	.....	11,571,367
1904	222,042	4,589,608	3,222,481	1,719,516	36,646,244	1,421,874	35,710,128	4,578,037	.....	.....	12,309,035
1905	238,660	4,933,102	3,439,417	1,971,818	56,580,703	2,399,022	37,692,251	5,876,222	.....	.....	15,180,164
1906	224,027	4,630,639	2,990,262	1,897,320	52,408,217	2,667,578	42,990,488	8,288,565	.....	.....	17,484,102
1907	196,179	4,055,020	2,745,448	1,703,825	47,738,703	2,291 458	40,832,720	8,166,544	.....	.....	16,216,847
1908	255,582	5,282,880	2,631,389	1,321,483	43,195,733	1,632,799	47,274,614	6,240,249	.....	.....	14,477,411
1909	238,224	4,924,090	2,582,742	1,239,270	44,396,346	1,709,259	45,597,245	5,918,522	8,500,000	400,000	14,191,141
1910	267,701	5,533,380	2,450,241	1,245,016	34,058,746	1,336,360	38,243,934	4,871,512	4,184,192	192,473	13,228,731
1911	228,617	4,725,513	1,892,364	958,293	26,872,397	1,069,521	36,927,656	4,571,644	2,634,544	129,092	11,454,063
1912	257,496	5,322,442	3,132,108	1,810,045	44,871,454	1,805,627	51,456,537	8,408,513	5,358,280	316,139	17,662,766
1913	272,254	5,627,490	3,465,856	1,968,606	55,364,677	2,175,832	46,460,305	7,094,489	6,758,768	324,421	17,190,838
To'l	3,711,103	76,486,512	63,138,715	35,832,546	741,023,348	29,696,585	550,198,207	80,818,051	27,435,784	1,362,125	224,195,819

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

COAL.

Year.	Tons (2,240 lb.).	Value.
1836-1881	1,873,907	$ 6,003,245
1882	282,139	846,417
1883	213,299	639,897
1884	394,070	1,182,210
1885	265,596	796,788
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
Total	39,388,420 tons.	$126,168,678

COKE.

Year.	Tons (2,240 lb.).	Value.
1895–97	19,396	$ 96,980
1898 (estimated)	35,000	175,000
1899	34,251	171,255
1900	85,149	425,745
1901	127,081	635,405
1902	128,015	640,075
1903	165,543	827,715
1904	238,428	1,192,140
1905	271,785	1,358,925
1906	199,227	996,135
1907	222,913	1,337,478
1908	247,399	1,484,394
1909	258,703	1,552,218
1910	218,029	1,308,174
1911	66,005	396,030
1912	264,333	1,585,998
1913	286,045	1,716,270
Total	2,867,292 tons.	$15,899,937

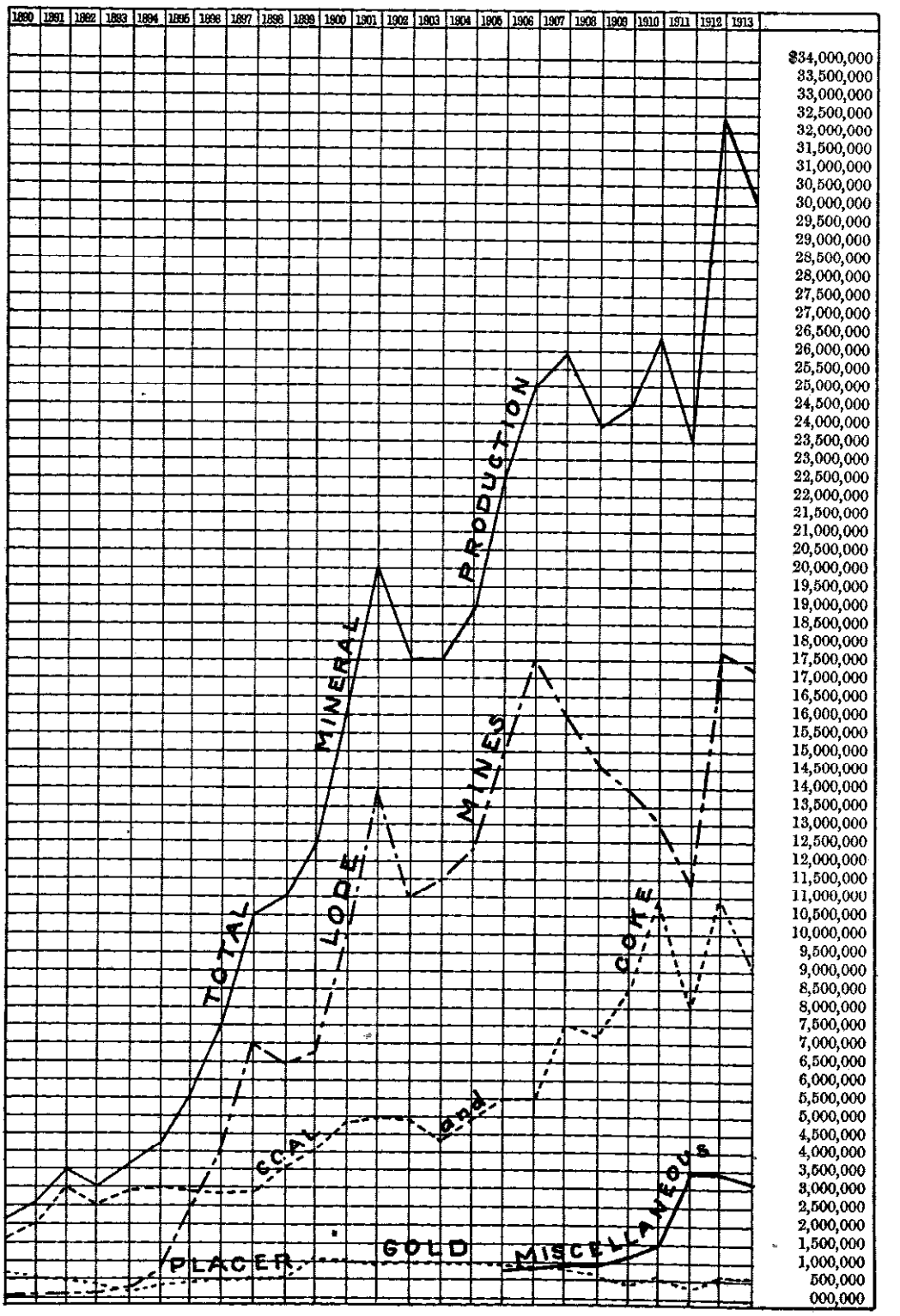
TABLE IX.—PRODUCTION IN DETAIL OF THE

DISTRICT.	YEAR	TONS.	GOLD—PLACER.		GOLD—LODE.		SILVER.	
			Ounces	Value.	Ounces.	Value.	Ounces.	Value.
				$		$		$
Cariboo								
Cariboo Division	1910		10,900	218,000				
	1911		6,800	136,000				
	1912		9,000	180,000				
	1913		6,550	131,000				
Quesanel "	1910		300	6,000				
	1911		1,700	34,000				
	1912		2,500	50,000				
	1913		1,500	30,000				
Omineca "	1910		750	15,000				
	1911		500	10,000				
	1912		400	8,000				
	1913	353	300	6,000	62	1,281	46,298	26,297
Cassiar								
Atlin Division	1910		13,750	275,000				
	1911	38	11,250	225,000	3	62	2,653	1,343
	1912		14,500	290,000				
	1913	310	15,750	315,000	1,355	28,008		
Liard, Stikine, Skeena, Queen Charlotte, Portland Canal Divisions.	1910	4	400	8,000			1,454	739
	1911	7,061	300	6,000	500	10,335	27,323	13,836
	1912	3,249	450	9,000	197	4,072	5,868	3,391
	1913	51	650	13,000	29	599	4,714	2,678
East Kootenay								
Fort Steele Division	1910	115,762	150	3,000			501,475	254 809
	1911	30,543	150	3,000			330,245	167,231
	1912	29,910	100	2,000			376,918	217,821
	1913	32,626	100	2,000			362,311	205,793
Windermere-Golden	1910	53					243	124
	1911							
	1912	20,400					7,405	4,279
	1913	10,000					4,756	2,701
West Kootenay								
Ainsworth Division	1910	21,850			71	1,468	233,010	118,397
	1911	671			4	83	77,375	39,183
	1912	32,741			80	1,653	301,755	174,384
	1913	92,472			25	517	447,015	253,905
Slocan and Slocan City	1910	44,466			101	2,088	964,634	490,150
	1911	45,466			47	971	793,926	402,044
	1912	103,629			198	4,092	1,657,105	957,641
	1913	116,206			252	5,209	1,841,226	1,045,816
Nelson Division	1910	36,203	100	2,000	36,334	761,359	45,787	23,265
	1911	39,756	50	1,000	17,640	364,619	76,774	38,878
	1912	52,323	50	1,000	17,513	361,994	164,182	94,881
	1913	79,843	50	1,000	26,324	544,117	129,011	73,278
Trail Creek Division	1910	253,471			119,277	2,465,455	87,833	44,630
	1911	254,062			116,633	2,411,837	88,076	44,602
	1912	243,870			132,073	2,729,949	87,530	50,584
	1913	253,870			137,004	2,831,873	109,585	62,244
Revelstoke, Trout Lake and Lardeau	1910	971	50	1,000	418	8,640	107,753	54,752
	1911	746	100	2,000	57	1,178	67,884	34,376
	1912	451	225	4,500	89	1,840	43,536	25,159
	1913	546	100	2,000	54	1,116	23,397	13,289
Boundary								
(Grand Forks, Greenwood and Osoyoos Divisions.)	1910	1,701,113	50	1,000	105,294	2,176,427	460,945	234,215
	1911	1,244,819	50	1,000	87,745	1,813,690	326,849	165,517
	1912	1,989,084	50	1,000	104,849	2,167,229	389,341	225,000
	1913	1,844,795	50	1,000	101,195	2,091,701	394,048	223,819
Similkameen, Nicola, and Vernon Divisions	1910		50	1,000				
	1911		50	1,000				
	1912		100	2,000				
	1913	54	150	3,000	1	20	335	190
Yale, Ashcroft and Kamloops Divisions	1910	12	100	2,000			3	1
	1911	4,257	50	1,000	52	1,075	343	174
	1912		100	2,000				
	1913	557	100	2,000	25	517	126	72
Lillooet								
Lillooet and Clinton Divisions	1910	443	350	7,000	137	2,832		
	1911	84	250	5,000	71	1,467		
	1912		250	5,000				
	1913	840	150	3,000	1,368	28,277	295	168
Coast								
(Nanaimo, Alberni, Clayoquot, Quatsino, New Westminster, Vancouver, and Victoria Divisions).	1910	42,080	50	1,000	5,569	115,111	47,104	23,934
	1911	143,252	50	1,000	5,816	120,196	100,926	51,109
	1912	212,875	50	1,000	2,497	51,613	98,468	56,905
	1913	231,288	50	1,000	4,560	94,255	102,739	58,356
TOTALS	1910	2,216,428	27,000	540,000	267,701	5,533,380	2,450,241	1,245,016
	1911	1,770,755	21,300	426,000	228,617	4,725,513	1,892,364	958,293
	1912	2,688,532	27,775	555,500	257,496	5,322,442	3,182,108	1,810,045
	1913	2,863,809	25,500	510,000	272,254	5,627,490	3,465,856	1,968,606

METALLIFEROUS MINES, ETC., FOR 1910, 1911, 1912, AND 1913.

LEAD.		COPPER.		ZINC.		TOTALS FOR DIVISIONS.				TOTALS FOR DISTRICTS.
Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	1910.	1911.	1912.	1913.	1913.
	$		$		$	$	$	$	$	$
						218,000				201,024
							136,000			
								180,000		
									131,000	
						6,000				
							34,000			
								50,000		
									30,000	
						15,000				
							10,000			
								8,000		
156,862	6,165	1,838	281						40,024	369,748
						275,000				
							228,776			
		19,151	2,371					290,000		
									343,008	
						8,807				
1,695	68						39,066			
238,578	9,495							32,579		
41,512	1,670	88,403	14,446						16,740	
6,579	259	1,336	204							1,036,597
						1,217,792				
23,874,562	954,983						853,122			
17,168,069	682,891							953,728		
18,238,238	733,907								935,829	
18,525,083	728,036					2,764				
66,010	2,640									
								103,204		
2,249,237	90,509			142,643	8,416				100,768	
2,495,355	98,067									7,012,407
						318,058				
2,558,353	102,334			2,083,896	95,859		50,765			
289,009	11,502							371,760		
4,863,894	195,723			150,680	7,233				616,450	
9,027,861	354,795			2,100,296	96,614	845,106				
6,406,358	256,254			2,634,544	129,092		798,989			
6,705,571	266,882			5,215,637	307,723			1,951,315		
16,944,811	681,859			6,608,088	317,188				2,258,309	
22,648,766	890,096					876,002				
1,245,844	49,834	231,936	29,544				481,265			
1,928,836	76,768							554,436		
2,293,000	92,270	26,257	4,291						818,966	
1,936,418	76,101	815,126	124,470			2,966,096				
6,946	278	3,577,745	455,733				2,881,366			
8,301	330	3,429,702	424,597					3,196,037		
11,396	459	2,539,900	415,045						3,281,771	
		2,538,661	387,654							
						82,924				
463,295	18,532						58,024			
514,314	20,470							40,729		
229,366	9,230								36,911	
521,771	20,506									6,700,439
						6,442,063				
35,584	1,423	31,354,985	3,993,988				4,745,517			
29,719	1,183	22,327,359	2,764,127					7,846,580		
		33,372,199	5,453,351						6,688,902	
45,982	1,807	23,621,973	4,370,575							
						1,000				
							1,000			
								2,000		
		8,073	1,233						4,443	
99	4	1,178	150			2,155				
		152,723	18,907				21,156			
								2,000		
		29,505	4,505						7,094	
										31,445
						9,832				
							6,467			
								5,000		
									31,445	
										2,359,178
		3,078,090	392,087			1,982,132				
		10,998,721	1,361,642				1,533,947			
		15,429,778	2,521,380					2,630,898		
		14,443,793	2,205,567						2,359,178	
84,658,746	1,886,350	38,243,934	4,871,512	4,184,192	192,473	15,268,731				
26,872,397	1,069,521	36,927,656	4,571,644	2,634,544	129,092		11,890,063			
44,871,454	1,805,627	51,456,537	8,408,513	5,358,280	316,139			18,218,266		
55,364,677	2,175,832	46,460,305	7,094,489	6,758,768	324,421				17,700,838	17,700,838

TABLE X.—Showing Mineral Production of British Columbia.



TABLE

SHOWING MINERAL PRODUCTION

OF

BRITISH COLUMBIA

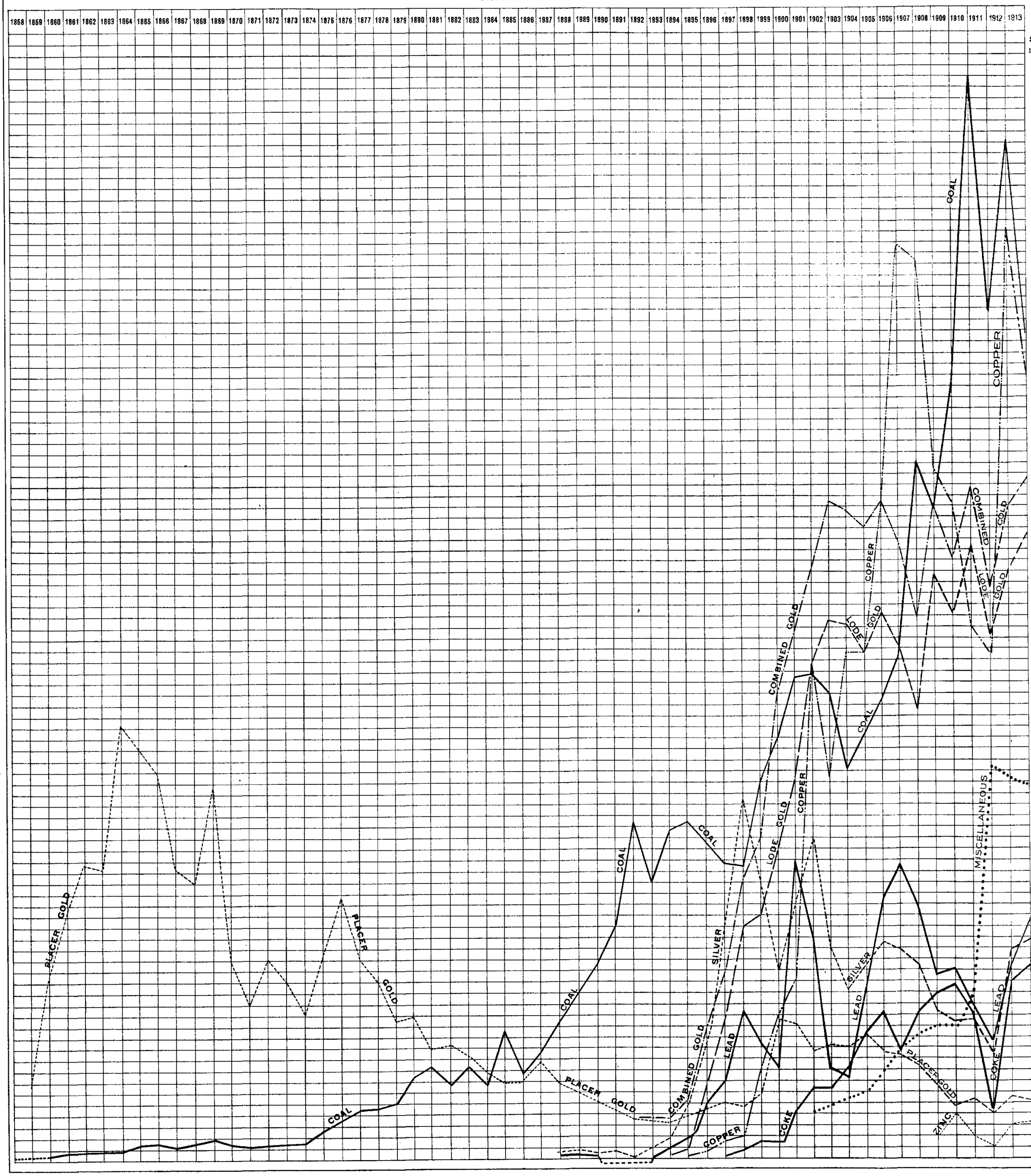
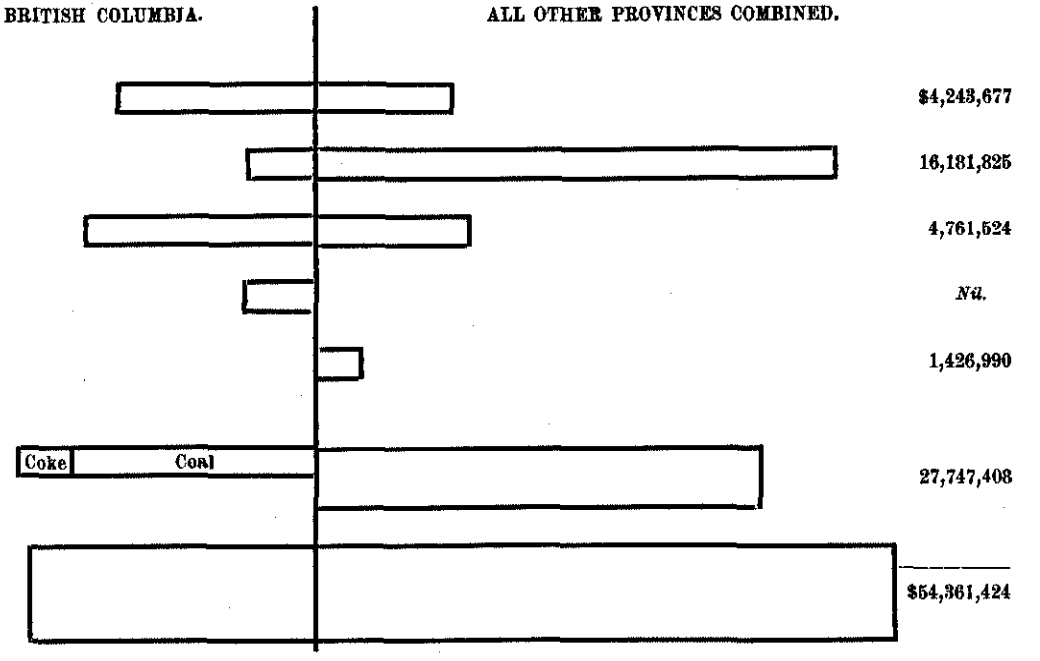


TABLE XI.

Showing Comparative Production in 1913 of Certain Minerals by British Columbia and All Other Provinces of Dominion Combined.

YUKON TERRITORY. Gold ..... $5,835,554 Silver †..... $30,312 Coal..... $20,250

	Aggregate of Provinces.*	BRITISH COLUMBIA.	ALL OTHER PROVINCES COMBINED.
Gold	$10,381,167	$6,137,490	$4,243,677
Silver †	18,150,431	1,968,606	16,181,825
Copper	11,856,013	7,094,489	4,761,524
Lead †	2,175,832	2,175,832	*Nil.*
Iron	1,426,990	*Nil.*	1,426,990
Coal	36,944,868	7,481,190	27,747,408
Coke		1,716,270	
Total	$80,935,301	$26,573,877	$54,361,424



* Taken from "Preliminary Report on the Mineral Production of Canada in 1913," corrected by final figures of British Columbia Statistics.
† At the British Columbia valuation.

PROGRESS OF MINING.

The year 1913 was a favourable one for mining in the Province, notwithstanding the fact that the mineral production made therein shows a slight decrease from the previous year, due to labour troubles at the Vancouver Island collieries.

The gross value of the mineral production for 1913 was $30,296,398, a decrease from that of the year 1912 of $2,144,402, or about 6.6 per cent.

This production has only once been exceeded, namely, by that of 1912, which year, owing to certain very favourable conditions, made a record production.

The gradual increase in production during the past twenty-three years, and its fluctuations, are graphically shown in Table X., on page 14 of this Report.

The tonnage of ore mined in the lode mines of the Province during the past year was slightly less than that of 1912, but nevertheless, greater than in any other year, The ore mined amounted to 2,663,809 tons, showing a decrease from that of the previous year of 24,723 tons, or 0.92 per cent.

The tonnage mined in 1913 was produced by the various districts in about the following proportions: Boundary, 69.30 per cent.; Rossland, 9.52 per cent.; the Coast District, 8.67 per cent.; Slocan District, 4.35 per cent.; Ainsworth, 3.46 per cent.; Nelson, 2.99 per cent.; East Kootenay, 1.60 per cent.; and all other parts of the Province combined, 0.11 per cent.

The following table shows the number of mines which shipped ore during the year 1913, 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:—

TABLE SHOWING DISTRIBUTION OF SHIPPING MINES IN 1913.

	Tons of Ore shipped.	No. of Mines shipping.	No. of Mines shipping over 100 Tons in 1913.	MEN EMPLOYED IN THESE MINES.		
				Below.	Above.	Total.
CARIBOO AND CASSIAR:						
Omineca, Atlin, Skeena, Queen Charlotte, and Portland Canal	714	12	2	36	25	61
EAST KOOTENAY:						
Fort Steele	32,626	3	2	99	54	153
Windermere-Golden	10,000	1	1	14	15	29
WEST KOOTENAY:						
Ainsworth	92,472	13	8	237	109	346
Slocan and Slocan City	116,206	31	12	396	165	561
Nelson	79,843	16	11	226	146	372
Trail Creek	253,870	8	5	510	179	689
Other Divisions	546	4	1	13	5	18
BOUNDARY:						
Grand Forks, Greenwood, and Osoyoos	1,844,795	13	9	668	238	906
Ashcroft-Kamloops	557	1	1	6	18	24
Similkameen-Vernon	54	2	.....	3	.....	3
LILLOOET	840	1	1	14	10	24
COAST	231,286	5	5	256	438	694
Total	2,663,809	110	58	2,478	1,402	3,880

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 NON-SHIPPING MINES AND MEN EMPLOYED.

DISTRICT.	NUMBER OF MINES.			MEN EMPLOYED.		
	Working.	Idle.	Total.	Below.	Above.	Total.
COAST AND CASSIAR	5	5	10	117	39	156
EAST KOOTENAY	....	2	2	...	.....	.....
AINSWORTH	4	5	9	14	5	19
SLOCAN	7	18	25	41	21	62
NELSON	5	7	12	37	10	47
TRAIL CREEK	2	6	8	24	8	32
LARDEAU	2	8	10	3	1	4
BOUNDARY	2	15	17	58	18	76
LILLOOET	1	1	2	1	1	2
Total	28	67	95	295	103	398

SUMMARY OF THE 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 1913, aggregating $460,433,920. From this table it will be seen that coal-mining has produced more than any other separate class of mining, a total of $142,068,615; followed next in importance by copper at $80,818,051, and next in order this year by lode gold at $76,486,512, thus relegating to fourth place placer gold at $72,704,603.

The metal gold, obtained from both placer and lode mining, amounts to a value of $149,191,115, the greatest amount derived from any one mineral, the next important being coal, the total gross value of which, combined with that of coke, is $142,068,615, followed by copper at $80,818,051, silver at $35,832,546, and lead at $29,696,585.

TABLE II. shows the value of the total production of the mines of the Province for each year from 1893 to 1913 (inclusive), during which period the output has increased nearly tenfold, and reached a production, for the year 1913, valued at $30,296,398, which is nearly three times what it was in 1898. While the gross production for the year 1913 is $2,144,402, or 6.6. per cent. less than that of the record year 1912, it is, nevertheless, with this exception, greater than that of any previous year, being $3,919,332, or 14.85 per cent. greater than that of 1910, which, prior to 1912, had been the record year. The value of the total mineral production of the Province up to the end of 1913 is $460,433,920.

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 purposes of comparison, similar data for the two preceding years.

The table shows that there has been this year a decrease in the production of placer gold of some $45,500, but at the same time an increase in the output of lode gold of $305,048, making an increase of $259,548 in the total production of the metal.

The amount of silver produced this year was 3,465,856 oz., having a gross value of $1,968,606, an increase in the number of ounces produced of 333,748, due to an increased production in the Slocan, Coast, and Boundary Districts. The gross value of the silver product this year shows an increase over that of last year of $158,561, notwithstanding that the market price of silver was lower during this year.

The table shows an output of lead in 1913 amounting to 55,364,677 lb., valued at $2,175,832, which is an increase over the production of the preceding year of 10,493,223 lb. of lead, or 19 per cent.

The production of copper this year was 46,460,305 lb., valued at $7,094,489, a decrease in amount of 4,996,232 lb., or about 9.76 per cent. The value of the product was less than that of the preceding year by $1,314,024—a decrease of 15.6 per cent.

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 this year again the Coast District has the honour of first place on the list, followed, in order of importance, by the Boundary and West Kootenay Districts. The Coast and East Kootenay 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 Coast District also derives a large proportion of its production from miscellaneous products, such as building materials, etc., due to the larger cities therein; this year this amounted to $2,854,400, as shown in Table V.

In this table, this year again, the value of zinc has been distributed to the districts producing it, which has occasioned some changes in this table as compared with the 1909 Report, thus making it differ from the column in that and previous reports.

TABLE V. is a new table, introduced two years ago, and 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 $3,398,100. 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. gives the statistical record of the placer mines of the Province from 1858 to 1913, and shows a total production of $72,704,603. The output for 1913 was $510,000, a decrease, as compared with the previous year, of about 8.2 per cent.

TABLE VII. relates entirely to the lode mines of the Province, and shows the quantities and value 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 $224,195,819; this figure includes the zinc production of 1909 and all subsequent years.

This year a new column has been made in this table in which to record the zinc production, and the output since 1909 has been recorded therein. In former years the zinc production was small and was listed as miscellaneous material.

TABLE VIII. contains the statistics of production of the coal-mines of the Province. The total amount of coal produced to the end of 1913 is 39,388,420 tons (of 2,240 lb.), worth $126,168,678. Of this, there was produced in 1913 some 2,137,483 tons valued at $7,481,190, a decrease of 491,321 tons in quantity and of $1,719,624 in value compared with the preceding year. 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 1913 was 433,277 tons, from which was made 286,045 tons of coke, having a value of

$1,716,270, an increase over the preceding year of 21,712 tons, or about 8.2 per cent. with an increase in value of $130,272. While only 286,045 tons of coke was actually made, 287,157 was actually sold; 1,528 tons being taken from the stocks at the mines, and 416 tons was used under the company's boilers. The total value of the output of the collieries of the Province in 1913 was $9,197,460.

The average selling prices taken this year in the calculation of value of product are the same as those used last year; that for coal being $3.50 and for coke $6 a ton of 2,240 lb. The prices used in calculations prior to 1907 were $3 and $5 respectively.

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 the metalliferous mines of the Province for the years 1910, 1911, 1912, and 1913, 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 1913 was 2,663,809 tons, having a gross value of $17,190,838 and with the placer gold a total value of $17,700,838.

The following table shows the percentages of such tonnage derived from the various districts of the Province:—

Boundary District	69.30	per cent.	of tonnage.
Trail Creek Mining Division	9.52	"	"
Coast District	8.67	"	"
Slocan District	4.35	"	"
Ainsworth Mining Division	3.46	"	"
Nelson Mining Division	2.99	"	"
East Kootenay District	1.60	"	"
Other Divisions	0.11	"	"
	100.00		

In reports previous to 1910 there has been included in this table 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.

It will be seen that, although coal-mining has been a constantly increasing industry during this whole period of twenty-three years, lode-mining did not begin, practically, until 1894, since when it has risen with remarkable rapidity, though not without interruption, until it reached, in 1906, the $17,000,000 line, and the total production in 1910 reached the $26,000,000 line, and last year it reached the $32,000,000 line, while this year it again drops to the $30,000,000 line.

TABLE XI. compares graphically the output of certain mineral products in British Columbia with that of the combined output of similar products in all the other Provinces of the Dominion, and shows that in 1913 British Columbia produced, in the minerals shown, an amount equal to over 32.8 per cent. of all the other Canadian Provinces combined.

COAL.

The collieries of the Province made in 1913 a gross production of 2,570,760 tons (2,240 lb.) of coal, a decrease from the preceding year of 454,949 tons, equivalent to a decrease of 15 per cent.

While this comparison is true as regards the Province as a whole, it must in fairness be stated that the output for 1912, with which the comparison is made, was one of the largest ever made in the Province, and also that the decrease in the production of the past year is entirely attributable to the labour troubles which have afflicted the Vancouver Island collieries during the whole year, causing a decrease in the gross output of this district of 584,747 tons.

The other districts each show a material increase; the Nicola-Princeton District of 59,285 tons, and the Crowsnest of 70,513 tons, together equal to an increase of 129,798 tons, which somewhat offsets the decrease in the Vancouver Island field.

The greater part of this production is still mined by three companies—the Crow's Nest Pass Coal Company of East Kootenay, the Canadian Collieries and the Western Fuel Company of Vancouver Island, which mined, collectively, 71 per cent. of the gross output, their respective production representing 40 per cent., 22 per cent., and 9 per cent. of such total.

Of the other collieries: In the Coast District, on Vancouver Island, the Pacific Coast Coal Mines, Limited, produced 79,646 tons, and the Vancouver-Nanaimo Coal Company 107,602 tons; and in the Nicola Valley section of the district, the Nicola Valley Coal and Coke Company mined 113,605 tons, the Inland Coal and Coke Company 114,003 tons, the Princeton Coal and Land Company 29,206 tons, the Diamond Vale Coal Company 6,326 tons, while the United Empire Coal Company produced some 1,752 tons of coal.

In the East Kootenay District, in addition to the Crow's Nest Pass Coal Company, which produced 1,041,409 tons, the Hosmer Mines, Limited, produced 217,528 tons and the Corbin Coal and Coke Company 72,788 tons.

In addition to those companies actually shipping, several other companies have been installing plant and have approached the shipping stage, mention of which will be made elsewhere in this Report.

The collieries of the Coast District, including the Nicola Valley field, are to be credited this year with about 48.2 per cent. of the total coal output.

The gross output of the collieries of the Province for the past year was, as already stated, 2,570,760 tons, in addition to which some 31,651 tons of coal was taken from stock, making the gross amount of coal distributed 2,602,411 tons.

Of this gross amount, there was sold for consumption in Canada, 1,169,605 tons; sold for consumption in the United States, 627,515 tons; making the total coal sales for the year 1,797,120 tons of 2,240 lb.

In addition to the coal sold, there was used in the manufacture of coke 433,277 tons, all in the East Kootenay field; and used under companies' boilers, etc., 192,402 tons; while 179,612 tons was lost in washing and screening.

There was no coke made this year in the Coast District, although some 66 tons was sold from stock, the total coke production having been made by the Crow's Nest Pass Coal Company, and Hosmer Mines, Limited, in the East Kootenay field, where, from 433,277 tons of coal, 286,045 tons of coke was manufactured, of which 416 tons was used under the companies' boilers.

The coke sales of the Province for the past year amounted to 287,157 tons, of which 1,528 tons was drawn from stock.

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.)	882,195	287,410	1,169,605
" export to United States..... "	99,895	527,620	627,515
" export to other countries..... "	.....	.....	.....
Total coal sales.....	982,090	815,030	1,797,120
COKE.			
Sold for consumption in Canada.....(Tons—2,240 lb.)	66	236,465	236,531
" export to United States..... "	.....	50,626	50,626
" export to other countries..... "	.....	.....	.....
Total coke sales.....	66	287,091	287,157

COLLIERIES OF COAST DISTRICT.

The Coast collieries mined 1,239,035 tons of coal in 1913 to which was added 31,139 tons taken from stock, making 1,270,174 tons distributed from these collieries in 1913. This amount was distributed thus:—

Sold as coal in Canada	882,195 tons.	
" United States	99,895 "	
" other countries	.....	
Total sold as coal		982,090 tons.
Used under companies' boilers, etc		108,472 "
Used in making coke		.....
Lost in washing		179,612 "
		1,270,174 "
Minus coal taken from stock		31,139 "
Gross output		1,239,035 "

The total coal sales of the Coast collieries for the year show, as compared with the sales of the previous year, a decrease of 465,657 tons, equivalent to 32.1.

The consumption of coal in that part of British Columbia served by the Coast collieries—partly due to the introduction of California oil-fuel—shows this year a decrease of 150,156 tons, or about 14.5 per cent. from the preceding year; the amount exported to the United States was 207,344 tons less, and no coal was exported to other countries.

Only one company in the Coast District—the Canadian Collieries, Limited—has ever made coke, and this year the ovens have not been in operation, although the company sold 66 tons of coke from stock, and still has 2,304 tons in stock.

The coke sold was entirely for consumption in British Columbia, no export sales having been made.

On Vancouver Island, four companies produced coal this year—the Canadian Collieries, Limited, the Western Fuel Company, the Pacific Coast Coal Mines, and the Vancouver-Nanaimo Coal Company; the majority of these companies each operate two, or more, collieries. The combined output of the Island collieries was 973,493 tons.

In the Nicola and Princeton valleys of the Coast District, the Nicola Valley Coal and Coke Company produced 113,605 tons of coal; the Princeton Colliery, 29,206 tons; the Inland Coal and Coke Syndicate (formerly Coal Hill Syndicate), 114,003 tons; the Diamond Vale Colliery, 6,326 tons; and the United Empire, 1,752 tons.

The total output of this portion of the district was 265,542 tons. The Pacific Coast Colliery Company of Nicola, and the Columbia Coal and Coke Company of Coalmont, on the Tulameen river, each mined coal in development-work, but have not as yet entered the market as producers to any serious extent.

East Kootenay Coalfield.

There were three companies operating in this district—the Crow's Nest Pass Coal Company, operating two separate collieries, the combined output of which was 1,041,409 tons; the Corbin Coke and Coal Company, which made an output of 72,788 tons; and the Hosmer Mines, Limited, which produced 217,528 tons of coal, making a gross output for the district for 1913 of 1,331,725 tons of coal.

In addition to the coal mined, 512 tons was taken from stock, making the amount of coal distributed from the collieries 1,332,237 tons.

Of this gross tonnage, 433,277 tons was used in the manufacture of coke, of which there was produced 286,045 tons (2,240 lb.).

The coke sold this year amounted to 287,091 tons, and 416 tons was used under the companies' boilers, making a total of 287,507 tons, from which must be deducted 1,462 tons taken from stock, making the coke production for this year 286,045 tons, as compared with 264,333 tons in 1912.

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

Sold as coal in Canada	287,410 tons.	
Sold as coal in United States	527,620 "	
Total sold as coal		815,030 tons.
Used by the companies in making coke		433,277 "
Used by the companies under boilers, etc.		83,930 "
		1,332,237 tons.
Minus coal taken from stock		512 "
Gross output		1,331,725 tons.

GOLD.

Placer Gold.

The production of placer gold during the past year was worth about $510,000 as nearly as can be ascertained; great difficulty is found in obtaining reliable figures, since the work is, in many cases, carried out by individuals or unorganized groups of men who keep no books, frequently paying wages, or for supplies, in gold-dust, which, being readily transported, is scattered, and the tax imposed thereon by law is thus evaded.

This year's output shows a decrease, as compared with 1912, of $45,500, accounted for in part by a shorter gravel-washing season than usual in the Cariboo District.

In addition to the Cariboo District, several other districts showed decreases, but this was to some extent balanced by an increase from the Cassiar District.

Considerable work in connection with placer-mining was done in the Similkameen District, although the actual production was small.

The production of placer gold is nearly all from the Atlin and Cariboo Districts; over 94 per cent. of the total coming from these two sections.

Gold from Lode-mining.

The value of the gold produced from lode-mining in the Province during the year 1913 was $5,627,490, an increase, as compared with the previous year, of $305,048, or about 5.74 per cent. Increases in lode-gold production have been made this year in every district except the Boundary and Ainsworth. In the Boundary District, which includes the Osoyoos Mining Division, the decrease is due to a smaller tonnage of ore smelted than in the previous year, and not to a lowering of the gold values in the ores, which were actually a little higher than last year. The Nelson District produced 8,811 oz. more than in 1912, or an increase of about 50 per cent.

The only large stamp-mill in operation in the Province is at the *Nickel Plate* mine at Hedley, in the Osoyoos Mining Division, which, this past year, milled some 70,796 tons of ore having a value of over $800,000. There are smaller stamp-mills operating at the *Poorman*, *Queen*, *Mother Lode*, and other mines in the Nelson Division; and, in addition, there are stamp-mills at the *Jewel* mine, Greenwood; *Coronation* mine, Lillooet; and *Engineer* mine, Atlin, which commenced operations during the year.

The following are the values of the gold product of the three most important camps: Rossland, $2,831,873; Boundary, $2,091,701; and Nelson, $544,117. About 73 per cent. of the gold production of the Province is obtained from the smelting of copper-bearing ores, the remainder from stamp-milling.

SILVER.

The total amount of silver produced in the Province during the year 1913 was 3,465,856 oz., valued at $1,968,606, an increase in amount, as compared with the previous year, of 333,748 oz., and in value of $158,561.

This is the greatest production of this metal since 1902, and is accounted for by the general revival of silver-lead mining in the Slocan District. The outlook for a large production during the ensuing year is bright.

The Slocan District—including the Ainsworth, Slocan, Slocan City, and Trout Lake Mining Divisions—produced about 67 per cent. of the total Provincial output of silver this year, and the Fort Steele Mining Division about 10.5 per cent., all from argentiferous galena. The remainder is chiefly derived from the smelting of copper-ores carrying silver.

The Hazelton District for the first time enters the field as an important producer, providing 46,298 oz. of silver, of which 38,839 oz. is credited to the *Silver Standard* mine.

The following table shows the silver production from the different Mining Divisions:—

Slocan and Slocan City M.D.	produced	1,841,226	oz. silver	53.25	per cent. of total.
Ainsworth	"	447,015	"	12.88	"
Boundary	"	394,048	"	11.34	"
Fort Steele	"	362,311	"	10.43	"
Nelson	"	129,011	"	3.72	"
Trail Creek	"	109,585	"	3.16	"
Coast	"	102,739	"	2.96	"
Omineca	"	46,298	"	1.35	"
Trout Lake	"	23,397	"	0.67	"
All others	"	10,226	"	0.29	"
		3,465,856	"	100.00	"

LEAD.

The lead production of the Province for the year 1913 was 55,364,677 lb. of lead, having a market value of $2,175,831, showing, as compared with the previous year, an increase in amount of 10,493,223 lb. of lead, or 23.4 per cent., and an increase in value of $370,204, or 20.5 per cent.

This amount of lead represents the amount of metallic lead actually recovered, and paid for, by the smelters, and tallies very closely with their receipts.

Instead of taking account of "loss in slags," we have followed, as has been our habit, the practice of the smelters of deducting 10 per cent. from the market price of the metal, in calculating the value.

The average market price of this metal for the year 1913 was a little lower than for the previous year.

The lead production is this year, as usual, derived chiefly from the Slocan and Fort Steele Mining Divisions, as is shown in the following table:—

Slocan	M.D. produced	22,648,766 lb.	lead =	41.00 per cent. of total.
Fort Steele	"	18,525,083	"	33.44 "
Ainsworth	"	9,027,861	"	16.26 "
Windermere-Golden	"	2,495,355	"	4.50 "
Nelson	"	1,936,418	"	3.48 "
Trout Lake	"	521,771	"	0.94 "
All others	"	209,423	"	0.38 "
		55,364,677	"	100.00 "

COPPER.

The amount of copper produced in the Province in 1913, smelted during the year, was 46,460,305 lb. fine copper valued at the average New York market price for copper at $7,094,489. These figures represent the amount of copper actually recovered, as nearly as it is possible to ascertain; the amount of copper really in the ores mined would be approximately 25 per cent. greater.

As compared with the year 1912, these figures show a decreased production in amount of 4,996,232 lb., or about 9.73 per cent. This decrease is accounted for by the lower grade of copper-ore mined and smelted in the Boundary District.

As to the future, it would appear that the Boundary, which now provides about 60 per cent. of our output of copper, is likely not only to hold up its present output, but to steadily increase it; while the Coast District within a year or so will be making at least three times its present output, due to improved processes at the *Britannia* mine and the operation of the Granby Company's plant at Observatory inlet, where a 2000-ton-a-day smelter is now nearing completion, with enough ore behind it, actually proved, to keep it running for some years.

The following table shows the production of the various districts for the years 1910, 1911, 1912, and 1913:—

	1910.	1911.	1912.	1913.	
Boundary District	31,354,985 lb.	22,327,359 lb.	33,372,199 lb.	28,621,973 lb.	= 61.60 %
Rossland "	3,577,745 "	3,429,702 "	2,539,900 "	2,538,661 "	5.46 "
Coast & Cassiar "	3,078,090 "	11,017,872 "	15,518,181 "	14,446,967 "	31.10 "
Yale-Kamloops "	1,178 "	152,723 "	.....	37,578 "	0.08 "
Nelson "	231,936 "	.....	26,257 "	815,126 "	1.76 "
	38,243,934 "	36,927,656 "	51,456,537 "	46,460,305 "	100.00 "

The average assays of the copper-ores of the various camps, based upon the copper recovered, were as follows:—

Boundary, 0.777 per cent.; Coast, 3.123 per cent.; and Rossland, 0.500 per cent.

ZINC.

The total quantity of zinc produced in 1913 was 6,758,768 lb., valued at $324,421, the average New York price, less 15 per cent., being taken as the basis of valuation.

This shows an increase, as compared with the year 1912, of 1,400,408 lb., or 26.2 per cent.

The lowering of the United States tariff on zinc-concentrates and ore entering that country served to stimulate zinc production during the latter months of 1913, and should still further increase the output in the future.

Ninety-eight per cent. of the zinc production comes from the Slocan District, the balance coming from the Ainsworth Mining Division.

The *Standard* mine, near Silverton, produced over one-half of the total output, while the *Lucky Jim*, *Rambler-Cariboo*, *Van-Roi*, *Noble Five*, and *Surprise* contributed in a lesser degree.

The laboratory experiments in electric smelting of lead-zinc ores that have been made during the last two years under the direction of the Mines Branch of the Dominion Department of Mines having reached a sufficiently advanced stage, arrangements have been made to experiment on a larger scale, and for this purpose an electric furnace has been constructed at Nelson, and G. C. Mackenzie, of the Mines Branch staff, assigned to the duty of endeavouring to smelt Slocan ores in sufficient quantity to demonstrate the commercial value of the reduction process to be used. It is, as yet, too early to make any statement as to the success or otherwise of the work that is being undertaken there.

OTHER MINERALS.

Iron-ore.

The situation in regard to iron-ore remains unchanged, no material advancement having been made in the utilization of the numerous deposits throughout the Province. At present there is no market in the Province for iron-ore, and, as a consequence, very little development-work has been done. There are, undoubtedly, a number of iron-ore deposits in different districts which are of considerable size, and which are, as a rule, very free from injurious elements. In considering the possibility of the successful establishment of an iron and steel industry, other factors besides availability of ore are important, namely, a sufficient market for the products, a supply of fuel near by at a price comparable with what it is in the East, and a steady supply of suitable labour.

So far as is at present known on the Coast, there is no developed body of hæmatite or other ore of iron, such as would be desirable to mix with the magnetites for blast-furnace smelting.

In the Coast District the iron-ores are all magnetites, as far as have been developed in any quantity, and, although these sometimes contain sulphur, as pyrite, they are singularly free from other impurities.

As to the electro-thermic smelting of such iron-ores into commercial pig-iron, the process has not as yet been sufficiently perfected, although it is looked upon as one of the possibilities of the future.

Considerable interest has been manifested during the past year in regard to iron-deposits generally, and there have been many rumours of intended installations of iron-smelting plants, but nothing at all definite has yet become public.

Platinum. No production of platinum in 1913 has been reported, and it is not likely that the Tulameen output from placer-mining was more than a few ounces. The Mines Branch of the Dominion Department of Mines, Ottawa, in October last, had one of its officers, Dr. Wilson, sample the dykes in the vicinity of Nelson which it had been claimed carried platinum. He took some seventeen samples, and Dr Haanel, the Director, now writes that, upon assay, none of the samples were found to contain any platinum or metals of the Platinum group. The full letter is given elsewhere in this Report.

Diamonds. Nothing has been heard concerning diamonds in the Tulameen country, the earlier discovery of the Geological Survey still remaining of purely scientific interest. Prospectors have been examining the gravels in the district for the precious stones, but, so far, have not found any of commercial value.

Oil. Drilling for oil was continued in the Fraser valley, and also in the neighbourhood of Otard bay, Graham island, but although the results are said to be encouraging, no appreciable flowage of oil is yet reported. The British Columbia Oil and Coal Development Company has put down three or four bores on Sage creek, in the Flathead section of East Kootenay, and it is reported that in the last couple of holes sufficient oil was encountered to induce the company to proceed at once to bore a big, deep well.

Mica. A small amount of development-work was carried out on the mica claims in the vicinity of Tete Jaune Cache, but no output is yet recorded. Now that the Grand Trunk Pacific Railway has been built to within a few miles of these claims, it is pretty well assured that they will be seriously investigated this coming season.

BUILDING MATERIALS.

The production of building materials during 1913 was less than in the year 1912, due no doubt to the financial depression which has, to some extent, retarded construction-work, especially in the Coast cities. An increase in the value of the cement production by $500,000 has helped greatly to offset the heavy decreases in crushed stone, sand and gravel, etc.

For the past year, although the statistical returns are not as complete as desired, a production of about $3,398,100 is accounted for, the details of which are given in Table V., on page 9. Approximately 84 per cent. of this output comes from the Coast District, and the larger part of this finds its market in the Coast cities.

Building-stone. Excellent building-stone of various sorts is found in abundance in almost every part of the Province, but 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 also export to the United States.

A detailed description of the more important quarries was given in the Report of this Bureau for 1904.

Marble. The Canadian Marble and Granite Company continued development-work on their marble-quarry on the line of the Lardeau-Trout Lake Railway, about eight miles from Lardeau, but as yet have not marketed any great quantity of marble. As far as can be learned, no important shipments of marble have been made from any quarry in the Province, although development-work on several has been carried out. A deposit on the line of the Grand Trunk Pacific Railway, some fifty miles from Prince Rupert, is now under development.

Red Brick. The production of red brick during the past year was about 40,000 M., amounting in value to $368,500. The price of common brick ranges from $8 to $11 a thousand, according to quality and demand. A considerable quantity of brick is still imported into Vancouver, but as the local plants are now well equipped with modern appliances, they should be able to overcome outside competition.

Firebrick. The only company producing firebrick in the Province is the Clayburn Company, Limited, with a plant at Clayburn, where the beds of clay are of the age of the coal-measures. This company made approximately 3,000 M. firebrick, worth about $77,000, and 2,000 M. front or face brick, worth about $60,000. Besides this the company made a large number of common brick, paving-brick, tiles, drain-pipes, etc.

Pottery, Drain-pipe, and Tile. The plant of the British Columbia Pottery Company at Victoria West, which manufactures drain and sewer pipe, chimney-tiles, etc., was burned down in September, 1913, thus reducing the year's output by one-quarter. The company commenced rebuilding at once, and will soon be operating on a larger scale than before. The Port Haney Brick Company, besides manufacturing common brick, also make drain-pipe, partition-block, etc.

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, Raymond & Sons have three kilns in operation, and there are kilns on Saanich arm. On Texada island—in addition to the old plant at Marble bay—a new and extensive plant has been erected at Blubber bay. 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 costs of quarrying.

The Consolidated Mining and Smelting Company quarried about 95,000 tons of limestone from the Fife quarries for use as flux in the furnaces at the Trail smelter.

Portland Cement. Three companies manufactured cement in the Province during the past year. The Vancouver Portland Cement Company, with works at Tod inlet, increased last year's output considerably, being said to have produced over $1,000,000 worth of cement. The Associated Cement Company, with works at Bamberton, entered the field with a production valued at about $250,000. The British Columbia Portland Cement Company, with works at East Princeton, made a beginning at making cement, but after running for a short time, closed down at the end of the year.

Crushed Rock and Gravel.

The returns for crushed rock and gravel indicate a falling-off in the demand for this material. The plants which have been in operation for the past two or three years nearly all kept up an output, but not on as large a scale as in the previous year.

Concrete construction has become so extensive on the Coast that a number of plants are well fitted up with crushing and screening machinery to make the various products required.

Near Vancouver and Victoria a number of companies supply 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 value of the sand and gravel produced for use in these two cities amounted during the past year to about $300,000.

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.

At the beginning of the year Herbert Carmichael, who for many years had filled the position of Assistant Mineralogist, Assayer and Analyst, resigned, in order to attend to his personal affairs. This necessitated a rearrangement of the permanent staff of the Bureau, which now consists of the Provincial Mineralogist and Assayer, Wm. Fleet Robertson; the Assistant Provincial Assayer and Provincial Analyst, D. E. Whittaker; and, since September, 1913, of J. D. Galloway, M.Sc., who was then appointed Assistant Provincial Mineralogist; while H. Nation continues as general office assistant.

During the season of 1913 the Bureau was allowed the temporary assistance in the field of two private practising mining engineers, who were engaged to make examinations of and report on the mineral properties in certain portions of the Province. These were Donald G. Forbes, M.E., who made inspections in the Coast District, and W. M. Brewer, who reported on the Lillooet and Kamloops Mining Divisions.

In addition, the Bureau engaged the services of Wm. Thomlinson, of New Denver, for the summer months to collect a series of ore specimens from all the mines of the Slocan District.

In March, 1913, the office of the Provincial Mineralogist was moved from the Department of Mines offices in the main Parliament Buildings to new quarters in the old Legislative Hall on Superior street, where offices were fitted up; in this building are also located the Mineral Museum, Assay Office, and Laboratory.

Provincial Mineralogist.

After the report for the preceding year had been issued, the Provincial Mineralogist, with assistants, held an examination at Victoria of candidates for Certificates of Competency as Assayers, which lasted a week. During the season of 1913 the greater part of the time of the Provincial Mineralogist was occupied in attending to work in connection with the XII. Session of the International Geological Congress, held in Canada in 1913, and of which special mention is made elsewhere.

The Provincial Mineralogist having been made a member of the Finance and Organization Committees of the Congress, as representing the Province of British Columbia, he, under instructions from the Department, went to Ottawa in March, 1913, attended meetings of these Committees, and, immediately afterwards, the annual meeting of the Canadian Mining Institute, also held at Ottawa.

During the early summer months his time was taken up with making preparations for the reception of and arranging excursions for the large number of delegates from the Congress who would visit the various parts of British Columbia.

From August 7th to 14th he attended, officially, the sessions of the Congress in Toronto, the trip occupying three weeks. On August 25th and 26th delegates and members of the Geological Congress to the number of about 225 arrived in Victoria, where they were appropriately entertained by His Honour the Lieutenant-Governor and by the Government of the Province.

After the meeting in Victoria the Provincial Mineralogist accompanied the excursions of the Congress, acting as guide to the Britannia mine, on Howe sound, and also to the Skeena and Bulkley valleys excursion.

Returning from Prince Rupert to Victoria on September 6th, after attending to accumulated office-work, he proceeded in company with Dr. A. W. G. Wilson, of the Mines Branch, Ottawa, to the placer goldfields of the Quesnel river and into the Horsefly camp, being prevented from getting into the Barkerville District by a severe and unusually early snow-storm occurring on October 17th, which rendered horse travelling impossible.

Returning to Ashcroft on October 26th, the Provincial Mineralogist continued on to the Slocan District, where he examined a number of mines and inspected the work that had been done by Mr. Thomlinson during the season, in the making of a collection of specimens of ore from all the mines in the District for the use of the Government Mineral Museum.

In December the Board of Examiners for Assayers met in the Government Laboratory, Victoria, and held an examination of candidates for Certificates of Competency as Assayers; the examination occupied a week.

Assistant Provincial Mineralogist.

As already noted, an Assistant Mineralogist was appointed in the person of J. D. Galloway, M.Sc., an Honour Graduate of the McGill University Mining Course of 1911. Mr. Galloway took up his duties on September 1st, 1913. The following is an outline of Mr. Galloway's itinerary in the field, while his notes on the various properties examined will be given under the heading of the Mining Division in which the properties are situated.

Mr. Galloway reports as follows:—

"The writer began his work with the Department of Mines on August 28th, 1913, on which date he was sent to Vancouver with a mineral collection loaned to the Vancouver Exhibition; this he unpacked, set up, and arranged in the Exhibition buildings, and at the close of the Exhibition the collection and case were repacked and brought back to Victoria.

"In the interval the writer examined and reported on the property of the Lynn Creek Zinc Mines, Limited, on Lynn creek, to the north of the city of North Vancouver, returning to Victoria on September 9th.

"On September 10th, 1913, the writer received instructions from the Provincial Mineralogist to make a trip through the Tulameen, Similkameen, and Boundary Districts in order to obtain information about the mining development taking place. Much of the territory covered was through old-established mining camps that are steadily producing, but some new camps were visited and also some old camps which have lately shown renewed activity. Owing to the lateness of the season, the trip was rather hurried, and, in the latter part, surface examination was rendered difficult on account of snow.

"Very favourable reports had been heard about the silver-lead showings in Summit camp, at the head of the Tulameen river, and so it was decided to make a fairly complete examination of this locality. Other new camps were examined and sampled as thoroughly as possible, while, at the producing mines, statistics were obtained and important developments noted.

"Leaving Victoria on September 10th, the writer proceeded to Merritt, the coal town of the Nicola valley. A little information was obtained in regard to the coal-mines and more about Aspen Grove, a copper camp lying twenty-five miles south of Merritt, and about half-way between Merritt and Tulameen. No new work has been done there in the last few years, and, as the camp has been written up from time to time, it was not thought advisable to visit it.*

"An auto stage runs three times a week between Merritt and Coalmont, passing through the town of Tulameen. Arriving at Tulameen, a saddle-horse was secured and the trip up the river to Summit camp accomplished. In addition to Summit camp, claims on Railroad, Kelly, and Eagle creeks were visited, accommodation being obtained at various prospectors' camps. From Tulameen a trip was made to claims on Rabbit mountain and Boulder creek.

"The next stop was at Coalmont, four miles down the Tulameen river from the town of Tulameen. Several days were spent here examining the coal-mine and placer operations on the Tulameen river and Granite creek; a small deposit of gypsum also was seen. Trains now run into Coalmont twice a week, on the Vancouver, Victoria and Eastern Railway.

"The next stop was at Princeton, fourteen miles below Coalmont, situated at the junction of the Tulameen and Similkameen rivers. Here the writer was fortunate enough to meet Chas. Camsell, Dominion Geologist, and accompanied him to Copper mountain, the scene of large-scale operations by the British Columbia Copper Company. Mr. Walz, superintendent, gave us a very cordial reception and personally conducted us on an inspection of the property. Returning to Princeton, trips were made to the plant of the British Columbia Portland Cement Company and the coal-mine of the Princeton Land & Coal Company.

"From Princeton the train was taken to Hedley, where the important gold-mine and reduction plant of the Hedley Gold Mining Company are situated. Apart from this concern, the only notable development-work in the camp this summer was the diamond-drilling operations of the Exploration Syndicate No. 2 on a group of claims situated on the Twenty-mile Creek slope. Shortly after this camp was visited, the *Kingston* group was unwatered in order to allow of an examination by an engineer; the results of this examination are not yet known.

"From Hedley train was taken to Oroville, Wash., and a stop made there to see the *Lakeview-Dividend* property, two miles from the International Boundary. The *Lone Pine* group, which is partly on the Canadian and partly on the Washington side of the line, was also visited. Greenwood was reached from Oroville by train to Midway, and thence by auto stage. Considerable information was obtained here in regard to the Boundary District generally, and it was decided to go to the West fork of the Kettle river to see the work going on in the locality of Beaverdell.

"A short time was spent examining the coal-showings near Midway, and the *Riverside* and adjoining properties near Rock creek. From the latter place Beaverdell was reached by means of a work-train on the Kettle Valley Railway, which is being constructed through that district; steel is now laid as far as Arlington lakes, twenty miles beyond Beaverdell. The advent of the railway has caused a revival of interest in this district, especially on Wallace mountain near Beaverdell. The *Sally* property, which a few years ago shipped ore to the value of $75,000, by wagon fifty miles to Midway, has been bonded and is again shipping ore, while deals are pending for several other properties.

"On the return trip from Beaverdell to Midway, a day was spent examining two properties at Boomerang camp, eight miles above Westbridge.

*The Provincial Mineralogist in the 1901 Report of the Minister of Mines.
R. A. Johnson, Canadian Geological Survey, 1904 Report.

"On arriving back in Greenwood, the following telegram was received from the Deputy Minister of Mines: 'If weather permits, please include the main Kettle river in your itinerary.' This telegram was the result of representations by Duncan McIntosh that it would be of public interest to have an examination made of the *Lottie F.* group, some fifty-five miles above Westbridge.

"These claims are reached by wagon-road to a point thirty miles above Westbridge, and from thence by pack-trail. As this property is in a section of the country in which stages do not run, it was necessary to supply one's own transportation; accordingly, a team, suitable for driving, riding, and packing, was secured at Greenwood, Mr. McIntosh acting as guide.

"From Greenwood trips were made to the *Big Copper* in Copper camp, recently bonded by the Granby Consolidated Mining and Smelting Company; the *Jewel*, ten miles north of the town; the concentrator in course of erection by the British Columbia Copper Company at Boundary Falls, to Phœnix; to the mines of the Granby Company, and to several claims around the town.

"Grand Forks was reached by Canadian Pacific Railway from Greenwood, where information in regard to the operations of the Granby smelter was obtained. Glowing reports were prevalent about the *Union* mine in Franklin camp; a five-day trip by team sufficed to see it, as well as some other adjoining properties.

"On returning to Grand Forks, the writer met A. C. Sintzenich, the kinematograph operator engaged by the British Columbia Government to take typical views of the leading industries of the Province. The writer had been requested by the Department of Agriculture, in whose hands the work was being carried out, to arrange some suitable mining and smelting scenes for Mr. Sintzenich. After considerable delay, waiting for suitable weather, views were secured at the Grand Forks and Greenwood smelters and at the *Mother Lode* mine. The subject is an extremely hard one to get even fair motion pictures of, but as good as possible were obtained.

"With the completion of the pictures at the Greenwood smelter, the field-work was finished and the writer returned to Victoria via Great Northern Railway, arriving on November 18th."

INTERNATIONAL GEOLOGICAL CONGRESS.

The XII. Session of the International Geological Congress, held in Canada during the summer of 1913, was the most important event of the year relating to geology, mineralogy, or mining engineering.

The Congress, as its name implies, is international in character, its membership of 982 comprising representatives of fifty-three separate countries scattered over the whole world; the membership is limited to those following geology or some allied subject as their profession or special study.

The sessions of the Congress are held at intervals of three years, in various countries, Canada being chosen as the place of holding the XII. Session in 1913, the preceding session having been held in Sweden in 1909.

The XII. Session was attended by some 447 members representing thirty-three separate countries, and of the members present, 410 were duly accredited delegates of some Government, Geological Survey, University, or Geological Society.

To indicate the importance with which the sessions of the Congress are regarded, the following shows the numbers of official delegates sent respectively from a few of the larger countries :—

Germany	43	France	24
Austria	19	Great Britain	38
Belgium	12	Italy	19
Canada	30	Russia	16
United States	97	Sweden	14

Delegates were also present from all the other countries of Europe and from the Argentine, Brazil, China, Chili, Egypt, Indo-China, Japan, Madagascar, Peru, Soudan, Uruguay, and other remote parts of the world. Among these delegates were included the foremost geologists of the world.

From this brief outline some idea may be formed of the widespread influence a gathering of such representative men would have in disseminating throughout the world the true conditions of Canada, as regards its mineral wealth particularly, and these men are all in a position, in their home countries, to command attention and to speak authoritatively, not of what they have read or been told, but of what they have actually themselves seen ; first-hand information, which is always the most convincing.

The actual sessions of the Congress were held in Toronto from August 7th to 14th, all the splendid buildings of the Toronto University being put at the service of the Congress, accommodations which could not be duplicated in Canada, while the hospitalities extended by the citizens of Toronto were such as to make a Canadian proud that an account of these should be spread over the whole civilized world.

These sessions afforded the opportunity for the members present to hear the exchange of views, by the greatest authorities, on debated questions of geology and mineral deposition, gaining thereby information which could not be readily gleaned from books.

At the XI. Session held in Sweden, the chief topic was the "Iron-ore Resources of the World," while at the XII. Session the chief topic was the "Coal Resources of the World," on which a most exhaustive monograph was published, prepared under the supervision of D. B. Dowling, of the Canadian Geological Survey, assisted by the Geological Surveys, Mining Bureaus, and eminent geologists and mining engineers of the various countries.

Perhaps the greatest good to the country at large was obtained through the inspection of a large part of Canada by the visiting delegates. This was accomplished by a series of some twelve excursions which were made before the session, extending over twenty-four days and covering the Maritime Provinces, Quebec, and parts of Ontario.

During the session ten excursions were made to points within reach of Toronto. After the meeting the excursions of most interest to this part of the Dominion began, and consisted, primarily, of two separate special trains from Toronto to Victoria.

The first of these excursions, C—1, followed the line of the Canadian Pacific Railway to Port Arthur, stopping at Sudbury and other points; from Port Arthur to Winnipeg the line of the Canadian Northern Railway was taken, then the main line of the Canadian Pacific Railway was followed to the Coast, stops being made at various places of interest en route, the trip taking twelve days. The excursion carried some 125 members.

The second excursion, C—2, followed the main line of the Canadian Pacific Railway to Medicine Hat ; thence by way of the Crowsnest branch, through the Kootenay and Boundary Districts and up the Arrow Lakes to the main line at Revelstoke, which was then followed to the Coast. Subordinate excursions were made to Rossland, Phœnix, and Nanaimo. This excursion consisted of some 100 members.

The two excursions joined at Victoria, each spending two days there, and on August 26th the members and delegates were entertained at a luncheon, tendered by the Government of British Columbia, and in the afternoon were received by His Honour Lieutenant-Governor Paterson and Mrs. Paterson at Government House.

About 225 delegates thus crossed the continent to British Columbia, and it might be said, as indicating the interest taken by these visitors in the trip, that they individually paid as travelling expenses alone, from Toronto to Victoria and return, the sum of $225 each.

The return of these main excursions was by way of Calgary, Edmonton, and Tete Jaune pass.

From Victoria and Vancouver special excursions were made to near-by points of interest, including the *Britannia* mine and the Clayburn clay-deposits.

From Vancouver some fifty members continued in a special excursion, C—8, to Dawson, in the Yukon, stopping at Prince Rupert, Granby bay, Juneau, Yakutat bay, and Skagway, with the opportunity of a branch excursion into Atlin.

From Prince Rupert a special excursion, C—9, proceeded by the Grand Trunk Pacific Railway up the Skeena to Hazelton and to the "end of steel" at Moricetown, on the Bulkley river.

Each of these excursions was in the direct charge of, and personally conducted by, "leaders," usually a senior geologist of the Canadian Geological Survey, with a prominent ex-member of the Survey as an assistant, and with the further assistance of local engineers, or geologists, as guides, who were specially familiar with the country traversed.

These "leaders" have for the past couple of seasons been engaged in a special study and examination of their routes, and had previously gone over the ground and planned out the excursions in detail.

A large portion of the staff of the Survey has been engaged for the past two or three years in making special surveys and preparing detailed geological maps of the lines of the routes traversed by all the excursions, which were published in convenient handbooks, containing descriptions as to the geology of the country passed through.

These handbooks, which can be obtained through the Survey, form the most concise and available information yet published regarding the geological formations of the districts passed through, and are of great value to the practising mining engineer who has not the time and possibly not the special training needed to work these problems out for himself.

The completion of the arrangements and all the details in connection therewith were under the direct charge of the Canadian Geological Survey, and the complete success attained is not only a matter for personal triumph on the part of the Survey, whose Director, R. W. Brock, acted as General Secretary, assisted by W. S. Lecky as actual Secretary in charge of arrangements, but is a subject for congratulation to the various Committees who assisted, especially the Toronto Committee, and its Chairman, G. G. S. Lindsay, to which the greatest part of the work was allotted.

ASSAY OFFICE.

The following is a summary of the work of the Assay Office of the Bureau of Mines for the year 1913, as reported by the Assistant Provincial Assayer, D. E. Whittaker :—

During 1911 the Laboratories and Mineral Exhibit Building were moved back to Superior street, and were opened again for business on January 1st, 1912.

During the year 1913 there were made by the staff in the Government Assay Office 1,766 assays or quantitative determinations ; of these, a large number 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 analysis	$1,069 75
" assaying	670 50
" melting and assaying gold-dust and bullion	152 00
" assayer's examinations	105 00
Total cash receipts	$1,997 25
Determinations and examinations made for other Government departments for which no fees were collected	500 00
Value of work done	$2,497 25

The value of gold melted during the year 1913 was $17,600 in 48 lots, as against $10,217 in 39 lots in 1912.

Some years ago, in this Province, nickel was erroneously reported from numerous places. It was found that the assayers let a part of the iron in solution pass through the filter-paper, then precipitated it and supposed it to be nickel, when if it had been properly precipitated and filtered off in the first place it would have left nothing to be precipitated later.

In the separation of gold, silver, and platinum, it has been the practice with many local assayers to dissolve the total metals, get out the gold and silver, and if there was any loss call it platinum, or to weigh up part of the gold as platinum. Such methods have cost the unfortunate investor many thousands of dollars.

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.

EXAMINATION FOR ASSAYERS.

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

I have the honour, as Secretary, to submit the Annual Report for the year 1913 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 Amendment Act, 1899."

An examination was held at Victoria, in the Government Laboratory, on May 12th and the following days. One candidate came up for examination and failed to qualify. Three candidates applied for exemption under section 2, subsection (2), of the Act, and the Board recommended that two of them be granted a Certificate.

Another examination was held at the Government Laboratory, Victoria, on December 17th. Two candidates came up for examination; one passed and one failed. Three candidates applied for exemption under section 2, subsection (2) of the Act, and the Board recommended that a Certificate be granted to them.

J. D. Galloway, M.Sc., Assistant Mineralogist, was granted a certificate under section 2, subsection (3).

In accordance with the recommendations of the Board, certificates have been duly issued by the Honourable the Minister of Mines to these seven candidates.

LIST OF ASSAYERS HOLDING PROVINCIAL CERTIFICATES OF EFFICIENCY UNDER THE "BUREAU OF MINES ACT AMENDMENT ACT, 1899."

(Only the holders of such certificates may practise assaying in British Columbia.)
Under section 2, subsection (1).

Ayres, D. A. ..... Moyie.
Austin, John W. ..... Hazelton.
Backus, Geo. S. ..... Britannia Beach.
Baker, C. S. H. ..... Greenwood.
Barke, A. C. .....
Belt, Sam'l Erwin .....
Bernard, Pierre ..... Monte Christo, Wash.
Bishop, Walter ..... Grand Forks.
Buchanan, James ..... Trail.
Buehman, A. C. ..... Trail.
Campbell, Colin ..... New Denver.
Carmichael, Norman ..... Clifton, Arizona.
Church, George B .....
Cobeldick, W. M. ..... Scotland.
Collinson, H. ..... Stewart.
Comrie, George H .....
Craufurd, A. J. F. ..... Rossland.
Crerar, George .....
Cruickshank, G ..... Trail.
Day, Athelstan ..... Dawson.
Dedolph, Ed. ..... Nelson.
Dockrill, Walter R. ..... Chemainus.
Dunn, G. W. ..... Rossland.
Farquhar, J. B. ..... Vancouver.
Fingland, John J. ..... Kaslo.
Grosvenor, F. E. ..... Vancouver.
Hamilton, Wm. J. ..... Grand Forks.
Hannay, W. H ..... Rossland.
Hart, P. E. .....
Hawkins, Francis ..... Silverton.
Hawes, F. B. ..... Ladysmith.
Hook, A. Harry ..... Greenwood.
Hurter, C. S. ..... Prince Rupert.
Irwin, Geo. E. ..... Vancouver.
John, D. ..... Haileybury, Ont.
Kiddie, Geo. R. ..... California.
King, R. ..... Greenwood.
Kitto, Geoffrey B. ..... Victoria.
Langley, A. S. ..... Crofton.
Lee, Fred. E. ..... Trail.
Lee, Geo. M. ..... Grand Forks.
Ley, Richard N. ..... Vancouver.
Lindsay, W. W ..... Rossland.
Longworth, F. J ..... Boyds, Wash.
Lukens, I. F. ..... Seattle.
Martin, S. J. ..... Hazelton.
Marsh, Richard ..... Republic, Wash.
Marshall, H. Jukes. ..... Vancouver.
Marshall, William S. ..... Ladysmith.
Miles, Arthur D. .....
Mitchell, Charles T. ..... Copper Cliff, Ont.
McCormick, Alan F. ..... Ruth, Nevada.
MacDonald, Alex. C. ..... Vancouver.
Nicholls, Frank ..... Norway.
O'Sullivan, John ..... Vancouver.
Parker, Robt. H. .....
Parsenow, W. L ..... Victoria.
Perkins, Walter G. ..... Basin, Montana.
Pickard, T. D. ..... Vancouver.
Pirrie, Noble W ..... Vancouver.
Richmond, Leigh ..... Duncan, B.C.
Robertson, T. R. .....
Rodgers, Ch. B. ..... Vancouver.
Rombauer, A. B. ..... Butte, Mont.
Schroeder, Curt. A. .....
Segsworth, Walter ..... Toronto, Ont.
Sharpe, Bert N .....
Sim, Charles John ..... England.
Snyder, Blanchard M. .....
Steven, Wm. Gordon .....

Under section 2, subsection (1).—Concluded.

Stimmel, B. A.....Trail.
Sundberg, Gustave .....Mexico City.
Tally, Robert E.....Spokane, Wash.
Thomas, Percival W.....
Tretheway, John H.....
Turner, H. A.....
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.
Welch, J. Cuthbert .....Butte, Mont.
Wells, Ben T.....Ladysmith.
West, Geo. G..... ....Vancouver.
Whittaker, Delbert E.....Victoria.
Widdowson, E. Walter .....Nelson.
Williams, W. A..... .....Grand Forks.
Williams, Eliot H.....
Wimberly, S. H. ... .Nevada, U.S.A.

Under section 2, subsection (2).

Archer, Allan.....
Bolton, George E.....Silverton.
Brennan, Charles Victor ....Bingham, Utah.
Browne, R. J..... .....Rossland.
Browne, P. J .....Nelson.
Bryant, Cecil M.....Vancouver.
Blaylock, Selwyn G.....Trail.
Burwash, N. A.....
Cartwright, Cosmo T .....Ottawa.
Cavers, Thomas W .....
Clothier, George A .....Stewart.
Cole, Arthur A.....Cobalt, Ont.
Cole, G. E.....Rossland.
Cole, L. Heber.....Ottawa, Ont.
Conway, E. J.....
Coulthard, R. W.....Blairmore, Alta.
Cowans, Frederick.....
Dawson, V. E.....Trail.
Dixon, Howard A.....Toronto, Ont.
Eardley-Wilmot, V. L.....Rossland.
Eldridge, Gardner S.....Vancouver.
Evans, A. J. L.....Rossland.
Galbraith, M. T.....
Gilman, Ellis P.....Vancouver.
Green, J. T. Raoul .....Blairmore, Alta.
Guess, George A..... .....Toronto, Ont.
Gwillim, J. C.....Kingston, Ontario.
Heal, John H.....
Hearn, Roy D..... .....Trail, B.C.
Hilliary, G. M.....Idaho, U.S.A.
Holdich, Augustus H .....England.
Johnston, William Steele....Lachine, Que.
Kaye, Alexander .....Vancouver.
Kendall, George.....Vancouver.
Kilburn, Geo. H.....
Lathe, Frank E .....Grand Forks.
Lay, Douglas ....Silverton.
Lewis, Francis B..... .... South Africa.
Merrit, Charles P.....
Murphy, C. J. .....
Musgrave, William N. .... Mexico City.
McArthur, Reginald E .....
McDiarmid, S. S .....
McGinnis, Wm. C.....Queen Charlotte Islands.
McKay, Robt. B..... .....Vancouver.
McLellan, John .....Queen Charlotte Islands.
McMurtry, Gordon O.....
McNab, J. A.....Thompson, Nevada.
McPhee, W. B.... .....
McVicar, John..... Edmonton, Alta.
Maclennan, F. W.....
Newton, W. E.....Sandon.
Outhett, Christopher .....Kamloops.
Pemberton, W. P. D.....Victoria.
Reid, J. A.....Greenwood.
Ritchie, A. B.... .....Nelson.
Rose, J. H.....
Scott, Oswald Norman.....
Shannon, S.....
Sharpe, G. P..... .....Midland, Ont.
Shorey, P. M.....Trail.
Sloan, David.....Three Forks.
Stevens, F. G..... .....Mexico.
Sullivan, Michael H.....Trail.
Sutherland, T. Fraser.....
Swinney, Leslie A. E.....
Thomson, H. Nellis.....Anaconda, Montana.
Thomson, Robt. W. .....
Watson, A. A.....Olalla.
Watson, Henry .....
Winslow, R. H.....Vancouver.
Wilson, Ridgeway R. ....Fernie.
Workman, Ch. W.....
Wright, Richard .....Rossland.
Wynne, Lewellyn C.....
Yuill, H. H.....

Under section 2, subsection (3).

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

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

Pinder, W. J.....
Thompson, James B.....Vancouver.

EXAMINATIONS FOR COAL-MINE OFFICIALS.

The "Coal-mines Regulation Act," as now consolidated and amended, provides that all officers of a coal-mining company having any direct charge of work underground shall hold Government Certificates of Competency, which are to be obtained only after passing an examination before a duly qualified Board, appointed for the purpose of holding such examinations, and known as the Managers' Board.

The certificates granted on the recommendation of such Board and the requirements shall be as follows:—

"(*a.*) If a candidate for a manager, that he is a British subject and has had at least five years' experience in and about the practical workings of a coal-mine, and is at least twenty-five years of age; or, if he has taken a degree in scientific and mining training, including a course in coal-mining at a university or mining school approved by the Minister of Mines, that he has had at least four years' experience in and about the practical working of a coal-mine:

"(*b.*) If a candidate for overman, that he has had at least five years' experience in and about the practical working of a coal-mine, and is at least twenty-three years of age:

"(*c.*) If a candidate for shiftboss, fireboss, or shotlighter, that he has had at least three years' experience in and about the practical working of a coal-mine, is the holder of a certificate of competency as a coal-miner, and is at least twenty-three years of age:

"(*d.*) A candidate for a certificate of competency as manager, overman, shiftboss fireboss, or shotlighter shall produce a certificate from a duly qualified medical practitioner or St. John's or other recognized ambulance society, showing that he has taken a course in ambulance-work fitting him, the said candidate, to give first aid to men injured in coal-mining operations.

"For the purposes of this section the experience demanded by such section shall be of such character as the Board shall consider of practical value in qualifying the candidate for the position to which such class of certificate applies.

"Experience had in a mine outside of the Province may be accepted should the Board consider such of equal value."

Any certificate is considered as including that of any lower class.

EXAMINATION FOR MINERS.

In addition to the examinations and certificates already specified as coming under the Managers' Board, 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."

Examinations for a miner's certificate are held each month at each colliery by a Board of Examiners, known as the Miners' Board, and consisting of an examiner appointed by the owners, an examiner elected by the miners of that colliery, and an examiner appointed by the Government.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS.

FIRST-, SECOND-, AND THIRD-CLASS CERTIFICATES.

Report of Tully Boyce, Secretary of Board.

I beg to submit the Annual Report covering the transactions of the above Board for the year ending December 31st, 1913.

The Board consists of Thos. R. Stockett, of Nanaimo, Chairman; George Williams, of Nanaimo, Vice-Chairman; Tully Boyce, of Nanaimo, Secretary; Thomas Graham, of Victoria, Chief Inspector of Mines; Andrew Bryden, of Merritt; and Henry E. Miard and John Shanks, of Coal Creek. The meetings are held in the office of the Board at Nanaimo.

An examination for Third-class Certificates of Competency was held at Nanaimo and Cumberland on January 21st, at which 25 candidates appeared, 20 of whom passed, 5 failed.

An examination for First-, Second-, and Third-class Certificates was held at Nanaimo, Cumberland, Merritt, and Fernie on May 27th, 28th, and 29th. The total number of candidates at this examination was 55, as follows: For first-class there were 14, of whom 7 passed and 7 failed; for second-class there were 10, of whom 9 passed and 1 failed; for third-class there were 31, of whom 17 passed and 14 failed.

Another examination for third-class only was held at Nanaimo, Cumberland, Merritt, and Fernie on October 28th, at which 20 candidates appeared, of whom 13 passed and 7 failed.

All of the candidates who passed the examinations, with exception of 5, have fully complied with other provisions of the Act, and certificates have been issued to the appended list.

During the year, two of the delinquent candidates mentioned in last Report have complied with the Act and taken out their certificates—viz., Arthur Phelan, first-class, and Jabez Ashman, third-class.

The publication and distribution of copies of previous questions in printed form seem to fill a long-felt want amongst the miners who are studying to better their condition. This becomes more apparent every day; not only with the miners of our own Province, but also with the miners of the adjoining Province of Alberta.

Request for copies of these questions have been received from the States of Washington and Montana, also from Australia.

The fullest information as to the standard of efficiency required and copies of previous questions in printed form may be had by applying to the Secretary at Nanaimo.

LIST OF CANDIDATES TO WHOM CERTIFICATES WERE ISSUED AT THE EXAMINATIONS HELD ON JANUARY 21ST, MAY 27TH, 28TH, AND 29TH, AND ON OCTOBER 28TH, 1913, AT NANAIMO, CUMBERLAND, MERRITT, AND FERNIE.

FIRST-CLASS CANDIDATES.

NAME.	DATE.	No.
Richard Battey	May 27th, 1913	
John Ovington	"	
Robert Broom	"	
Howe Hewlett	"	
Archibald Howden	"	
Andrew McKendrick	"	

SECOND-CLASS CANDIDATES.

NAME.	DATE.	No.
John Dando	May 27th, 1913	B 164
Hugh Davidson	"	B 165
Thomas John Shaw	"	B 166
Alexander McDiarmid Allan	"	B 167
Walter Joyce	"	B 168
Ernest Leonard Warburton	"	B 170
Allan Ford	"	B 171
John McDonald	"	B 172

THIRD-CLASS CANDIDATES.

NAME.	DATE.	No.
Reginald Scott Sopwith	January 21st, 1913	C 512
Rowland Blakeney Gascoyne	"	C 513
Fred Bell	"	C 514
Joseph Watson	"	C 515
Orlin William Dorrance	"	C 517
William Christopher Jones	"	C 518
Alexander Park	"	C 519
Eustace Lionel Saunders	"	C 520
George Edward Jardine	"	C 521
William Wright	"	C 522
Eli Odgers	"	C 523
Robert Seggie	"	C 524
Mathew Broderick	"	C 525
Hubert Allan Simms	"	C 526
William Sinclair	"	C 527
John Furbow	"	C 528
Alfred Odgers	"	C 529
Hugh Taylor	"	C 530
David Flockart	"	C 531
Clifford Dickinson	May 27th, 1913	C 532
Alexander Coomb	"	C 533
George Stewart	"	C 534
Arthur William Watson	"	C 535
Samuel Poole	"	C 536
George Thacker	"	C 537
Ernest Henry Devlin	"	C 538
Ropert Cairns	"	C 539
John Elliott	"	C 541
John Edwards	"	C 542

THIRD-CLASS CANDIDATES.—*Concluded.*

NAME.	DATE.	No.
Daniel Parks Marsh	May 27th, 1913	C 543
Samuel Jones	"	C 544
John Sutherland	"	C 545
James Bain	"	C 546
William Touhey	"	C 547
Thomas Baybutt	"	C 548
Frank Cope	October 28th, 1913	C 549
Robert Nesbitt Hamilton	"	C 550
Joseph William Bateman	"	C 551
Hugh Penman	"	C 552
Thomas McGuire	"	C 553
George Witherington	"	C 554
Hugh Osborne	"	C 555
William Ernest Jones	"	C 556
Joshua Norris	"	C 557
David Morgan Francis	"	C 558
Alfred Kirkham	"	C 559
John Henry Vaughan	"	C 560
Richard Beveridge Smith	"	C 561

Registered List of Holders of Certificates of Competency as Coal-mine Officials.

FIRST-CLASS CERTIFICATES.—SERVICE CERTIFICATES ISSUED UNDER SECTION 39, "COAL MINES REGULATION ACT, 1877."

John Bryden, Victoria.
Edward G. Prior.
Thomas A. Buckley.
Archibald Dick, Government Inspector of Mines.
James Dunsmuir, Victoria.
James Cairns, Comox, Farmer.

FIRST-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL MINES REGULATION ACT, 1897."

NAME.	DATE.
Shepherd, Francis H	March 5th, 1881
Honobin, William	May 1st, 1882
Little, Francis D	" 1st, "
Chandler, William	December 21st, 1883
Priest, Elijah	" 21st, "
McGregor, James	January 18th, 1888
Randle, Joseph	" 18th, "
Matthews, John	" 8th, 1889
Norton, Richard Henry	August 26th, "
Bryden, Andrew	December 30th, "
Russell, Thomas	April 20th, 1891
Sharp, Alexander	*October* 27th, "
Kesley, John	March 4th, 1892
Wall, William H	May 30th, 1896
Morgan, Thomas	" 30th, "
Wilson, David	" 30th, "
Smith, Frank B	" 30th, "
Bradshaw, George B	June 12th, 1899
Simpson, William G	" 12th, "
Hargreaves, James	February 5th, 1901
Drinnan, Robert G	" 5th, "
Stockett, Thomas, Jr	August 3rd, "
Pearson, Robert	" 3rd, "
Cunliffe, John	" 3rd, "
Evans, Daniel	" 3rd, "
McEvoy, James	October 17th, 1902
Wilson, A. R	" 17th, "
Simister, Charles	" 17th, "
Budge, Thomas	" 17th, "
Mills, Thomas	" 17th, "
Faulds, Alexander	" 17th, "
Richards, James A	" 17th, "
McLean, Donald	January 21st, 1905
Wilkinson, Geo	" 21st, "
Wright, H. B	" 21st, "
Coulthard. R. W	" 21st, "
Roaf, J. Richardson	" 21st, "
John, John	" 21st, "
Manley, H. L	" 21st, "
Battey, Richard	May 27th, 1913
Baxter, Andrew	June 10th, 1911

FIRST-CLASS CERTIFICATES ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."

NAME.	DATE.
Biggs, J. G.	July 22nd, 1908
Bonar, Robert	October 28th, 1911
Bridge, Edward	July 22nd, 1908
Broom, Robert	May 27th, 1913
Caufield, B.	" 1st, 1909
Church, James A. H	June 10th, 1911
Crowder, James	" 10th, "
Cunningham, John Howard	May 9th, 1912
Darbyshire, James	November 9th, 1907
Davidson, W. A	May 1st, 1909
Davies, David	June 10th, 1911
Devlin, Henry	May 1st, 1909
Dixon, James	October 31st, 1912
Elliott, Daniel	November 9th, 1907
Emmerson, Joseph	" 9th, "
Evans, Evan	" 9th, "
Fairfoull, Robert	June 10th, 1911
Foy, Joseph	" 10th, "
France, Thos	November 22nd, 1906
Fraser, Norman	March 4th, 1905
Freeman, H. N.	May 1st, 1909
Galloway, C. F. J.	July 22nd, 1908
Glover, Francis	October 31st, 1912
Graham, Charles	November 14th, 1905
Graham, Thomas	" 9th, 1907
Gray, James	" 27th, 1909
Heathcote, Elijah	March 4th, 1905
Henderson, Robert	November 27th, 1909
Hewlett, Howe	May 27th, 1913
Holden, James	" 1st, 1909
Howden, Archibald	" 27th, 1913
Howells, Nathaniel	October 28th, 1911
Humphries, Clifford	June 10th, "
Jackson, Thos. R	November 9th, 1907
James, William	July 22nd, 1908
Keith, Thomas	November 9th, 1907
Kellock, George	June 10th, 1911
Kinsman, A. D.	September 10th, 1910
Knox, T. K	July 27th, 1909
Lancaster, W	" 22nd, 1908
Leighton, Henry	May 9th, 1912
Macauley, D. A	June 10th, 1911
McCulloch, J.	September 10th, 1910
McGuickie, Thomas	July 22nd, 1908
McKendrick, Andrew	May 27th, 1913
McMillan, J. H.	September 10th, 1910
McVicar, Samuel	May 1st, 1909
Mazey, William John	October 31st, 1912
Miard Henry Ernest	May 9th, "
Millar, John K	November 22nd, 1906
Miller, Andrew Anderson	October 31st, 1912
Montgomery, John W	May 1st, 1909
Mordy, Thomas	September 10th, 1910
Musgrave, J. T.	October 28th, 1911
Newton, John	July 22nd, 1908
Ovington, John	May 27th, 1913
Peacock, Frank David	October 28th, 1911
Phelan, Arthur	May 27th, 1913
Powell, J. W.	June 10th, 1911
Saville, Luther	July 22nd, 1908
Shanks, John	May 1st, 1909
Shaw, Alex	November 14th, 1905
Shaw, William	May 9th, 1912
Shenton, T. J.	September 10th, 1910
Shone, Samuel	May 1st, 1909

FIRST-CLASS CERTIFICATES ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."—*Concluded.*

NAME.	DATE.
Sloan, Hugh	November 27th, 1909
Smith, A. E	October 28th, 1911
Smith, Joseph	July 22nd, 1908
Spicer, J. E	October 28th, 1911
Spruston, T. A	November 27th, 1909
Stevens, L. C	" 27th, "
Stewart, R. T	September 10th, 1910
Strachan, Robert	March 4th, 1905
Strang, James	June 10th, 1911
Thomas, J. D	September 10th, 1910
Thorne, B. L	" 10th, "
Wallbank, J	" 10th, "
Willey, Edward	October 31st, 1912
Williams, Thos. H	November 22nd, 1906
Wylie, John	July 22nd, 1908

SECOND-CLASS CERTIFICATES OF SERVICE.

NAME.	DATE.	Cer. No.
Corkhill, Thomas	March 4th, 1905	B 7
Lee, John S	" 4th, "	B 9
Millar, J. K	" 4th, "	B 10
McCliment, John	" 4th, "	B 11
Martin, David	" 4th, "	B 12
Hunt, John	" 4th, "	B 13
Walker, David	" 4th, "	B 14
Powell, William Baden	" 4th, "	B 16
Bryden, Alexander	" 4th, "	B 18

SECOND-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1894."

NAME.	DATE.	Cer. No.
Adamson, Robert	September 10th, 1910	B 120
Allan, Alex. McDairmid	May 27th, 1913	B 167
Anderson, Robert	September 10th, 1910	B 119
Barclay, Andrew	July 29th, 1905	B 25
Bastian, John	November 2nd, 1907	B 42
Bevis, Nathaniel	September 10th, 1910	B 123
Biggs, J	May 1st, 1909	B 94
Biggs, John G	November 2nd, 1907	B 40
Brace, Thomas	" 27th, 1909	B 96
Bridge, Edward	October 23rd, 1906	B 33
Brown, David	September 10th, 1910	B 108
Brown, James L	October 28th, 1911	B 136
Brown, John C	" 23rd, 1906	B 39
Brown, John Todd	May 9th, 1912	B 150
Brown, R. J	October 28th, 1911	B 134
Bushell, J. P	May 1st, 1909	B 81
Carroll, Henry	July 22nd, 1908	B 62
Caufield, Bernard	October 23rd, 1906	B 30
Cawthorne, L	May 1st, 1909	B 93
Churchill, James	July 22nd, 1908	B 65
Commons, Wm	September 10th, 1910	B 115

SECOND-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."—*Continued.*

NAME.	DATE.	Cer. No.
Cook, Joseph	July 22nd, 1908	B 64
Courtney, A. W.	October 28th, 1911	B 138
Cox, Richard	May 9th, 1912	B 143
Crawford, David	" 1st, 1909	B 88
Cunliffe, T.	" 1st, "	B 78
Dando, John	" 27th, 1913	B 164
Daniels, David	November 2nd, 1907	B 53
Darbyshire, James	October 23rd, 1906	B 32
Davidson, Hugh	May 27th, 1913	B 165
Davies, Stephen	September 10th, 1910	B 113
Devlin, Henry	November 2nd, 1907	B 44
Dewar, Alexander	October 31st, 1912	B 162
Dunsmuir, John	November 14th, 1905	B 26
Dykes, J. W	May 1st, 1909	B 77
Eccleston, Wm	" 1st, "	B 87
Evans, Evan	March 11th, 1905	B 2
Fairfoull, R	May 1st, 1909	B 83
Finlayson, James	July 29th, 1905	B 21
Ford, Allan	May 27th, 1913	B 171
Foster, W. R.	November 27th, 1909	B 102
France, Thos	" 14th, 1905	B 27
Francis, Enoch	May 1st, 1909	B 86
Francis, James	July 22nd, 1908	B 63
Freeman, Henry N.	November 2nd, 1907	B 45
Garbett, Richard	October 31st, 1912	B 161
Garman, Morris Wilbur	" 31st, "	B 155
Gillespie, Hugh	July 29th, 1905	B 24
Gillespie, John	October 23rd, 1906	B 36
Gillespie, John M.	June 10th, 1911	B 126
Graham, Chas	March 4th, 1905	B 1
Gray, David	May 1st, 1909	B 76
Henderson, Robert	July 22nd, 1908	B 60
Horrocks, Abner G.	June 10th, 1911	B 130
Howells, N	November 27th, 1909	B 97
Hudson, George	September 10th, 1910	B 121
Hughes, John C.	" 10th, "	B 109
Hutton, John	May 9th, 1912	B 154
Jackson, Thos. R	March 4th, 1905	B 5
James, David	November 2nd, 1907	B 58
Jarrett, Fred	May 1st, 1909	B 84
Jaynes, Frank	September 10th, 1910	B 111
John, Howell	" 10th, "	B 122
Johnson, Moses	May 1st, 1909	B 75
Jones, William	July 29th, 1905	B 20
Jones, William T	" 22nd, 1908	B 66
Jordon, Thos	November 27th, 1909	B 104
Joyce, Walter	May 27th, 1913	B 168
Kirkwood, John Robertson	October 31st, 1912	B 160
Knowles, James E.	" 28th, 1911	B 137
Lancaster, William	November 2nd, 1907	B 50
Lane, Joseph	May 9th, 1912	B 142
Lee, Robert John	September 10th, 1910	B 110
Littler, Matthew	October 31st, 1912	B 157
Luck, George	June 10th, 1911	B 128
Manifold, Albert	May 9th, 1912	B 145
Massey, H	November 27th, 1909	B 99
Mather, Thomas	June 10th, 1911	B 127
Mattishaw, S. K.	October 28th, "	B 135
Matusky, A	May 1st, 1909	B 91
Mayer, Ralph Waldo	" 9th, 1912	B 144
Mazay, W. J.	November 27th, 1909	B 101
Merryfield, William	July 22nd, 1908	B 61
Miard, Hy. E.	September 10th, 1910	B 107
Middleton, Robert	July 22nd, 1908	B 72
Monks, James	November 2nd, 1907	B 55

SECOND-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."—*Concluded.*

NAME.	DATE.	Cer. No.
Morgan, John	November 2nd, 1907	B 43
Morris, John	July 22nd, 1908	B 67
Morton, Robert W	" 22nd, "	B 59
Musgrave, J	May 1st, 1909	B 90
Myers, Peter	" 9th, 1912	B 149
McDonald, J. A.	October 28th, 1911	B 133
McDonald, John	May 27th, 1913	B 172
McFegan, W	November 27th, 1909	B 106
McGarvey, Martin	October 31st, 1912	B 156
McGuckie, Thomas M	" 23rd, 1906	B 35
McKelvie, J	May 1st, 1909	B 92
McKendrick, And	September 10th, 1910	B 112
McMillan, D.	June 10th, 1911	B 125
McNay, Carmichael	May 9th, 1912	B 151
McPherson, James E.	July 22nd, 1908	B 73
Neen, Joseph	June 10th, 1911	B 129
Nellist, David	March 4th, 1905	B 6
Newton, John	October 23rd, 1906	B 31
Newton, Wm	September 10th, 1910	B 116
O'Brien, Charles	May 9th, 1912	B 148
O'Brien, George	" 1st, 1909	B 82
Ovington, John	November 2nd, 1907	B 52
Parkinson, T	May 1st, 1909	B 80
Parnham, Charles	November 2nd, 1907	B 49
Quinn, John	May 9th, 1912	B 146
Rankin, Geo.	November 27th, 1909	B 103
Raynes, M. T.	October 28th, 1911	B 139
Reid, Thomas	July 29th, 1905	B 23
Reid, Wm.	October 28th, 1911	B 132
Renny, James.	" 28th, "	B 140
Richards, Thomas	November 2nd, 1907	B 57
Richards, Samuel	May 9th, 1912	B 152
Rigby, John	July 29th, 1905	B 29
Roberts, Ebenezer	September 10th, 1910	B 117
Robinson, William.	July 22nd, 1908	B 69
Rogers, George	May 1st, 1909	B 79
Roper, William	" 9th, 1912	B 141
Russell, John	November 2nd, 1907	B 47
Saville, Luther	" 2nd, "	B 51
Shanks, David	October 31st, 1912	B 159
Shaw, Alex	July 29th, 1905	B 19
Shaw, Thomas John	May 27th, 1913	B 166
Somerville, Alex.	March 4th, 1905	B 4
Spruston, Thos. A.	November 2nd, 1907	B 46
Stafford, Matthew.	June 10th, 1911	B 131
Stewart, J. M	May 1st, 1909	B 95
Stobbart, Jacob	" 9th, 1912	B 153
Stockwell, William	November 2nd, 1907	B 56
Strang, Thomas	October 31st, 1912	B 158
Thomas, J. B	November 27th, 1909	B 105
Thomas, Joseph D	October 23rd, 1906	B 38
Thompson, Joseph	September 10th, 1910	B 114
Touhey, James	May 9th, 1912	B 147
Tonge, Thomas	July 22nd, 1908	B 71
Vanhulle, Peter	November 2nd, 1907	B 54
Virgo, J	May 1st, 1909	B 89
Warburton, Ernest Leonard	" 27th, 1913	B 170
Watson, Adam G	November 14th, 1905	B 28
Webber, John Frank	March 4th, "	B 3
Wesnedge, W	November 27th, 1909	B 98
White, John	" 2nd, 1907	B 48
Whitehouse, William	October 31st, 1912	B 163
Wilson, Thomas	July 22nd, 1908	B 74
Wilson, W	" 22nd, "	B 70
Worthington, Joseph	May 1st, 1909	B 85

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."

NAME.	DATE.	Cer. No.
Adamson, Robert	May 1st, 1909	C 323
Aleen, Alexander	October 28th, 1911	C 430
Almond, Alex	" 1st, 1907	C 252
Almond, W.	July 22nd, 1908	C 286
Anderson, John	October 28th, 1911	C 437
Archibald, Thomas	" 28th, "	C 454
Ashman, Jabez	May 27th, 1913	C 131
Bann, Thomas	October 31st, 1912	C 494
Baggaley, J.	July 22nd, 1908	C 300
Bain, James	May 27th, 1913	C 546
Barker, Robert	June 10th, 1911	C 415
Barlow, B. R.	May 1st, 1909	C 337
Barnes, B. J	" 1st, "	C 346
Bateman, Joseph William	October 28th, 1913	C 551
Bauld, Wm.	June 10th, 1911	C 422
Baxter, Robert	October 28th, "	C 450
Baybutt, Thomas	May 27th, 1913	C 548
Beeton, D. H.	" 1st, 1909	C 338
Bell, Fred	" 27th, 1913	C 514
Bell, John	" 9th 1912	C 477
Bennie, John	June 10th, 1911	C 411
Beveridge, Wm	" 10th, "	C 396
Biggs, John	March 4th, 1905	C 210
Biggs, Thomas	October 28th, 1911	C 449
Birchell, Richard	" 1st, 1907	C 266
Blair, James	" 31st, 1912	C 502
Blewett, Ernest	July 22nd, 1908	C 298
Bradley, William	" 22nd, "	C 291
Bridge, Edward	" 29th, 1905	C 223
Briscoe, F.	" 22nd, 1908	C 309
Broderick, Matthew	January 21st, 1913	C 525
Brown, David	November 1st, 1909	C 348
Brown, James	September 10th, 1910	C 364
Brown, James	June 10th, 1911	C 412
Brown, John	September 10th, 1910	C 392
Brown, Robert	October 28th, 1911	C 451
Brown, Robert D	June 10th, "	C 423
Brown, Robert S.	" 10th, "	C 408
Brownrigg, J. H.	July 22nd, 1908	C 276
Bullen, Thomas	September 10th, 1910	C 379
Bushell, Jas. P	October 1st, 1907	C 264
Cairnes, Andrew	June 10th, 1911	C 420
Cairnes, Robert	May 27th, 1913	C 539
Calverly, Joseph	September 10th, 1910	C 375
Camamile, Hollis	October 28th, 1911	C 443
Catchpole, Charles	July 29th, 1905	C 227
Caufield, J.	May 1st, 1909	C 321
Challoner, Arthur	October 28th, 1911	C 433
Cheetham, Ben	July 22nd, 1908	C 311
Chester, John	October 28th, 1911	C 440
Clark, Lewis	June 10th, "	C 405
Clark, Walter Pattison	May 9th, 1912	C 480
Clarkstone, Wm. W	October 28th, 1911	C 431
Cleaves, Walter	May 9th, 1912	C 475
Clifford, William	July 22nd, 1908	C 313
Commons, William	" 22nd, "	C 304
Cooke, Joseph	March 4th, 1905	C 209
Coombe, Alexander	May 27th, 1913	C 533
Cope, Frank	October 28th, "	C 549
Coulthard, James	June 10th, 1911	C 407
Crawford, David	March 4th, 1905	C 208
Cunningham, G. F	November 11th, "	C 229
Cunliffe, Thos	October 1st, 1907	C 265
Dando, John	May 9th, 1912	C 465
Davidson, Hugh	" 9th, "	C 464

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."—*Continued.*

NAME.	DATE.	Cer. No.
Davies, Evan Thomas	May 9th, 1912	C 463
Davis, William	" 1st, 1909	C 339
Derbyshire, A.	June 10th, 1911	C 401
Dewar, Alex.	September 10th, 1910	C 369
Devlin, Edward	October 23rd, 1906	C 241
Devlin, Ernest Henry	May 27th, 1913	C 538
Dickson, Clifford	" 27th, "	C 532
Dingsdale, Geo.	October 28th, 1911	C 459
Doherty, J. J.	May 1st, 1909	C 340
Doney, John	March 4th, 1905	C 211
Donnachie, John	June 10th, 1911	C 425
Doodson, Robert	October 28th, "	C 455
Dorrance, Orlin William	January 21st, 1913	C 517
Douglas, D. B	October 23rd, 1906	C 235
Dykes, Isaac	June 10th, 1911	C 409
Dykes, Joseph W.	October 1st, 1907	C 248
Edwards, John	May 27th, 1913	C 542
Elliott, John	" 27th, "	C 541
Elmes, George	October 31st, 1912	C 511
Evans, D.	July 22nd, 1908	C 284
Ewart, Alex.	September 10th, 1910	C 374
Fairfoull, James	October 28th, 1911	C 453
Fitzpatrick, T. J.	" 28th, "	C 452
Flockart, David	January 21st, 1913	C 531
Ford, Allen	October 28th, 1911	C 445
Fowler, Robert	" 31st, 1912	C 495
Francis, David Morgan	" 28th, 1913	C 558
Francis, James	" 1st, 1907	C 250
Freeman, H. G	November 14th, 1905	C 230
Frew, A.	" 27th, 1909	C 360
Frodsham, Vincent	July 22nd, 1908	C 282
Furbow, John	January 21st, 1913	C 528
Garbett, Richard	September 10th, 1910	C 377
Gascoyne, Rowland B.	January 21st, 1913	C 513
Gemmell, James	October 31st, 1912	C 505
Glen, James	" 28th, 1911	C 435
Gordon, Davis John	May 9th, 1912	C 474
Gourley, Robert	" 9th, "	C 470
Graham, John	July 22nd, 1908	C 292
Gray, George	May 9th, 1912	C 467
Griffoth, Edward	October 31st, "	C 508
Gunniss, Matthew	May 9th, "	C 460
Hallinan, W.	" 1st, 1909	C 343
Halsall, J.	July 22nd, 1908	C 307
Hamilton, John	October 28th, 1911	C 444
Hamilton, Robert Nesbitt	" 28th, 1913	C 550
Hartley, Thomas	" 31st, 1912	C 510
Harwood, Fred	September 10th, 1910	C 384
Harvey, Thomas	May 9th, 1912	C 466
Harvie, George	September 10th, 1910	C 378
Hayes, Edward	May 1st, 1909	C 320
Heaps, Robert	September 10th, 1910	C 373
Henney, Jonathan	June 10th, 1911	C 424
Henry, James	May 9th, 1912	C 471
Hilley, Fred.	July 22nd, 1908	C 290
Hilton, R. G.	September 10th, 1910	C 376
Hodson, R. H	March 4th, 1905	C 216
Horbury, Joseph W.	June 10th, 1911	C 406
Horrocks, A. G.	May 1st, 1909	C 324
Horwood, S.	July 22nd, 1908	C 312
Howells, Nathaniel	May 1st, 1909	C 316
Huby, Norman	June 10th, 1911	C 394
Hutchison, Ben	November 14th, 1905	C 232
Hutchison, F.	" 27th, 1909	C 358
Ireson, John	October 31st, 1912	C 507

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."—*Continued.*

NAME.	DATE.	Cer. No.
Irvine, David	June 10th, 1911	C 413
Jardine, George Edward	Jannary 21st, 1913	C 521
Jarrett, Fred. J	October 1st, 1907	C 256
Jaynes, Frank	July 22nd, 1908	C 277
Jemson, J. W	March 4th, 1905	C 205
Jenkins, John	September 10th, 1910	C 390
John, Howel	July 22nd, 1908	C 305
Johnson, Moses	October 1st, 1907	C 258
Johnston, Robert	May 9th, 1912	C 479
Jones, Samuel	" 27th, 1913	C 518
Jones, William C	January 21st, 1913	C 556
Jones, William Ernest	October 28th, "	C 221
Jones, W. T	March 4th, 1905	C 544
Joshua, John	May 9th, 1912	C 478
Joyce, W	November 27th, 1909	C 361
Judge, Peter	September 10th, 1910	C 391
Keenan, Wm. James	June 10th, 1911	C 426
Kingham, Alfred	October 28th, 1913	C 559
Kirkeberg, H. S	November 27th, 1909	C 350
Lancaster, William	October 23rd, 1906	C 243
Lane, Joseph	" 1st, 1907	C 254
Leeman, T	May 1st, 1909	C 345
Lewis, Benj. J	September 10th, 1910	C 386
Liddle, John	July 29th, 1905	C 228
Littler, John	June 10th, 1911	C 410
Littler, Matthew	" 10th, "	C 417
Littler, Robert	" 10th, "	C 418
Livingstone, Alex	October 28th, "	C 436
Loxton, George	June 10th, "	C 428
Loxton, John	" 10th, "	C 416
Lynch, Stewart	October 28th, "	C 432
Mackie, John	June 10th, "	C 421
Makin, J. Wm	September 10th, 1910	C 385
Malone, Patrick	October 1st, 1907	C 247
Maltman, James	" 31st. 1912	C 501
Mansfield, A	May 1st, 1909	C 336
Manson, T. H	July 22nd, 1908	C 280
Marsh, Daniel Parks	May 27th, 1913	C 543
Marsh, John	October 1st, 1907	C 270
Martin, James	June 10th, 1911	C 398
Mason, J	July 22nd, 1908	C 297
Massey, Henry	May 1st, 1909	C 317
Mather, Thomas	July 22nd, 1908	C 293
Mattishaw, Samuel K	October 23rd, 1906	C 237
Matusky, Andrew	" 1st, 1907	C 259
Mawson, J. T	November 27th, 1909	C 359
Meek, Matthew	May 9th, 1912	C 484
Merrifield, George	October 23rd, 1906	C 239
Merrifield, William	" 23rd, "	C 236
Miles, John	June 10th, 1911	C 414
Millar, Peter	September 10th, 1910	C 388
Mitchell, C	May 1st, 1909	C 322
Mitchell, Henry	September 10th, 1910	C 366
Monks, James	November 14th, 1905	C 234
Moore, George	October 23rd, 1906	C 242
Moore, J	May 1st, 1909	C 335
Moreland, Thomas	July 22nd, 1908	C 299
Morgan, John	" 29th, 1905	C 224
Morris, David	May 9th, 1912	C 472
Myers, Peter	October 28th, 1911	C 446
McAlpine, John	March 4th, 1905	C 217
McBroom, Al	July 2nd, 1908	C 287
McCulloch, James	May 1st, 1909	C 315
McDonald, John	October 28th, 1911	C 448
McFagen, Alexander	May 9th, 1912	C 490

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."—*Continued.*

NAME.	DATE.	Cer. No.
McFegan, W	May 1st, 1909	C 319
McGarry, M.	" 1st, "	C 326
McGuckie, Thomas	July 29th, 1905	C 226
McGuire, Thomas	October 28th, 1913	C 553
McKelvie, J.	July 22nd, 1908	C 285
McKenzie, Peter	June 10th, 1911	C 427
McKinley, John	October 28th, "	C 442
McLaughlin, James	May 9th, 1912	C 485
McLachlan, Alex.	June 10th, "	C 419
McLean, M.D.	September 10th, 1910	C 389
McLellan, William	March 4th, 1905	C 219
McLeod, James	July 22nd, 1908	C 296
McMillan, D.	September 10th, 1910	C 363
McMillan, Edward	October 31st, 1912	C 493
McNay, Carmichael	July 22nd, 1908	C 306
McNeill, Adam T.	" 22nd, "	C 281
McNeill, Robert	September 10th, 1910	C 387
Neen, Joseph	November 27th, 1909	C 352
Nelson, Horatio	October 1st, 1907	C 263
Neilson, William	May 9th, 1912	C 481
Nicholson, James	" 9th, "	C 469
Nimmo, James	" 9th, "	C 461
Norris, Joshua	October 28th, 1913	C 557
Oakes, Robert	" 31st, 1912	C 498
O'Brien, Charles	November 27th, 1909	C 349
Odgers, Alfred	January 21st, 1913	C 529
Odgers, Eli	" 21st, "	C 523
Orr, Alexander	October 28th, 1911	C 434
Osborne, Hugh	" 28th, 1913	C 555
Oswald, Geo. L.	September 10th, 1910	C 370
Owen, T.	May 1st, 1909	C 347
Park, Alexander	January 21st, 1913	C 519
Parker, L.	May 1st, 1909	C 341
Parkinson, T	July 22nd, 1908	C 289
Pearson, Jonathan	May 9th, 1912	C 473
Penman, Hugh	October 28th, 1913	C 552
Perry, James	March 4th, 1905	C 215
Philips, T	November 27th, 1909	C 356
Pickup, A.	July 22nd, 1908	C 310
Picton, W.	May 1st, 1909	C 333
Plank, Samuel	November 14th, 1905	C 233
Poole, Samuel	May 27th, 1913	C 536
Potter, Robert	October 31st, 1912	C 503
Price, Walter	September 10th, 1910	C 371
Puckey, Wm. R.	" 10th, "	C 368
Quinn, James	October 28th, 1911	C 441
Quinn, John	" 28th, "	C 429
Rallison, R.	July 22nd, 1908	C 279
Rankin, George	" 22nd, "	C 275
Rankin, Wm. Shaw	May 9th, 1912	C 489
Ratcliffe, Thomas	October 1st, 1907	C 253
Raynor, Fred	" 1st, "	C 257
Reid, Robert	September 10th, 1910	C 383
Reid, Wm.	June 10th, 1911	C 403
Reilly, Thomas	July 22nd, 1908	C 303
Renny, Jas.	November 27th, 1909	C 354
Richards, James	" 1st, 1907	C 249
Richards, Samuel	October 23rd, 1906	C 244
Richardson, J. H.	" 28th, 1911	C 458
Rigby, John	July 29th, 1905	C 225
Roberts, E	May 1st, 1909	C 327
Robinson, M.	" 1st, "	C 332
Roper, William	July 22nd, 1908	C 274
Rowan, Alexander	October 31st, 1912	C 500
Rowbottom, Thomas	" 31st, "	C 492

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."—*Continued.*

NAME.	DATE.	Cer. No.
Royle, Edward	October 31st, 1912	C 506
Russell, Robert	November 27th, 1909	C 351
Rutledge, Edwin	July 22nd, 1908	C 302
Scott, Henry	" 22nd, "	C 294
Saunders, Eustace L.	January 21st, 1913	C 520
Seggie, Robert	" 21st, "	C 524
Shanks, David	September 10th, 1910	C 372
Sharp, James	May 1st, 1909	C 325
Sharples, J. T.	September 10th, 1910	C 380
Shearer, L.	May 1st, 1909	C 330
Shenfield, W	November 27th, "	C 357
Shipley, John W.	October 28th, 1911	C 456
Shooter, Joseph	" 1st, 1907	C 261
Shortman, J	May 1st, 1909	C 331
Simister, J. H	November 27th, "	C 353
Simister, W	May 1st, "	C 334
Simms, Hubert Allan	January 21st, 1913	C 526
Sinclair, William	" 21st, "	C 527
Skelton, Thos	May 1st, 1909	C 344
Smith, A. E.	September 10th, 1910	C 367
Smith, Joseph	March 4th, 1905	C 207
Smith, Richard Beveridge	October 28th, 1913	C 561
Smith, Thos. J	" 1st, 1907	C 271
Smith, Thomas	May 9th, 1912	C 486
Sopwith, Reginald Scott	January 21st, 1913	C 512
Sparks, Edward (C 314 issued in lieu of C 255 destroyed by Fernie fire)	October 1st, 1907	C 255
Spencer, G	May 1st, 1909	C 329
Sprusten, R. L	November 27th, "	C 355
Spruston, Thomas A	March 4th, 1905	C 206
Stafford, M.	September 10th, 1910	C 382
Starr, Wallace	May 9th, 1912	C 488
Steele, James	" 9th, "	C 462
Steele, Walter	October 28th, 1911	C 439
Stewart, George	May 27th, 1913	C 534
Stewart, James M.	October 23rd, 1906	C 240
Stockwell, William	" 23rd, "	C 238
Strang, Thomas	June 10th, 1911	C 409
Strang, Wm	" 10th, "	C 395
Suik, George	May 1st, 1909	C 318
Sutherland, John	" 27th, 1913	C 545
Taylor, Charles M	March 4th, 1905	C 213
Taylor, Hugh	January 21st, 1913	C 530
Taylor, J. T.	October 28th, 1911	C 447
Taylor, Leroy	September 10th, 1910	C 381
Thacker, Geo.	May 27th, 1913	C 537
Thomas, Thomas	September 10th, 1910	C 365
Thomas, John B	November 14th, 1905	C 231
Thomas, Joseph	March 4th, "	C 220
Thomas, Warriett	October 1st, 1907	C 273
Thompson, Thomas	" 1st, "	C 267
Thompson, John	" 31st, 1912	C 509
Thompson, Joseph	" 1st, 1907	C 269
Thomson, Duncan	March 4th, 1905	C 218
Toubey, William	May 27th, 1913	C 547
Tully, Thomas	" 9th, 1912	C 468
Tune, Elijah	" 9th, "	C 476
Vaughan, John Henry	October 28th, 1913	C 560
Walker, Jas. Alexander	" 31st, 1912	C 496
Wallace, Fred	" 1st, 1907	C 260
Warburton, Ernest Leonard	June 10th, 1911	C 399
Wardrop, James	October 31st, 1912	C 504
Watkins, William	May 9th, "	C 483
Watson, Adam G	March 4th, 1905	C 212
Watson, Arthur W.	May 27th, 1913	C 535
Watson, George	July 22nd, 1908	C 288

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."—*Concluded.*

NAME.	DATE.	Cer. No.
Watson, Joseph	January 21st, 1913	C 515
Watson, William	October 22nd, 1906	C 246
Webb, Herbert	" 28th, 1911	C 457
Weeks, John	March 4th, 1905	C 214
White James	October 31st, 1912	C 499
White, John	" 22nd, 1906	C 245
Whitehouse, Wm	June 10th, 1911	C 402
Wilcock, J	July 22nd, 1908	C 308
Wilkinson, Edward	October 28th, 1911	C 438
Williams, John Sam	June 10th, "	C 404
Williams, Watkin	" 22nd, 1908	C 301
Wilson, Robinson	" 10th, 1911	C 397
Wilson, Thomas	October 1st, 1907	C 272
Wilson, William	" 1st, "	C 262
Winstanley, H.	July 22nd, 1908	C 283
Wintle, Thomas A	" 29th, 1905	C 222
Witherington, George	October 28th, 1913	C 554
Wood, Thos. James	" 31st, 1912	C 491
Worthington, J	July 22nd, 1908	C 295
Wright, William	January 21st, 1913	C 522

COAL-MINES 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.	Certificate No.	Name.	Date.	Certificate No.
Adam, Robert	Oct. 12, 1904	C 42	Marshall, Howard	Dec. 6, 1905	C 127
Addison, Thos	Dec. 10, 1904	C 52	Matthews, Chas	April 27, 1904	C 9
Aitken, James	Oct. 24, 1904	C 44	Miard, Harry E	March 3, 1905	C 76
Allsop, Harry	Oct. 11, 1904	C 34	Middleton, Robt	Feb. 11, 1905	C 71
Aughinvole, Alex	March 29, 1905	C 89	Miles, Thos	Aug. 10, 1904	C 31
Barclay, Andrew	April 27, 1904	C 19	Miller, Thos. K	Feb. 21, 1905	C 74
Barclay, James	April 27, 1904	C 20	McKenzie, John R	Oct. 12, 1904	C 40
Barclay, John	April 17, 1905	C 111	McKinnon, Arch'd	April 3, 1905	C 102
Berry, James	Feb. 11, 1905	C 70	McMillan, Peter	March 29, 1905	C 94
Bickle, Thos	Oct. 11, 1904	C 37	McMurtrie, John	March 29, 1905	C 96
Biggs, Henry	April 10, 1905	C 110	Moore, Wm. H	June 17, 1905	C 119
Black, John S	April 3, 1905	C 108	Morris, John	Dec. 27, 1904	C 57
Bowie, James	May 13, 1905	C 116	Myles, Walter	April 3, 1905	C 100
Briscoe, Edward	Oct. 10, 1906	C 129	Nash, Isaac	June 1, 1904	C 120
Campbell, Dan	March 29, 1905	C 93	Neave, Wm	Oct. 12, 1904	C 43
Carr, Jos. E	Oct. 11, 1904	C 36	Nellist, David	April 27, 1904	C 13
Carroll, Harry	March 29, 1905	C 98	Nelson, James	April 27, 1904	C 16
Clarkson, Alexander	April 27, 1904	C 18	Newton, John	Oct. 12, 1904	C 39
Collishaw, John	Feb. 7, 1905	C 68	Nimmo, Jas. P	April 3, 1905	C 103
Comb, John	March 23, 1904	C 2	O'Brien, Geo	Feb. 6, 1905	C 66
Cosier, Wm	March 29, 1905	C 86	Pengelly, Richard	Dec. 27, 1904	C 58
Courtney, A. W	Nov. 2, 1904	C 45	Perrie, Jas	March 15, 1905	C 81
Crawford, Frank	April 6, 1904	C 7	Perry, James	June 13, 1904	C 27
Daniels, David	April 27, 1904	C 12	Pounder, Geo	Oct. 16, 1905	C 125
Davidson, David	April 3, 1905	C 106	Price, Jas	Nov. 8, 1904	C 50
Davidson, John	March 29, 1905	C 87	Rafter, Wm	March 29, 1905	C 95
Devlin, Henry	Oct. 12, 1904	C 41	Reid, Thos	Nov. 3, 1904	C 47
Dobbie, John	Nov. 27, 1905	C 126	Reid, James	March 23, 1904	C 1
Dudley, James	March 22, 1905	C 114	Reid, Wm	Dec. 15, 1904	C 54
Duncan, Thomas	Aug. 29, 1906	C 128	Richards, Thos	April 27, 1904	C 14
Dunlap, Henry	Nov. 21, 1904	C 51	Ross, John	April 3, 1905	C 101
Dunn, Geo	Dec. 19, 1904	C 56	Roughead, George	Jan. 30, 1907	C 130
Dunsmuir, John	March 29, 1905	C 90	Ryan, John	Dec. 28, 1904	C 59
Eccleston, Wm	March 15, 1905	C 80	Sanders, John W	April 3, 1905	C 107
Evans, Evan	March 13, 1905	C 78	Shenton, Thos. J	July 25, 1904	C 30
Evans, W. H	March 14, 1905	C 79	Shepherd, Henry	June 13, 1904	C 26
Fagan, David	April 6, 1905	C 109	Smith, Ralph	March 7, 1905	C 77
Farquharson, John	April 27, 1904	C 17	Smith, Geo	March 29, 1905	C 84
Findlayson, James	June 6, 1904	C 25	Somerville, Alex	March 24, 1904	C 3
Fulton, Hugh T	April 3, 1905	C 105	Stauss, Chas. F	Feb. 9, 1905	C 69
Gibson, Edward	May 30, 1905	C 118	Steele, Jas	March 29, 1905	C 92
Gilchrist, Wm	March 29, 1905	C 85	Stewart, Duncan H	March 28, 1904	C 4
Gillespie, Hugh	April 6, 1904	C 8	Stewart, John	April 3, 1904	C 104
Gillespie, John	April 6, 1904	C 5	Stewart, Daniel W	May 16, 1904	C 23
Gould, Alfred	April 17, 1906	C 112	Stoddart, Jacob	Feb. 21, 1905	C 73
Green, Francis	Oct. 11, 1904	C 38	Strachan, Robt	April 27, 1904	C 15
Handlen, Jas	June 16, 1904	C 122	Strang, James	April 27, 1904	C 10
Harmison, Wm	Feb. 3, 1905	C 65	Thomas, John	March 29, 1905	C 97
Haworth, Geo	March 29, 1905	C 88	Vass, Robt	Dec. 12, 1904	C 53
Hescott, John	Jan. 16, 1905	C 62	Vater, Charles	April 6, 1904	C 66
John, David	Nov. 8, 1904	C 49	Walkem, Thos	Dec. 16, 1904	C 55
Johnson, Geo	May 9, 1904	C 124	Webber, Chas	Sept. 13, 1904	C 32
Johnson, Wm. R	March 1, 1905	C 75	Webber, Charles F	Sept. 13, 1904	C 33
Kerr, Wm	March 29, 1905	C 91	Whiting, Geo	May 29, 1905	C 117
Lander, Frank	Jan. 9, 1905	C 61	Wilson, Austin	Feb. 7, 1905	C 67
Landfear, Herbert	Jan. 27, 1905	C 63	Wilson, Thos	April 27, 1904	C 11
Lewis, Thos	Oct. 11, 1904	C 35	Woodburn, Moses	March 29, 1905	C 83
Malpass, James	Nov. 7, 1904	C 113	Yarrow, Geo	Nov. 3, 1904	C 46
Marsden, John	May 3, 1904	C 21			

CARIBOO DISTRICT.

CARIBOO MINING DIVISION.

REPORT BY C. W. GRAIN, GOLD COMMISSIONER.

I have the honour to submit herewith my report on the progress of the mining industry in the Cariboo Mining Division for the year ending December 31st, 1913.

I regret that I can only report, as I have been obliged to do for the last two years, that the conditions of this Division remain very much the same as they have been for the past five or six years. That is, the old "stand-bys" in the way of mines still giving a good account of themselves, the amount of gold recovered depending only on the number of days' piping; otherwise nothing in the way of new discoveries or of new works having been started up.

It cannot be expected that much capital will be invested in this Division until the expenses in connection with the transportation of machinery and supplies are considerably reduced.

If one compares the present prices of goods with the list of prices prevalent in 1875, which is given by John Bowron, Gold Commissioner, in his report for that year, it will be seen that prices have varied very little since that date; some have decreased and others increased, and that, consequently, the actual cost of living is as high as it was in 1875, if not more. To illustrate this I give the prices of 1875 and those of to-day on a few of the staple articles:—

1875.		1913.	
Flour	18 cents per lb.	Flour	12 cents per lb.
Beans	15 "	Beans	15 "
Bacon	35 "	Bacon	40 "
Tea	$1 "	Tea	75 "
Butter	50 "	Butter	60 "
Cheese	50 "	Cheese	35 "
Beef	12½ "	Beef	30 "
Sugar	33⅓ "	Sugar	15 "
Gum boots	$8.	Gum boots (reliable)	$13.
Nails	25 cents per lb.	Nails	15 cents per lb.

In those days—that is, in the year 1875—freight rates were 7½ cents from Yale to Barkerville; it is now the same price from Ashcroft to Barkerville.

The above list of prices demonstrates the difficulties an investor in this country has to contend with, in addition to the large sum which has to be laid out to open up the property, which necessarily has to be done in any country, before there can be any hope of its proving to be a paying concern.

In the early days of this district the ground was very rich, and it could easily stand the prices of the day. It is different now; there is a lot of good ground still in the district that could be profitably worked were the price of wages, cost of living, and transportation charges at all reasonable.

Nowadays, if any one comes in to look over a property, which may look very promising, inquiries as to the freight rates, prices of lumber, wages and supplies, and the average length of the season, show, by a little figuring, that there is very little left for the investor: the freighter, labourer, and merchant have got it all. I may say that I have in mind two such cases that happened to be brought to my notice this past summer.

It therefore seems to me that this renowned old district will have to plod along as best it can and patiently await the gradual development of the country, which is bound to make everything very much cheaper.

The season of 1912-13, just past, was certainly an ideal one for the hydraulic miner—that is, as regards weather conditions; in fact, it would hardly be possible to better it. The winter of 1912-13 was above the average as to snowfall, practically 20 feet of snow having fallen; during the winter there were two or three thaws which helped to pack the snow, which tended to make the snow last longer when the warm weather came, and to go more gradually than if it had been loose and powdery.

The actual season started about the second week in April, when all the mine-owners started to have a channel shovelled in their ditches. We then had nice warm days and cold nights, the best combination that the hydraulic miner can have. By April 20th all ditches were shovelled, when it turned cold, and piping, with a real full head, did not start in earnest until about May 14th.

The water lasted well, the snow going very slowly, so slowly, in fact, that this year one could hardly say that there was a high-water season. This welcome state of affairs was greatly augmented by a wet summer, about 16 inches of rain falling during the piping season, at most convenient intervals, so that last season very little water went to waste.

The piping season was good up to the beginning of October, and most of the claims continued piping, with a small head up to the end of that month.

The output of the district as a whole, including Cariboo and Quesnel Mining Divisions, was, as far as I can gather, very much the same as last year; it may possibly have been a little better, as the season was longer. From inquiries made from the mine-owners, express companies, and bankers, I would estimate the output of the whole Cariboo District for the year to be somewhere about $200,000. It is very difficult to obtain a true estimate, as there are a considerable number of individual miners, recovering small amounts of gold varying from $2,000 to a few hundreds, from whom it is difficult to obtain an account of their recovery; this is especially the case with Chinese miners. This year also having been an exceptionally busy one in my office, I was not able to get around the country as much as I would have liked. I have to thank Laurent Muller, the manager of John Hopp's mines, for kindly considering my convenience as regards the "clean-ups" in connection with his mines, in arranging that, whenever possible, the clean-ups should take place on a Saturday afternoon or on a Sunday, so that I could be present.

The mining receipts of this office again show an increase over that of the previous year, not quite such a large increase as last year, but still a good substantial increase.

WILLIAMS CREEK AND TRIBUTARIES.

The flats adjacent to the lower portions of this creek were this summer tested by several boreholes, sunk with a Keystone drill in charge of E. H. Dawson, of New York. The machine was shipped into the district by way of the Grand Trunk Pacific Railway via Edmonton to the "end of steel," then down the Fraser river by boat to Quesnel, from which place it travelled by road to Barkerville under its own steam.

This is the first shipment of freight brought into this country by this route, and thus the renowned Williams creek, a name so mixed up with the history of the Province, had the honour of receiving the first freight brought down the Fraser river. I gather that the results of the boring were not so satisfactory as hoped for, and that the owner of the ground is not perfectly satisfied, so that a more systematic test of the ground in question will be made next summer.

Only four holes were put down, commencing just below the old Kurtz and Lane shaft and finishing at the Goldfields elevator.

It is on this creek and its tributaries that John Hopp carries on his chief mining operations; that is, on the mines commonly known as the *Forest Rose*, *Stouts Gulch*, and *Lowhee*, situated on Williams creek, Stouts gulch, and Lowhee creek respectively.

No work was done this year on the *Forest Rose*.

On Stouts gulch, operations were carried on as long as there was enough water for piping, the work being chiefly carried on at the far end of the gulch, where very good pay was taken out in the old days by drifting; here large quantities of rock-piles left by the old-timers had to be sent through the flumes, the removal of which was, more or less, so much lost time, but nevertheless, as usual, Stouts gulch gave most excellent returns, some very rich spots being struck at times, evidently missed by the old-timers, as the bed-rock in this claim is very rough, and, apparently, many deep troughs or trenches had been overlooked by the old miners. About a week's piping was put in on Emory gulch, a tributary of Stouts gulch, and the result was far above what was hoped for, giving a most excellent little clean-up for the amount of dirt moved.

At the *Lowhee* mine a large quantity of gravel was moved and the channel was found to draw into a narrow canyon, the pay at the mouth of which was very good. This spot must have been very rich in its virgin state, as indicated by the timbers of the old-timers, the ground being literally studded with them; they must have run drives in all directions. Good pay is always encountered by the present-day hydraulicker in the vicinity of the timbers of the old-timers, especially in the *Lowhee* mine.

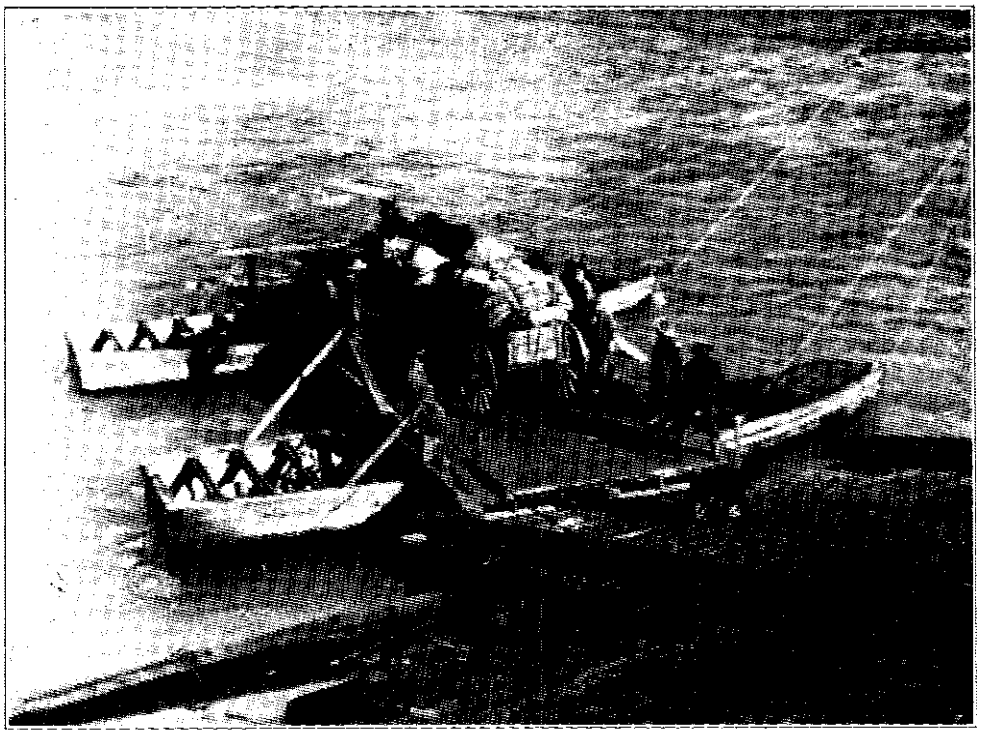
Ella Lake dam and the Lowhee dam again proved what an excellent plan it is to have a reservoir in which to conserve the spare water, and thus be able to obtain a further supply for ground-sluicing purposes and an additional supply to make up a full head when the main supply begins to run short.

At the *Mosquito Creek* mine, also owned by John Hopp, a good season was put in, and, as usual, some good clean-ups obtained.

On Little valley the West Canadian Deep Leads, Limited, an English company, whose shaft is now down some 285 feet, started running its drainage-tunnel, which is to tap the main shaft at the 100-foot level; this tunnel is now in 800 feet, and I believe it is the intention to run it for 2,300 feet. It is hoped that this tunnel will take off the greater part of the water that now has to be pumped up, and thus leave very little for the pumps, as the greater part of the water comes in above the level of the proposed tunnel. At present the work is shut down awaiting instructions from England.

At the *Point* mine, on Slough creek, owned by the Chinese merchant, Loo Gee Wing, of Vancouver, a good summer's work was put in. This year this mine was in charge of Joseph Wendle and great alterations were made in the manner of working the property, as hitherto it has been managed solely by Chinese. A new and much larger plant was installed, the water-supply somewhat improved, a new pit opened up, and the whole mine put into systematic working shape; of course, all this took up considerable time, yet, nevertheless, some good clean-ups were made and the mine more than paid its way, which, considering the many extra expenses caused by the many improvements, was as much as was looked for this season.

The Lightning Creek Hydraulic Mining Company worked with a large force on its property on Lightning creek in the vicinity of the old town of Van Winkle, on the ground commonly known as the *South Wales* property. This company is still greatly hampered by the old workings and also from lack of dump, although this latter trouble has been greatly lessened



Ferry across Quesnel River at Hydraulic.

Quesnel Hydraulic Mining Co.—Sampling gravels.

by the installation of an hydraulic elevator. I am informed that everything points to a great improvement next year in the quantity of the gold recovered, as by then they will be more or less clear of the old workings and into new ground.

On Peters creek very little work was done; the Venture Company did not work this year. I am reliably informed that there is a good chance of this company selling the property, and I hope that the sale will go through, as I have seen some very nice gold obtained from this ground, and I feel sure that, if a little money is put into this property, it will give a good account of itself.

On the property of the Ogden Gold Mining Company on Lightning creek, Mr. Ogden informs me, 300 feet of tunnel was run and several shafts, varying from 40 to 70 feet, were sunk, with the idea of locating the higher channel of Lightning creek.

On the property of the Lightning Creek Gold Gravels and Drainage Company on Lightning creek, at Wingdam, work was resumed in September, 1912. I visited the works about January and went down the shaft, which is about 195 feet deep. I found that the works had been put in good shape, considerable repairs and retimbering having been done, the main drives and tunnels having been cleaned out.

The following is a report handed in by C. H. Uverzagt, the vice-president of the company:—

"The company has been operating the property throughout the year. During the first part of the year the underground drifts were put in order and the main tunnel advanced into the gravel. As the top of the main tunnel, however, seemed to be higher than the bed-rock gravels, it was determined to sink the shaft about 10 feet deeper and run an additional tunnel about 6 feet lower than the present one, so as to get well under the gravel with the top lagging or timbers, thus ensuring the safety of the work against any runs of material until the ground is drained. This will require about 150 feet of additional rock-work. The engineer has obtained estimates upon improved boilers, a compound condensing-engine, and electric-power equipment; also a Lidgerwood logging system and a freight-truck to carry the company's own freight, with incidental equipment to put the property upon the most economical operating basis, which material the company expects to have in place for spring operations; the present equipment being improved by orders for extra or repair parts to put it in first-class condition.

"The company has purchased the ranch property, store, buildings, etc., of John T. Fleming, immediately surrounding the company's main works at its No. 1 shaft-house at Wingdam.

"The water was handled by the four-stage, No. 6 turbine pump which the company recently installed, although for portions of the time it was easily handled by the two Cornish pumps when the turbine was not running. This turbine is driven by a belt attached to a pulley at the surface, the pulley being fastened to a vertical shaft extending to the bottom. This is a new style of turbine pump, and enables the company to do all installation-work at the top of the shaft regardless of whether the shaft is full of water or not. There is no difficulty in handling the entire volume of water to be pumped. Care must be exercised, however, in breaking through into the old channel, in order to prevent any run of the material until the ground is drained. The company finds that with its new turbine pump it can pump out the shaft and lower workings in four hours' running, at any time after closing down for repairs."

On Sugar creek the Cooper Creek, Limited, had but a disappointing season, as it had considerable trouble with the ditch-line, which runs along a very steep mountain-side, frequent slides from which caused trouble by constantly coming down and filling the ditch; thus the best part of the water season was lost.

On Nugget gulch and on the property of the Waverly Hydraulic Company hydraulic operations were carried on as in past years, with practically the same results.

On Big Valley creek the ground in the vicinity of that which was bored by Mr. Dickerson last year was again tested with a Keystone drill in charge of J. T. Towers, who had carried on considerable work of this kind on Perry creek, near Fort Steele. I understand that good results were obtained, but not so good as obtained by Mr. Dickerson.

I understand that Mr. Towers will return in the spring, and will work his drill on the upper parts of Willow river and also in Mustang valley.

MINERAL OR LODE MINING.

Very little has been done in the immediate vicinity of Barkerville, but in the vicinity of Tete Jaune Cache and Fort George there has evidently been a certain amount of work done, as I have issued a fair number of certificates of work in connection with mineral claims in those districts.

OFFICE STATISTICS—CARIBOO MINING DIVISION.

Free miners' certificates (individual)	316
" " (company)	6
Placer claims recorded	4
" re-recorded	26
Mineral claims recorded	65
Certificates of work	39
Placer leases granted	44
Leaves of absence	17
Conveyances and other documents recorded	75

Revenue.

Free miners' certificates	$ 2,355 50
Mining receipts, general	14,320 30
Leaves of absence	42 50
Land sales	123,252 06
Land revenue	820 00
Water revenue	2,813 75
Real-property tax	10,811 92
Personal-property tax	1,108 62
Wild-land tax	118,681 31
Income-tax	97 71
Acreage-tax	416 75
Interest	865 21
Marriage licences	35 00
Liquor licences	1,505 00
Trade licences	565 00
Game licences	525 00
J. P. court fines	453 50
Miscellaneous receipts	78 11
Total	$278,293 74

TETE JAUNE DISTRICT.

NOTES BY PROVINCIAL MINERALOGIST.

The mica claims in the vicinity of Tete Jaune Cache have lately attracted some attention, and it seems likely that the coming year will see some active development-work carried out. The following notes forwarded by W. A. Jowett, Stipendiary Magistrate, to the Provincial Mineralogist are submitted:—

"The Grand Trunk Pacific Railway is now running trains through from Edmonton, Alta., to Fort George. From the boundary between Alberta and British Columbia to Fort George is 235 miles. The Canadian Northern Railway will by June next have laid steel from the boundary to Thompson River Crossing, a distance of about 120 miles. These two lines will open up a large mineral district in the vicinity of Tete Jaune Cache not hitherto accessible.

"For over twenty years mica has been known to occur in large quantities in this district, and at that time prospectors staked a number of claims, coming in from Kamloops, but at the then low price of mica it was not found possible to work at a profit, when transportation was by pack-train a distance of about 300 miles.

"During the year 1914 the New York and New Brunswick owners of ten mica claims are going to thoroughly prospect their claims, and mining operators from Calgary have purchased claims and will commence work in the spring.

"In all, about twenty-seven mica claims are staked, with ten Crown-granted, and these claims being within three to five miles from transportation by the Grand Trunk Pacific Railway, there is no doubt they will now be throughly tested at the earliest opportunity.

"The present mica claims are situated at the head of McLennan river, Sand creek, and Mica or Swanson creek; these creeks run into the Fraser river from the south between Mile 49 and Mile 53, Grand Trunk Pacific Railway.

"Other known deposits of Mineral are five copper claims staked on Moose river, which runs into the Fraser river from the north, and are said to be about twelve miles from the Grand Trunk Pacific Railway. The vein is reported to be from 20 inches to 4 feet in width, and an average sample gave $33 in copper, gold, and silver.

"On Beaver river, which enters the Fraser river from the north about Mile 81, Grand Trunk Pacific Railway, about six miles from the track, is a large quartz vein said to be 75 feet in width, and to assay $7 to the ton in gold and silver; this claim was first staked in 1907.

"There is also a deposit of red marble, some six miles from the Grand Trunk Pacific Railway on Grant brook, which joins the Fraser river from the north; whether this is commercially valuable or not is at present unknown.

"Surface croppings said to indicate the presence of coal have been found in the neighbourhood of Mile 160, Grand Trunk Pacific Railway, but as far as known no real coal has been struck.

"There is no doubt that the mountains in the immediate vicinity of Tete Jaune Cache will be thoroughly prospected in the coming year, and it is within the bounds of possibility that good mineral of commercial value will be found in the near future."

QUESNEL MINING DIVISION.

REPORT BY ARTHUR SAMPSON, MINING RECORDER.

I have the honour to submit herewith my report on mining operations in the Quesnel Mining Division of the Cariboo District for the year ending December 31st, 1913.

The Westenhiser Company has made considerable progress towards opening up its property on Hemlock creek at the head of Clearwater lake. A force of men was engaged all summer on the construction of a sleigh-road across the portage between Quesnel and Clearwater lakes to permit the hauling of the pipe and other mine equipment which was landed at the head of Quesnel lake.

A crew of six men has been employed throughout the winter getting out necessary lumber, etc. Mr. Westenhiser, the manager of the company, informs me that the prospects obtained during several years' work of running tunnels, etc., were very satisfactory, and that they had an available water-supply of 6,000 miners' inches. This company will have a small steamboat in operation on Quesnel lake this ensuing season, which will greatly reduce the cost of delivering supplies to the works.

The Morehead Mining Company, with head office at Calgary, is operating on Seven-mile creek. The ditch was completed in May last, and hydraulicking was started with a No. 6 Monitor; later on another monitor was added for ground-sluicing. A satisfactory clean-up is reported, and the company has announced the intention of constructing a ditch at a higher level, the existing pressure having been found insufficient for the tight character of gravel now disclosed in the pits.

The dredge at Seven-mile creek is now completed; work on it was delayed by a slide on the river which caused the ways to be flooded and necessitated the removal of the sawmill, and these in turn prevented the launching of the scow at a favourable stage of the water.

The old Bullion pit, which has to its credit a production in a single season of $350,000, in gold, may again be in operation during the coming season.

Reports from Philadelphia are to the effect that the Quesnel Hydraulic Mining Company's big plant at Twenty-mile will also resume work this ensuing spring.

On Keithley creek very little was accomplished last season. On Four-mile creek, a tributary of Keithley, Messrs. Lowden ground-sluiced, with the intention of rigging up a hydraulic plant.

Mr. Mallonee, who has been prospecting for the supposed high-run of Snowshoe creek, reports getting very good prospects in his tunnel.

On Snowshoe creek little work was done; early in the spring a slide carried away a large section of the ditch of the *Luce* hydraulic mine, which made operation of the mine impossible, as repairs could not be made in time to enable the spring water freshet to be used.

The Marten Creek hydraulic was operated as usual.

On the North fork of Quesnel river Shafter and Company have been getting good pay in their workings in the old river-channel.

DREDGING FOR GOLD.

The dredging possibilities of this section are just beginning to receive the attention they deserve, and it is indisputable that parts of the Quesnel river and its tributaries offer great inducements to dredge operators. In the early days small fortunes were obtained from the various bars in the river, and the river itself was wing-dammed at various points, and the portions of the river-bed thus uncovered paid handsomely.

It must be understood that, owing to lack of drainage, it was only possible to mine the river-bed for a few feet in depth.

If the primitive methods of the hand-miners, with their natural limitations, yielded so much gold, it surely points to the conclusion that there is in this district territory well worth the investigation of those on the outlook from promising localities in which to introduce gold-dredges.

LODE-MINING.

With the advent of the Pacific Great Eastern Railway into the Cariboo in the near future, which will, of course, tap this district, great developments may be looked for in the opening-up of its hidden wealth. Some noteworthy occurrences of low-grade copper-ore, together with most promising bodies of silver-lead ore, have already been discovered.

Work of a desultory character has been done on several free-milling gold ledges, but there is a reluctance to do anything like active development-work until an assurance of better transportation facilities is received. At present the district is served mainly by pack-trails.

OFFICE STATISTICS—QUESNEL MINING DIVISION.

Free miners' certificates	145
" " (special)	1
Mineral claims recorded	41
Placer claims recorded	15
Certificates of work	24

QUESNEL MINING DIVISION.

NOTES BY WM. FLEET ROBERTSON, PROVINCIAL MINERALOGIST.

HARPERS CAMP.

The Provincial Mineralogist, accompanied by Dr. Wilson, of the Dominion Mines Department, on October 21st drove from the 150-Mile House into Harpers Camp, a distance of about thirty miles, to find out what placer-work was being carried on there. This camp was last visited by the writer in 1902, and was described in the Report for that year.

Ward's Horsefly.

The old Ward's Horsefly pit in the bed of the river at this point, which some years ago produced regularly, was found to have been abandoned, as far as work is concerned, for some years past, the available rich streak or pocket having been exhausted. For the past couple of seasons drilling operations have been going on on the extensive flats to the north-east of the old Ward pit in the search for a continuation of the pay-streak opened up by the Ward operations. While these operations have met with some encouragement, it has not been sufficient, as yet, to induce those interested to install a plant to work the deep gravels.

Miocene Co.

The old workings of the Miocene Gravel Mining Company of Cariboo, Limited, at Harpers were also found to be idle and abandoned. It will be remembered that here an attempt was made by sinking shafts to strike a continuation of the Ward Horsefly gravels to the southward and only some 1,000 feet distant; in these attempts a couple of shafts were sunk over 500 feet deep, at an expense of over $200,000, but bed-rock was never reached, the rim still dipping away. Some gold was found in the gravels pierced, though not sufficient to justify mining.

UPPER HORSEFLY RIVER.

The upper part of the Horsefly river, described by the writer in the 1902 Report, is still being prospected, and a very small quantity of gold has been recovered; just sufficient to keep up the hopes of the prospectors and, in the language of the country, "to keep them broke." The gold found is very fine and flaky, different in general appearance from the placer gold usually found in the district.

Galena-ore has been found in this section, but, as the silver-content has proved to be low, there is no inducement to develop it so far from transportation.

Horsefly Hydraulic Mining Co.

The Horsefly Hydraulic, perhaps better known as "Hobson's Horsefly," where the late J. B. Hobson first carried on operations in the Cariboo District, is some six miles north of, and down, the river from Harpers Camp. Mr. Hobson ceased working the property in 1899, since when the property has lain idle until within the past few years.

Some four years ago E. J. West, with associates, took a lease from the old company, and they have since been carrying on operations in a modest way, employing altogether the past season some eight men.

At the old plant erected by Mr. Hobson, including the water service bringing water in from lakes at the head of Mussel creek, a distance of about 12½ miles, Mr. West informed the writer that he found everything so well constructed and taken care of that it was nearly as good as new, a very conclusive tribute to the thorough manner in which Mr. Hobson did his work. The details of this plant are given in the 1902 Report.

Mr. West has opened a pit immediately adjoining the old Hobson pit on the north, and has run an open-cut to the river 900 feet long, 75 feet deep, and 120 feet wide.

The total amount of material mined is said to have been 390,000 cubic yards, of which 40,000 cubic yards was gravel which yielded 25 cents to the yard, the remainder being clay, etc., which ran less than 2 cents to the yard.

Black Creek.—Messrs. Ross, Rutherford, and Champion are reported as having been doing serious prospecting on an old channel on Black creek the past couple of seasons, with results that justify further work, to which end the drill from the workings of the Ward Horsefly was to be taken in there as soon as snow was available.

QUESNEL RIVER.

Dredge on Quesnel River.

The Water-tight Dipper Dredge and Mining Co., Limited, a Calgary flotation, with head office in that city, has for the past couple of years been constructing a dredge on the south bank of the Quesnel river at the mouth of Morehead creek, some ten miles below the forks. The company is reported to have acquired Dredging Leases Nos. 96 and 97 covering the bed of the Quesnel river for a distance of ten miles from the forks down-stream. The river-bed here is fairly wide, with, in certain parts, quite extensive gravel-bars, or flats, on either side, all of which it is proposed to dredge.

The gravel-wash appears to be fine, with few boulders of any great size, and in this respect is admirably suited to dredging. The depth of this gravel-wash has not been determined with any degree of accuracy, but it is reported not to exceed 25 feet and to be underlain by a bed of shale or clay, which should form a suitable bed-rock for dredging operations. According to its printed prospectus, the company has tested the gravels by some fifty-five test-pits, and it claims to find the average gold-tenure to be over $1 to the cubic yard, which is somewhat higher than would ordinarly be expected, and also finds a material amount of alluvial crude platinum.

Some years ago a previous attempt was made to construct a dredge at this same spot, but the work was never carried to completion, and when the present company started construction a considerable amount of the material for the first dredge was on the ground which could be utilized in this second venture. The dredge under construction is an innovation on the ordinarily accepted dredging practice, and is the patented device of J. W. Moore, whose rights the company appears to have acquired, for this plant at least, and it is claimed to be "a dredge which obviates all the weak points in existing forms" of dredges.

The dredge mechanism is similar to that of the ordinary harbour dredge—its peculiarity lies in the dipper itself, which, as the name of the company implies, is "water-tight"; that is to say, the dipper does not have a trap-door bottom which might be thrown open to discharge its contents of material lifted, as do the common dredges, but the bottom is a solid water-tight one riveted on. The dipper is emptied by being turned upside down, and to enable this to be done the dipper itself is attached to the arm and so hung on a pair of trunions that by moving a suitably constructed latch the bucket will reverse and, having dumped its load, come back to its original position; this dipper has a capacity of 2 cubic yards.

Another feature of this dredge, which is expected to aid in recovering values, is that the bucket-dredging is followed by the cleaning-up of the bed-rock by powerful suction pumps. In the prospectus it is stated that there is a considerable concentration of gold on the bed-rock, and this suction apparatus is expected to recover these values, which would for the most part be missed by the buckets. The prospectus of the company states that it is likely that the pumps will recover as much if not more values than the buckets.

No definite statement can be made as to the effectiveness of this arrangement, as at the time the plant was visited, on October 16th, 1913, although the machinery was mostly on the ground, no attempt had then been made to assemble it in position; to do which work Satchell Clarke, of Vancouver, who has had some dredging experience, had been engaged, and was there, but had not begun erecting the machinery, as the scow was not at that time completed. The machinery was constructed by the Seattle Machine Works. The scow, a photograph of which accompanies this Report, was nearing completion in October; it was found to be a massively constructed and braced wooden structure, 105 feet long by 38 feet wide, and having a total depth from deck to bottom of approximately 10 feet, and, according to the management, weighed as it stood, without the machinery, 160 tons.

The plan of the scow is a rectangle of the dimensions given, and its longitudinal vertical section is also a rectangle—that is, both ends are square. The expectation of the management was that the machinery would be in place and everything ready to begin operations in the spring of 1914.

The problem of launching the craft seemed to be causing some anxiety, as the water in the river is shallow and the current swift. To obviate this difficulty it was proposed to have the dredge dig a berth out for itself, into which it would be gradually launched.

Morehead Mining Co.

The Morehead Mining Company was found to be operating a hydraulic plant in the left bank of Morehead creek about a mile or more up from its mouth; the ground from the opposite side of the creek is included in one of the old leases held by the Consolidated Cariboo Hydraulic Mining Company. This property was formerly operated in a small way by Chinese, who built a ditch which took water out of Morehead creek and delivered it to the pit under a head of only about 100 feet in the pit-bottom.

The water in Morehead lake was included in the water system of the Consolidated Cariboo Hydraulic Company, and if this company was at work and draining off the water for the Bullion pit there would be practically no water-flow in Morehead creek, what there is at present

being due to seepage and overflow from the Morehead dam. Until a right to take water from the lake, which would give a very good head at this pit, is secured, or water obtained from some other source, the tenure of title to water is too insecure to justify any very extensive installation.

The productive operations of the present company began in 1913, and there is an open pit now approximately 300 feet long and 200 feet wide, with a gravel-face 150 feet high. The bed-rock exposed is somewhat irregular and appears to be dipping into and under the exposed gravel-face, which would seem to make it advisable that the deposit be attacked from a point lower down the creek; but, however desirable this might be, it could not be attempted without an assured water-supply, and it is probable that under existing conditions the pit was opened in the most available place and manner.

The water-supply thus available from the creek was estimated at about 200 miners' inches delivered at 100-foot head through an 18-inch pipe to two No. 8 Monitors. The pit was equipped with about 350 feet of 5-foot sluice, with the usual riffles and gold-saving devices, laid on a 5-per-cent. grade, the upper end of which was already above bed-rock.

The insufficiency of both the quantity and head of the water-supply prevented the pit being operated in a proper manner, as even quite small boulders had to be moved by hand.

A force of from ten to fifteen men was employed under the management of S. M. Pletch, with Andrew Nesbitt as foreman.

The exact amount of gold recovered is not known, but, from the deliveries to the Dominion Government Assay Office, Vancouver, it was sufficient to prove the ground very attractive with any proper water-supply.

A certain amount of crude platinum was recovered from the riffles and tested in the British Columbia Government Assay Office. The quantity was not of commercial importance, nor is it probable that, without undercurrents, any appreciable proportion was collected.

Spanish Creek.—The old Hobson property on Spanish creek, later acquired by John Hopp and associates, was not operated this past season, and was in charge of a caretaker.

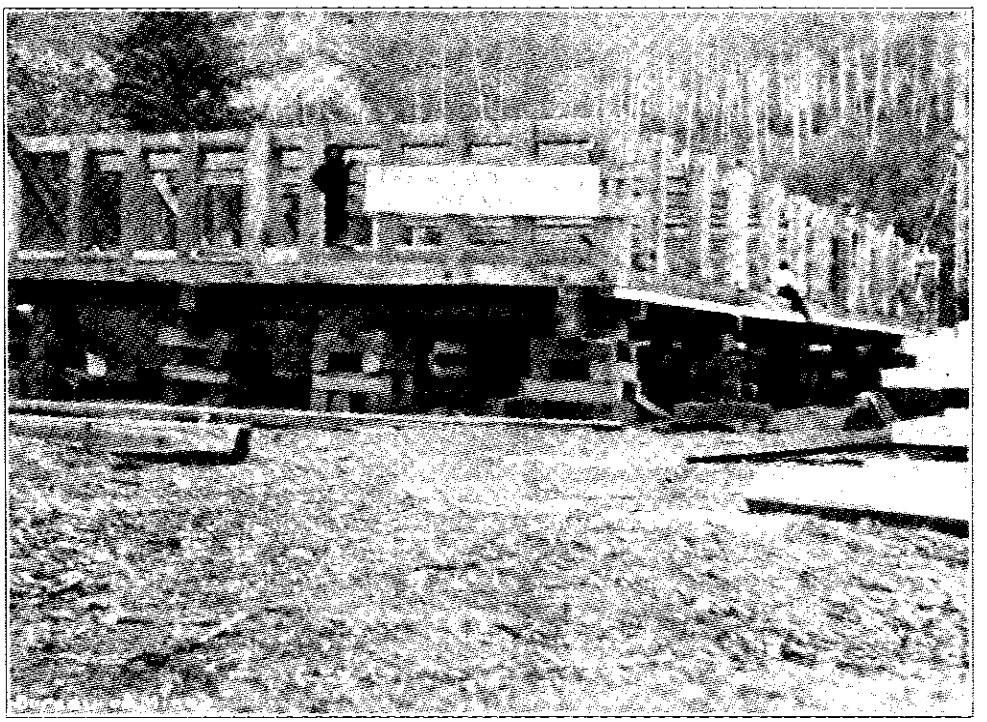
Quesnel Hydraulic Mining Co.

The Quesnel Hydraulic Mining Company's installation on Twenty-mile creek, on the Quesnel river, and its water system, by which water was brought over the divide from the watershed of Swift river, was so fully described in the Report for 1911 that it will be unnecessary to again enter into details. The plant was operated during the season of 1912, but apparently the results were anything but satisfactory, no material or sufficient recovery of gold having been effected, and no further work was carried on during the season of 1913. The property was visited by the writer in October, 1913, in company with Howard Du Bois, the company's consulting engineer, who very kindly gave up an important engagement elsewhere and returned with the writer from Ashcroft to the mine.

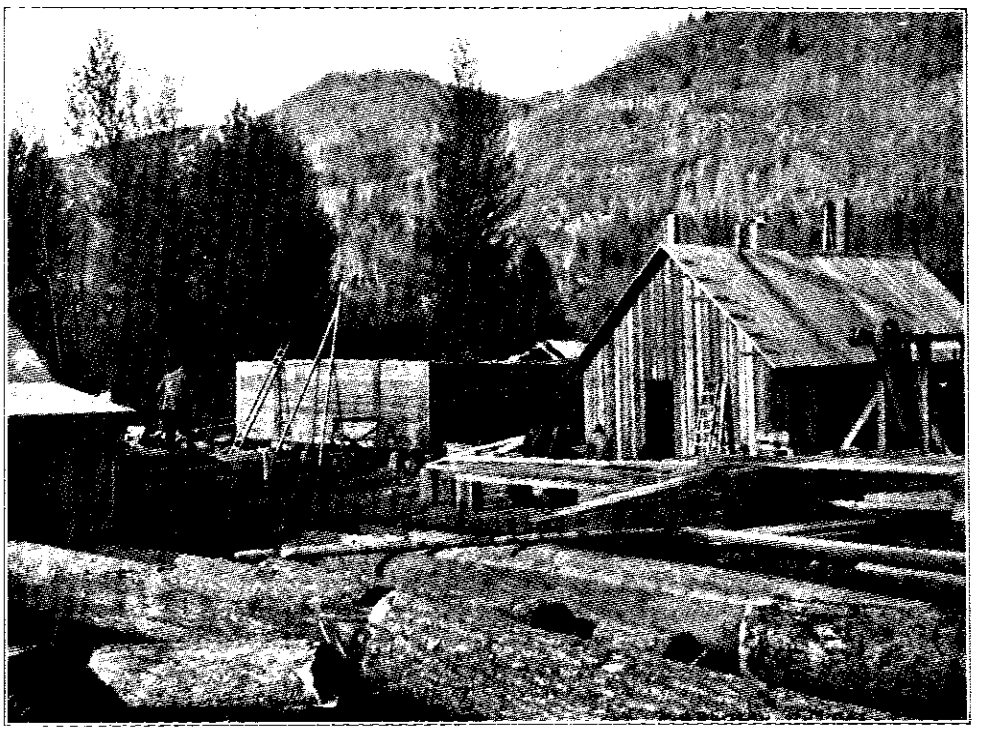
Mr. Du Bois was in active charge of the construction of the plant to 1911, but the management and the hydraulicking operations in 1912 were in the hands of a hydraulic foreman of experience in California hydraulics.

The mine was found to be in the care of the book-keeper of the company, Mr. Brook, who, with one man as an assistant, lived at the mine, while another man lived in a cabin on the ditch-line, patrolling the line daily and seeing that it was kept in repair; water was kept running through the system all season.

The following is a brief summary of the property as it appeared to the writer:—



Watertight Dipper Dredge—under Construction—Quesnel River.



W.T.D. Dredge—Scow completed, October, 1913.

Water-supply.—The water-supply is sufficient and to spare, both in quantity and in head; it is assured in all seasons, and the cost of maintenance should be very light. The source of supply—Swift river—has such an abundance of water at all seasons that conservation reservoirs are unnecessary.

A natural flat a short distance above the pit has, at a very slight expense, been converted into a pooling-reservoir of ample size. The property has about the best water-supply of any hydraulic mine in the province.

Gravel-deposit.—The deposit of gravel cut through by Twenty-mile creek is very extensive and does not carry any prohibitive overburden. As to the gold-tenure of these gravels, the writer cannot venture an estimate of his own, but the statements made by the company's officials as the work was being opened up indicated that, from extensive sampling, the deposit would run from 5 to 8 cents a cubic yard.

When visited, the plant had been idle for a year and the spring freshets had more or less disturbed the pits opened, but, as things were found, there did not seem to be any well-defined or visible bed-rock, although in places solid formation did seem to appear. The pits were, however, worked without bed-rock.

The questions of dump and of grade for sluiceways are of vital importance in this property, as the grade of the creek was not greater than that which would be required for a sluiceway lined with the ordinary wooden blocks, and, consequently, no proper dump could be obtained without an unduly long sluiceway, which it was not practicable to keep in operation in the bed of the creek. The management seems to have recognized this difficulty and had brought in a large number of high-carbon steel plates for lining the sluiceways, which will permit of a sluice so lined being operated on half the grade required for a block-lined sluiceway. This would allow of the length of the sluiceway being greatly diminished and permit its being placed out of the reach of the spring freshets. These plates were brought in largely as an experiment, and, in the opinion of the writer, were a decided success, the wear, after a season's run, being almost imperceptible; they are almost a necessity if this plant is to be operated.

The first cost of this steel installation must be heavy in any event, but observation as to the wear, or rather lack of wear, on such high-carbon steel plates would guarantee a minimum of maintenance costs.

The present freight rates on these plates from Ashcroft into the mine is so great that a further supply of the plates will not be sent in until they can be brought in from the line of the Grand Trunk Pacific Railway at a much lower rate.

The management claims that operating with these steel plates the cost of handling gravel was $1\frac{1}{3}$ cents a cubic yard. The yield obtained from the operations during the season 1912 was very unsatisfactory, the gravel not giving a yield of over 2 cents a cubic yard. This is so greatly below what the samples gave reason to expect that some explanation seems necessary, and a very casual visit to the pit, as it stands now, would seem to supply such explanation in the manner in which the pit was operated.

In the operations it is evident that the boulders—none of these large—which occurred in the gravel-face had been allowed to accumulate at the working-face in such a manner that they would inevitably serve as riffles, and so retain most of the gold washed from the bank, thus preventing its getting into the sluiceway.

The company is apparently convinced that the method of operating the pit was not one calculated to save but a fraction of the gold-content of the gravels, and, consequently, it is asserted that the plant will be operated in 1914 under the best and most experienced hydraulic operator obtainable.

The following additional notes regarding the Forks section are extracts from a report by W. Stephenson submitted to C. W. Grain, Gold Commissioner, Barkerville :—

This section of the Cariboo District did not make a very good showing this year, as there was comparatively little actual mining carried on. A fair amount of prospecting and preliminary work was done which will probably ensure a larger production during the ensuing year.

On Little Snowshoe creek a little prospecting was done by Borland & Adams, but without very encouraging results, and also a little work by Chinese.

On French Snowshoe four men from Calgary prospected for about two months, but they did not obtain much gold.

On Honey creek one man was prospecting, but he had not yet reached the pay-channel for which he is driving.

One man worked on Goose creek during the season and obtained a little gold.

On Keithley creek B. Mallonee did fairly well for the amount of ground worked. Also two or three Chinamen have been getting a little gold.

On the North fork of Quesnel river a few Chinamen made a fair clean-up. Five Austrians who have been working drifting into the bench on the left-hand side of the Quesnel river below Spanish creek are reported to be getting favourable results, although it is difficult to get actual figures from them.

On Half-mile gulch, South fork Quesnel river, two men did fairly well in the early part of the season while they had a good supply of water, which was lacking in the fall. The only other work on the South fork was prospecting by a man from Edmonton, who was satisfied and said he would return with more men in the spring.

Very little was done on the main Quesnel river, with the exception of the building of a dredge, which is not yet in operation. Robt. Winkley and partner take out a little gold each season, as long as their water-supply lasts, from their claim on the north side of the Quesnel lake near the Dam. Winkley also has a quartz ledge in the vicinity on which he does annual assessment-work.

On the Horsefly there is some prospecting going on, but very little gold was obtained. Rutherford and others have some locations about Black creek. They intend bringing in a drill, which can be transported by pack-trail, next season with which to prospect their ground. Mr. Stephenson had three men at work on his own leases putting down prospect-holes and cuts, but were unable to get any depth on account of water flooding them out.

CASSIAR DISTRICT.

ATLIN MINING DIVISION.

REPORT OF J. A. FRASER, GOLD COMMISSIONER.

I have the honour to submit my report on mining operations in the Atlin Mining Division of Cassiar District for the year ending December 31st, 1913.

The excitement created last winter by the reputed discovery of placer gold on Silver, Johnson, Trout, and Moose Horn creeks which was unduly enhanced and fostered by designing parties, induced quite a number of strangers to visit that district, but it did not take long for genuine prospectors to discover that there was not sufficient gold there to justify any excitement, or even to pay for mining what there was; whilst a few of the new-comers turned their attention to O'Donnell and other streams and valleys in the district, the majority passed out again, leaving us by midsummer and for the greater part of the season with only about the same number of people in the district as in other years.

A number of the strangers, and even some old-timers, passed on to other creeks in the vicinity of those above mentioned, and thus another wave of cursory prospecting swept over that section of the district, revealing nothing new.

The water-supply was, however, better than for some seasons past, due in part to a heavy snowfall during the previous winter and to a fairly copious rainfall during the summer, and, whilst it contributed materially towards a larger output in some cases, it also served to emphasize the necessity for conservation by leaving those who had no reservoir facilities more or less hampered by the uneven supply, according as it rained much or little.

Considerable amounts of gold were not reported at all, and some not in time to be included in the annual statement; even as it is, the output exceeds that of last year, and, with the outlook on O'Donnell river and for some of the lode mines, next season should witness a marked increase in the amount reported.

There is also a slight increase in revenue, but it should have been considerably more under some heads, which, however, will likely inure to the credit of the next or some other year.

McKEE CREEK.

On this creek the Pittsburg-British Gold Company, under the management of George Adams, commenced sluicing operations on May 16th and continued until October 8th. During that period over 11,000 square yards of bed-rock was uncovered, and over 60 per cent. more gold was recovered than during the previous season.

This was largely due to the fact that a better supply of water was available during the greater part of the season, but the shortage was sufficiently marked to impress the owners with the necessity for conservation, and I am pleased to note that steps are being taken to provide storage facilities which will surely increase the output and the profits from season to season.

During the season a reorganization amongst the owners of this property took place, pursuant to which the above-named company will be dissolved and the property will be owned and operated by the Delta Gold Mining Company.

During the spring, and before sluicing was commenced, the company's headquarters were transferred from the north to the south side of the creek, and the ground formerly so occupied was sluiced out.

A force of from ten to twenty-four men, with an average of twenty, was employed throughout the season.

There were no individual mining operations on the creek.

PINE CREEK.

On this creek the North Columbia Gold Mining Company, under the superintendence of A. D. Hughes, M.E., and the general management of J. M. Ruffner, operated hydraulically upon its own holdings on the south side, and upon those of the Atlin Consolidated Mining Company, Limited, on the north side, and, with a force averaging about fifty men, cleaned up a large area of bed-rock and realized on the north side particularly, returns exceeding those of any previous season.

I regret being unable to give more details owing to the failure of the management to supply them.

The Pine Creek Flume Company, Limited, under the management of C. L. Queen, operated on its leases on Pine creek, adjacent to those of the Atlin Consolidated Mining Company, from April 29th to September 30th, and with a force of from five to thirteen men, and an average of seven, moved about 10,000 cubic yards of gravel, but for lack of water was unable to clean up the bed-rock, and consequently the returns were not very satisfactory.

The initial steps have been taken for procuring a supply of water from Birch creek, and it is to be hoped and expected that with a sufficient supply of water satisfactory returns may be realized for the time to come.

Some individual mining was indulged in on Pine creek, which, however, was principally confined to resluicing old "tailings," and no returns were made by which results could be ascertained.

On Gold Run two men worked all season and realized wages at least.

SPRUCE CREEK.

On Spruce creek there were about 100 men engaged in mining during the season, and with generally satisfactory results.

The Spruce Creek Power Company, Limited, owing to the continuance of individual operations, with which they would be liable to conflict if operating hydraulically, pursued the policy of the last two seasons, so that there was no hydraulic mining on this creek during the season.

On the *Gladstone* lease and adjacent holdings James McCloskey continued his operations throughout the season, and with a force of from three to thirty-three, and an average of twenty men, made a very good showing for the time they were operating.

On the *Joker* lease Isaac Matthews, with a force of about twenty men, at intervals, carried on drifting operations, which proved very remunerative, as did also the operations of Foley & McPherson until they unfortunately drifted into legal complications, which caused a cessation of operations and had a marked effect upon the output, which was much less than it might have been.

Other operators in that vicinity had no reason to feel disappointed at results for the time devoted to mining, but for various reasons, work was not prosecuted continuously, so that the returns from Spruce creek were not up to those of former seasons.

At Blue canyon, on Spruce creek, Swanson & Pettit, with a force of six men, spent about two months in prospecting upon a lease which they have located over ground that was worked by individual miners in the early days, and was acquired by a company years ago and abandoned. They have found very encouraging results and are well satisfied. They have everything in shape for commencing sluicing operations with a small hydraulic plant as soon as the frost will have left the ground in condition to permit of their doing so successfully.

Other exploratory work along this creek has revealed the fact that it is by no means exhausted, and even encourages the belief that as good ground will be found thereon as has hitherto been worked, if not better.

About thirty people are on Spruce creek this winter, but the old-time activity is not in evidence.

Owing to more pressing claims upon his time and resources elsewhere in the district, J. M. Ruffner was not able to prosecute the exploration of the deep ground which he discovered in 1912 on Spruce creek, but he appears sanguine as to results when he does so, and expects in the near future to have an installation there which will provide work the year round for many seasons.

BIRCH CREEK.

Not quite so many men were employed on this creek this season as last, but the results of their operations were quite as good, or better, *per capita.*

Under the management of H. Peploe Pearse, a force of from nine to eleven men operated hydraulically on the lower part of the creek between May 14th and October 15th, during which period they turned over about 67,000 cubic yards of gravel and won therefrom considerably over $15,000.

The pay-gravel is quite as rich as farther down-stream, but it is found to be swerving into the bench, which necessitates the removal of a greater quantity of barren overburden and reduces the percentage value per cubic yard.

During the season a nugget of almost pure gold was found, which weighed 73 oz., and was valued at about $1,200; this was perhaps the largest or most valuable nugget yet discovered in this district.

Notwithstanding the rain, etc., there was a scarcity of water on this creek during midsummer, and the output was consequently lessened, showing plainly that on this creek conservation of water is necessary to secure the best results.

During the winter the entire camp will be removed up-stream, and the reservoir will also be moved farther up.

Individual miners did not operate to the same extent on the upper reaches of the creek as in former years.

BOULDER CREEK.

A force of about ten men operated on this creek during the season, with almost the same results as in former years. An old "pay-streak," which was supposed by some to have been exhausted, was rediscovered, and gives promise of excellent returns from the operation thereof. This creek is by no means exhausted, although only a very few have been sticking to it.

The Société Minière de la Colombie Britannique has gone into voluntary liquidation, and its assets on the creek have been acquired by another Frenchman who is in the camp, but who has not yet attempted to do anything with them.

There are about seven men mining on the creek this winter.

RUBY CREEK.

On this creek the Placer Gold Mines Company, under the management of T. M. Daulton, commenced operations on April 24th and continued until October 13th. A force of fifteen to twenty men (with an average of eighteen) was kept employed during that period, and the open-cut advanced up-stream a distance of 300 feet by 120 feet in width. About 47,000 square feet of bed-rock was uncovered and about $1 per square foot won therefrom. Still better results are expected as they proceed up-stream.

The above was the result of hydraulic operation, and no individual mining worth mentioning was in evidence on the creek.

This company has procured and intends installing manganese-steel plates, by which the efficiency of the water-supply will be materially enhanced.

WRIGHT CREEK.

About five men worked on this creek throughout the season, but neglected to make returns, so that results are not available; they were, however, about similar to those of last year.

OTTER CREEK.

On upper Otter creek J. E. Moran assisted by three others, operated throughout the season, and when overtaken by the early freeze-up, was compelled to leave the greater part of the results of his last pit unrecovered, and will therefore have an easy clean-up to commence with in the spring; results secured, however, even as it was, were better than for the previous year. A new dam was built during the season which will enhance the efficiency of the water-supply.

On lower Otter creek the Maluin Syndicate, under the management of W. H. Brethour and the general superintendence of Henry Maluin, with an average of twelve men, continued working down towards bed-rock, as in former seasons, commencing May 15th and closing down on October 20th. During that period of operation about 150,000 cubic yards of earth and gravel is reported as having been moved, besides making a sluiceway through rock for about 400 feet, with an average depth of 8 feet. This heavy "dead-work" has been rendered necessary in order to follow the "pay" which a Keystone drill and other prospect-work has disclosed as swinging out of the creek and under a high bank of gravel. It is expected that "pay" on bed-rock will be reached next summer. This work is being done by water, under pressure, and the debris is carried down towards Surprise lake, which provides excellent dump-room.

Other work done during the season comprised the laying of 900 feet additional flume, moving camp buildings, re-enforcing dams, etc.

No work has been reported by the Lincoln Creek Syndicate, and apparently very little, if any, work has been done on that group of leases. Lack of funds for development and to procure and install the necessary plant appears to be the only reason for delay, as the prospects hitherto found were decidedly encouraging.

On Consolation creek one or two men have been working, without, however, reporting any new developments.

On Davenport creek two or three men have been prospecting pretty steadily, and evidently securing some "pay," although no formal report has been made. The indications reported are that they may have a good hydraulic property there if they can equip it.

On Wilson creek not much has been done this year, only three men being reported as operating there during the summer. There are two men wintering on the creek.

BURDETTE CREEK.

On this creek, which is a tributary of the O'Donnell river, some little excitement was occasioned last year when a discovery of gold was reported and a number of individual claims were located.

In deference to the sentiment and policy of giving the individual miners the first chance at the ground, no leases were allowed on the creek, but this season no work whatever has been reported as done on it, and apparently the claims located thereon have been practically abandoned.

O'DONNELL RIVER.

The discovery of rich "pay" on a high bench of this stream last year attracted more than usual attention, and some systematic prospecting was prosecuted on the benches during last winter and throughout the summer, with the result that the indications now are that rich "pay" does exist both in the stream and benches, but how far it extends has not yet been determined.

In consequence of the attention thus attracted a large number of leases have been located on the stream and its tributaries, and more or less prospecting has been done on both sides for perhaps twelve to twenty miles, and many promising indications are reported.

The banks are rather high and the stream-grade rather flat, so that it will be expensive conveying water on to the benches; but, if a sufficient supply for conservation can be secured, the indications now are that successful hydraulic operations may be conducted along this stream for miles.

On the group of leases held by the Canadian Alaska Exploration Company and Robert McKee, on one of which the rich "pay" reported last year was found, J. M. Ruffner secured a bond and option of purchase early in the year, and he has been actively engaged throughout the season in prospecting the property, with very encouraging results in some places, and apparently with sufficiently good results, so far as his explorations have extended, to induce him to take up the option and acquire the property absolutely.

During the summer Mr. Ruffner had a force of from twenty-five to thirty men employed on those properties, and, besides pushing drift tunnels into the benches, he cut a diversion canal across from one bend to another of the river, at considerable cost, thus enabling him to work a portion of the river-bottom by ordinary individual methods.

He also brought a considerable quantity of water by ditch and flume from Canyon creek, a distance of about three miles, for use in connection with the sluicing operations above referred to, and with a hydraulic elevator which he installed about the close of the season.

On the property where the discovery was made, one crew of five men (Martin *et al.*) has been working intermittently during the season, and recently reported striking very rich "pay," which apparently is a continuation of the original discovery "pay-streak." How far it extends has not yet been ascertained, but, as there are others working on it as well this winter, more will be known about it by spring, and it may prove to be the richest discovery yet made in the district.

On Bull creek, a tributary of O'Donnell river, considerable prospecting has been done by Swanson, Pettit, & Co. and others, but without definite results, as they unfortunately struck material with which they could not cope without improved appliances.

On Fox, Slate, and other tributaries of O'Donnell river, leases have been located and encouraging prospects reported, so that considerable activity is anticipated in that valley during the coming season.

About one hundred leases have been located on O'Donnell river and its tributaries to date, and thus a considerable area has been covered; but, owing to the difficulty in getting water on to the ground and other conditions, the 250-foot individual claim was not attractive, and comparatively little of the ground would have been located in that form, even had leases not been granted.

About forty men are located on O'Donnell this winter.

There is good reason to expect that other outlying creeks will be revisited and prospected this coming season, and if done at all thoroughly, fresh discoveries of importance may be looked for.

Mineral Claims.

On the *Engineer* group of mineral claims, situated on Taku arm, a force of from twenty to thirty men, under the superintendence of Captain James Alexander, the principal owner, operated during the summer months in surface prospecting, stripping new ledges, sinking, drifting, and blocking out ore. During these operations about 900 feet of tunnelling was accomplished, 100 feet of sinking in different places, and 1,000 feet of stripping.

In this way 700 to 800 tons of high-grade ore was blocked out, whilst about 300 tons of the lower-grade ore thus produced was run through the 2-stamp (Joshua Hendy) mill which is on the ground, and over $26,000 in bullion and 10 tons of concentrates are said to have been recovered therefrom.

The concentrates were shipped to the Tacoma smelter and gave a further return of $1,800, so that about $28,000 would have been realized from the ore treated.

These operations have exposed large quantities, or bodies, of low-grade ore the value of which is difficult to estimate, but they are confidently claimed to carry good values in free-milling gold.

The probabilities are that a large capitalization will be effected upon this property, and that it will be equipped with an efficient modern plant capable of treating all the products of those ledges.

Ben M'Chree Group.—On this group, which is situated at the extreme southern end of Taku arm and about ten miles from the *Engineer* group, work was continued with a small force of men throughout the previous winter in preparation for the erection of an aerial tramway, the material for which had been placed on the ground during the previous season, and by July 1st sixty-one men were employed, under the superintendence of J. H. McLean, a tramway engineer.

Some unforeseen difficulties having arisen, it was deemed advisable by the owners, Partridge & Edgerton, to consult an expert mining engineer before proceeding with the actual erection of the tramway. He pointed out to them the probable difficulty that might be experienced in maintaining the tramway in position on such a steep mountain-side, on account of the frequent heavy snowslides which sweep over its surface, and strongly advised them to reserve the tramway for use on their properties on White Moose mountain, closely adjacent, and just across Taku arm from the *Engineer* mine, where there was no danger from such a menace and where he recommended active development.

Acting on his advice, they reluctantly abandoned those operations for the time being and directed their attention to the development of their several groups on White Moose mountain, where a force of from twelve to twenty men, under the direction of W. H. Ireland, an experienced quartz-miner, was kept steadily employed from April 24th until November 1st, during which period a large amount of work was performed in uncovering and prospecting ledges known to exist on the property and in searching for new ones.

Altogether, from thirty to forty distinct veins or ledges are now known to exist on the property, varying in width from 16 inches to 10 feet, and all showing greater or lesser values.

The result of assays showed values in gold, silver, and copper.

The owners expected to have made a mill-test shipment of 25 or 30 tons before the close of navigation, and had the ore in readiness, but the non-completion of the trail which was being built from the lake (and which was three parts finished) rendered this impossible; they hope this difficulty may be removed next season and the shipment made at an early date.

The proprietors of those properties report having expended in the work above mentioned (on both properties) $41,800 since last year's report, and that they intend proceeding actively with the exploitation of the White Moose Mountain properties, but that they are very much handicapped for want of a good wagon-road, everything at present being transported on pack-horses.

They report their greatest handicap to be the excessive cost of transportation, on incoming freight in particular, and state that the rate on the all-water section from Carcross to *Ben M'Chree*, a distance of eighty-five miles approximately, is nearly three times as great as would be the ocean tariff from Skagway to Liverpool, some 25,000 miles; they further claim that in consequence of those prohibitive freight charges no permanent or true development of the mineral resources of this district and country can be expected, or even hoped for, and they join with other operators in the district in the demand for relief from this transportation burden, which is described as intolerable.

However, it is confidently claimed by the owners that they have on White Moose mountain a property as good as the *Engineer*, and this would seem to justfy the anticipation of the eventual development of another important gold-mine on Taku arm.

Kirkland Group.—A little to the south of, and on the same side of Taku arm as, the *Engineer* group is situated the *Kirkland* group of seven mineral claims, which is held by Captain Wm. C. S. Hathorn and Thomas Kirkland.

During the greater part of the past season from two to four men were prospecting upon this group, particularly upon the *Jersey Lily* and *Tom Boy* mineral claims, stripping and sinking on the ledges from 1 to 20 feet, exposing ledge-matter very similar to that of the *Engineer* mine, and in which free gold is visible.

The ledge on the *Jersey Lily* is from 3 to 4 feet wide where exposed and is classified as andesitic breccia.

Still farther to the south, near Wann river, lies the *Brown* group of mineral claims, upon which the work so far done has revealed very promising prospects; whilst to the north of the *Engineer* mine lies the *Gleaner* group, from which very high values were secured some years ago, and upon which I am advised it is the intention to prosecute active development next season.

Big Horn Group.—A few miles to the west of the *White Moose* group, but across a mountain-range and situated on the Big Horn river, lies the *Big Horn* group, comprising several mineral claims owned by Fred Lawson, Thos. Kirkland, and others.

While none of those claims have been Crown-granted, considerable work has been done exposing high-grade ore, apparently in considerable quantities, and the owners are sanguine that in this property they possess, in embryo, a mine.

Altogether, it does not seem unreasonable to assume that, given reasonable freight rates from tide-water into the district, it may not be long until a very important mining camp will be established on Taku arm, and if that is accomplished, attention will surely be directed towards the many other interesting properties to be found in this district.

On Lake Bennett Fred Storey and others are developing a group of claims within a mile of the railway and near Bennett Station, from which great things are expected.

KLEHINI-RAINY HOLLOW.

Another season has passed without any material change in the situation last reported here. Such assessment as was necessary to protect un-Crown-granted properties has been performed, but not much else, and on Crown-granted property nothing has been done, nor will there be, I fear, until rail communication with tide-water at Haines or Pyramid harbour be established.

That section is attracting more attention from year to year, and will doubtless be thoroughly investigated before many more seasons have past.

Another year has passed without anything having been done to develop or investigate the deposits of coal and hydro-magnesite located in the district, but present indications point hopefully towards an early investigation of one or both.

Recently a deposit of dolomite was located on Atlin lake, near Pike river, and about two miles of the ledge taken up in the form of mineral claims. Samples have been taken to the Coast, and it is stated that a drilling and prospecting outfit will be installed there in the course of a few weeks. The material is used for furnace and smelter purposes.

Following is a statistical report of revenue collected during the year 1913:—

OFFICE STATISTICS—ATLIN MINING DIVISION.

Free miners' certificates (individual)		800
" " (companies)		10
" " (special)		2
Placer records		427
Placer re-records (representing 297 claims)		281
Leaves of absence (representing 297 claims)		119
Groupings		36
Permissions		...
Bills of sale (placer)		222
" (hydraulic)		46
" (mineral)		12
Mineral records		53
Certificates of work		177
Filings		8
Certificates of improvements (recorded)		3
Crown grants issued		6
Certificates of improvements (advertised, not yet issued)		7
Gold reported (companies)—12,308 oz.	Value	$190,792 00
" (individuals) 4,391 "	"	70,170 00
Totals 16,699 "		$260,962 00
Royalty paid by companies		$3,615 85
" " individuals		1,121 15
Total		$4,737 00

Revenue collected during 1913.

Land sales	$ 409 00
Land revenue	8 00
Water revenue (rentals)	426 10
Timber royalty (cordwood)	130 60
Free miner's certificates (individuals)	3,656 00
" " (companies)	950 00
" " (special)	30 00
Mining receipts (lease rentals)	3,895 00
" (lease deposits)	1,440 00
" (other sources)	4,352 70
Leaves of absence ("Placer Act")	697 50
Licences (liquor)	625 00
" (trade)	280 00
Fines and forfeitures	345 30
"Marriage Act"	10 00
Law-stamps	16 00
Revenue tax	51 00
"Taxation Act"—	
Real-property tax	3,169 35
Personal-property tax	52 70
Wild-land tax	23 55
Income-tax	14 05
Mineral-tax	4,737 00
Tax on unworked Crown-granted mineral claims	880 00
Interest	2 90
Miscellaneous (tax-sale deeds)	30 00
Total	$26,231 75

STIKINE AND LIARD MINING DIVISIONS.

REPORT OF A. W. DODD, ACTING GOLD COMMISSIONER.

I have the honour to submit the annual report on mining operations in the Stikine and Liard Mining Divisions of Cassiar District for the year ending December 31st, 1913.

While fewer men were actively employed in mining this season than in 1912, more prospectors arrived in the district and a greater amount of prospecting was done, with satisfactory results in some instances.

More placer leases have been staked and applied for this season than formerly, and a number of men, under the direction of Wm. Ogilvie, a mining engineer, have been engaged all summer, testing with an Empire drill the Hyland properties at the mouth of Dease and Thibert creeks. Altogether, some twenty-five holes were sunk at a depth ranging from 25 to 40 feet; the results of these operations were so satisfactory that negotiations are now under way for the installation of a dredge to work the properties.

On Thibert creek the Boulder Creek Mining Company was piping from June until October 15th, and, although working fewer men than the previous year, was more successful in the amount of gold recovered, but was hindered considerably by slides, to which the ground worked is subject; once this difficulty is overcome, there is every assurance that the returns will be large.

On Deloire and Mosquito creeks a little desultory mining was done, but, owing to a shortage of water, in August all work ceased for the season.

At McDame creek Captain Pendleton and associates installed a pump for the working of their property, but, owing to the depth of ground and the inflow of water being greater than they could handle, this method was abandoned for the construction of a bed-rock flume in the spring.

Mineral Claims.

Nothing much has been done in regard to mineral claims this season, the Iskut Mining Company satisfying itself with assessment-work.

Coal.

Very little activity has taken place in the coalfield north of Groundhog.

In conclusion, I will say that, with the completion of the Dease-Telegraph Wagon Road by the Government, the construction of which is now well under way, better and cheaper transportation will be afforded for bringing in mining machinery to develop properties which in the past could not be taken up owing to excessive freight rates by pack-train, etc., which was one of the causes for the retarded development of the district.

Office Statistics—Stikine and Liard Mining Divisions.

Revenue collected from free miners' certificates	$	648 50
" mining receipts, general		2,455 45
" other sources		2,898 10
Total	$	6,002 05

SKEENA DISTRICT.

SKEENA AND BELLA COOLA MINING DIVISIONS.

REPORT BY J. McMULLIN, GOLD COMMISSIONER.

I have the honour to submit herewith my annual report as Gold Commissioner for the Skeena and Bella Coola Mining Divisions for the year ending December 31st, 1913.

OBSERVATORY INLET.

The number of new locations in this section show an increase over 1912. Very few claims have been allowed to lapse, the assessment-work having been well kept up.

Active mining operations appear to be carried on chiefly by the Granby Consolidated Mining, Smelting and Power Company, Limited, at Granby bay, other properties are not as yet being so extensively developed. The year 1913 has been a most notable one for Anyox, having in a very short period sprung from a small mining camp into a smelter city.

I am indebted to the Granby Consolidated Mining, Smelting and Power Company for the following notes regarding its Hidden Creek mines and smelter plant. The expenditure made by this company on the property is about $3,000,000, and the Smelter, which has a daily capacity of 2,000 tons, will be in active operation early in 1914. The buildings that are erected include an hotel, hospital, stores, warehouses, machine-shops, etc., and are of modern design and permanent structure.

Notes on Hidden Creek Mines and Smelter at Anyox, B.C.

Mine.—Ore is chalcopyrite, with pyrite occuring in slates and schists. There are two distinct ore-bodies: No. 1, heavy sulphide ores; No. 2, siliceous sulphide ores.

Development.—Diamond-drilling, 40,600 feet; tunnels, 2,300 feet; drifts, 15,000 feet; stopes, 4,200 feet.

Tonnage developed.—8,800,000 tons over 2-per-cent. copper; 15,000,000 tons over 1½-per-cent. copper.

Railroad.—Four miles and a half of electric system, 3-foot gauge, 56-lb. rails. The distance from the mine to the smelter is 9,600 feet, and the grade is level. There are branch lines to the dock and copper tracks to the converters.

Equipment.—42-ton electric locomotive; 25-ton steel ore-cars, flats, etc.

Smelter.—Capacity, 2,000 tons daily. Three 50-inch by 30-foot long water-jacketed rectangular copper-smelting furnaces. Converters, casting-machine, etc. Steel building containing two 20-ton cranes. Bin-capacity, 8,000 tons.

Power.—The dam is constructed one mile back from the smelter-site. The water has a 400-foot head and is carried in a 6-foot stave pipe to Pelton wheels.

Power-house.—Two electric generators, 938 k.v.a.; Two motor-generator sets, 300 kw. each; Three Connersville blowers with a capacity of 48,000 cubic feet free air a minute; One Nordberg blowing-engine, capacity 21,500 cubic feet free air a minute; Nordberg compressor, 4,000 cubic feet a minute, 100 lb. air. Buildings are of steel and brick.

Town.—Dock 50 x 800 feet long; warehouse, 60 x 120 feet; hospital, hotel, recreation hall, Customs office, telegraph-office, office buildings, and 100 cottages. There are also mess and sleeping quarters for 600 men. Modern conveniences, etc.

ALICE ARM.*

Very encouraging developments have taken place in the vicinity of the Kitsaulte and Illiance rivers. The sample of ore brought out from the *Dan Patch* group of claims is of high grade, and attracts considerable attention. Some thirty new locations have been made in this section, and the usual annual assessment-work has been done on a large number of claims which show promise. Many of these properties are situated from fifteen to twenty-five miles in from the head of the arm and are rather difficult of access; with improved transportation facilities, so that a small amount of machinery could be taken in, there is no doubt that the results would be highly satisfactory.

Excellent samples of copper-ore have been brought out from the hills surrounding Hastings arm, and a number of claims recorded. This section has as yet been only slightly prospected, but during the coming summer, when more prospectors go in, there will be more definite reports as to the quality of the mineral in that part of the district.

KITSUMGALLUM.

A number of claims have been recorded and assessment-work has been done in the different properties, the owners of which appear to be satisfied with the results. The ore generally is copper-silver and high grade, carrying considerable gold values.

On the *Iona* group, situate at Cedar river, and owned by J. A. Kirkpatrick, a shaft has been sunk 30 feet and a drift made 75 feet. At this depth a vein of sulphide ore has been encountered, a sample of which assayed $97 in silver and copper.

COAST AND ADJACENT ISLANDS.

Claims in this section are still held by prospectors, but development on an extensive scale has not been attempted. Some surface showings of magnetite-iron ore are of a highly encouraging nature. This ore is found on Porcher island, Pitt island, and also on the mainland. Operations on Princess Royal island and Khutze inlet have not been as energetic as in previous years. Preparations are being made to renew active mining on the *D.L.S.* group, and also on the *Princess Royal* group. On the *Bonanza* group, at Klekane inlet, the property of the United Bonanza Mines, Limited, considerable work has been done; the ore on these claims is bornite and looks very promising.

BELLA COOLA MINING DIVISION.

There appears to be very little activity in quartz-mining in this section. The claims previously recorded have been generally represented. Reports of a find of placer gold in the vicinity of Dean channel resulted in a number of claims being staked and recorded. No definite information as to the extent of the discovery has as yet been forthcoming.

Mining operations during the year 1913 have been satisfactory. There has been more actual development-work than in previous years; miners and prospectors are more optimistic, having continued faith in the mineral resources of these districts.

OFFICE STATISTICS—SKEENA AND BELLA COOLA MINING DIVISIONS.

Free miners' certificates	489
Mineral claims recorded	206
Placer claims recorded	16
Certificates of work	393
Certificates of improvement	28
Bills of sale	68

Revenue.

Free miners' certificates	$2,393 25
Mining receipts	2,932 50
Total	$5,325 75

See also Report by D. G. Forbes, following this.

SKEENA MINING DIVISION.

NOTES ON VARIOUS PROPERTIES, BY DONALD G. FORBES, M.E., M.AM.INST.M.E., M.I.M.M., ETC.

KITSAULTE COPPER CAMP, ALICE ARM, OBSERVATORY INLET.

Near the headwaters of the Kitsaulte river and on its west bank, some sixteen miles in a direct line from Alice arm, Observatory inlet, a considerable number of mineral claims have, during the last two years, been located at elevations ranging from 700 to 3,500 feet above sea-level. The trail at present followed to these properties is about twenty-two miles in length and is impassable for horses after the first five miles. These claims have nearly all been located on a mineralized zone in quartzite interspersed with diabase intrusions. This mineralized zone has a probable width of 5,000 feet, and, the prospectors state, it can be traced on the surface for over four miles. It forms the backbone of a spur of the mountain-range in which the Kitsaulte river has its source, and lies between the Kitsaulte river and Evendsen creek. The mineralized belt is bounded on the south-west side by red porphyry and on the north-east side by slates. The ore occurs in a quartz gangue, sometimes in the quartzite and at other times bounded by diabase, but does not appear to have regular walls; although its limits are fairly well defined when it occurs in diabase rock. The mineralization is chalcopyrite and pyrite, the latter being predominant in the quartzite and the former scarce. The mountain is heavily covered with decayed vegetation and standing timber of poor quality, and there are very few exposures of rock in place.

Red Point.

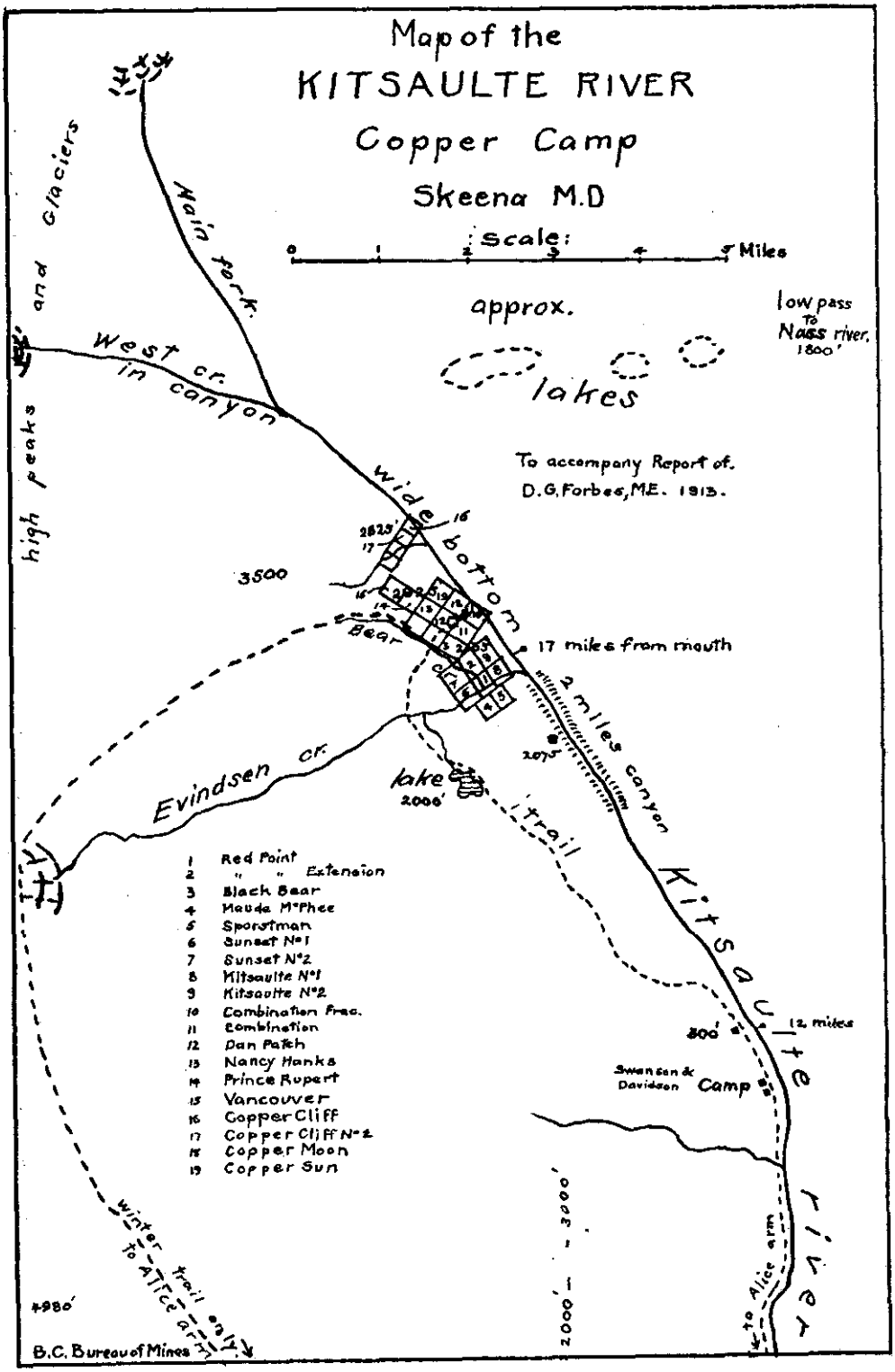
Red Point Mineral Claim.—This claim, owned by Evendsen *et al.*, was one of the first located in the district. The surface has been broken away, leaving a series of bluffs from 50 to 75 feet high, extending about one-third of the width of the claim. In these bluffs, which are heavily stained with iron, two bodies of ore, consisting of chalcopyrite and pyrite in a quartz-gagnue, have been located about 350 feet apart. Examination of these bluffs can only be made by going down on a rope, after the overhanging vegetation has been removed, and they have not been thoroughly prospected. The attention of the owners has been devoted chiefly to stripping and making trails in connection with the two exposures of ore mentioned, and very little actual work has yet been done to determine the value and extent of the ore-bodies.

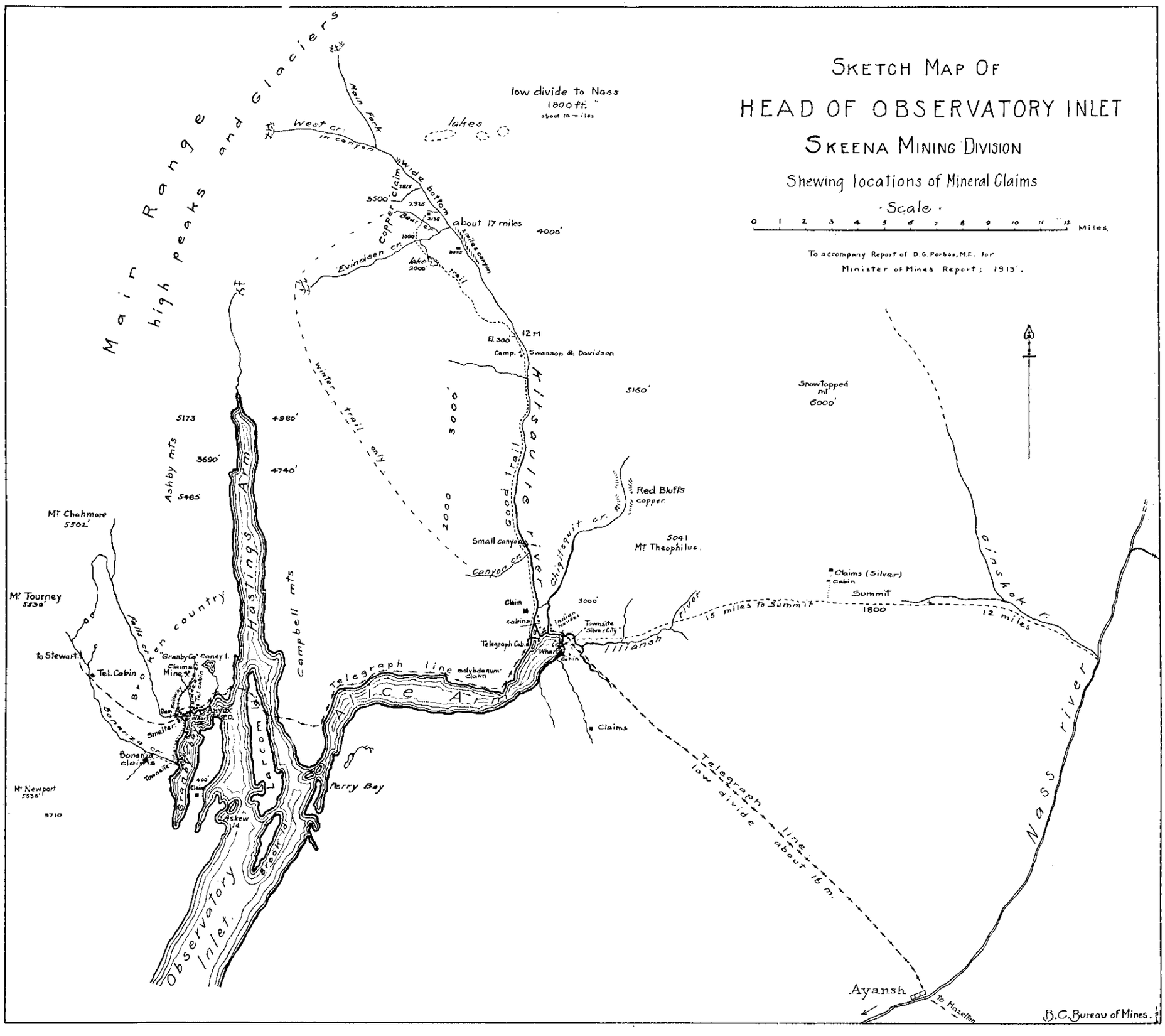
The first of these discoveries was made in what is known as No. 1 Bluff, at an elevation of 1,700 feet above sea-level, and shows from 14 to 16 feet of siliceous ore near the top of the bluff. It appears to dip to the east into a sag in the bluff, but has not been located at a lower elevation. Sample No. 5 was taken from this exposure, and assayed: Copper, 5.9 per cent.; silver, 2.5 oz.; gold, $6. No effort has been made to follow this ore either up or down the hill.

At No. 2 Bluff more work has been done than at the first discovery. At an elevation of 1,750 feet the face of the bluff has been stripped for 38 feet, disclosing irregular bodies of diabase rock alternating with siliceous ore. A tunnel has been driven 15 feet into the face of the bluff in ore, and now shows at the face 2 feet of ore, from which Sample No. 4 was taken and assayed: Copper, 4.6 per cent.; silver, 0.6 oz.; gold, 80 cents.

From the above-mentioned point the bluff is nearly vertical for about 60 feet and shows ore in many places where it has been broken. At an elevation of 2,025 feet an exposure of ore 20 feet wide has been laid bare at the top of the bluff, from which Sample No. 1 was taken as an average across the face, and assayed: Copper, 8.5 per cent.; silver, 1.3 oz.; gold, $7.60. One hundred feet back from the face of the bluff a cut 6 feet deep, 5 feet wide, and 20 feet long has been excavated across the ore, the eastern half of the cut showing the best ore. Sample No. 2 was taken from the eastern half of this cut, and assayed: Copper, 4 per cent.;

silver, 1.4 oz.; gold, $9.20. Sample No. 3 was taken from the western half, and assayed: Copper, 0.7 per cent.; silver, 0.2 oz.; gold, $1.20.




SKETCH MAP OF
HEAD OF OBSERVATORY INLET
SKEENA MINING DIVISION
Shewing locations of Mineral Claims
· Scale ·
0 1 2 3 4 5 6 7 8 9 10 11 12 Miles.
To accompany Report of D.G. Forbes, M.E. for Minister of Mines Report; 1913.
Main Range high peaks and Glaciers
low divide To Nass 1800 ft. about 10 miles
lakes
West cr. in canyon
Main fork
Wide bottom
about 17 miles
4000'
3500'
Evindsen cr.
Bear cr.
3 miles canyon
lake 2000
trail
12 M
El. 300
Camp. Swanson & Davidson
winter trail only
Kitsaulie river
Good trail
5160'
Snow Topped mt 6000'
5173
4980'
3690'
4740'
5485
Ashby mts
3000'
2000'
Red Bluffs copper
Chgitsquit cr.
5041 Mt Theophilus.
Small canyon
Canyon cr.
Mt Chahmore 5502'
Mt Tourney 5930'
Claims (Silver) cabin
Summit 1800
15 miles to Summit
12 miles
Glaskok r.
Claim cabins
Indian houses
Townsite Silver City
Telegraph Cab.
Wharf
Cabin
Tillamish river
Hastings Arm
Campbell mts
Larcom I.
Alice Arm
Telegraph line molybdenum claim
Claims
Telegraph line low divide about 16 m.
Nass river
Fall creek country
Granby Co. Caney I. Claims
Mine
Tel. Cabin
To Stewart
Bonanza cr.
Smelter
Bonanza claims
Townsite
Mt Newport 5538'
5710
Perry Bay
Askew I.
Observatory Inlet.
Ayansh
To Hazelton
B.C. Bureau of Mines.

One hundred and seventy-five feet from the face of the bluff the surface soil and the standing and fallen timber had been cleared off and the quartz exposed again, but had not been broken into. This body of quartz has a strike of N. 45° W. (magnetic), and has been traced farther up the hill towards the *Red Point Extension* claim. It does not appear to have any distinct walls, and, as far as development has gone, appears to be vertical.

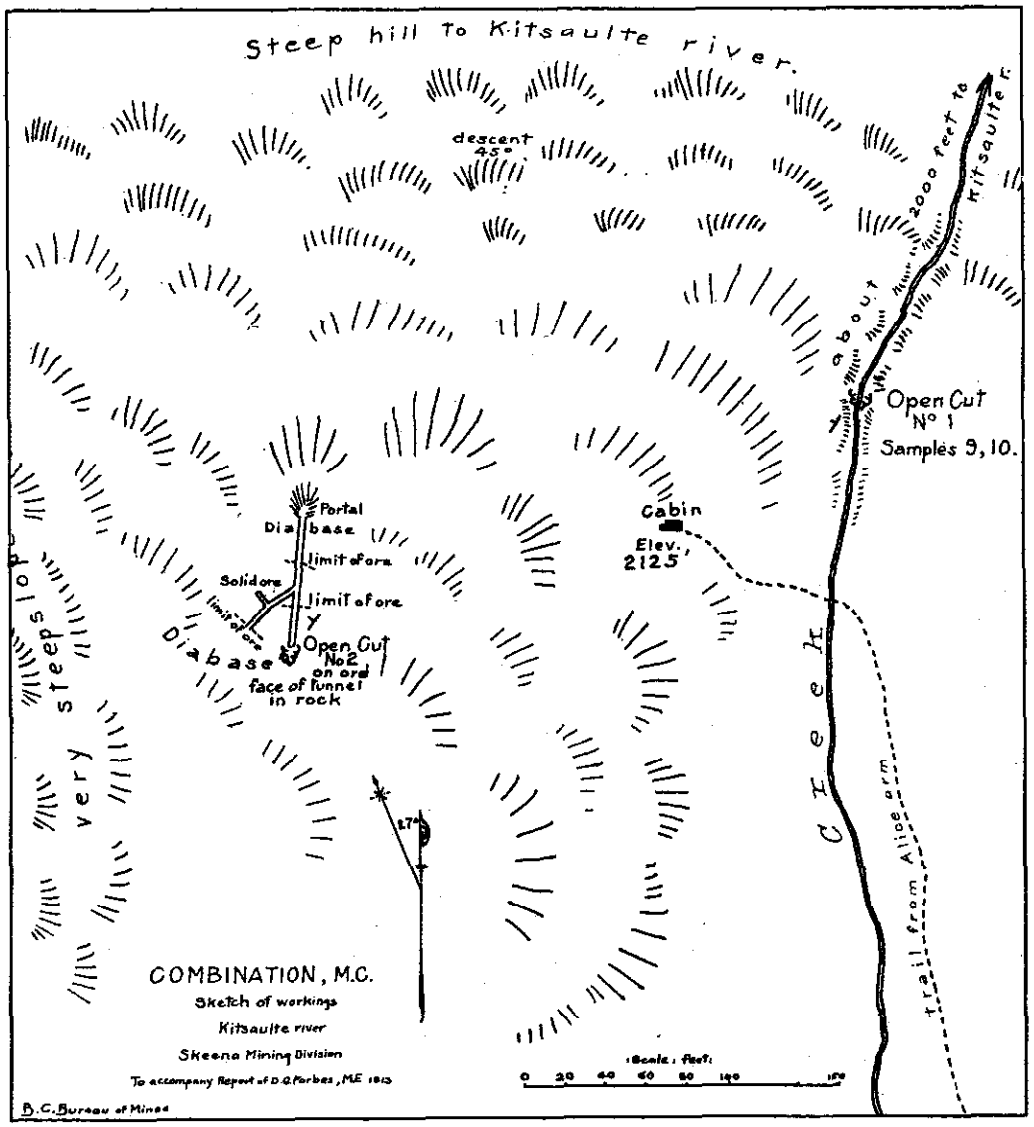
Red Point Extension.—On this claim, also owned by Evendsen & Co., no work has been done, but a natural exposure in a small bluff shows ore 10 feet wide, from which Sample No. 6A was taken, assaying: Copper, 3.1 per cent.; silver, 0.6 oz.; gold, 80 cents.

Combination Mineral Claim.—Owned by Swanson, McPhee, and Brun.

Combination.

On this claim two exposures of ore have been located about 150 feet apart.

No. 1 cut shows 7 feet 6 inches of quartz containing chalcopyrite and pyrite, with a parting in the centre of 18 inches of vein-matter. Sufficient excavation has not been made to expose the limits of this ore; it has an apparent strike of S. 33° W. Sample



No. 9 was taken from the western half, and assayed: Copper 3.9 per cent.; silver, 2.2 oz.; gold, 60 cents. Sample No. 10 was taken from the eastern half of this outcrop, and assayed: Copper, 1.9 per cent.; silver, 1.2 oz.; gold, 60 cents.

Cut No. 2 in the side of the mountain shows 5 feet of very much oxidized ore, apparently on the foot-wall side; the ore dips slightly to the south, its strike being S. 36° W. Elevation, 2,125 feet above sea-level. A tunnel has been driven about 30 feet below this cut, which found ore; at a distance of 34 feet 6 inches from the portal 15 feet of mixed ore was passed through, the tunnel being then continued for 17 feet in country-rock. A drift was started on the west side of the tunnel on the best ore, and followed a slip for 33 feet, the face of the drift being in diabase. At a distance of 17 feet from the tunnel in this drift a small crosscut was driven 10 feet to the north-west, the face of this crosscut being still in ore. The ore on the dump at this tunnel was sampled, and gave upon assay: Copper, 5 per cent.; silver, 2.8 oz.; gold, 80 cents.

The ore in this tunnel is very irregular in value, in places being much mixed with country-rock; the drift to the west and the small crosscut are almost entirely in solid ore. The ore cut in the crosscut appears to dip to the south at about 80 degrees, its strike was not determined. More exploration-work is necessary to determine the limits and value of this deposit; the ore exposed is, however, sufficiently to fully warrant a further expenditure on the property.

Dan Patch.

Dan Patch Mineral Claim.—Owned by Swanson & Miner; elevation, 2,925 feet above sea-level. This claim was nearly all covered with snow when visited. Three exposures of quartz could be seen, having a strike east and west, mineralized with pyrite and a little chalcopyrite. The largest exposure of quartz measured over 50 feet across, its limits not being visible. Sample No. 6B was taken from this exposure, and assayed: Copper, 0.9 per cent.; silver, 2 oz.; gold, 80 cents. Below this bluff it is stated that there is some high-grade copper-ore, but this was covered with snow and could not be examined.

Nancy Hanks Mineral Claim.—Owned by Swanson & Miner. This claim was also covered with snow. The same body of quartz exposed in the *Dan Patch* is said to run through this property.

Prince Rupert Mineral Claim.—Owned by Peardon & Young; elevation, 3,300 feet. This claim was nearly all covered with snow; the owners were working on a small ridge on the top of which some good-looking quartz float containing chalcopyrite had been found. The mineral had not been located in place when the property was visited by the writer.

Vancouver Mineral Claim. Owned by Peardon & Young; elevation, 3,450 feet above sea-level. This claim was also covered with snow. A quartz ledge 4 feet wide is said to run through this property, but was covered with from 8 to 10 feet of snow. By digging in the snow some ore was obtained, from which Sample No. 7 was taken, assaying: Copper, 10.9 per cent.; silver, 20.7 oz.; gold, $7.20.

Copper Cliff.

Copper Cliff Nos. 1 and 2 Mineral Claims.—Owned by Davidson & Wells; elevation, 2,775 feet above sea-level. These claims are located in a deep gulch in the side of the mountain, with precipitous sides, bearing north and south, magnetic. Some considerable quantity of quartz float containing chalcopyrite has been found in the creek-bed, but has not as yet (July 13th) been located in place.

Assessment-work was being done by the owners on the outcrop of a small ledge of kindly-looking quartz, which showed a little free gold and some pyrite, from 2 to 4 feet in width, dipping 85 degrees E., strike north and south magnetic, and situated on the west side of the gulch.

The gulch still contained from 30 to 40 feet of snow which had thawed round the edges, but not sufficiently so that its sides could be closely examined. There appeared to be two other quartz ledges, parallel to the one mentioned above, showing in the bed of the creek at a point where it falls over a bluff 40 feet high. The owners state that they have not yet been able to examine these ledges. The sides of the gulch are very precipitous in places, being over 100 feet in height, and they are everywhere heavily stained with iron-oxide; the strike of the rock being at right angles to the general run of the country—i.e., north and south instead of east and west.

Copper Moon, etc.

Copper Moon and Copper Sun Mineral Claims.—Owned by Strombeck Bros.; elevation, 2,325 feet above sea-level. The bluffs on these claims show a large body of quartz containing pyrite and occasionally a little chalcopyrite, but, as far as development-work has gone, no body of ore of value has been located.

Dolly Varden.

The *Dolly Varden* mineral claim is located at an elevation of 2,076 feet above sea-level on the mountain on the south-east side of Evendsen, and between that creek and the Kitsaulte river. This claim was the first located on the upper waters of the Kitsaulte river, and is owned by Evendsen & Co. A cut of 45 feet has been excavated across a large body of quartz striking east and west. The cut does not expose the walls of the deposit. The quartz contains pyrite, galena, arsenopyrite, and chalcopyrite. A general sample assayed: Gold, 0.02 oz; silver, 1.4 oz.; copper, 1.2 per cent.

This was the only opening on the claim seen by the writer, but another is said to exist at a lower level, showing better values.

SUMMARY.

Owing to the limited amount of work done, it is not practical to give any estimate of the probable ore available in these claims; it is, however, reasonable to expect that there may be some deposits of payable siliceous ore within the limits of this mineralized zone, and the little development-work already done points to the *Red Point* mineral claim as a probable location of payable ore. A diamond-drill could be profitably employed to test the ore bodies on this claim. On the other claims examined so little work has been done (with the exception of the *Combination*) that no conclusions could be arrived at as to their possible value.

On the *Combination* claim there is some siliceous ore, and an expenditure of a few thousand dollars in the present tunnel would decide whether it is advisable or not to go to the expense of a deep-level tunnel; some more stripping and exploration work could also be done to advantage on the surface.

It is essential that the Government pack-trail should be pushed up to the flat on the Kitsaulte above Evendsen creek as soon as possible, as no satisfactory work can be done at present, owing to the cost of getting in supplies (30 cents a pound) and the time wasted in packing, practically fifteen miles, on men's backs.

OBSERVATORY INLET.

GRANBY BAY.

The *Bonanza* mine, owned by Henry Doyle, is situated on Bonanza creek at an elevation of 200 feet above and about one mile from salt-water.

Several small bodies of chalcopyrite, pyrite, and pyrrhotite, intimately associated with small diorite dykes, have been exposed by a small creek entering Bonanza creek on the north side. The country exposed at this point consists of mica-schist containing small bedded veinlets of quartz, and containing some pyrite and chalcopyrite. The schist lies fairly flat, the mineralized portion being from 50 to 60 feet in thickness.

The development-work has been done with the idea of tracing this deposit downwards, and several tunnels have been driven with that end in view, without satisfactory results.

During the past year the property has been under option to the Granby Company, and has been prospected with a diamond-drill, with the result that the deposit has been proved to be a blanket formation. The solid bodies of iron and copper pyrites mentioned above appear on both sides of the dykes, and, contrary to the experience in the development of the Hidden creek properties, two miles distant, the dykes appear to the writer to be responsible for the aggregations of ore and the mineralization of the surrounding mica-schist.

Two samples of clean ore assayed returned: (1.) Copper and iron pyrites—Gold, 0.08 oz.; silver, 1.6 oz.; copper, 6.2 per cent. (2.) Copper and iron pyrites—Gold, 0.02 oz.; silver, 2.8 oz.; copper, 1.7 per cent.

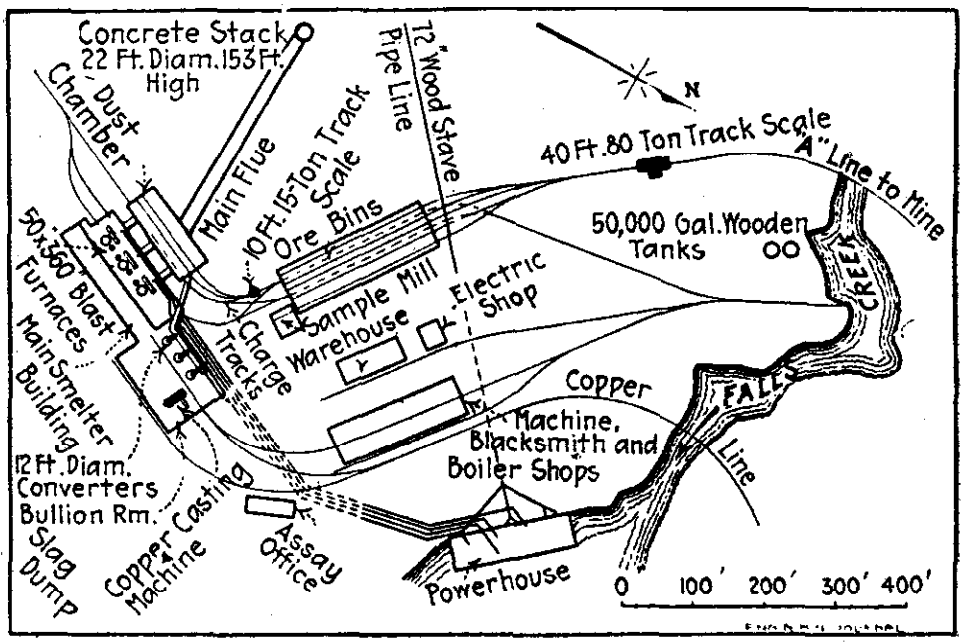
The *Ground Hog* mineral claim, owned by W. Clarke & Merrill, is situated on the south side and near the head of Granby bay. A quartz-outcrop, 6 to 8 feet in width, has been located 350 feet above high-water mark, striking north magnetic. The country is covered with heavy second-growth timber and soil, and the quartz was not traced for more than 50 feet.

One opening has been made 25 feet in length. There was a streak of ore on the foot-wall side, from 10 to 16 inches wide, containing galena, zinc-blende, and pyrite, which assayed: Gold, 0.16 oz.; silver, 51.5 oz.; lead, 32.5 per cent. An average sample taken across the exposure from east to west, for a width of 8 feet, assayed: Gold, 0.14 oz.; silver, 2.4 oz.

Granby Co.'s Hidden Creek Mine.

This mine is owned and operated by the Granby Consolidated Mining and Smelting Company. It was previously reported on by the writer, the report appearing in the Annual Report of the Minister of Mines for 1911. Since then, continuous development-work has been carried forward, proving the No. 1 and No. 2 ore-bodies above the 530-foot level, to be far more extensive than the work done previous to the former examination promised.

No 1 ore-body has been proved to be 1,300 feet in length, and has been opened up for a considerable distance to the north of the main crosscut tunnel.



Granby Co.'s Smelter-site, Granby Bay (from E. & M. Journal).

No. 2 ore-body has also been further explored at this level, and proved to cover a greater area to the north and west than was formerly supposed. This work has developed ore of much higher value than the average of the mine.

Another ore-body, the existence of which was suspected on the surface, has been located at this level to the north-west of No. 2 body, and shows ore of good grade.

The Treadwell system of stoping will be followed for the present in order to provide a sufficient supply of ore for the smelter, and to avoid, as far as possible, the necessity of handling the ore a second time on the dump. This system may be briefly described as follows :—

Raises are put up from the main levels and are connected above the levels, no timber being used in the levels except for the chutes. The stopes are then continued upwards, about two-thirds of the ore being left in the stope to provide footing for the men until the next level is reached, when the whole of the stope filling is drawn out.

At the 385-foot level, No. 1 ore-body has been proved to be over 1,000 feet in length, containing good average grade ore. The main tunnel has entered the limits of No. 2 ore-body and will be in good ore, the existence of which has been proved by diamond-drill work from the level above.

In all, over 16,000 feet of development-work has been done underground in this mine, exclusive of diamond-drill holes, and preparations are being made to deliver an output of 2,000 tons of ore a day. The Treadwell system of stoping is being followed at present.

The ore will be conveyed through the 385-foot level to the surface, and then over a surface tramway to ore-pockets above the crushing plant. In order to do away with wooden bins, these ore-pockets have been excavated at the end of the surface tramway. These pockets feed the crusher located in a chamber below them, and it in turn feeds into five excavations serving as bins below the crusher-chamber.

These lower bins are located just above the 150-foot level, in which the railway-cars receive the ore from them and convey it to the smelter. The smelter, of a capacity of 2,000 tons a day, is now under construction near salt-water, and it is hoped that it will be completed during the coming winter or early in the spring of 1914.

An average of about 1,000 men has been employed on the property during the summer of 1913, the majority working on the surface on the construction of the smelter plant and the necessary more commodious offices and buildings.

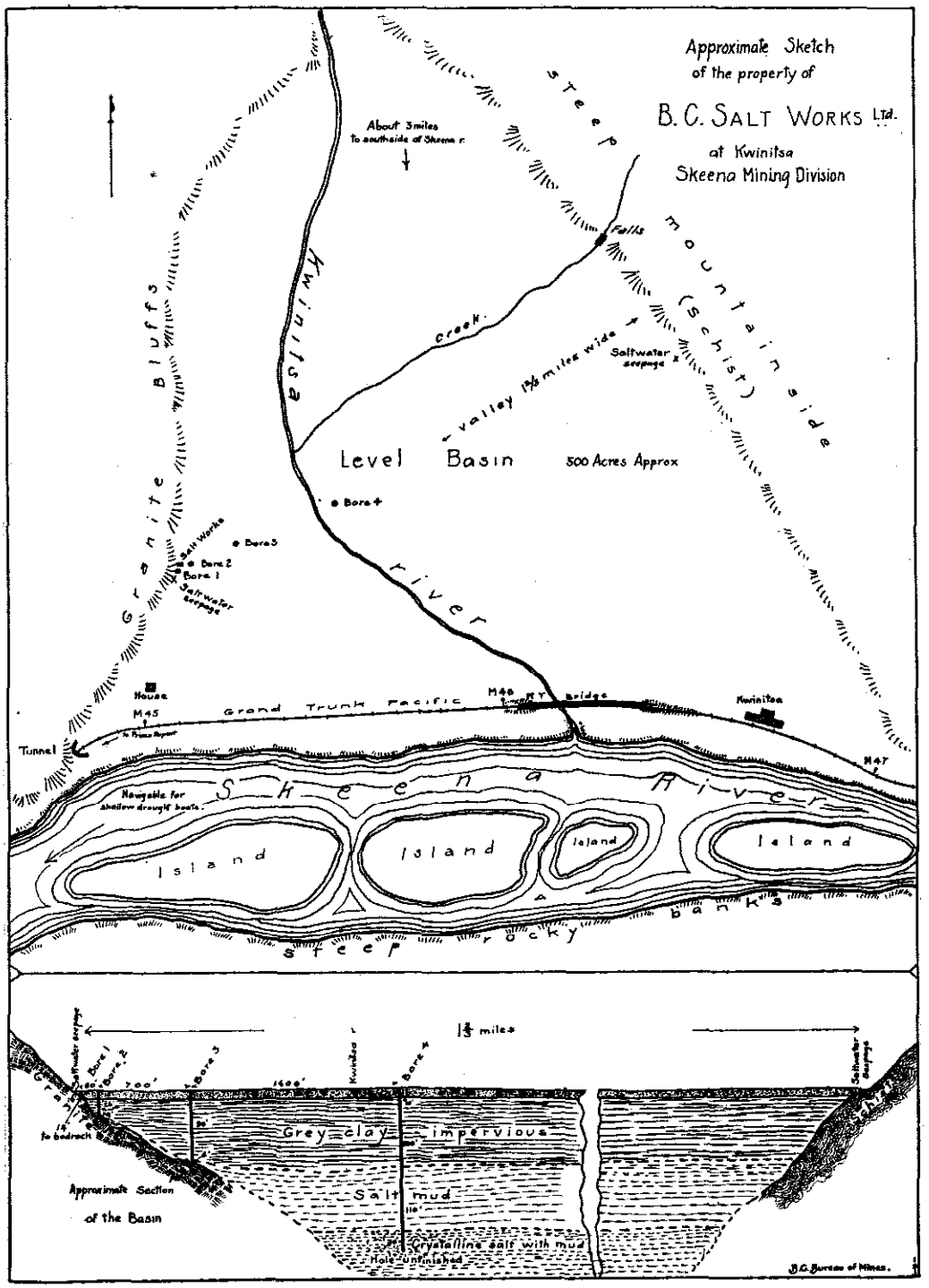
KWINITZA SALT-DEPOSIT, SKEENA RIVER.

The Kwinitza salt-deposit, owned by the British Columbia Salt Works, Limited (D. Whiteford, manager), is located in a basin in the Coast range of mountains between the 45th and 47th mile-posts on the Grand Trunk Pacific Railway. It is surrounded by high mountains, the Skeena river crossing the south-east end of the basin. The basin is bounded on the south-west side by granite and on the north-east by basic schists. The Skeena river is navigable for shallow-draught vessels during the greater part of the year from this point to the sea, being closed for a few months in winter.

This salt was discovered by Mr. Whiteford in 1910-11, his attention being attracted to it on account of their being no snow on the ground in midwinter near the rim-rock on the south-west side of the basin, where a natural seepage of brine occurs.

A 2-inch pipe was driven down 14 feet and a hand-pump attached to the pipe, and a considerable amount of brine, containing $\frac{3}{4}$ lb. of salt to the gallon, pumped without reducing the quantity or density of the water.

Last winter a drilling plant, operated by a gasolene-engine, was installed and 80 feet from the south-west rim-rock No. 2 hole was driven. In this hole the drill is said to have passed through 10 feet of surface soil and gravel, 26 feet of impervious grey clay, and 9 feet of salt-mud; bed-rock being found at a depth of 45 feet.



A heavy flow of brine was struck at bed-rock, which slacked off after the hole had been open a short time. There was no apparent flow last June, but the water at the collar of the hole was still salt.

No. 3 hole was put down 600 feet from the rim-rock, with similar results. The hole passed through 10 feet of surface material, clay 90 feet, and 6 feet of salt-mud to the granite bed-rock at a depth of 106 feet.

No. 4 hole was driven 1,600 feet north-west from rim-rock, a 6-inch casing being used. Salt-mud was struck at 110 feet after passing through 10 feet of surface and 100 feet of clay. The hole was continued to a depth of 250 feet, when the casing stuck. As no smaller casing had been provided, work was discontinued. The last 30 feet of this hole contained salt crystals mixed with the mud. Close to the rim-rock on the north-east side of the basin, another seepage of brine occurs, being distant about one and two-thirds miles from the first discovery.

The distance from south-east to north-west across the basin from rim to rim is about three miles, but no natural seepages of salt have been located near either rim.

While there is undoubtedly a deposit of salt in the basin, its thickness and the area it covers cannot be determined without further systematic prospecting with the drill.

A small experimental evaporating plant, consisting of open galvanized-iron pans with a fire underneath, has been erected at No. 1 hole, and a few tons of salt have been produced to demonstrate the possibilities of the deposit.

The detail of the boreholes and the information from which the sketches are prepared were supplied by Mr. Whiteford, the company's manager. The writer during his visit started up the Cyclone drill at No. 4 hole, and obtained some crystalline salt discoloured with grey clay from the bottom of the hole.

A sample of the salt as evaporated in the temporary plant mentioned, gave the following analysis, showing it to be quite up to the commercial standard of table-salt:—

Analysis made on Dry Sample.

Sodium chloride	98.15 per cent.
Calcium sulphate	1.82 "
Magnesium sulphate	Trace.
Insoluble matter	"
Iron and alumina	*Nil.*
Magnesium chloride	"
Calcium chloride	"
Sodium sulphate	"
Calcium carbonate	"
Magnesium corbonate	"

PORTLAND CANAL MINING DIVISION.

REPORT BY JOHN CONWAY, MINING RECORDER.

I have the honour to submit herewith my annual report for the Portland Canal Mining Division for the year ending December 31st, 1913.

The past year has been the quietest in the history of the camp; little, if any, actual prospecting was done and no new discoveries were reported.

Neither the Red Cliff Mining Company nor the Pacific Coast Exploration Company operated during the year. These two companies, when working, employed between them nearly 100 men. At the last annual meeting of the Red Cliff Mining Company it was decided to recommence operations in the spring.

An encouraging feature of the year was the shipping of several tons of galena-ore from two properties on Glacier creek and from the *Montana* group on the Marmot river; the results were in every case very gratifying, and smelter returns gave values high enough to warrant the respective owners in arranging for further shipments during the coming year.

MAPLE BAY.

The group of claims owned by the *Comstock* mining partnership were surveyed for the purpose of Crown-granting. This group and the groups of claims held by Collinson & Noble have been examined by engineers of the Granby Consolidated Mining, Smelting and Power Company, and I am informed that negotiations are pending with a view to the company developing all these properties in the near future. Maple bay is about sixteen miles distant in a westerly direction from Granby bay, on Observatory inlet, the Burniston range of mountains dividing it, and the distance by water is about sixty miles. A large tonnage of ore was shipped in 1907-8 by the Brown Alaska Company from the *Blue Bell* group.

SWAMP POINT.

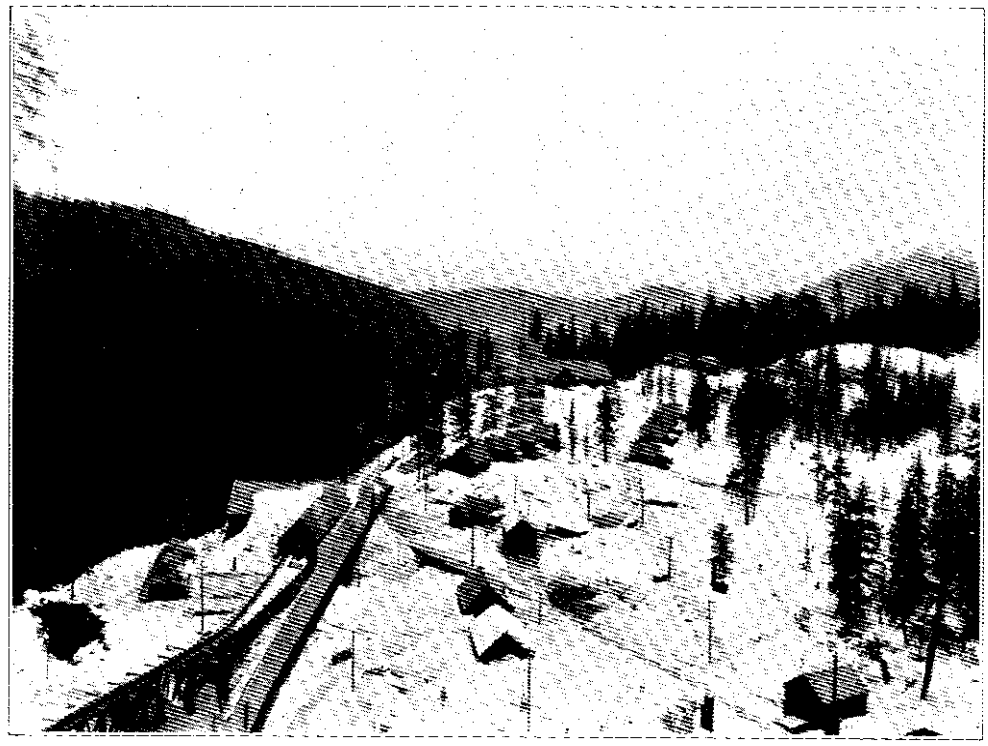
The Granby Consolidated Mining, Smelting and Power Company has completed the purchase of the group of claims consisting of the *Limestone*, *Last Laugh*, *Last Laugh No. 2 Fractional*, and *Last Laugh No. 3 Fractional*, owned by W. H. Moult and J. S. Harkley. These claims are situated about five miles north from Maple bay on the shore-line of Portland canal. The following is the report furnished by H. J. C. MacDonald, superintendent:—

"The Swamp Point claims, which the company has been developing for the lime-content of the rock, have been placed in condition to ship the necessary tonnage to the smelter at Anyox. A combined bunk and mess house (20 x 90 feet), to accommodate fifty men, has been built. The building has been piped for running water and a substantial boat-landing built in front. Several acres, covering the limestone, have been cleared. Two docks, each of 60 feet frontage, have been built, with bins on each to load the rock on to barges. Near these docks a blacksmith-shop has been erected and a boiler and air-compressor have been installed. Quarrying operations have been started in a long open-cut parallel to the shore-line at the docks. A tunnel has also been driven into the hill, and at its end a raise to the surface started. They are at present working thirty-five men there in the loading of the first barge, which is nearly completed."

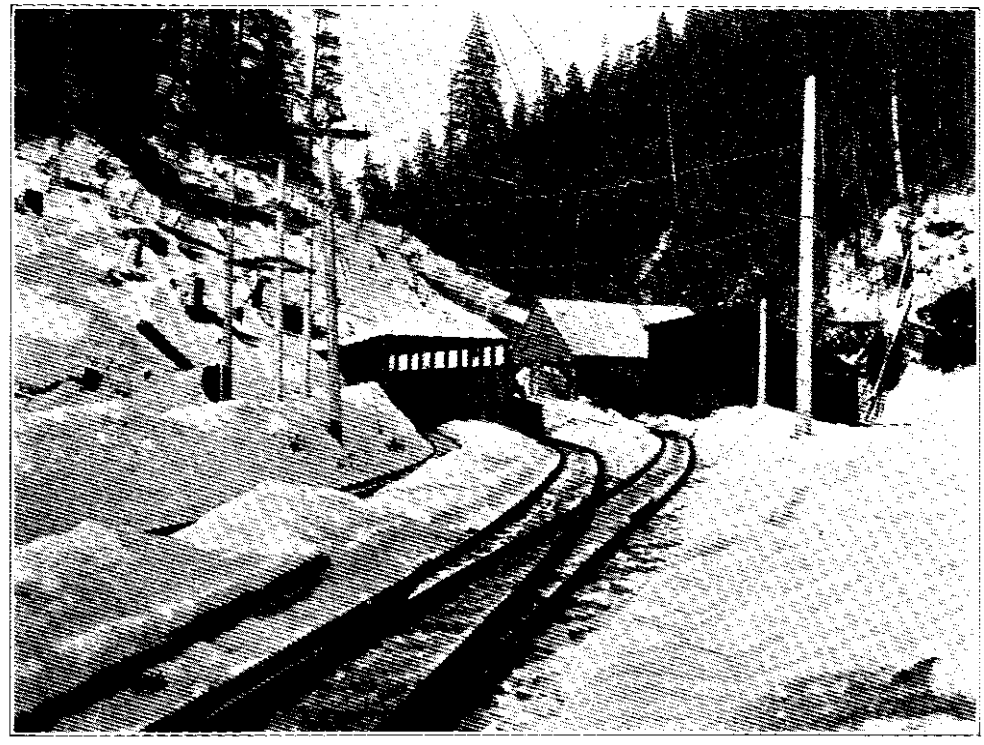
MARMOT RIVER.

Montana.

A shipment of 5 tons of silver-lead ore was made from the *Montana* group of claims to the Tacoma smelter in December, which gave returns of $221 to the ton in gold, silver, and lead. The work done on the property has opened up a fine showing of high-grade galena, and it is the intention of the owners, G. W. Bruggy and H. C. Magee, to commence development-work as early as possible in the spring with a view to making further shipments.



Granby Co.'s Hidden Creek Mine—Mine Camp.



Granby Co.'s Hidden Creek Mine—150-foot Tunnel.

SALMON RIVER.

Indian Mines.

The work done on the property of the Indian Mines, Limited, during 1913 consisted of the extension of the two tunnels being driven on the vein. The upper (or No. 1) tunnel was driven a distance of 158 feet with some crosscutting, and is in ore for over 100 feet; the face of this tunnel is now directly under the big surface showing, and, from indications, it is expected that a little further advancement of the work will show the continuation of the ore-shoot to this level.

The lower (or No. 2) tunnel, which is 150 feet vertically below No. 1 and some 350 feet farther south on the vein, was continued about 50 feet. This work is in a good grade of shipping ore varying in width from 1 to 4 feet, following a well-defined foot-wall.

Fifty or sixty tons of shipping ore were taken out in this season's work, and, with the exception of the first 40 feet in No. 1 tunnel, all the driving has been in ore of good concentrating grade.

The Government has done considerable trail-work during the season in this section, and there is now an excellent horse-trail being built to the Silver Lake country above that will pass within a mile of the property.

Sufficient supplies were taken in last fall and development-work will be continued throughout the winter. (Report furnished by G. A. Clothier, B.Sc., superintendent.)

The Cascade Falls Mining Company, Limited, reports 175 feet of tunnelling completed during the year.

The Salmon-Bear River Mining Company, Limited, did not operate during 1913.

On the *Yellowstone* and *Big Missouri* groups the work done during the year has proven very satisfactory; several new ore-bodies have been opened up which look very promising.

BEAR RIVER.

Red Reef Group.—The main tunnel was continued a distance of 75 feet and a body of quartz, carrying low copper and gold values, was struck. This quartz was crosscut for a distance of 20 feet before running into the country-rock, giving a total width of quartz of 25 feet.

The crosscut was then continued another 26 feet, but without encountering any ore-bodies other than one or two small stringers. On one of the outcrops above this tunnel, 20 feet was driven in on a quartz vein about 4 feet in width, also carrying low gold and copper values.

Dredging Leases on Bear River.—A syndicate was formed early in the year for the purpose of exploiting the ground covered by the leases. A Keystone drill was in operation for about four months, but the results were not satisfactory owing to the looseness of the ground. A series of six holes were driven, averaging from 47 to 67 feet in depth; colours were found all through the ground, and if a false bed-rock or tight clay strata had been struck, the results would have been highly satisfactory, but, as stated, it would have been impossible to recover the gold with a dredge owing to the looseness of the ground. The work was done under the superintendency of J. G. McLaren, M.E.

GLACIER CREEK.

On the *Evening Sun* group, Rush & Bagg drove 60 feet of tunnel and shipped 7 tons of galena-ore to the Tacoma smelter, from which they received net returns of $95.29 a ton; assay value, $114.06.

The Rush-Portland Mining Company, owning adjacent property, built half a mile of horse-trail connecting the *Katherine* mineral claim with trails already built, and shipped twenty sacks of ore that gave a net return of $169.77 a ton; assay value, $192.46.

Lakeview Group.—A shipment of 3 tons of galena-ore was made to the Tacoma smelter, the total net value of which was $953.57. The property is owned by J. McKay and C. Bibeau, and is located at an elevation of 2,700 feet. An excellent pack-trail was built to the property this past summer by the Government, and it is now possible to pack and rawhide ore out at quite a reasonable figure. A lead of some 6 to 8 feet in width has been exposed by open-cuts for a distance of some 1,500 feet, the whole of which is said to run in the neighbourhood of $70 to the ton. There is a considerable tonnage of ore in sight of the same grade as shipped and which will be mined during the coming season.

Portland Canal Tunnels, Ltd.

On January 1st, 1914, the face of the tunnel was in a distance of 2,813 feet from the portal, or 2,855 feet from the starting-point. In addition to this work in the tunnel proper, during the months of July and August, 1913, an adit 80 feet in length was run from a point 730 feet in the tunnel, in a northerly direction, out to Glacier Creek canyon. This supplies an excellent dumping-ground and shortens the tramming and ventilating distance by 650 feet.

In addition to the work in the tunnel proper and the adit, 50 feet of drifting, which will be described later, has been done during the month of December. This makes the total underground work for the year 1913, 2,844 feet. This work has been done at a cost of less than $22 a foot, including all equipment and the salary of the manager.

About 1,540 feet from the portal of the tunnel the "greenstones" (Bear River formation) were left and the "argillites" (Bitter Creek formation) entered. The contact was dry, tight, and showed but little evidence of mineralization of any sort. From then to the present time the tunnel has continued in this latter formation. At 1,807 feet in, a vein of quartz, fairly well mineralized with pyrrhotite, was entered. This vein is very well defined, and where cut is 11 feet wide, with a course of S. 58° E. and dipping 65 degrees to the south-west. Some galena, the first seen in the tunnel, was found in the vicinity of this vein. The point of intersection of this vein with the "fissure-zone" will be one of interest when it is reached by the drift from the tunnel. After passing through this vein considerable calcite was seen; in fact, almost everywhere through the argillites, small veinlets of quartz and calcite occur, and these often carry pyrite and pyrrhotite mineralization, and, in rare cases, a little galena and blende.

At 2,285 feet from the portal the "fissure-zone" was entered; first came a zone of "graphitic shales" 20 feet in thickness; this was a veritable coal-mine in appearance, black and shining, the polished "slickensides" showing proofs of the motion and pressure along this line. Then about 40 feet of rather barren argillites were passed through, and the vein, which we call No. 1, was reached. This and the band of graphitic shales roughly coincide in both strike and dip, S. 7° E. and dipping 45 degrees to the west. While the work was proceeding in the No. 1 vein there was some doubt as to its exact definition, as a number of included dykes rendered the formation difficult to classify. Now that it is passed, the boundaries are well defined and show a width of 100 feet. The gangue is quartz and calcite, and everywhere the characteristic brecciated structure is apparent. This breccia is a feature of the veins in the workings of the *Ben Bolt* and *Jumbo*, the Portland Canal Mining Company, the *O.K. Fraction*, the *Portland Wonder*, the Glacier Creek Mining Company, and the Stewart Mining and Development Company, both within and outside of the ore-bodies. It consists of bits of argillite and porphyrite of varying size, completely included in the quartz and calcite, and sometimes in the ore itself. The vein at this point showed but little ore, its mineralization being pyrite and a little galena. Specimens from this ore ran 3.6 to 5.6 oz. silver to the ton, and a trace of gold. My first careful examination of this vein produced the impression upon me that it was too wide, too scattered, for an ore-body at the point where it is exposed in the

tunnel. It is entirely normal, except for its great width, and shows all the characteristics of this and the other veins of the series, outside of the ore-bodies. We know that ore does occur both north and south of the tunnel in this vein, and, while it would have been most satisfactory to have developed an ore-body at the point the vein was reached, still our future operations would have been the same in that event, as now become necessary.

On December 27th, 1913, drifting to the north into the *Lucky Boy* claim was begun, starting from Station No. 27, about 2,343 feet from the portal of the tunnel. On January 1st, 1914, this drift was in 21 feet, and this work will be pushed as any round may open up ore.

For 150 feet beyond the No. 1 vein the formation was practically featureless; at 2,600 feet the No. 2 vein was entered. This is 40 feet in width, with strike and dip nearly coincidental with those of the No. 1 vein and the hanging-wall of the "fissure zone" where cut by the tunnel. It is very strong and well defined, largely white quartz breccia with but little mineralization. Some pyrite is scattered through the quartz and a little galena was found. A sample of this slightly mineralized quartz assayed 1.4 oz. silver and 0.02 oz. gold to the ton, not at all important in itself, except as showing some value even in the poorly mineralized ore. On December 22nd, 1913, drifting to the south on the No. 2 vein was begun from Station No. 30, about 2,638 feet from the portal of the tunnel. This has now progressed 27 feet (January 1st, 1914), and the showing at this point is most promising. This drift should be certainly continued to ore, and it does not look as if it would have far to go. It will continue for about 300 feet in the *Melba* claim and, then, if further extended, enter the *Richard II.*

The tunnel-work will be made secondary, for the time being, to the drifting, as it is manifest that there is more probability of opening ore by the latter means. The face of the tunnel 175 feet beyond No. 2 vein looks promising for the cutting of another vein, and, judging from the distance between them on the surface, another is nearly due. Three more veins at least are included in the "fissure-zone," and the tunnel must be ultimately driven across them. Added importance has recently been given to this plan of crosscutting by the discovery of ore of very good grade ($40) on the surface of the *O.K. Fraction*, and in a vein which seems, from its location, not to have been found elsewhere.

Practically all of the underground work of the company to date has been what is known as "dead-work." In driving the tunnel there was a possibility of cutting veins unknown on the surface, but it was a very remote one; blind-veins are rare in such a formation, and the country as a whole, and particularly this locality, has been well prospected. The "fissure-zone" and the two veins were found in, practically, their calculated positions. It would have been most fortunate had we entered ore-bodies in these veins, but it is obvious to any one at all acquainted with the nature of ore-deposits that the chance for any unknown portion of a vein 8 x 10 feet in size to carry ore is extremely small. The No. 1 vein, where cut by the tunnel, is 600 feet deep, on the dip, below the *Richard II.* cut, the nearest surface workings. Conditions there could not reasonably be expected to continue downward for that distance. In fact, the assumption of "ore-shoots" (vertical, rather than horizontal, extensions of ore in the vein) in this particular locality is unwarranted. Actual developments show lenticular masses of ore, rather long than deep, and usually in the narrower parts of the veins, as the prevailing form of occurrence. Ore of pay grade has been found within the "fissure-zone" upon every mining claim from the *Lucky Seven* on the south to the *Sunbeam* on the north. This covers a distance of nearly 15,000 feet. Erosion has been extensive and recent; a section between the south end of the Portland Canal Mining Company's property and the bed of Glacier creek shows a difference in elevation of 2,500 feet; this great gash has been cut by nature's forces down through the "fissure-zone," and there is almost no surface oxidation where ores outcrop.

Such conditions afford excellent facilities for the accurate study of the formation. The only conclusions I am able to reach are that any section of the veins may contain ore, but that such ore is most likely to be found where the veins are not too wide. With known ore to the north and to the south of the tunnel and the veins encountered entirely normal as to physical condition and position, it would seem that there should be no question as to the nature of future operations. Drifting, preferably on both veins, should be energetically pushed until ore-bodies are reached. At the same time, the tunnel should be continued across the "fissure-zone," when such work can be done without interfering with the drifts. We may still be fortunate enough to cut the veins ahead in ore, and, in any event, they will be ready for development later. (Report furnished by W. J. Elmendorf, M.E., manager of the Portland Canal Tunnels, Limited.)

OFFICE STATISTICS—PORTLAND CANAL MINING DIVISION.

Free miners' certificates (individual)	161
" " (company)	6
" " (special)	3
Mineral claims recorded	148
Placer claims recorded	1
Certificates of work issued	389
Bill of sale, etc., recorded	61
Filings	25
Certificates of improvements recorded	10

Revenue.

Free miners' certificates	$1,416 25
Mining receipts, general	3,542 20
Other sources	279 00
Total	$5,237 45

PORTLAND CANAL MINING DIVISION.

REPORTS BY DONALD G. FORBES, M.E., M.AM.INST.M.E., M.I.M.M.

RED TOP GROUP OF MINERAL CLAIMS, BEAR RIVER, PORTLAND CANAL.

The *Red Top* group of mineral claims, owned by McNeil & Ericsen, of Stewart, B.C., is situated on the north side of Bear river near the Nass divide, and can be visited from the town of Stewart, on the Portland canal, by following Bear river seventeen miles, by wagon road to the terminus of the Portland Canal Short Line, now no longer working; thence six miles by pack-trail and two miles up the mountain on the north side of the river, there being no trail for the last two miles.

The property is located in siliceous limestone and diabase rock, which in places is more or less iron-stained from the decomposition of pyrite, aggregations of which occur in the rock, sometimes in considerable quantities, usually accompanied by some quartz and a few specks of chalcopyrite. The general strike of the diabase is north and south (magnetic).

At an elevation of 4,250 feet, by barometer, above sea-level an exposure of quartz, striking east and west (magnetic) and dipping to the south, was inspected. This deposit can be traced on the surface for several hundred feet. A few shots have been put into this quartz-outcrop, which show it to be practically barren. At one point a little galena and heavy-spar was found on the foot-wall from 4 to 7 inches wide; no sample was taken, as the ore was not present in sufficient quantity to be of commercial value.

At an elevation of 2,850 feet and distant about 1,000 feet east-south-east from the quartz-outcrop mentioned above, some stripping has been done on a brecciated zone of quartz, calcite, and shattered diabase containing some pyrite and chalcopyrite. The deposit occurs in the face of a bluff at the top of a small slide, and is 36 feet wide where the cut has been made, but narrows to 20 feet at the top of the bluff some 70 feet above the cut; its limits are well defined, and it dips to the north at an angle of 75 degrees.

Three samples were taken—i.e., of the foot-wall section, 13 feet; the centre section, 14 feet; the hanging-wall section, 9 feet wide.

These samples assayed as follows: Foot-wall section, 13 feet wide—Copper, 4.0 per cent.; silver, 1.0 oz. to ton; gold, trace. Centre section, 14 feet wide—Copper, 3.9 per cent.; silver, 1.2 oz. to ton; gold, trace. Hanging-wall section, 9 feet wide—Copper, 2.2 per cent.; silver, 1.2 oz. to ton; gold, trace.

The chalcopyrite occurs in bunches mixed with quartz, lime, and diabase, the portions of the deposits between the bunches being practically barren.

The deposit has not been completely stripped, the foot-wall section being partly covered with iron-capping containing some azurite and malachite. The deposit is not shown to be of any great extent; it has not been traced above the bluff in which the outcrop occurs, nor lower down the mountain in the bluff on the opposite side of the narrow valley in which it is located. But, taking into consideration the values in copper obtained from the average samples taken across the open-cut, the ore-deposit is worthy of further development. The foot of the slide below the open-cut is 150 feet vertically below the lowest exposure of ore, and a tunnel could easily be driven 100 feet vertically below the present open-cut, which would follow the ore-body and give a better idea of its size and value than can be obtained from surface exploration, which, at the present time, is of very limited extent.

The owners state that the two deposits mentioned in this report form part of a continuous ledge, but the writer was unable to establish any connection between them; they both strike east and west, but dip in opposite directions, and are entirely dissimilar in every respect.

The quantity of ore of commercial value exposed in the property would not justify it being classed other than a prospect at present, as the present owners have done nothing practically to prove the value of the claims.

SALMON RIVER.

On August 18th a start was made from Stewart, Portland canal, with one pack-horse and a man to act as guide, for the headwaters of the Salmon river. The pack-trail crosses the International Boundary-line one mile and a half from Stewart, and follows the north-east bank of the Salmon river for eleven miles, the grade being thirty feet to the mile; at eleven miles from tide-water the trail leaves the Salmon river and climbs over a spur of the mountain, recrossing the International Boundary at fourteen miles from salt-water, at an elevation of 950 feet; thence, after rising another 50 feet it drops down to an elevation of 500 feet and crosses Cascade creek, which flows into the Salmon river about a mile below the crossing. Cascade creek forks just above the trail-crossing, one part heading to the east and the other to the north-east. From Cascade creek the trail climbs the spur of the mountain between the Salmon river and Cascade creek to the camp of the Indian Mines, Ltd., at an elevation of 2,150 feet where it ends. The latter part of the trail has not yet been graded, but is passable for horses with light loads. The total distance from Stewart to the Indian Mines is about nineteen miles. A wagon-road on an easy grade could be constructed to the Cascade trail-crossing, that point, following the creek, being about seventeen miles from and 500 feet above tide-water.

Indian Mines.

The Indian Mines, Limited, owns a group of four claims situated on the ridge of the spur of the mountain which lies between Salmon river and Cascade creek. The claims are thickly timbered, free from snowslides, and all the power that may be required for working the property can easily be obtained from Cascade creek.

The shattered zone in which the ore occurs lies between quartzite on the west and chloritic schist on the east, strikes north and south, dipping vertically, having a width of 20 to 30 feet, and can be traced for over 1,000 feet on the surface; at intervals along this zone diabase dykes sometimes occur following the main direction of the contact, at other times crossing it in a north-easterly direction, and, in one instance, at right angles. The mineralization has taken place at a later date than the intrusion of the dykes, which do not appear to have had any influence on deposition of the ore. Bodies of quartz, from a few inches to several feet in thickness, lie between these dykes, and, in places, cut them diagonally, following the strike of the line of contact. These contain galena, zinc-blende, and pyrite carrying a little gold; the galena at times occurs in solid bodies, fairly free from zinc. The management stated that the galena carries, on the average, 1 oz. in silver to the unit of lead, the gold-content varying according to the quantity of pyrite in the ore. A sample of the clean galena assayed: Gold, 0.06 oz.; silver, 8 oz.; lead, 42.6 per cent. On the surface at the summit of the ridge, at an elevation of 2,380 feet, an open-cut shows 8 feet of solid ore consisting of galena, blende, and pyrite; on the south side of the hill several other cuts have been made which show some galena, but not in any very large quantity.

At an elevation of 2,250 feet a tunnel has been driven, following, for the first few feet, one of the diabase dykes mentioned above; at 110 feet from the mouth of the tunnel, ore was met, of from 2 to 4 feet in thickness, but the tunnel appears to be run on the top of the ore-body, as it did not rise to the roof of the tunnel. The face of this tunnel is now 270 feet from the portal, and it has passed through several bodies of ore, the widest being 6 feet, and containing a considerable percentage of clean galena; the tunnel has still to go some 75 feet to be under the open-cut on the summit of the ridge, which shows 8 feet of ore.

Another tunnel is being driven at an elevation of 2,100 feet, following a small body of galena, quartz, and pyrite of good value. This tunnel is now in 20 feet from the portal, and located on the same fractured zone as was the one above it, and is situated about 200 feet to the south of and 150 feet below it vertically.

On August 19th some of the claims situated above the Indian Mines were visited; timber-line was left behind at an elevation of 3,500 feet but, unfortunately, when at an elevation of 3,700 feet a thick fog blew up from the west, and, after wandering some hours over a comparatively flat area of broken ridges and steep ravines rising gradually to the north-west, the visit had to be abandoned.

Province.

On the return journey the *Province* mineral claim, owned by Daniel Lindeburg, was visited. On this claim a large deposit of quartz occurs, 150 feet in width, bounded by schist on the foot-wall and quartzite on the hanging-wall side. The quartz, which has been shown up by an open-cut and tunnel across it, shows a little galena and a considerable quantity of zinc-blende and pyrite.

Big Missouri.

The *Big Missouri* mineral claim, owned by Hiram Stevenson and D. Lindeburg, near the *Province*, also shows a large body of quartz, of low value, striking east and west and dipping to the south. There is an open-cut 45 feet wide across the best of the ore. This cut is situated, at an elevation of 2,900 feet, in the face of a bluff 500 feet above the Salmon River glacier. A short prospecting-tunnel has

been driven 40 feet and shows ore of the same average value as the cut. Both foot-wall and hanging-wall are chlorite schist. A sample was taken over 10 feet of the best ore in the open-cut, showing galena and considerable pyrite, assayed: Gold, 0.1 oz.; silver, 6 oz.

On August 20th, on the return journey to Stewart, the Salmon Bear River Mining Company's claims, of which O. B. Bush is manager, were visited. The claims are located on the mountain between the east branch of Cascade creek and the Salmon river.

At an elevation of 1,730 feet a tunnel has been driven 100 feet, south-east, in schist, following a ledge of quartz 12 feet wide, called No. 1 ledge, containing a considerable quantity of pyrite carrying a little gold. The ledge has been crosscut at two points. On the same outcrop up the mountain 145 feet, to an elevation of 1,875 feet, a tunnel has been driven on a band of pyrite showing galena 12 feet in width; this band of ore lies in a mineralized body of quartz 75 feet in width exposed in an open-cut. At 1,925 feet elevation another opening has been made on the same ore, having the same width of 12 feet; a sample taken at this point assayed: Gold, 0.16 oz.; silver, 2.8 oz. One hundred and fifty feet south of No. 1 ledge and at an elevation of 1,880 feet, a diabase dyke is exposed cutting through the schists, striking north-east and dipping 70 degrees to the south-east. At this point both sides of the dyke are mineralized, but the chief deposit lies on the north-west side, the ore being solid galena, which can be traced up the mountain for 100 feet, and at one point attaining a width of 9 feet. At 2,000 feet elevation the dyke and ore are covered by the surface material on a bench on the side of the mountain. At the last point seen, there is 4 feet of galena and lead-carbonates. A sample taken of this ore, being clean solid galena, assayed: Gold, 1.2 oz.; silver, 12.4 oz.; lead, 32 per cent.

A short tunnel has been driven in the diabase dyke at a lower elevation, from which a crosscut has been driven, which has cut the galena on the north-west side of the dyke, width 2 feet, but no further work has been done.

Three hundred feet north of No. 1 ledge at an elevation of 1,910 feet, another ledge outcrops, striking east and west, and showing galena and pyrite, on which no development-work had been done.

The favourable geological and topographical conditions and the results obtained from the small amount of development-work done on the promising mineral deposits in this district should encourage prospectors to further efforts. It appears probable that systematic development-work will prove the existence of large bodies of ore of commercial value, which would justify transportation facilities which are at present not available.

QUEEN CHARLOTTE MINING DIVISION.

REPORTS BY D. G. FORBES, M.E., AM.INST.M.E., M.I.M.M.

WEST COAST OF MORESBY ISLAND.

TASU HARBOUR.

Tasu harbour is situated on the west coast of Moresby island some forty-five miles from Queen Charlotte; the distance to the western entrance of Skidegate channel being twenty-five miles, and the passage south along the shore of the island about twenty miles. It can also be reached from the east coast of the island by a trail from the head of Sewell inlet, a distance of four miles over a level trail, and by another trail from Crescent inlet, a distance of eight miles, rising over a summit of 800 feet elevation. The district was visited by the Provincial Mineralogist and is described by him in the Minister of Mines' Report for the year 1909.

Tasu Copper-mine.

The principal development-work in the district has been done on the Tasu mine, owned by F. C. Elliott *et al.*, and at present under option to R. R. Hedley and associates, of Vancouver. The mine is situated on the slope of the mountain, opposite Gowing island, at 1,175 feet above sea-level and 2,000 feet from high-water mark.

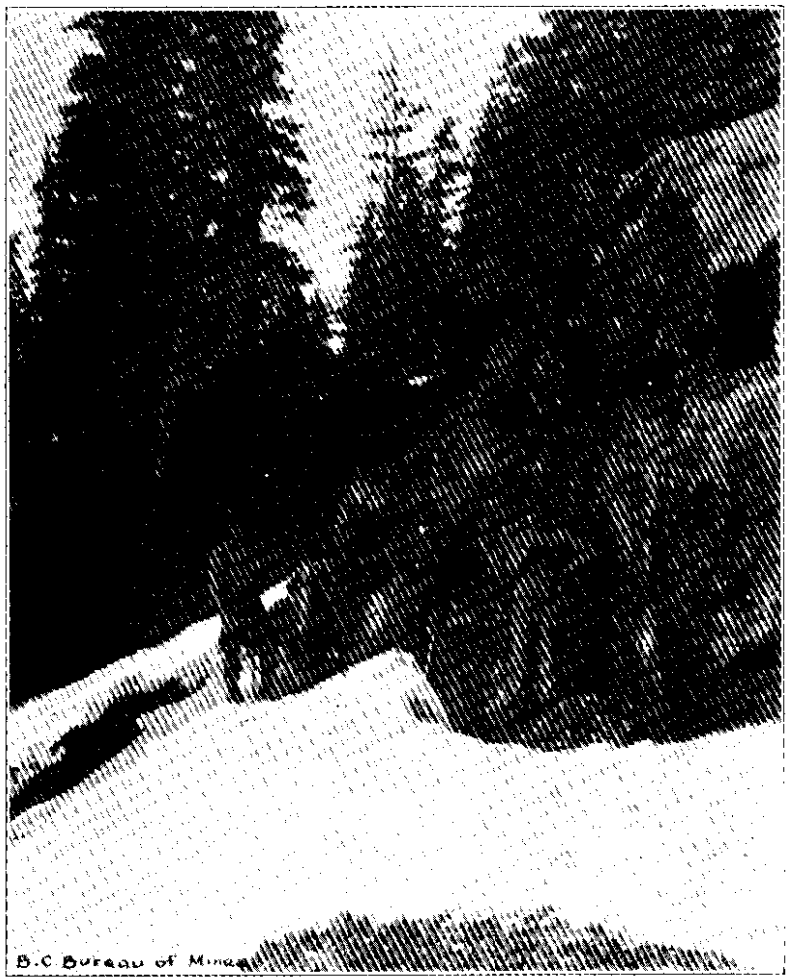
The formation at the base of the mountain is granite, which changes, at an elevation of about 700 feet, to felsite and diabase, the felsite being more in evidence near the point of change; above the mine the country-rock is nearly all limestone.

The surface shows a large deposit of magnetite, which is exposed on the company's claims for over 500 feet, and can be traced some considerable distance on the claims adjoining to the west, dipping to the north at 75 degrees and striking nearly due east and west. Several openings have been made on the surface, showing chalcopyrite fairly evenly distributed through the magnetite. A tunnel has been driven 300 feet southerly, crosscutting the ore and country-rock, the face of the tunnel being in porphyry. In all, the tunnel has cut 134 feet of magnetite-ore, in separate bodies, from 4 to 28 feet in width, and separated by diabase and trap dykes and bodies of limestone.

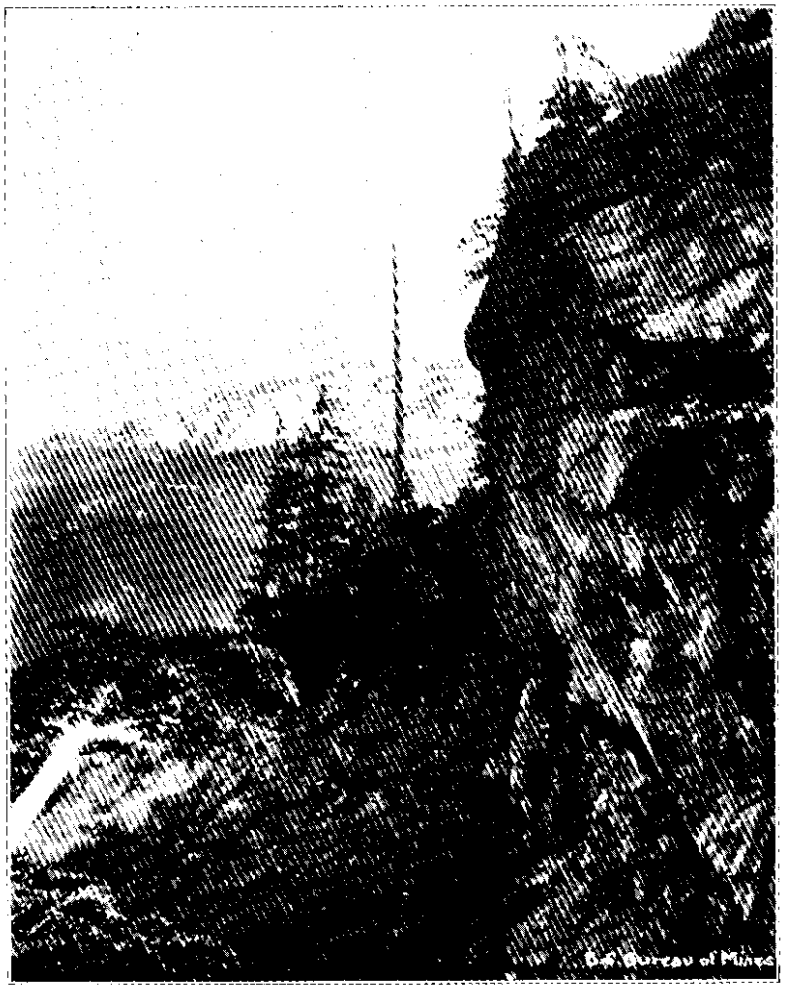
This ore has been carefully sampled by the management, which states that 40 feet of it will average 2.5 per cent. copper; 13 feet, 2.85 per cent., or better; and the balance about 1.5 per cent. copper, with a little gold and silver which varies with the copper-contents. A section of the tunnel starting from the portal on the east side gives: Ore, 28 feet; diabase, 9 feet; ore, 8 feet; diabase, 16 feet; mixed ore, 4 feet; trap, 10 feet; lime, 12 feet; diabase, 7 feet; ore, 35 feet (winze); diabase, 13 feet; mixed ore, 9 feet; diabase, 20 feet; ore, 8 feet; diabase, 2 feet 6 inches; ore, 7 feet; diabase, 1 foot 8 inches; ore, 18 feet; diabase, 10 feet; lime, 28 feet; diabase, 18 feet; ore, 17 feet; diabase, 12 feet; porphyry, 1 foot to face of the tunnel, which is in the same rock.

In most cases the diabase rock and ore dip to the north at an angle of from 60 to 75 degrees; in a few instances the dykes stand vertically or dip to the south. There is every reason to expect that when the crosscut tunnel is extended, further ore-bodies will be encountered. At 129 feet from the portal of the tunnel a winze has been sunk on the best ore to a depth of 40 feet, and is said to show good ore in the bottom; this is the only development-work done below this level. No exploration-work east and west from the tunnel has yet been carried out.

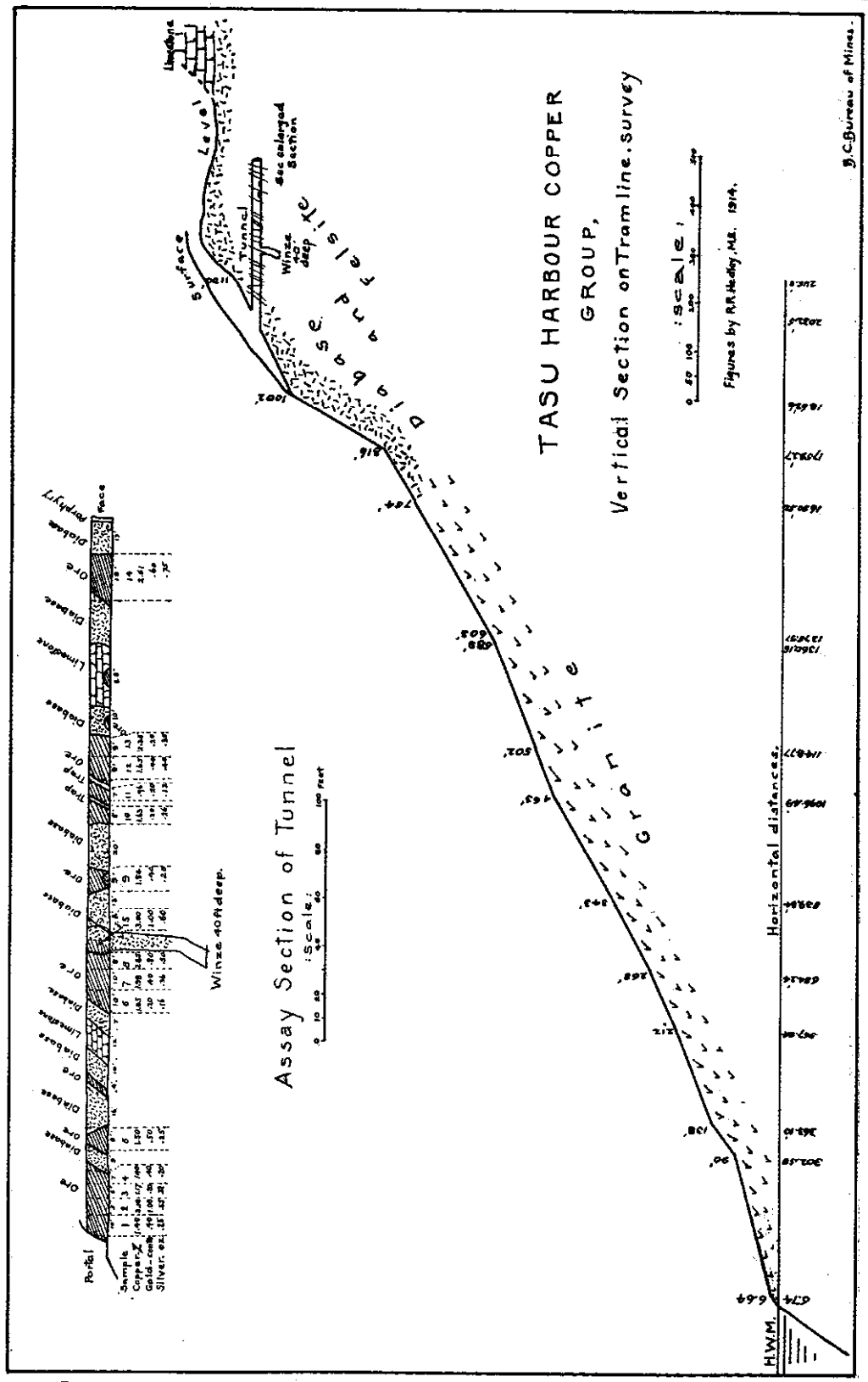
It is proposed, in the immediate future, to continue the development of the ore-body with the assistance of a small air-compressor, and to erect a wire-rope tramway from the mine to bunkers at tide-level, from which the ore can be sent by sea to the smelters, very favourable smelting terms having been obtained.



Dan Patch Mine—Kitsaulte River—Alice Arm.



Copper Cliff Mine—Kitsaulte River—Alice Arm.


TASU HARBOUR COPPER GROUP,
Vertical Section on Tramline. Survey
Figures by R.R. Hedley, M.E. 1914.
B.C. Bureau of Mines.
Assay Section of Tunnel
Scale:
Winze 40 ft deep.
Tunnel
Surface
Level
Winze 40' deep
Horizontal distances.
H.W.M.
Portal
Face
Sample
Copper %
Gold...oz.
Silver oz.
Porphyry
Diabase
Ore
Limestone

EAST COAST OF MORESBY ISLAND.

CUMSHEWA.

On Monday, August 4th, a gasolene-launch was hired at Queen Charlotte, Skidegate inlet, for the purpose of visiting some of the properties situated on the east coast of Moresby island. Owing to bad weather a day was lost at the Skidegate sandspit, and the camp of the Queen Charlotte Island General Development Company, Limited, on Cumshewa inlet, distant thirty-five miles from Queen Charlotte City, was reached on the evening of August 5th.

Homestake Group.

The *Homestake* group of mineral claims, owned and operated by the above-mentioned company, is situated on the north side of the inlet, at an elevation of 240 feet above sea-level and half a mile from salt-water.

The ledges worked lie in a shattered zone of slate situated between slate on the south and siliceous limestone on the north; the gangue is quartz and calcite, and the mineralization pyrite, zinc-blende, and a little galena. A tunnel has been driven in this shattered zone for a distance of 365 feet, from which point two quartz ledges have been exposed. The northerly one, known as the "*Homestake* ledge," has been followed for 239 feet, the fissure being 5 feet in width and nearly vertical; this is sometimes filled with barren-looking quartz, but often only contains vein-filling, consisting of a little quartz mixed with country-rock. A sample of the quartz from this level gave only traces of gold and silver. The south ledge, known as the "*Go East* ledge," has been followed for 435 feet and dips at 78 degrees to the north-west; the fissure has a width of 5 feet and is filled with quartzite, quartz, and vein-filling. The ore in both ledges is low grade, generally, except when it contains galena, when the gold values often run up to over $100 to the ton; unfortunately, galena is not plentiful in the ledge. A sample assayed 0.03 oz. gold. A winze has been sunk 55 feet on the best of the ore on the foot-wall side of the *Go East* ledge; the winze shows from 12 to 18 inches of fairly well-mineralized quartz, occasionally showing some free gold. A sample assayed 0.4 oz. gold and 6.6 oz. silver.

At the end of the drift on the *Go East* ledge a crosscut has been driven to the north, cutting the *Homestake* ledge, which at this point is only a few inches in thickness, and this crosscut has been extended for some distance into the siliceous limestone on the north side of the ledge; the total length of the crosscut is 280 feet.

A crosscut has also been driven south from the *Go East* ledge a distance of 155 feet, in slate several other short crosscuts have been driven, as the work has proceeded, both to the north and south, but they have disclosed little of value. On the *Homestake* ledge, 65 feet above the main tunnel, a tunnel has been driven 117 feet, but does not look promising. Owing to the broken nature of the rock in the lower tunnel it has been necessary to close-timber the levels, and consequently the greater part of the ledges opened up could not be seen.

Development-work consists of 1,206 feet of driving, 610 feet crosscuts, and 280 feet winzes—in all, 2,096 feet of work; five men were employed at the time of my visit.

Some shipments of ore have been made to the smelters from this property, but they do not represent the average value of the ore, as it was closely hand-picked before shipping.

LOCKEPORT.

On the afternoon of August 6th the launch left Cumshewa inlet for Lockeport, but owing to heavy weather, was unable to proceed beyond Pacofi fishing-station. On the morning of August 7th the wind was still blowing hard from the south-east, but moderated after midday, and Lockeport was reached that evening; the distance from Cumshewa to Lockeport being forty-five miles by the inside channels.

Swede Group. The *Swede* group of mineral claims, owned by Pearson, Larson & Rogers, consisting of eleven mineral claims, was visited on August 8th. These claims were inspected by the Provincial Mineralogist in 1907 and 1909. They are located on a mineralized zone of diabase rock some 500 feet in width, crossing a small peninsula which runs out into Lockeport harbour. The rock contains little chalcopyrite on the surface, and when broken into a few feet shows mineral at most points—sometimes in the form of minute veinlets, sometimes in small granules. A good many small crystals of epidote were noticed in the rock, especially near the surface.

No. 1 tunnel has been driven 139 feet, S. 85° E. magnetic, at an elevation of 60 feet above high-water mark. Some small barren dykes, striking north and south, have been met with in this tunnel. The rock is fairly well mineralized throughout, with the exception of the dykes; the best ore, 27 feet in width, being near the face of the tunnel, a sample from which assayed 2.2 per cent. copper.

One hundred feet north of No. 1 tunnel and on the same level, No. 2 tunnel has been driven 32 feet, following a small stringer of bornite and chalcopyrite; the face of the tunnel is well mineralized, showing chalcopyrite in all the rock broken. A sample from the face assayed 5.7 per cent. copper.

Several open-cuts have been made on the surface of these claims, the highest one visited being at an elevation of 710 feet above sea-level, all showing chalcopyrite. The property is well worth further prospecting, as there is a fair chance of its proving to contain a large body of low-grade ore.

Apex Group. The *Apex* group of claims, owned by Harris, Davis & Bull, were inspected on August 9th. The claims were situated on the summit of the divide between Lockeport harbour and Tasu harbour, on the west coast of the island, at an elevation of 2,700 feet above sea-level and about three miles by trail from Lockeport. A deposit of magnetite and garnetite containing chalcopyrite, occurs near the top of the mountain above the granite, and outcrops on both the north and south sides of the divide, being partially covered by limestone.

The deposit, which appears to lie in a trough in the granite, is 600 feet in length and is from 50 to 60 feet in thickness, 125 feet wide on the south side and 40 feet wide on the north side of the mountain. The best copper ore lies on the east side of the deposit.

A cut has been made across the deposit on the south exposure, and a small shaft sunk on the west side of the deposit 8 feet deep, which shows that the deposit at this point dips to the east.

A crosscut tunnel in granite has been driven 50 feet below the shaft, and below the south end of the ore-exposure, for a distance of 200 feet. Considerable exploration-work has been done to the west of this crosscut by drifts from it. If the deposit lives down to this level, it lies to the east of this crosscut tunnel and not to the west, where the exploration-work has been done.

A sample from the best ore on the west side of the deposit, 3 feet wide, assayed: Gold, 0.02 oz.; silver, 2.8 oz.; copper, 6.7 per cent.

SOUTH END OF MORESBY ISLAND.

JEDWAY, IKEDA BAY.

On August 25th the town of Jedway, near the south end of Moresby island, was reached by steamer from Prince Rupert, and on the following day a launch was hired to visit the mineral claims situated along the coast to the south of the town.

Ikeda bay is situated on the eastern shore of the island and is distant from Jedway five miles by sea or three miles and a half by trail over the mountains. Here the party was met and hospitably entertained by A. Ikeda, one of the directors of the Ikeda Mines, Limited, who insisted that we should use his house as headquarters while visiting the properties at the south end of the island.

Ikeda Mines.

The property owned by the Ikeda Mines, Limited, consists of forty-seven mineral claims. The principal development-work has been confined to the *Lily* mine, the original location. This claim is situated about a mile from the head of Ikeda bay, with which it is connected by a surface tramway. An Ingersoll-Sargeant air-compressor with a capacity of 300 feet of free air a minute, and a 40 horse-power, under-fired, multitubular boiler, have been erected at the mine, together with the necessary ore-bins, both at the mine-workings and at the landing, to handle the output of the mines.

The ore-deposits in the *Lily* mine occur in lenses and irregular bodies along a north-and-south fissure in the diabase country-rock, dipping from 32 to 35 degrees to the east. The gangue consists of diabase, quartz, and calcite, and the mineralization pyrite, chalcopyrite, and magnetite. The No. 3 tunnel, driven at an elevation of 270 feet above sea-level, follows the fissure south, No. 1 shoot of ore being cut at 112 feet from the portal of the tunnel; this ore was followed for some 300 feet, several breaks occurring in that distance, and it has been stoped out to the surface, proving to be the best grade of ore found in the mine.

At 600 feet from the portal an east-and-west diabase dyke crosses the fissure. No. 2 ore-body was encountered to the south of this dyke, and consists mainly of diabase with chalcopyrite scattered through it, sometimes in small granules and occasionally in irregular masses.

This ore-body is of some considerable size, having been proved to be 60 feet in width and 80 feet in length along the strike of the fissure. Much of it is of very low grade, and the ore could not be shipped to the smelters at a profit without close sorting.

No. 3 ore-shoot parallels No. 1, on the hanging-wall of the vein; the width of ore varies from 4 to 18 inches, consisting of pyrite and chalcopyrite in a gangue of calcite and quartz. The values in this small vein run high, in places up to 20 per cent. copper, but, owing to its narrow average width, it could scarcely be mined at a profit; the drift follows this ore-shoot for 200 feet.

No. 2 tunnel has been driven at an elevation of 340 feet. It does not open up any ground beyond the limits of No. 1 ore-shoot.

At an elevation of 600 feet, No. 1 tunnel has been driven 110 feet, starting on a shoot of ore consisting of calcite, hornblende, pyrite, chalcopyrite, and magnetite, 2 to 4 feet in thickness; the hanging-wall at this point is limestone, the foot-wall diabase. This ore-shoot has not been reached in No. 3 tunnel, the face of the latter being 350 feet distant horizontally. No. 1 tunnel has been driven in the hanging-wall limestone, and the contact has been left under foot; the face of the tunnel is all in limestone.

It is not practical to drive another tunnel below No. 3 to further explore No. 1 ore-shoot, which is the best part of the mine at present opened up, and a shaft, preferably on the incline, will have to be sunk to follow up the ore. There should be no difficulty in sinking on the fissure after the surface water has been caught up.

HUSTON INLET.

The entrance to Huston inlet lies two miles to the west of Jedway harbour, at the head of Skincuttle inlet. This inlet, which is some two miles in width and five miles long, was visited on August 29th. It is apparently free from rocks and is surrounded by low timbered mountains not exceeding 1,600 feet in elevation.

Ivan Group.

The *Ivan* group of mineral claims, owned by I. Thompson, W. McKinnon, and A. Sivart, is situated on the slope of the mountain about a mile south-west from the head of the inlet. A good trail leads up to the property from the sea, crossing diabase country-rock containing a few isolated bodies of limestone.

Between the elevations of 700 and 800 feet above sea-level and scattered over an area of 100 feet in width and 600 feet in length, north-west and south-east, several deposits of magnetite, containing chalcopyrite, have been located. These deposits all occur on the east or west sides of diabase dykes which strike north and south. No work has been done to prove if these deposits are continuous between the dykes; the surface is heavily covered with fallen timber and broken and decomposed rock. A tunnel has been started a few feet below the largest of these deposits with the object of determining the width of the body; near the entrance of the tunnel 6 feet of diabase was encountered, containing chalcopyrite, but the tunnel has not yet advanced far enough to cut the magnetite ore. Two similar deposits of magnetite, containing a little copper, occur at lower elevations on the claims. The *Hercules* mineral claim, owned by H. McEachern, is situated on the western slope of the mountain, which lies between the head of Huston inlet and Collision bay.

At an elevation of 1,200 feet above sea-level, near a north-and-south contact between granite and diabase, and apparently in the latter, a deposit of magnetite and garnetite, some 200 feet in width, occurs, containing some chalcopyrite. Some small tunnels and open-cuts have been made on the deposit, but so far the work done has not exposed a tonnage of commercial ore. The chalcopyrite occurs in bunches and is not evenly distributed through the deposit.

Hope M.C.

On the return to Jedway via Huston inlet, the *Hope* mineral claim was visited. This claim, owned by H. McEachern, lies in a basin 250 feet above sea-level and one mile from the head of Huston inlet. Two deposits of magnetite on this claim, 200 feet apart, have been located, striking north-west and south-east and lying between diabase and felsite dykes. An open-cut 30 feet long has been made on one of them, and has exposed a little copper ore, but nothing of commercial value has yet been found.

Copper Island Mine.

The *Copper Island* mine is located at Copper island, five miles north-east from the town of Jedway. The island is covered by three mineral claims owned by J. Heino. The island was visited by the Provincial Mineralogist in 1907, an account being published in the Minister of Mines' Report for that year. Since that date a body of magnetite showing traces of copper has been traced out for 200 feet N. 80° E. magnetic. On the north side of the island several open-cuts have been made and a tunnel 40 feet in length driven on the deposit. On the south side of the island a body of limestone occurs which can be traced for some 1,500 feet to the eastern end of the island. On the south shore of the island the limestone is not far distant from the shore, and small pockets of copper ore occur in the neighbourhood of portions of limestone included in the diabase. Several small shafts, tunnels, and cuts have been made with the object of making shipments to the smelters from the small pockets of copper ore occurring along this contact. These shipments, the owner states, have netted him $9 a ton, but no body of ore of any size has been located.

On the north side of the limestone in the centre of the island the surface is heavily covered with soil, fallen timber, and brush, and very little work has been done. At a few points where the surface has been stripped the diabase exposed showed chalcopyrite fairly evenly distributed, and the chances of obtaining ore in commercial quantities, although possibly of lower grade,

are better than along the south shore of the island. A shaft has been sunk in limestone near the south shore at about the middle point of the island, east and west, to a depth of 100 feet, and 180 feet of crosscutting has been done from the bottom of the shaft, mostly to the south, where the contact has been located, but no payable ore was found. The contact on the north side of the lime has not yet been reached. The gangue is quartz, calcite, diabase, hornblende, garnetite, and the mineralization chalcopyrite, magnetite, copper-glance, and bornite.

KUNGHIT ISLAND.

On August 27th an early start was made from Ikeda bay by launch for the eastern shore of Kunghit island. This island, which is the most southerly of the Queen Charlotte group, exhibits the same geological conditions as the neighbouring islands to the north, the country-rock being mainly diabase of a rather lighter colour than in the Jedway district; in places showing many distinct crystals of epidote. Irregular bodies of limestone occur more frequently than in Moresby island, exposures of copper ore being often found near the contacts of the lime and volcanic rocks.

Copper Coin. The *Copper Coin* mineral claim, owned by J. Uniaka, is situated on the east side of High island, an island lying a short distance to the north east of Kunghit island. The claim is located on a limestone-contact; some copper-pyrites occurring in the diabase rock, and, at one point, close to the lime an exposure of 2 feet of chalcopyrite has been found; little or no exploration-work has been done on the property.

Sakai M.C. The *Sakai* mineral claim, also owned by J. Uniaka, is situated near the eastern point of Kunghit island; the claim is located on a fractured zone in the diabase crossing the point from north to south, the mineralized area being about 1,500 feet long by 150 in width; a considerable body of limestone lying to the east of the fracture. The fractured zone consists of fragments of diabase and limestone, often of several feet in diameter, a little bornite occurring in the calcite, cementing the rock fragments. One open-cut some 50 feet in length crossing the zone has been made, near the sea, on the south end of the claim, which shows some ore, but sufficient development-work has not yet been done to prove the property of commercial value.

Several other small deposits of copper ore occur in this district, but are not worthy of individual mention.

COLLISON BAY.

On August 28th we left Ikeda for Collison bay, a few miles farther south from Jedway.

Thunder M.C. The *Thunder* mineral claim, owned by I. Thompson, is located on the south side of the mountain-spur that divides Ikeda bay from Collison bay. On this claim, at an elevation of 830 feet above the sea, a deposit of magnetite is exposed on the surface which can be traced some 600 feet, striking N. 10 degrees E. magnetic and apparently dipping to the west at an angle of 52 degrees. This dip could not be definitely determined, as the diabase foot-wall was only exposed at one point over a very limited area. The deposit has been shown to be 12 feet in width on the surface, but, although several openings have been made on it along the outcrop, the hanging-wall of the deposit has not been exposed. The ore consists of magnetite and garnetite, carrying chalcopyrite, apparently fairly evenly distributed.

A crosscut tunnel has been started, at elevation 700 feet, to cut the deposit, which should be reached in a distance of 220 feet if the dip of the ore-body remains 52 degrees west, as on the surface. A sample taken from the open-cut above the tunnel assayed: Gold 0.02 oz.; silver, 1 oz.; copper, 2.1 per cent.

At an elevation of 1,075 feet and about 300 feet distant to the west of the first-mentioned deposit, a deposit of magnetite with a little garnetite has been located, apparently some 2,000 feet in length and 300 feet in width, and of some considerable thickness. The deposit appears to contain just sufficient copper to render it valueless as an iron ore, but Mr. Thompson hopes, when the crosscut tunnel now being driven gets under this outcrop, that he will find some payable copper ore.

Oceanic. The *Oceanic* mineral claim, owned by John Lawson, is situated on the shore of Collison bay. A small body of chalcopyrite, in diabase, 10 feet in length by 5 feet in width has been located on a limestone-contact. The deposit is below sea-level and can only be worked at low tide. Some good-looking ore is being mined by the owner and one assistant, and has been sacked up for shipment to the smelters. Smelter returns of 15 tons ore showed 4 per cent. copper with a little silver.

Meal Ticket. The *Meal Ticket* mineral claim, situated half a mile from Collison bay, owned by J. A. Leckie, of Vancouver, was visited by the Provincial Mineralogist in 1907; a description of the property is given in the Report for that year. Since that date there has been no change in the prospective value of the property.

QUEEN CHARLOTTE MINING DIVISION.

REPORT OF E. M. SANDILANDS, GOLD COMMISSIONER.

I have the honour to submit the annual report on mining operations in the Queen Charlotte Mining Division for the year 1913.

The head office of Gold Commissioner was moved from Jedway to Queen Charlotte City, on Skidegate inlet, and a new office opened there on May 15th, 1912.

I regret to say that mining in general has not been very brisk the past year, and practically very little prospecting has been done. However, towards the end of the year two or three working bonds were given, and it looks as if things may be more lively for the coming year. Quite an amount of surveying has been done, and some forty applications for Crown grants are pending.

COLLISON BAY.

At the south end of Moresby island, at Collison bay, an average of from eight to ten men has been working on the *Thunder* group, owned by Thompson & McMillan *et al.*, consisting of the *Thunder*, *Sadie*, and *Spade Flush*. This property is under option to Geo. A. Macleod, of Vancouver, and associates. They are driving a crosscut tunnel to strike a large surface showing of chalcopyrite, which, at the time of writing, is in over 250 feet, and is expected to uncover a large body of ore. The group was surveyed this summer and Crown grants are being applied for.

Alex. Smith, in the same bay, is working on the *Oceanic* and has made a small trial shipment; this property has also been surveyed preparatory to obtaining Crown grants.

IKEDA BAY.

At the *Ikeda* mines, with the exception of the necessary assessment on un-Crown-granted claims, nothing has been done this year. It is rumoured the property is about to change hands.

JEDWAY.

The *Copper Queen* group at Jedway, and owned by J. S. McMillan, of Roche Harbour, Wash., has not been worked this past year, with the exception of surveying some dozen claims and for which Crown grants are being applied for.

On Copper island, opposite Jedway, Abe Heino has worked continuously, from four to six men; sinking has been the main feature of work. The property is looking promising.

In Huston inlet a bond has been let on the *Ivan* group, owned by Thompson & Mackinnon, to some Vancouver parties; some development-work has been done and the property is showing up well.

LOCKEPORT.

Very little work other than surveying has been done the past year around this section. The *Grandview* and *Bird* groups have both been surveyed and Crown grants are being applied for. It is rumoured that there is a deal on for the *Swede* group.

TASU HARBOUR.

The *Warwick* group, in Tasu harbour, and owned by J. E. Corlett, of Seattle, has been bonded to a company, with R. R. Hedley as manager. About twenty men have been employed continuously, with Mr. Thomson in charge. A Crawford aerial tramway is about completed, with bunkers at the beach, and shipments are expected daily. The ore is of a good quality and is much sought after by the smelters. This property has a crosscut tunnel in over 350 feet, crosscutting a large body of ore.

CUMSHEWA INLET.

On Louise island, in Cumshewa inlet, are located a group of iron claims owned by H. K. Owen, of Seattle. Considerable prospecting work has been done on these claims, and the iron ore is reported to be of a very good grade and a large area. The claims have been surveyed and Crown grants are to be applied for.

On the opposite side of the inlet is the *Homestake* group, owned by the Queen Charlotte Mining and Development Company, with Mr. Pomeroy in charge. They are still working a small gang of men. This property has been worked continuously for the past three years and a large amount of work done; of late, some very rich ore has been encountered. Shipments are expected from this property in the near future.

GOLD HARBOUR (WEST COAST).

On Gold harbour, on the west coast of Moresby island, is the *Early Bird* group, owned by John McLellan. This is a free-milling gold property and is equipped with a small stamp-mill. Mr. McLellan ran the mill for a short time this summer, and with very satisfactory results. This property was first worked in 1852, and has the distinction of being the first gold discovery in British Columbia.

OTARD BAY (WEST COAST).

Oil-drilling.—On the west coast of Graham island, at Otard bay, oil-drilling has been continued the past summer by McPhail & Stewart. They expect next summer to have three drills working on the west coast.

Coal-drilling.—Up the Yakoun river a couple of coal-drills were in operation the past summer; one owned by the Graham Island Collieries and in charge of Mr. Barton, the other owned by the Graham Island Coal and Timber Company and in charge of F. C. Wright. They expect to work an extra drill the coming summer.

At the Robertson-Wilson coalfields a number of men were also employed in prospecting the country and doing some development-work.

A party of the Geological Survey, in charge of Mr. Mackenzie, from Ottawa, spent a good part of the summer investigating the extent and quality of the coal-areas in that section.

The blowing-in of the smelter at Granby bay will be a great boon to mining in the north, and should give a great impetus to mining generally, especially to these islands, as the transportation to that point would be a very small item.

OFFICE STATISTICS—QUEEN CHARLOTTE MINING DIVISION.

Claims recorded (quartz)	67
Certificates of work issued	169
Certificate of improvements	3
Bills of sale, etc	61
Free miners' certificates	119

Revenue.

Free miners' certificates	$ 587 75
Mining receipts	1,166 35
Other sources	704 00
Total	$2,458 10

OMINECA MINING DIVISION.

REPORT BY STEPHEN HOSKINS, GOLD COMMISSIONER. (OFFICE AT HAZELTON.)

I have the honour, as Gold Commissioner, to submit the annual report for the Omineca Mining Division for the year ending December 31st, 1913.

As was predicted in the report for the year 1912, considerable outside interest has been manifested during the past year in the mining properties in this Division, and there is reason to hope that some of the earlier prospects, which, prior to the advent of the Grand Trunk Pacific Railway, were being steadily developed, have now arrived at the stage of being classed among the regular shipping mines of our Province.

GLEN MOUNTAIN.

Silver Standard Group.—This property, comprised of eight claims, containing silver-lead ore, has been steadily and systematically developed under the management of W. S. Haskins. During the past summer 282 tons of ore was shipped to the smelter at Trail, which averaged $4.20 in gold, and 138 oz. silver to the ton, and 24 per cent. lead. A further 600 tons is now sacked at the mine ready for shipment, and a great deal more is broken in the mine preparatory to sacking. The expectations regarding this property are being fully realized, and it is anticipated by the management that during the coming year an aerial tram will be constructed from the mine to Two-mile creek to connect with a proposed concentrating mill, which would handle all the second-class ore.

The *Canadian King* group is also a silver-lead property belonging to the same persons who own the *Silver Standard* group. During the past year assessment-work only was performed on this group, for which Crown grants have recently been obtained.

Assessment-work was performed upon the *Morning, Evening, Mammoth Fractional, Good Friday, Tiger, Peerless*, and *Black Bear*, owned by the Harris Bros., which show promise for the future.

On the *Surprise* group about 1,000 feet of underground development-work was done, but in the early part of the summer the management saw fit to stop operations and close the property down. This, no doubt, was on account of the owners having many other interests in other parts which required their attention.

Only four new locations have been made upon this mountain.

NINE-MILE MOUNTAIN.

The *American Boy* group, owned by the Harris Mines, Limited, has been undergoing steady development during the whole of the past year. No ore has been taken out of this property, with the exception of that actually broken out in the course of *bona-fide* development. During the year 50 tons of first-class ore was shipped from this property, which assayed 22 per cent. lead and 90 oz. silver to the ton, and gave net returns of $73 a ton. The second-class ore that has been taken out still remains on the dump, awaiting treatment.

The management supplies the following statement of the actual work done on this property during the past year:—

"On No. 1 vein a drift was run from the bottom of the shaft at the 100-foot level north for 50 feet, and a cross-cut run east towards the hanging-wall 25 feet. This vein will average about 3½ feet in width, and has been uncovered on the surface for a distance of 175 feet, showing some very high-grade ore. A prospecting shaft 90 feet north of the main shaft shows the vein to be 4½ feet in width, with 14 inches of high-grade galena ore on the hanging-wall, and the remainder mixed or concentrating ore. A sample taken from the 14-inch pay-streak assayed as follows: Gold, 0.15 oz.; silver, 167 oz.; lead, 32 per cent.; zinc, 4 per cent.

"On No. 2 vein some surface cuts have been made and prospecting shafts sunk. The vein has been uncovered for 150 feet, the average width for the entire distance being about 3 feet. Some very high-grade silver-lead ore carrying grey copper shows in the different cuts.

"On No. 3 vein the main drift on the lowest level (175 feet) has been advanced 190 feet north from the shaft, the average width of the vein for the entire distance being about 2 feet. A raise has been put through from this level to the 100-foot level, a distance of 75 feet. The raise was carried up on to the vein, which has an average width of about 2 feet.

"A stope has been started south and is now up about 25 feet and about 30 feet in length. A stope has also been started 50 feet south of the raise and is now up about 15 feet and 20 feet long, showing 16 inches in clean shipping ore. The drift was continued on the 100-foot level along the vein north 90 feet, all in ore, which had an average width on this level of about 2 feet. Samples have been taken from time to time as follows: No. 1—Gold, 0.16 oz.; silver, 140 oz.; lead, 39 per cent.; zinc, 12 per cent. No. 2—Gold, 0.21 oz.; silver, 121 oz.; lead, 42 per cent.; zinc, 10 per cent. No. 3—Gold, 0.25 oz.; silver, 112 oz.; lead, 36 per cent.; zinc, 12 per cent. A drift was also run south for 50 feet, the average width of the vein being about 12 inches.

"On No. 4 vein a tunnel has been run for 45 feet. This vein shows some good clean ore along the surface for a distance of 90 feet which will average about 14 inches. No assays have been taken of the mineral in this vein.

"No. 5 vein has been opened by surface trenching and surface cuts, and a shaft has been sunk for 25 feet. This vein has an average width of 20 inches, which shows some clean high-grade ore assaying as follows: Gold, 0.23 oz.; silver, 370 oz.; lead, 41 per cent.; zinc, 6 per cent.

"The veins in this property are all silver-lead, the principal values being in silver. All the veins run parallel, with a strike of about 30 degrees east of north."

Nothing further than the necessary assessment-work has been done on any of the other many groups in this vicinity, owing, it is stated, to the pressing need of transportation facilities. It is hoped that the present wagon-road on Nine-mile mountain may, in the near future, be extended, and thus assist in opening up this highly mineralized locality.

There were thirty-nine new locations on Nine-mile mountain during the past year.

ROCHER DÉBOULÉ MOUNTAIN.

This vicinity is still attracting the attention of prospectors; during the past year eighty-three new locations have been recorded. There are various promising copper properties in different stages of development, sufficient work having been done to lend hopes for the future.

The *Juniper* group, consisting of nine claims, is owned by the Rocher Déboulé Copper Company of Salt Lake City. For a general description of this property and the approximate development-work done thereon, I will refer you to the annual report from this Division for 1912. In the early months of 1913 all operations upon this property were suspended until late in the fall of the year, after the new management had decided on a comprehensive plan for future development, as follows: On Juniper creek, about four miles and a half from the mine, it is intended to erect a 200-horse-power hydro-electric plant to provide light and power. A compressed plant, electrically driven, with a capacity of 744 cubic feet of air a minute at a pressure of 90 lb., is being installed at the mine. This plant will also contain a Leyner drill-sharpener. A double-cylindered (8 x 10 inches), single-drum, geared hoist has been procured to handle the men and supplies from the camps to the mine over an incline tramway 1,800 feet long to timber-line, at an angle of 30 to 34 degrees. An aerial tramway three miles and a half long has been contracted for, which will carry the ore from the mine to the main line of the Grand Trunk Pacific Railway. It is expected by the management that this property will be on a producing basis early in the coming summer.

The *Highland Boy* group, which adjoins the *Juniper* group, is owned by the Butte-Rocher Déboulé Copper Company, Limited. During the past year energetic prospecting-work has been continuously carried on, with most encouraging results.

The *Great Ohio* group joins the *Juniper* group on the east, and has recently been bonded for the sum of $35,000 by Portland, Oregon, interests, who are systematically opening up and developing the property.

The *Wonder* and *Black Prince* groups are situate at the head of Mud creek, Rocher Déboulé mountain, and lie to the east of the *Juniper*, *Great Ohio*, and *Highland Boy* groups. The formation is granite and the character of the ore chalcopyrite, with small gold values. Assays of ore taken from these properties average $60 a ton, mostly in copper, but from samples taken from many places upon these properties values have run much higher.

These properties have recently been bonded to parties in Spokane, Wash., and Wallace, Idaho, who are actively engaged in carrying on development-work.

There are many properties in this vicinity which are equally entitled to special mention, upon which the annual assessment-work only has been recorded, but no information as to the result of such work has been obtainable.

HUDSON BAY MOUNTAIN.

During the year 1913, seventy-eight new locations were recorded in this vicinity, and assessment-work recorded on all the older properties.

Extensive development-work was prosecuted on the *Coronado* group, which, it may be anticipated, will be on a shipping basis in the early fall of 1914. The ore on this property is, for the most part, lead (galena) carrying good values in silver and some copper.

The *Silver Creek* group, which was bonded for $100,000 in the year 1910, has been steadily developed under the bond, it is stated, with very encouraging results. This is stated to be a concentrating proposition, and a concentrator to handle the ore is under advisement by the management.

The annual assessment-work on twenty-five groups of claims in this vicinity has been recorded during the past year.

Hunters Basin.

The usual annual assessment-work has been carried on and six new claims have been recorded in this vicinity.

Babine Mountain.

Seventy-one new locations have been recorded in the vicinity of Babine mountain, many of them with strong surface showings. From samples taken from the *Debenture* group, owned by Ritzins & Morton, assays ran as follows: (1) 60 oz. silver and 52 per cent. lead; (2) 76 oz. silver and 60 per cent. lead.

These samples were taken from the surface, from a vein 5 feet in width, which is naturally exposed for 1,000 feet. It is above timber-line at an altitude of about 4,000 feet. Between this group of claims and the west shore of Babine lake, it is stated there are twenty-five miles of country which have been prospected.

The *Babine Bonanza* group has been idle all the year, awaiting transportation facilities.

Babine Lake.

The annual assessments have been recorded upon all locations in this vicinity, which is now attracting the notice of outside mining-men.

Copper City.

Thirty new locations have been recorded in this vicinity, and the annual assessments recorded upon the older locations, among which may be mentioned the *Old Ironsides* group of five claims. These contain limonite-iron ore, of which it has been estimated there is a large tonnage in sight, assaying about 50 per cent. iron. These claims are situated on Summit creek, about thirty-seven miles up from the mouth of the Zymoetz river.

The *Lucky Seven* group, upon which work only for the purposes of assessment has been performed, is reported to have a very good showing. Assays of ore taken from this property give high values in gold.

Kitsalas.

In the vicinity of Kitsalas fifty-nine new locations and assessments on all the older claims have been recorded.

During the year 1913 greater interest has been taken in mining, practically throughout the whole of the Omineca Mining Division.

Placer-mining.

In the early fall placer gold was found by A. G. Goodwill on Sibolla creek, a tributary of the Tahtsa river, which is in the south-western portion of this Mining Division, and near the eastern base of the Coast range. This led to 107 placer-mining claims being staked, but, owing to conflicting reports, it is impossible to venture any estimate as to the value of the properties.

Forty-six new leases have been granted during the year 1913 upon the Omineca river and tributary creeks.

From a report received from George W. Otterson, general manager of the Kildare Mines, Limited, the owners of fourteen hydraulic leases on Slate creek, it is learned that his company had a crew of eight men constantly employed upon the property throughout the season.

On March 15 work was commenced by overhauling and repairing the old plant, but actual mining operations were not started until the latter end of July, owing to some of the new machinery not arriving, on account of the difficulty of securing pack-trains until September 21st—too late in the season to be of any use; very little actual mining was accomplished. However, Mr. Otterson states the plant, machinery, and equipment will all be on the ground and in place in time for full advantage to be taken of the entire mining season in 1914.

The Omineca Gold Mines, Limited, owning fourteen placer-mining leases on Quartz and Vital creeks, worked a crew of men on its properties all the season, but no details so far have been received from this company.

G. H. Knowlton and associates, of Vancouver, who are the owners of twenty-one placer-mining leases on Silver creek, and the Omineca river, have, during the past season, been continuing a wagon-road from Takla lake towards Old Hogem, to facilitate the importation of dredging machinery to be placed in operation on their properties.

The Cassiar Hydraulic Mining Company, with placer-mining leases on Gold creek, Skeena river, has installed new machinery to the value of $4,000, but had the misfortune during the past season, owing to the high water, of losing a large portion of the flume, which had to be replaced, thus delaying actual mining operations.

Below you will find the mining statistics of this office for 1913. The revenue derived from this source shows an increase of more than 50 per cent. over the revenue derived from the same source in 1912.

OFFICE STATISTICS—OMINECA MINING DIVISION.

Free miners' certificates (ordinary)	1,008
" " (special)	11
" " (company)	9
Mineral claims recorded	493
Certificates of work issued	818
Certificates of improvement issued	25
Bills of sale and other documents of title	215
Powers of attorney	212
Partnership agreements recorded	5
Documents filed	98
Placer claims recorded and re-recorded	127
Placer-mining leases granted, hydraulic, creek, and bench	31
Placer-mining leases granted, dredging	15
Crown grants of mineral claims issued	25

Revenue.

Free miner's certificates	$ 5,730 25
Mining receipts	15,792 15
Total	$21,522 40

OMINECA MINING DIVISION.

NOTES BY WM. FLEET ROBERTSON, PROVINCIAL MINERALOGIST.

The Provincial Mineralogist has been favoured by certain mining engineers and others with private notes, or reports, on properties examined by them, from which, by permission, the following notes have been extracted, and are herewith submitted, to supplement the report of the Gold Commissioner of the district.

COAL-AREAS ON THE HEADWATERS OF THE ZYMOETZ RIVER.

These areas were examined in the fall of 1913 by Mr. Rice, of the firm of R. W. Hunt & Co., engineers, of Pittsburg and Chicago, a firm of such wide and favourable reputation that its report is of more than usual interest.

These areas have already been noted in the Minister of Mines' Report for 1911, page 93, and have been under development for some years.

The claims are held by the Copper River Coal Syndicate, represented by the North American Securities, Limited, of Vancouver, and are located on Coal creek, a tributary of the Zymoetz river, near its headwaters, and about forty miles by the sleigh-road recently constructed from the town of Telkwa, on the line of the Grand Trunk Pacific Railway. It is from Telkwa that it would be proposed to build a branch railway for the exploitation of the property.

The general location of the property is designated on a map accompanying the Report of the Minister of Mines for 1911. The property, as surveyed, embraces some twenty sections of a square mile each. The Report mentions six seams numbered from 1 to 6.

The following is a rough summary of the description given of the various seams:—

No. 1 Seam or Main Seam.—The dip of this seam is about 29 degrees, and it has a total thickness, including partings of 9 feet 6 inches, or, discarding the lower 12 inches as carrying too much ash, of 8 feet 6 inches, in which there is a total of 7 feet 7½ inches of clean coal. The following are analyses of samples from different sections of the seam: (A.) Sample of entire seam below clay-band, including all partings. (B.) Sample of top 4 feet 10 inches, below heavy clay-band. (C.) Picked sample first 30 inches below heavy clay-band. (D.) Top 3 feet above the heavy fireclay-band.

	A.	B.	C.	D.
Moisture	3.08	5.10	5.56	3.80
Volatile combustible matter	32.16	33.76	35.65	37.24
Fixed carbon	53.31	53.58	55.25	53.85
Ash	11.45	7.56	3.54	5.11
Sulphur	0.51	0.53	0.46	0.38
B.T.U.	11,941	12,694	13,258	13,208

No. 2 Seam or 6-foot Seam.—This seam is about 50 feet stratigraphically above No. 1 seam, and dips at 29 degrees to north-west, having a fireclay roof. The thickness of the seam is 5 feet 6 inches, but this includes several clay-partings, two of which are quite heavy—one, 5 inches, and the other, 9 inches.

The coal-seam does not show up as well as No. 1 seam on account of its high ash, especially in the lower part of the seam, but the ash could be materially reduced by washing, so that the washed coal would be almost as good as in No. 1 without washing.

The following is the sampling and analysis of this No. 2 seam: (A.) Sample from entire seam, including all partings, except main parting near the centre of the seam. (B.) Sample from the bottom 3 feet of the seam, not including partings. (C.) Sample from top 2 feet 6 inches of seam, not including partings.

	A.	B.	C.
Moisture	5.59	6.20	4.89
Volatile combustible matter	31.96	34.28	36.81
Fixed carbon	47.61	47.12	51.32
Ash	14.84	12.40	6.98
Sulphur	0.44	0.44	0.43
B.T.U.	10,876	11,175	12,734

Seam No. 3.—This seam is from 60 to 70 feet stratigraphically above No. 2 and has the same strike and dip. It has a thickness of about 3 feet of coal divided by two heavy partings. This seam is not looked upon at present as of commercial importance. It has been driven on for about 210 feet.

Seam No. 4.—This seam is 28 feet above No. 3 and with the same strike and dip. It contains 2 feet of coal in two layers, with a 3-inch parting between them. The seam has been tunnelled parallel with the strike for 110 feet without showing material change.

Seam No. 5.—This was the original, or Discovery, seam, and outcrops in the bed of Coal creek; it lies 38 feet above No. 4, with the same strike and dip. There is about 20 or 22 inches of coal in this seam, with a 2-inch clay-parting near the bottom of the seam. The seam is not considered commercially important at present. It has been drifted into to a depth of 108 feet.

Seams 3, 4, and 5 have not either a good roof or good floor, while Seams Nos. 1 and 2 have both a good roof and good floor.

Seam No. 6.—This seam also outcrops on Coal creek, but at a distance of one mile and a half from No. 5 or Discovery seam, and some of the coal contains conglomerate pebbles. Its exact relation to the other seams has not been determined; it is not regarded as of present commercial importance.

General.—It would seem that, as far as the Report covered, the value of the field is dependent on Seams Nos. 1 and 2, of which the analyses have been given, the samples having been taken as the coal would be commercially mined.

These coals are semi-coking; that is, they would probably make a metallurgical coke in a by-product oven, although possibly not in a bee-hive oven.

While the coal-seams have been somewhat broken by upheaval, such is not sufficient to interfere with production of a large percentage of lump coal.

The coal seems to withstand the weather, as coal from No. 2 vein has been lying outside for two years and shows no sign of slacking. The coal can be classed as bituminous and is well suited for steaming or domestic use.

IRON CLAIMS ON ZYMOETZ RIVER.

The following is a condensed summary of the report of John V. Rittenhouse, consulting mining engineer, Seattle, Wash., on the iron claims owned by the North Pacific Iron Mines, Limited, Prince Rupert, British Columbia:—

Location.—The property is situated on the headwaters of Summit creek, a tributary of the Zymoetz river, about thirty-eight miles east of Copper City, which is at the junction of the Zymoetz and Skeena rivers, in the Omineca Mining Division. The company owns nine full

and fractional claims, covering a total area of approximately 375 acres, located on the hill sloping north from Summit creek at an elevation of from 2,800 to 5,000 feet. The property is well timbered and watered, there being a sufficient supply of both for all development purposes; hydraulic power can be obtained from Summit creek. Transportation, when the property shall have been sufficiently developed to warrant it, will be obtained by means of a railway to Copper City, on the Grand Trunk Pacific Railway. From data obtained from a preliminary survey of the Grand Trunk Pacific from Telkwa to Copper City, the length of this railroad would be about sixty miles.

Description of Deposit, Ore, etc.—The iron-deposit is exposed at different places over the hillside, which lies at an angle of 30 degrees. It appears to be of the nature of a surface deposit of bog-iron ore or limonite, but sufficient development-work has not yet been done to prove the thickness or extent of the deposit. A number of open-cuts and trenches have been dug which show iron ore here and there over an area of 200 acres. These open-cuts were made entirely with pick and shovel, no explosives being necessary, and were made, practically, at random at various points on the claims. Mr. Rittenhouse says: ". . . the measurement of the showings justifies the conclusion that, of the 375 acres in the group, at least 200 acres are underlain by the iron-deposits to the minimum depth of 15 feet." From this he deduces "a known deposit of 7,500,000 tons."

The following assays show the quality of the ore:—

No. 1 was taken on the surface directly under the moss; No. 2 was taken at a depth of 10 feet; and No. 3 at a depth of 25 feet.

	No. 1.		No. 2.		No. 3.	
Iron (Fe.)	53.2	%	53.2	%	54.0	%
Sulphur (S.)	2.65	"	1.89	"	1.15	"
Phosphorus (P.)	0.0016	"	0.014	"	0.002	"
Silica (SiO_2)	1.31	"	1.62	"	1.04	"
Weight per cubic foot in place	141	lb.	125	lb.	1.32	lb.

Analyses by Falkenburg & Laucks, Seattle, Wash.

The samples submitted to the Provincial Mineralogist at Victoria gave the following returns:—

Iron	50.6 %
Sulphur	0.8 "
Phosphorous	*Nil.*
Silicia	1.7 "

These assays show that the ore is fairly good iron ore, with the phosphorus-content negligible and the sulphur only slightly higher than the Bessemer pig-iron limit.

Mr. Rittenhouse recommends, in conclusion, that extensive drilling be carried out to determine the thickness and continuity of the deposit.

Babine Lake.

Newton W. Emmens, M.E., of Vancouver, who had occasion to visit Babine lake this past summer, very kindly supplied the Provincial Mineralogist with a description of the district and of the mineral deposits he saw there, from which the following notes have been extracted:—

The shortest and easiest route to Babine lake from the Grand Trunk Pacific Railway at present is by the trail which starts at Burns lake, crossing the southern end of the Babine range by a low pass, via Divide and Pinkut lakes to Donald's cabin on the shore of Babine lake, about twenty-four miles down the lake from its upper or eastern end. This trail, which is an easy one to pack over, is twenty-one miles long, and the maximum altitude attained by it is 3,150 feet above sea-level.

The country eastward from the Coast range, when viewed from a height, gives the impression of a desiccated peneplane, and is undoubtedly the remains of an ancient plateau which was elevated contemporaneously with the Coast range. Babine lake, which is 110 miles long by two to eight miles wide, occupies an ancient pre-glacial valley which has been scoured out and deepened by ice-action. It lies between the southern end of the Babine range on the west and a range of low hills on the east, forming the divide between the Babine and Takla Lake watersheds. To the west and north-west the country is rugged and mountainous, attaining elevations of 6,000 to 8,000 feet, while to the east and south it slopes away into rolling intermountain plateau country.

The country around Babine lake is well timbered with spruce, jack-pine, alder, poplar, and cottonwood; few of which exceed 12 inches in diameter. The underbrush is, as a rule, not thick, but a heavy mantle of wash over the country makes prospecting difficult.

Geologically, the rocks in this section belong to the porphyrite group of the Cretaceous era, together with a series of coarsely crystalline igneous rocks of later age, which have been named by an officer of the Geological Survey of Canada as "the later eruptives," and are probably of Tertiary age. The porphyrite group consists of andesites, tuffs, and agglomerates, while the later eruptives are mainly diorite-porphyry, syenite-porphyry, and granite-porphyry. This latter series of rocks appear to have been the chief mineralizing agent in the district, as it is in association with them that the principal ore-bodies have been discovered.

Eight miles east of Donald's cabin, and a mile off the south shore of Babine lake, is a small island locally known as Silver island, on which are a series of quartz veins carrying copper and silver minerals. The vein on which most work has been done is known as the *Silver* vein, and is from 4 to 8 feet wide, following a line of fissuring in a dioritic rock and having a north-westerly and south-easterly strike. The mineralization is pyrite, chalcopyrite, arsenopyrite, and grey copper in a siliceous gangue, while, near the centre of the vein, there is a streak of high-grade ore containing grey-copper and native silver in a gangue of calcite, quartz, and barytes. The vein has been traced on the surface for a distance of 100 feet, and an adit tunnel, commenced on the water-level, has been driven a distance of 72 feet on the vein. Assays of selected samples taken from the surface give high values in silver and copper. Three other veins have been discovered, selected samples of which assay well, but very little work has yet been done on them.

Opposite Marble point and about three miles back from the shore of the lake, some claims have been located on veins showing galena, which is said to carry good gold values.

On Copper island, one of a group of islands in an arm of Babine lake, about twelve miles north-west of Wright bay, deposits of copper-ore have been discovered and prospected to some extent. The island is composed mainly of the later eruptives, together with some exposures of the porphyrite group; while, near the north-east corner of the island, there is an exposure of a dense dark-coloured igneous rock (trap) forming a low cliff rising from the lake at that place. The copper-bearing minerals, bornite, chalcopyrite, and malachite, are disseminated through fractures and fissures in the igneous rocks, together with more or less cementing quartz, thus giving rise to a brecciated structure.

One adit tunnel 77 feet long, driven into what is locally known as the "bare hill," is in mineralized diorite-porphyry all the way. A sample taken across the face, over a width of 52 inches, assayed 0.03 oz. gold, 0.26 oz. silver, and 1.4 per cent copper. Another adit 565 feet south of the former one has been driven 55 feet, all in ore, which, however, owing to its being very close to the surface, shows much leaching, the chief mineral being malachite with only subordinate amounts of sulphides. A sample from the face assayed 0.12 oz. silver and 0.75 per cent. copper, and a sample taken along the left, or west, wall of the drive assayed 0.06 oz.

silver and 1 per cent. copper. A prospecting-shaft has been sunk to a depth of 27 feet on one outcrop; a sample from the bottom assayed 0.01 oz. gold, 0.19 oz. silver, and 1 per cent. copper; and another sample, taken down the side of the shaft, returned 0.02 oz. gold, 0.25 oz. silver, and 1.1 per cent. copper.

On the south-west corner of the island an adit tunnel has been driven 36 feet on a galena vein, 4 to 16 inches in width; the galena is said to carry good values in gold and silver.

Several veins, or mineralized zones, have been discovered on a peninsula eight miles north-west of Copper island, the locations being known as the *Newman* group. The ore minerals are pyrite, chalcopyrite, and zinc-blende, carrying gold, silver, and copper in a siliceous gangue. The Nos. 1 and 2 veins are said to be 50 and 30 feet wide respectively, and are developed by adit tunnels 55 and 40 feet long, showing more or less ore throughout. A sample of the No. 1 vein, presumably of selected ore, assayed 1.05 oz. gold, 44 oz. silver, and 4.35 per cent. copper. The other veins show similar mineralization, but in places carry considerable zinc.

GERMANSEN CREEK.

The Royal Standard Investment Company of Vancouver has been doing some work this past season in prospecting its leases on Germansen creek. The work was in charge of H. B. Perks, from whose report to his company the following extracts have been made:—

The property consists of dredging leases on the Omineca river and hydraulic leases on Germansen creek, at its junction with the Omineca river and near the old town of Germansen.

A comfortable camp was erected and supplies brought in from Hazelton, the freight rate being 15 cents a pound during the summer months and 20 cents a pound in the winter.

The ground prospected this past summer is a large flat, or bar, on the bank of the Omineca at the mouth of Germansen creek, estimated to have an area of 4,500,000 square yards. The average height of the bar above river-level is about 6 feet; this was sampled systematically by first laying the ground out in squares of 600-foot sides, and, at the corners of the squares, where possible, test-shafts were sunk, and the material from these tested as to its gold-tenure by suitably washing, etc.

In all, some fifty-two such shafts were sunk and tested; the average depth of shafts was 6 feet, it being found impracticable to sink any of them below the level of the water in the river.

The pannings varied from nothing to 43 cents to the cubic yard, and Mr. Perks averages them at 5.06 cents to the cubic yard. The higher values were obtained in a portion of the gravels which appeared to be older than the present river-gravel deposits, and, he says, the lower layers of this were increasingly richer.

From this indication Mr. Perks argues that, although the depth of 2 yards tested only ran 5 cents, he is justified in calculating the depth of the gravels to 10 yards deep, and to place the average value of entire deposit at 20 cents a yard.

To quote from his report: "I am placing the average value of your entire deposit at 20 cents a yard; it will run higher, not less, due to the natural progressive increase of values from top to bottom in such a deposit, without considering the concentration on bed-rock."

The quantity of gravel as calculated by Mr. Perks is the area of 4,500,000 square yards by the depth of 10 yards, equalling 45,000,000 cubic yards.

While it is hoped that Mr. Perks's assumption as to values, etc., may prove correct, it is felt that it would be advisable to corroborate them by actual tests.

NORTH-EAST KOOTENAY DISTRICT.

GOLDEN MINING DIVISION.

REPORT BY H. C. RAYSON, GOLD COMMISSIONER.

I have the honour to submit the annual report on mining in the Golden Mining Division for the year ending December 31st, 1913.

Mining operations in this Division have been practically at a standstill, and nothing beyond the necessary assessment-work has been done.

The *Monarch* mine on Mount Stephen, near Field, was worked for a time and appeared to be doing very well, but, owing to some financial troubles, it has been closed down for some time, although I believe that matters are now being satisfactorily arranged, and it is expected that the mine will very shortly be again operated on a better footing than ever.

The Kootenay Central Railway is now being pushed forward with all possible speed, and, it is expected, will be opened between Golden and Fort Steele in the summer of 1914, when, there is no doubt, more prospecting and development-work will be done, as there are considerable deposits of low-grade ore on the Spillimacheen river, and also to the west of Carbonate, on the Columbia river.

OFFICE STATISTICS—GOLDEN MINING DIVISION.

Mineral claims recorded	19
Certificates of work issued	22
Mining leases in force	2
Re-recorded leases	1
Free miners' certificates (ordinary)	84
" " (company)	4

Revenue.

Free miners' certificates	$ 760 25
General mining receipts	453 50
Tax on Crown-granted mineral claims	398 50
	$1,612 25

WINDERMERE MINING DIVISION.

NOTES BY PROVINCIAL MINERALOGIST.

Very little actual mining-work has been carried on in this Division during the past year, but annual assessment-work was kept up as usual on a number of claims. This Bureau has no information that there was any ore shipped from this Division in 1913. The attention which has been given of late to fruit-farming and agriculture generally, together with the necessary irrigation-ditches has provided work for all the available men in the district, with the result that very little prospecting was done. This section has for many years remained in a quiet condition awaiting the advent of the Kootenay Central Railway from Fort Steele to Golden.

The completion of this railway, which should soon be an accomplished fact, will undoubtedly help considerably the successful exploitation of the latent mineral possibilities of the district, by permitting the shipment of low-grade ore which cannot now be handled at a profit.

The Windermere Mining Division has been reported on from time to time by the Provincial Mineralogist; first in 1898, second in 1903, and lastly in 1909, his notes being recorded in the Minister of Mines' Annual Reports for those years. A number of properties have been worked at different times and small amounts of ore shipped therefrom, but of late years there has been very little attempt at serious mining, as all have been waiting for more adequate transportation.

To the west of the valley on Horse Thief, Toby, Spring, and other creeks there are a number of properties which have promising surface showings, and which will probably be further developed in the near future.

The mineral showings are mostly confined to the hills on the west side of the valley, which are part of the Selkirk range. On the eastern side of the valley is the Rocky Mountain range, in which, as yet, not much mineral has been found. The ore-deposits occur mainly in the form of fissure-veins cutting schistose rocks and carrying streaks of high-grade silver-lead ore. These veins vary from a few inches up to several feet in width and seem to be well defined and very persistent. The ore minerals found are galena, copper-pyrites, and grey copper, carrying values in silver and copper and sometimes a small amount of gold. The gangue is, as a rule, quartz, together with some calcite. The pay-shoots would seem to be rather irregular, but still, from the previous reports on the district, the conclusion seems warranted that many of the properties are worth further exploration.

Mineral Springs.

In Sinclair pass there is a series of three hot springs which is known as Sinclair Hot Springs. The temperature is variously estimated by different writers as from 108° to 150° Fahr. A sample of this spring-water was analysed by the Chemistry and Mineralogy Department of the Canadian Geological Survey in 1894, and was found to be as follows:—

"The sample received for examination was found to contain a small quantity of suspended matter, consisting of organic matter with traces of ferric hydrate. The filtered water had a faint brownish colour; was devoid of any marked odour or taste, and reacted neutral—both before and after concentration. It was found to have a specific gravity, at 15.5°C., of 1,000.77, and to contain 0.687 parts of dissolved saline matter, dried at 180°C., in 1,000 parts, by weight of the water, or 48.16 grains per imperial gallon.

"A qualitative analysis showed it to contain—

Potassa	Trace.
Soda	Small quantity.
Lime	Somewhat large quantity.
Magnesia	Very small quantity.
Ferrous oxide	Traces.
Sulphuric acid	Small quantity.
Carbonic acid	Small quantity.
Chlorine	Very small quantity.
Silica	Traces.
Organic matter	Traces.

"Boiling produced a somewhat small precipitate, consisting mainly of carbonate of lime with a little carbonate of magnesia."

In 1912 water from this spring was examined by Dr. McIntosh, of McGill University, who reports that it exhibits radioactivity in a marked degree. While it is a common occurrence for spring-waters to exhibit radioactivity through containing in solution radium-emanations

(or rays), it is quite rare to find any that contain minute quantities of radium salts in solution. According to Dr. McIntosh, this spring-water does contain an infinitesimally small amount of radium salt in solution—namely, about one part in 4,000,000,000. For years back these springs have been supposed to have great curative powers for rheumatism and other diseases, a belief strongly held by the Indians of the district. It is quite possible that the curative powers of these waters are due to the radioactive properties they possess. It is interesting to note that these spring-waters are more highly radioactive than the famous springs at Bath, England.

Near Brewer's Ranch, about thirteen miles south of Windermere and only a few hundred yards from the main road, there is a series of hot springs, known as Fairmont Springs, which at this point bubble out from the side-hill. The waters as they leave the ground have a temperature of from 90° to 120° Fahr.

These springs, some twenty or twenty-five in number, cover an area of several acres and are of varying size and temperature, the largest running about as much water as would come out of a 3-inch pipe under a 10-foot head.

The water is as clear as crystal and is evidently highly charged with lime and a little iron, judging from the deposits which form on the surface around the springs. This deposit forms in the shape of a circular basin with the spring in centre—regular natural baths—much used as such by the people of the locality, who credit the waters with great medicinal properties, a belief handed down by the Indians of the neighbourhood. There are several of these basins in the creek-bottom with waters at a temperature of 100° Fahr., while within 5 feet flows a good-sized creek with water at 40 degrees, providing the "hot bath and cold plunge" of the Turkish bath.

The Windermere District is one of the most picturesque sections in British Columbia, and it would seem as if a greater effort should be made to induce tourists to visit it, by providing suitable accommodation, etc. The country around is exceedingly beautiful, with good fishing and shooting for the sportsman; boating, bathing, and mountain-climbing for those desiring such sports; and a dry, healthy climate with a delightful summer season. The hot springs, already described, should attract many, and doubtless in the future, when better provision has been made, this section will take its rightful place as one of the most charming tourist resorts of the Province.

WINDERMERE MINING DIVISION.

REPORT OF GEO. F. STALKER, MINING RECORDER.

I have the honour to submit the annual report on mining operations in the Windermere Mining Division for the year ending December 31st, 1913.

Mining operations in this district show a marked increase over the year 1912; much greater interest has been taken by mining-men than has been for several years.

Several companies have been formed and will develop different properties. The Black Diamond Mining Company has purchased the *Black Diamond* group of claims, and since October has been developing the property; work will be continued throughout the winter. The force of men now employed on this property will be increased in the spring.

In the year 1912 a great many claims were staked on Prospector creek, in the Kootenay valley; these claims have been taken over by the Zenith Mines, Limited, of Calgary, Alberta, which has done a great amount of work in connection with these claims this year.

Findlay creek also drew the attention of prospectors this year, with the result that many new claims were staked on this creek.

The certificates of work issued this year show a favourable increase over 1912, and, taking all things into consideration, it would appear that, now that the Kootenay Central Railway is almost completed, this district will have greater attention paid to it than in the past, and many of the properties now lying idle, owing to inadequate transportation facilities, will be reopened and commence the shipment of ore.

OFFICE STATISTICS—WINDERMERE MINING DIVISION.

Free miners' certificates issued	74
Locations recorded	45
Certificates of work recorded	75
Bills of sale and transfers recorded	30
Revenue	$2,847 35

SOUTH-EAST KOOTENAY DISTRICT.

FORT STEELE MINING DIVISION.

REPORT BY N. A. WALLINGER, GOLD COMMISSIONER.

I have the honour to submit a report on the progress of mining in the Fort Steele Mining Division for the year 1913.

The following table shows approximately the number of mineral claims held during each year since 1899:—

Year.	Held under Crown Grant or Certificate of Improvement.	Certificate of Work.	New Locations.
1899	37	718	729
1900	71	704	470
1901	104	642	455
1902	117	451	253
1903	142	335	200
1904	167	260	169
1905	189	193	181
1906	241	235	160
1907	254	160	115
1908	264	150	100
1909	280	154	116
1910	294	161	179
1911	307	167	96
1912	316	143	145
1913	319	139	104

The *North Star* group, on Mark creek, has remained shut down since 1910, and it is probable that it will not be opened up again until some economic method of reducing low-grade refractory ores has been successfully demonstrated; this also applies to the *Stemwinder* group, an adjoining property.

Sullivan Group.

The *Sullivan* group, on the east side of Mark creek, has been worked steadily during the year and shipped almost 32,000 tons of ore, besides the initiation of new development-work. This group is under the control of the Consolidated Mining and Smelting Company of Canada, Limited, which has shipped strongly during the year, and at the same time carried on diamond-drilling operations, with so much success, it is claimed, as to have found large bodies of reserve ore, which will guarantee continuance of activity in this camp, and which, it is hoped, will in the near future extend to the *North Star* and *Stemwinder* groups.

Notes by Provincial Mineralogist.—The *Sullivan* mine, owned by the Consolidated Mining and Smelting Company, during the past year produced the second largest output of lead of any mine in the Province, its output being only slightly exceeded by that of the *Standard* mine at Silverton. Since its acquisition four years ago by the present owners this property has been systematically developed, with the result that it is now better equipped and has larger ore-bodies proved than ever before.

During the past year the mine was worked steadily with a force of about 100 men, and shipped 31,189 tons of ore, containing 324,729 oz. silver and 17,175,905 lb. lead, to the Trail smelter.

The following description of the *Sullivan* ore-body is taken from J. J. Schofield's reconnaissance in East Kootenay, Geological Survey of Canada, Summary Report, 1911 :—

"*Sullivan Group.*—This group was discovered in 1895 and is located on Sullivan hill, two miles and a half by road north of Kimberley, at an elevation of about 4,600 feet above sea-level. The deposit lies in the lowest-known subdivision of the Purcell series, which here strikes about north and dips from 10 to 60 degrees to the east. The country rocks consist of thin-bedded argillaceous quartzites and heavy-bedded, purer quartzites. The ore-body conforms in dip and strike with the quartzites and cannot be called a true fissure-vein, but a replacement deposit in which the sulphides have replaced the fine-grained quartzites. The hanging and foot walls are, in general, not well defined, but the ore gradually passes into the normal country rocks, so that the distinction between country-rock and ore is commercial rather than structural. Exceptions to this occur where the walls consist of the thin-bedded slaty quartzites, which are evidently difficult to replace. In the upper workings close folding, later than the ore-deposition, increases the apparent width of the deposit. On the 60-foot level the dip of the ore-body in places approximates 25 degrees, and on the 100-foot level the dip increases to 70 degrees, which is also the dip of the surrounding quartzites. As far as exploited, the maximum stope width is 120 feet and the maximum stope length 325 feet. There are nine levels, the deepest being 100 feet below the surface. The deposit is a lens-shaped mass striking about north and south, with a dip to the east.

"The ore-body is arranged in distinct zones which grade imperceptibly into each other. The centre of the body is occupied by a fine-grained mixture of galena and zinc-blende in which masses of purer galena occur as lenses. The gangue in this inner zone is absent, except for a few well-formed crystals of pink garnet. This inner portion gradually passes exteriorly into a fine-grained mixture of pyrite, pyrrhotite, and zinc-blende, which contains as a gangue numerous crystals of a clear colourless garnet, with some grains of anthophyllite and possibly diopside. The sulphides gradually diminish in amount and finally give way to a fine-grained chert, which is present where the country-rock is a heavy-bedded, purer quartzite, and is absent where a more argillaceous slaty member constitutes the wall-rock. The chert gradually passes into the normal country-rock. The contact minerals occur only in the ore-body and are entirely lacking in the country-rock surrounding the deposit. The presence of the minerals garnet and diopside, so characteristic of contact deposits, is not due to any intrusion of igneous material at present visible, for the nearest outcrop of granite is four miles away near Wycliffe, on the St. Mary prairie. The presence of the minerals garnet, pyroxene, and pyrrhotite warrants the conclusion that the *Sullivan* ore-body was formed under conditions of high temperature and pressure, and in origin was connected with some deep-seated intrusion of granite which has not yet been exposed by erosion in the neighbourhood of the *Sullivan* mine."

During the past year the development-work at the mine included driving two lower levels north, and, in addition, a lot of diamond-drilling was done. In all, about 5,000 feet of narrow work and about 5,000 feet of diamond-drilling was carried out. Additions to plant included auxiliary steam-boilers at Mark creek, so that the 30-drill air-compressor there may be driven altogether by steam, or by part steam and part water, when water-power is not available or is insufficient. Building improvements made were: New machine, blacksmith, and carpenter shops; dry-house, storehouse, etc.; and, in connection with accommodation for the employees, a large dining-room and kitchen. A steam-heating system was put in at all the men's buildings.

The development-work at the mine has resulted very satisfactorily; the reserves of lead-ore having been considerably increased, and much of the ore opened up having proved to be of higher grade. The zinc-lead ore sorted out before shipment of the ore to the smelter is stored for later treatment whenever a suitable plant shall be provided.

The *St. Eugene* group, on the east side of Moyie lake, has still a force of some thirty men, shipping a few car-loads and prospecting generally.

On the *Aurora* group, after considerable prospecting during 1313, particularly in the lower drift, the management has been unable to locate any large body of ore and has closed down temporarily, but will probably open up again.

The *Society Girl* group, on the east side of Moyie, has been steadily going ahead, shipping a small quantity of ore, but not yet in the list of regular shippers.

Some little interest in mining has appeared, particularly with regard to the Perry creek and St. Mary districts. The interest on Perry creek is still maintained, and the attention of outside capital is being drawn to the free-gold quartz characteristic of this camp. The ledges being wide and continuous on the surface and free from anything deleterious to free-milling and cyaniding, makes these low-grade bodies an excellent subject for an industrial investigation.

Two or three discoveries on Whitefish creek of large bodies of low-grade copper associated with diorite has drawn some attention to the St. Mary country, and it is confidently expected that these will be thoroughly prospected during 1914.

OFFICE STATISTICS—FORT STEELE MINING DIVISION.

Mineral claims recorded	104
Placer claims recorded or re-recorded	0
Certificates of work	139
Certificates of improvement issued	12
Conveyances and other documents of title	19
Partnership agreements	1
Gold Commissioner's permits	2
Documents filed	20
Affidavits filed	194
Mining leases issued	1
Mining leases in force	37
Free miners' certificates (ordinary)	279
" " (company)	2
" " (special)	1
Crown grants issued	3

Revenue.

Free miners' certificates	$1,272 00
Mining receipts	736 75

NORTH-WEST KOOTENAY DISTRICT.

REPORT OF ROBERT GORDON, GOLD COMMISSIONER.

I have the honour to submit herewith the annual report on the progress of mining within the Revelstoke and Lardeau Mining Divisions for the year ending December 31st, 1913.

No improvement has taken place in any part of this district as far as quartz or lode mining is concerned, very little interest being evinced, either by the claim-holders or investors, in this class of property.

A slight revival of interest in placer-mining was shown, particularly on French creek, where from twenty-five to forty men were employed throughout the greater part of the year, mostly by the Pioneer Placer Mines, Limited.

This company has installed a testing-drill, hoisting and electric-lighting machinery, has done a considerable amount of prospecting on its property, and is supposed to have lately struck "pay-dirt."

The Goldstream Placer Mines, holding three leases on the same creek, has also done quite a lot of prospecting during the year.

Some work has also been done on several placer claims, and gold enough to cover good wages for the men employed taken out.

Some development-work has been done at the *Lanark* mine, near Laurie, but the results have not been communicated to this office.

OFFICE STATISTICS—REVELSTOKE MINING DIVISION.

Free miners' certificates issued	116
Claims recorded (mineral)	6
" (placer)	1
Certificates of work recorded	22
Placer leases granted	4
Agreements and powers of attorney filed	2

LARDEAU MINING DIVISION.

REPORT OF WM. A. STRUTT, MINING RECORDER.

I have the honour to submit herewith my report of the progress of the mining industry in the Lardeau Mining Division for the year 1913.

The mining operations in this district show very little increase over the past year, in so far as development-work is concerned, which was limited as in the year 1912.

It is hoped that operations will resume at an early date, to re-establish the confidence in this Division.

OFFICE STATISTICS—LARDEAU MINING DIVISION.

Free miners' certificates	35
Certificates of work	52
Payments in lieu of work	1
Locations recorded	40
Agreements and transfers recorded	14

SLOCAN DISTRICT.

AINSWORTH, SLOCAN, SLOCAN CITY, AND TROUT LAKE MINING DIVISIONS.

REPORT BY R. J. STENSON, GOLD COMMISSIONER.

I beg to submit the annual report for the Ainsworth, Slocan, Slocan City, and Trout Lake Mining Divisions for the year 1913.

Mining throughout the above Divisions for the year has been the best for years, as shown by reports following, particularly those of the Slocan and Ainsworth Divisions. It is the general opinion that mining development and production for 1914 will exceed that of the year just ended. In connection with the mining future of the district, it should be noted that the reduction of the duty on zinc ore into the United States has stimulated the zinc shipments from the Slocan Division. This stimulation should extend to the Ainsworth Division upon the completion of the rebuilding of the Kaslo & Slocan Railway.

AINSWORTH MINING DIVISION.

The opinion of mining men is that, with the present confident feeling as to the future of the mines, the reopening of the Kaslo & Slocan Railway will bring about increased local mining activity, particularly the South fork of Kaslo creek, where the outlook is stated to be most promising when transportation shall be available. These views would seem to be justified the activity in other mining divisions not handicapped by disrupted transportation.

Bluebell Mine.—The mine and plant at *Bluebell* mine, Riondel, were operated throughout the year, giving employment directly to slightly less than 100 men. The tonnage of ore mined and milled was 80,460. Further development at depth is being carried on, and at the close of the year had advanced to a vertical depth of 200 feet below the level of Kootenay lake. No changes of importance to plant or equipment were made during the year.

The *No. 1*, *Highland*, *Maestro*, and *Banker*, at Ainsworth, were operated by the Consolidated Mining and Smelting Company, Limited.

At the *No. 1* mine an average of sixty men has been employed, thirty-five being underground. About 5,000 tons of silver bearing ore was shipped; 1,377 feet of development-work was performed. The terminal facilities at Cedar creek were improved and a pipe-line was laid for new Cedar creek power plant; a pole-line was constructed and wires strung between the power plant and the mine.

At the *Highland* mine the average number of men employed was sixty-five, of whom twenty were on the surface; 5,266 tons of ore was mined, of which 5,023 tons was milled and 1,100 tons of crude ore and concentrates shipped; 2,514 feet of development was performed.

The *Highland* mill was repaired and some new machinery installed; the tramway was repaired and terminal facilities improved; a new boarding-house was erected at the mine.

At the *Maestro* and *Banker* an average of fifteen men was employed, of whom ten were underground; 156 tons of ore was shipped; 920 feet of development was performed.

Annual assessment was performed and surveys made for the purpose of obtaining Crown grants for several of their un-Crown-granted claims.

The *Whitewater* mine, operated by J. L. Retallack & Company, worked an average of eighteen men during the year, shipping to the Trail smelter 510 tons of ore and accomplishing 1,770 feet of development.

The Deeps Mine, Limited, during the period from January 1st to July 31st, 1913, developed to the extent of 1,175 feet, at which latter date the mine closed down; fourteen men were employed.

The *U.S.* mine shipped 110 tons of 54-per-cent. zinc ore to Kansas.

The *Eureka* mine, operated by E. R. Davidson, of Spokane, has been developed at the rate of 100 feet a month. Five men were employed. Good showings in Nos. 1 and 2 tunnels.

The *Revenue*, on the South fork of Kaslo creek, did considerable work during the summer, and shipped 16 tons of ore.

The *Panama* employed four men during the year, which force will be doubled in the spring. Work to the extent of 400 feet was done, consisting of drifts, winzes, and upraise; at present a winze is being sunk below the lowest level to determine the position and size of the ore-body; 70 tons of silver-lead ore was shipped.

Black Prince No. 2, on Kaslo creek. L. A. Lemon, the owner, has driven a 30-foot tunnel and several open-cuts, and has uncovered about 18 inches of lead ore and carbonates. It is the intention, in the near future, to erect some more buildings, the clearing for which was done last summer.

The *Florence Silver* group, on Princess creek, operated by F. R. Wolfle, employed, on an average, ten men during the year, mined about 100 tons of ore, and installed two air-compressors. He contemplates erecting a concentrator and driving a 1,500-foot tunnel to tap ore-body at 400 feet depth.

The Silver Hoard Company, operating near Ainsworth, worked steadily all year and shipped quite a tonnage.

The *Utica* mine, situated on Paddy's peak, has been operated continuously during the year under the management of C. F. Caldwell, a crew of thirty men being employed; the pay-roll aggregated $30,000. Ore shipments netted, approximately, $45,000 from a tonnage of 660 tons. An experimental shipment of 40 tons of zinc ore was made during the year to Pueblo, Colorado; the returns were very satisfactory. The sawmill erected late last fall has been in successful operation, enabling the management to erect substantial bunk-houses for a crew of forty men. A Fraser & Chalmers 5-drill air-compressor was installed. The question of separating the ores into satisfactory market products has been given serious consideration by the management, and, at present, negotiations are being carried on for the erection of a separation plant, to utilize the milling-ore at present on hand. The small lead has produced the greater tonnage of ore up to the present, but recent indications point to the fact that the large lead will shortly become equally productive.

OFFICE STATISTICS—AINSWORTH MINING DIVISION.

Free miners' certificates (personal)	203
" " (company)	1
" " (special)	1
New claims recorded	116
Certificates of work	291
Transfers	37
Certificates of improvement	16

SLOCAN MINING DIVISION.

REPORT BY ANGUS MCINNES, MINING RECORDER.

I have the honour to submit herewith the annual report on the mining operations in the Slocan Mining Division for the year ending December 31st, 1913.

The year 1913 has been a very prosperous one in the history of the Slocan Mining Division.

SILVERTON CAMP.

The *Standard*, situated near Silverton, since my last report has worked steadily, mining 55,776 tons of ore, from which has been shipped 4,098 tons of high-grade crude silver-lead ore and 9,868 tons of similar silver-lead concentrates to the Trail smelter, also 4,443 tons of silver-zinc concentrates to the United States. During the same period it has paid monthly dividends of $50,000, except in December, when $100,000 was paid. This is a good record, especially as the mine now looks better than ever.

The *Van-Roi*, situated on Four-mile creek, and owned and operated by an English company, has been working continuously for the last ten years. The character of the ores is high-grade silver-lead with quite a percentage of zinc; nearly 19,000 tons of ore was mined. It possesses a fine concentrating plant. This property is paying dividends to its shareholders. Douglas Lay is manager.

The *Lucky Thought* group is a new group that has only recently been located, and is now under bond, for a large sum, to the Consolidated Mining and Smelting Company of Canada, and it is expected to be on the shipping-list shortly.

The *Hewitt* group, owned and operated by the Silverton Mines, Limited, has for the last six months done development-work. There is over three years' supply of rich ore blocked out for the large concentrating-mill which is being constructed. This mill is being built on a system comparatively new to British Columbia, namely, that of the "Minerals Separation Company"; and if this process is here found to work successfully, it is likely to be adopted by other mines, and to have a very beneficial result in the Slocan. M. S. Davys is managing director and George Stillwell is in charge of the mine.

The *L.H.* group is situated on Red mountain south of Silverton, and has been operated for the last eighteen months under bond by the British Columbia Copper Company. This is a gold property and, so far, all that has been done is development-work.

SANDON CAMP.

There are great signs of improvement in the Sandon camp in the last year, and mining men from there inform me that there will be an increase in the output of ores this coming year.

The *Slocan Star* mine was developed considerably, and ore was found at greater depth than in previous years. The most striking development was in No. 8 level, where early last October, a shoot of high-grade silver-lead ore was encountered. The mine superintendent reported this ore-body to contain 2 feet of clean ore and 4 feet of concentrating ore. Drifts had been run east and west, and when the last report was received there was similar ore in both faces, while in the eastern drift the face showed the ore to be twice as wide. Between 400 and 500 tons of first-class ore shipped to Trail averaged about 88 oz. of silver to the ton, 55 per cent. lead, and 7 per cent. zinc. At the annual meeting of shareholders in the company, held in December, it was stated that results obtained had fully justified the deep-level development undertaken about two years ago, and the outlook for the mine was believed to be promising.

The *Hope* has worked continuously for about eighteen years and has shipped high-grade ore for nearly all this time. It is owned and operated by the Ruth Mines, Limited, of Kaslo; D. McKenzie, superintendent.

The *Surprise* is operated by Alex. Smith and partners, of New Denver, and I am informed that in the last few months large bodies of ore have been struck. In places there is 6 feet of clean, high-grade lead ore; such ore is now being shipped regularly, also some zinc ore.

The *Payne* is driving a crosscut tunnel 2,700 feet long, and the management is very hopeful of favourable results. This tunnel has not yet reached the vein on this old property, but I am informed that it is within 300 feet of where the vein is expected to be.

The *Rambler-Cariboo*, at McGuigan, has been operated regularly all year, employing thirty-eight men underground and twenty-four above. Nearly 36,000 tons of argentiferous galena ore was shipped, containing nearly 250,000 oz. of silver and over 2,000,000 lb. of lead, while some zinc ore was shipped.

The *Noble Five*, at Cody, has been chiefly occupied in development-work, driving a lower adit tunnel, but managed to ship a car of galena ore and a couple of cars of zinc ore; an average of about twenty men was employed.

There are many other properties working on a small scale in this district, principally doing development-work.

OFFICE STATISTICS—SLOCAN MINING DIVISION.

Free miners' certificates	146
Mineral claims recorded	54
Assessments recorded	141
Conveyances recorded	10

SLOCAN CITY MINING DIVISION.

REPORT OF HOWARD PARKER, MINING RECORDER.

I have the honour to submit my report for the Slocan City Mining Division for the year ending December 31st, 1913.

The aggregate tonnage of ore shipped during the year is considerably in excess of the previous year, and the fact that the Consolidated Mining and Smelting Company, Limited, commenced mining operations in this district will give considerable impetus to the industry.

The *Eastmont*, situated at Ten-mile, on Slocan lake, did a considerable amount of development-work, besides shipping some 336 tons of high-grade ore.

The *Meteor*, owned by Finch & Campbell, yields some of the richest ore found in the Slocan District; 25 tons shipped during the year gave over $7,000 gross returns.

G. B. Webster, lessee of the *Neepawa*, on Ten-mile, employed six or eight men and shipped about 70 tons.

The *Ottawa* group, comprising over twenty mining claims, was acquired during the year by the Consolidated Mining and Smelting Company, Limited. A large force of men is employed in extensive development-work. It is understood that a large body of silver-lead ore has been encountered, and preparations are now being made for shipping to the Trail smelter. The company shipped some 60 tons during the year.

The *Kilo*, on Lemon creek, has not been operating for some months.

On Lemon creek there are several properties showing high-grade gold-bearing quartz.

The *Black Prince* group, on Springer creek, shipped over 26 tons of ore. This group is operated by J. C. Moen, the lessee.

The Slocan City Mining Division is in what is termed the Dry Ore Belt, and now that the mines are being operated in a more businesslike manner than heretofore, the prospects for the coming year are distinctly good.

OFFICE STATISTICS—SLOCAN CITY MINING DIVISION.

Free miners' certificates (ordinary)	87
" " (company)	1
Certificates of work recorded	120
Locations recorded	41
Conveyances recorded	7

TROUT LAKE MINING DIVISION.

REPORT OF F. MUMMERY, MINING RECORDER.

I have the honour to submit herewith my report of the progress of the mining industry in the Trout Lake Division for the year 1913.

The *Ajax*, adjoining the *Nettie L.*, on Nettie L. mountain, was worked above the No. 1 tunnel at a depth of about 40 feet, and shipped 475 tons from this ground; the ore-shoot is 140 feet long by an average of 12 feet wide. A crosscut tunnel has been driven 50 feet lower than No. 1 tunnel to tap the lead. The shipping ore averages 60 per cent. lead and 40 oz. silver to the ton; development done was about 450 feet during the year; and an average of ten men was employed.

The *Silver Cup*, on Silver Cup mountain, was worked by owners until the middle of March; shipping 60 tons of ore; development-work done, 250 feet; average number of men employed, 17. Since March this property has been worked by A. P. Garrett under lease, who shipped 40 tons of ore; development-work, 100 feet; average number of men employed, 4.

On the *Ethel*, on Ethel mountain, work was started on July 1st by J. S. Lamphere, as manager for an American company, employing three men; two cabins were built to accommodate twenty men. Development consisted of running a tunnel to crosscut the lead about 500 feet below the old workings; 50 feet of this tunnel has been driven and 5 tons of ore shipped.

The *Great Northern*, situated on the Great Northern mountain, started work September 1st under the management of H. MacPherson, and consisted of cleaning out the old tunnel and drifting on the lead. This tunnel is in 190 feet in all, 45 feet of which has been driven this year; three men were employed.

The *Morning Star*, on Brown creek, owned by Abrahamson Bros., is reported to have struck about 1 foot of ore, running about $100 a ton.

OFFICE STATISTICS—TROUT LAKE MINING DIVISION.

Mineral locations	97
Certificates of work	122
Bills of sales, agreements, etc	12
Free miners' certificates	81
Notices	23

NELSON DISTRICT.

NELSON MINING DIVISION.

REPORT OF J. CARTMEL, GOLD COMMISSIONER.

I have the honour to submit the annual report on the Nelson Mining Division for the year ending December 31st, 1913.

GENERAL REMARKS.

The ore production for the past year shows an increase over that of 1912 of about 27,500 tons, due principally to heavy shipments from the *Queen Victoria* mine, and in a lesser degree to increased activity at the *Mother Lode*, *Yankee Girl*, and other mines, and would have been still greater but for the very much reduced tonnage from the *Queen*, in the Sheep Creek District, the production of which was restricted by the labour troubles in that section during the year, and to the closing-down of several other properties which produced last year. The *Silver Dollar*, near Salmo, which is controlled by the Consolidated Mining and Smelting Company, closed down owing to the aforesaid labour troubles, and will in all probability not be operated until these disputes are adjusted.

One new feature of the year's progress which is worthy of note is the development of the deposit of molybdenum on Lost creek, near Salmo, from which property, I am informed, it is intended to ship a car of ore to Denver, Colorado, for treatment.

The mining industry throughout the district seems to have taken on a new lease of life, and all indications point to the fact that in ore production the year 1914 will greatly outstrip the past year.

In addition, it is gratifying to learn that more *bona-fide* prospecting has been done lately than for some years past, and I believe some likely-looking properties have been located during the past season.

Eureka. This property is situated about nine miles from Nelson at the head of Eagle creek, and is under lease and bond to the British Columbia Copper Company, which has made the payments which have become due, and has employed an average of twenty-five men in development-work during the year under the management of H. Johns.

A hoist driven by a gasolene-engine was installed and a winze sunk 100 feet on about 18 inches of quartz ore carrying bornite and native silver; this winze was started from the 250-foot level. About 200 feet of drifting was done from the bottom of the winze and the main drift carried ahead about 250 feet; a lot of ore, principally chalcopyrite, was opened up. Most of the ore formerly encountered on this level was carbonate, and this mine is said to be the only one in British Columbia in which copper-carbonate ore occurs at this depth. Several raises were put up, totalling about 600 feet, one being from the 250-foot level to the surface.

A small boiler and ore-concentrator were installed, also a pump; but, owing to the difficulty of handling the water, the sinking operations have been abandoned until spring.

Granite-Poorman.

The mill at this mine (also on Eagle creek) was closed down on March 15th, 1913, after about 3,000 tons of ore had been milled, on account of financial difficulties, and the company went into liquidation. There is a shoot of ore traced for about 680 feet in length by 18 inches in thickness, showing good pay values, in the bottom of the *Hardscrabble* tunnel. Above the tunnel-level the ore was found to be badly broken up by faulting. This property should not lie idle, as it has a good showing and the difficulties encountered seem to have been entirely of a financial nature.

Silver King.

The work at the *Silver King* mine during the past year has been principally development and construction work. The *Dandy* tunnel was run into the shaft on the vein a distance of 2,000 feet, the work being started in March and continued until December, when they broke into the shaft 40 feet above the No. 8 level, and a considerable quantity of ore was opened up in this tunnel.

During the summer some ore was mined from the old glory-hole, but this work, of course, can only be carried on during the summer-time. Three small stopes are being worked above No. 5 (the main working-tunnel) at present.

In No. 1 tunnel they have crosscut about 25 feet, from which they have drifted about 50 feet on 50 inches of high-grade copper-silver ore similar to that which came out of the mine in early days.

A great deal of construction-work is being done and new machinery being installed, the old mine buildings, which were injured by a forest fire several years ago, having to be rebuilt.

An average of 75 men has been employed during the year, and in addition to the work above mentioned about 5,000 feet of diamond-drilling has been done; and in view of the large amount of development already accomplished, it is safe to predict this mine will be a great producer for some time to come.

Queen Victoria.

This mine is situated near Beasley Station, on the north side of the Kootenay river, about twelve miles below Nelson. It is now owned by the British Columbia Copper Company, of Greenwood, which completed the purchase of the property last summer. The season's work has shown the ore-body (estimated last year at 40,000 tons) to be much greater than was expected, and the ore runs from 1½ to 2 per cent. copper and carries from 75 cents to $1 in silver and gold. Over 28,000 tons of ore was shipped to the Company's smelter at Greenwood, and an average of thirty-five men was employed.

Molly Gibson.

The *Molly Gibson* mine, owned and operated by the Consolidated Mining and Smelting Company, under the management of K. B. Carruthers, is situated near the head of Kokanee creek. Last year a big snowslide carried away about two miles and a half of the tramway, which took a considerable part of this summer to repair, and in consequence the mining operations were much restricted. The mine buildings are constructed in such a manner that the snowslides (which are very numerous in that particular locality) pass over them without damage, the buildings being set against the rock bluffs, with the roofs on about the same slope as the hillside above. Owing mainly to the dangerous character of these slides, however, it has been decided to close down for the winter.

A new tunnel was started on a grade level with the so-called 6,900-foot tunnel (6,900 feet above sea-level). About 4,900 tons of ore was milled, the concentrates being shipped to Trail for smelting. The output of the mine was curtailed last year owing to the construction-work above referred to, and will doubtless be greatly increased this coming year.

The Perrier. This mine is on Cottonwood creek, about ten miles from Nelson, near the line of the Great Northern Railway, and is owned by a local syndicate. A shaft has been sunk 20 feet, from which about 15 tons of free-milling ore, said to average about $28 to the ton, was put through a small prospecting-mill.

Venus. This mine is under lease and bond to a syndicate of which A. H. Gracey is the head. A tunnel has been started 100 feet below the previous lowest level and a raise is being put up for ventilation. It is intended to ship some ore this winter and start up the *Athabaska* mill, near by, next spring, which mill will probably be kept in continuous operation.

Pingree. This mine is on the divide between Eagle and Forty-nine creeks. Four or five men have been employed in development-work, but, so far as I have been able to ascertain, the ore-body has not been struck yet.

California. This property is under lease to Wm. A. Moore, who has four men working there. About 25 tons of ore has been shipped to the Trail smelter, and also a small amount to the Granby smelter, I believe.

SHEEP CREEK DISTRICT.

Mother Lode. The mill at the *Mother Lode* mine was run steadily during the year. The first nine months the output averaged 70 tons a day, and the last three months about 100 tons a day; 24,266 tons of ore was treated during the year. The stamp-mill and cyanide plant are said to be most "up-to-date," the average recovery being 96.6 per cent. of the gross value for the year, and the highest recovery being 98 per cent.

There are two ore-shoots in the mine called the *Independence* and *Mother Lode*, which are about 500 feet apart. A winze was sunk 100 feet on the *Independence* and 170 feet of drifting done therefrom; this winze will be continued down next year. The ore in this shoot is all worked out beyond the 400 and 500-foot levels.

On the *Mother Lode* the work is being done between the 300-foot level and the surface, but a drift is being run from the 500-foot level to catch this ore-shoot. During the last six months 1,140 feet of drifting has been done. The increased production is due to changes in the mill, whereby an increased tonnage is handled without increased cost. W. J. Alderson is manager, and an average of fifty-three men was employed in the mine and twenty at the mill.

Queen. The output of this mine was curtailed by a strike in the first part of the year, during which time the mill was closed down for about three months, but the mine is now running full force under the old wage scale, and for the past nine months the output has averaged about 50 tons a day. No new development-work was done during the year, all the ore coming from the big ore-shoot on the No. 6 level. Two machine-drills kept the mill running at full capacity. An average of forty-three men was employed.

Vancouver. About 25 tons of high-grade ore was shipped during the year from this property, which adjoins the *Queen*.

Spokane Group. This group is situated on Cultus creek, over the summit from Sheep creek. On this property the Laibe Brothers have run 105 feet of drift in on the vein. A crosscut of 25 feet was also started below to get 150 feet more depth, and they have drifted 150 feet or so from this crosscut. These drifts are said to be all in ore, which is quartz, with galena, carrying gold; the lead can be traced on the surface for about 1,000 feet.

H.B. The *Hudson Bay* or *H.B.*, which is situated on Deer creek, a branch of Sheep creek, has been leased by Sol. Salisbury, who has eight men working, and will commence shipping as soon as the snow becomes sufficiently deep for sleighing. About 1,850 tons of ore was shipped last spring.

Zincton. On this mine, which adjoins the *H.B.*, H. M. Billings and Percy Horton drove 140 feet of crosscut, but did not reach the ore-shoot. As they have a good showing on the surface, of over 2 feet of clean galena, they have decided to sink there this winter. Six men are employed.

The Aspen. This mine is owned by the same parties, who have driven 100 feet this year on the crosscut, now in 150 feet, at which point the vein was struck. As the mine is somewhat inaccessible and the trail very poor, work has been suspended for the winter, but will be resumed again in the spring.

Nugget. Control in the stock of this property has been acquired by a Vancouver syndicate, which, I am informed, will not operate the mine until the labour difficulties are definitely settled.

Kootenay Belle. This is said to be a good property, but nothing was done on same this year.

Emerald. This is a silver-lead proposition situated in the vicinity of Salmo. The lower crosscut has been run in to a point about 600 feet from the portal and an upraise of 130 feet, run from a point 400 feet in on the crosscut, to the ore, and continued up through the ore to the level above. At the end of the first raise 200 feet of drift was run, and they have 3 feet of ore nearly all the way which is said to run 35 per cent. lead and 2 oz. silver. Another raise is being run from the end of the crosscut to catch the ore at that point.

From four to nine men have been working, and about 1,100 tons of ore was shipped to the Trail smelter, which ore was hauled on sleighs to Salmo. It is estimated that about three times as much ore would have been shipped had it not been for the labour troubles in that vicinity.

ERIE DISTRICT.

Arlington-Erie. J. W. Barker worked this property under lease until November with an average of six men, all the available ore being taken out and shipped to the British Columbia Copper Company's smelter. As a great deal of development-work will have to be done before any new ore-bodies can be opened up, the present lessee has thrown up his bond.

Second Relief. This mine is situated on the North fork of Salmon river, in the vicinity of Salmo. An average of eighteen men has been employed. About 3,100 tons of ore has been put through the 10-stamp mill during the past nine months, the concentrates being shipped to the British Columbia Copper Company's smelter. The ore yielded about 2,500 oz. of gold. All the development-work has been done on the second level.

YMIR DISTRICT.

Ymir-Wilcox. This mine is situated on Wild Horse creek, about seven miles from the town of Ymir. It is developed to a depth of 800 feet on the *Fourth of July* vein, with levels at practically every 100 feet, totalling about 3,900 feet of development-work on that lead. It is stated that the ore runs $18 a ton in free gold for a width of 42 inches, samples being taken every 2 feet throughout the workings. The *Wilcox* vein is developed by two tunnels, one 220 feet long and the other 340 feet. No output was made this year. The mine is under the management of Arthur Lakes, Jr.

The Yankee Girl. This mine is situated on Bear creek, near Ymir. During the year, 2,937 tons of ore was shipped to the Trail smelter and 850 tons to the British Columbia Copper Company, giving net smelter returns of about $100,000. The large ore-shoot is practically all worked out above the No. 2 tunnel, but the company intends to start a new tunnel in the spring to get 400 feet more depth. There are large bodies of low-grade ore, carrying silver, opened up in the mine, in places over 25 feet in thickness. The Company intends to make a series of experiments to find a good method of treatment, and, if successful, to build a mill and concentrator, together with a power plant on Wild Horse creek.

Dundee. This mine adjoins the *Yankee Girl* and is not producing at present, although ten men are being employed on development-work, etc., preparatory to more extensive work to be undertaken shortly.

On the *Jennie Belle*, situated on Ymir mountain above the old *Ymir* mine, a winze was sunk 20 feet on the ore and a crosscut run 60 feet before work was closed down for the winter.

The *Nevada* is also near Ymir, on Porcupine mountain, and is under lease to D. E. Grobe. The usual development was done this summer.

OFFICE STATISTICS—NELSON MINING DIVISION.

Free miners' certificates (individual)	572
" " (special)	5
" " (company)	5
Mineral claims recorded	233
Certificates of work recorded	528
Agreements, transfers, etc.	80

Revenue.

Free miners' certificates	$3,138 00
Mining receipts	3,753 90
	$6,891 90

NOTE ON PLATINUM.

The following is from a letter from Dr. Eugene Haanel, Director of Mines Branch, Dominion Government Department of Mines:—"I am enclosing herewith a memorandum from Dr. Wilson giving the results of the sampling at Nelson. These results have been embodied in the forthcoming Summary Report of the operations of the Mines Branch for the year 1913."

MEMORANDUM *RE* NELSON PLATINUM.

BY DR. A. W. G. WILSON, DEPARTMENT OF MINES, OTTAWA.

Seventeen samples were collected by me personally, and a sample of special concentrates was obtained from Thomas Gough. Eleven of these samples were assayed for gold, silver, platinum, and metals of the Platinum group. Ten of these assays did not show the presence of any of the precious metals in the samples collected by me. The sample of concentrates showed only 0.87 oz. of gold to the ton of 2,000 lb., but no platinum or metals of the Platinum group. Mr. Gough informs me that 65 tons of ore from "granite dyke" on the *Beelzebub* drift

of the *Granite-Poorman* mine was taken to make 3 tons of concentrates, hence each pound of concentrates represented 21.67 lb. of original material. The ten samples analysed were obtained—

3 at Rover Creek.
5 at *Granite-Poorman* mine (two localities).
1 at Five-mile, *Patenaude* dyke.
1 at Five-mile, *Devlin* dyke.

ARROW LAKE MINING DIVISION.

WALTER SCOTT, MINING RECORDER (OFFICE AT NAKUSP).

It would appear that the Mining Recorder has no knowledge of any mining or new mining development having taken place in his Division during the year, for his report this year is, word for word, identically the same as he submitted last year, and consequently it is unnecessary to reprint it.

OFFICE STATISTICS—ARROW LAKE MINING DIVISION.

Free miners' certificates	25
Certificates of work recorded	18
Mineral claims recorded	9
Bills of sale recorded	4
Cash paid in lieu of work	$100

ROSSLAND DISTRICT.

TRAIL CREEK MINING DIVISION.

REPORT OF H. R. TOWNSEND, GOLD COMMISSIONER.

I have the honour to submit the report of mining operations in the Trail Creek Mining Division duringthe year 1913.

As has been the case for several years past, the Consolidated Mining and Smelting Company of Canada, Limited, and the Le Roi No. 2, Limited, have been the principal operators in this Division. The mines worked by these two companies are situated on Red mountain, and their production for the year amounted to $3,276,677.

What is locally known as the "South Belt" has made some progress, but, owing to the lack of capital, the development is slow.

Centre Star.

The *Centre Star* group, comprising the mineral claims *Centre Star, War Eagle, Iron Mask, Mugwump, Idaho, Enterprise, Virginia, Red Mountain, Stewart Fraction, Pilgrim, City of Spokane, Iron Horse, Monte Christo, Butte Fraction, Lulla Fraction,* and some fractions not yet Crown-granted, has produced the following: 152,996 tons of ore and 42 tons of concentrates shipped, containing by assay 95,767 oz. gold, 51,365 oz. silver and 1,422,291 lb. of copper, giving a gross assay value of $2,211,402.

The average number of men employed was 311 underground and 116 above ground. The advance during the year was 13,750 feet, and 9,719 feet of diamond-drilling was also done.

Le Roi.

The *Le Roi* group, also operated by the same company, and being comprised of the mineral claims *Le Roi, Pack Train, Black Bear, Ruby Fraction, Pearl Fraction, Durham, and Treadwell,* produced 62,283 tons of ore shipped and 459 tons of concentrates, giving a gross assay content of 26,432 oz. gold, 27,290 oz. silver, and 1,134,391 lb. of copper, and having a gross assay value of $731,258.

The average number of men employed was 113 underground and nineteen above ground. The advance was 3,340 feet, and diamond-drilling 11,831 feet.

Le Roi No. 2.

The *Le Roi No. 2* group, owned and operated by the Le Roi No. 2, Limited, consists of the *Annie, Annie Fraction, Josie Fraction, No. 1,* and *Poorman.* The ore shipped from this group was 20,875 tons, of a gross value of $422,976, containing 13,403 oz. gold, 28,840 oz. silver, and 901,618 lb. of copper. Ore concentrated in addition to the above, 15,779 tons, which produced 1,489 tons of concentrates, containing 1,224 oz. gold, 1,002 oz. silver, and 27,256 lb. of copper, of a gross value of $29,276.

Seventy-four men were employed underground and thirty-five on surface, the wages paid being $119,277.

During the year the company opened a wide body of ore on and below the 1,500-foot level, which is the deepest horizon on which it has worked. This discovery augurs well for the deep territory of the company.

In the northern ground on the 900-foot level of the *Josie* a vein has been discovered and is now being followed. This discovery, considered in conjunction with those of their neighbours in this region, gives promise of valuable mineralization still to be found in this district.

Richmond.

The *Richmond* group contains the mineral claims *Richmond*, *Hattie*, *Lily May*, and *Black Horse*, and the fractions *Dew Drop*, *Sunbeam*, and *Alice D.*, all situated in the "South Belt." As this property was only equipped during the year with machinery, a full description might prove interesting, so I will give the particulars in full as furnished me by R. Dalby Morkill, the secretary of the company:—

"The property is equipped with a 12-drill Sullivan air-compressor, hoist, and electric motor, air-drills, pumps, piping-tools, etc. A commodious compressor and hoist building, machine and blacksmith shop, office, store, and changing-room, headworks, powder-house, two dwellings, water right, with dam and reservoir have been erected. These improvements are all situated on the *Lily May* claim, upon which there is a shaft 207 feet deep.

"The *Lily May* was unwatered about September 1st, 1913, since when underground work was continuously carried on until December 23rd; some 630 feet of work was done in exploring the *Lily May* vein and in running north and west drifts. In the west drift a large amount of mineralized ground was encountered, but, while occasional assays gave workable values, the average was below that standard. This drift, now heading north, requires to be driven a considerable distance to reach its objective point, namely, vertically under a surface showing that gives high values in gold and copper-gold from $2 to $140 a ton. The formation is sedimentary, but a short extension of the drift will bring it into an eruptive formation.

"A northerly drift started from near the bottom of the shaft is in 297 feet, and was being driven to cut a series of five veins, all cropping within a width of 250 feet on the *Richmond* and *Hattie* claims. This drift will have to be extended 160 feet to intersect the first of these veins. The formation here is eruptive and of exactly the same nature as that in which the tremendous ore-bodies of the North Belt have been found. A trial shipment of sorted ore from one of the surface workings gave a net value of about $25 a ton.

"The claims have been systematically explored by surface cuts and shallow shafts, and values found in every case, some running high in silver and others in gold and copper.

"The work accomplished is so satisfactory that the directors of the company feel encouraged to expect that further development will have very favourable results.

"Work was discontinued on December 23rd owing to shortage of funds; the mine is being kept pumped out, however, and it is expected operations will be resumed in the near future."

Blue Bird.

The *Blue Bird*, also in the "South Belt," has not been operated during the year.

Inland Empire.

This group, situated on Grenville mountain to the north-west of Rossland, has only carried on some further experimental work, of which I have been unable to obtain particulars.

The following notes are taken from a lengthy description of the Rossland mines in the Nelson *Daily News*:—

"The mines at Rossland during the year have continued to bear out the prophecy that the camp will produce a steady tonnage for many years to come. The ore-shoots in the bottom level of the *War Eagle*, worked from the *Centre Star*, have been opened up another 60 feet lower down and proven to be as large as on the level above. The ore continues to hold its values at a depth of about 2,100 feet below the collar of the *War Eagle* shaft. A new ore-shoot on what is probably the continuation of the *War Eagle* vein containing valuable ore has been opened up at depth, and this is practically like adding a new mine to the camp.

"In the *Le Roi* new ore-bodies have been opened up and a good tonnage of ore is in sight, while the results of diamond-drilling have been highly satisfactory.

"In the *Le Roi No. 2* much new ore has been found, and exploration is being carried into new territory to the north with very satisfactory results. Ore has been mined from the 1,650-foot level during the year. This ore comes out of the *Le Roi* shaft, as it is at a greater depth than the *Josie* shaft has been sunk to. It has proven to be of a very good pay grade and gives indication that the values will be continued at depth in this property as well as in the others.

"The block of ground between the *Le Roi* and the *Josie*, which was partly opened up years ago, but never worked owing to disputes over extra lateral rights, which were not carried into Court, has, since the settlement by definite boundary-lines made last year, been worked steadily, and some very rich ore is being mined there now.

"During the year a very careful and exhaustive study of the geology of the camp has been made by Dr. Drysdale of the Geological Survey, and his report will be awaited with interest by the whole camp. Mining in the camp, and especially all the exploration-work by diamond-drilling at depth, is carried on with the greatest care and study of the different formations. It has been found in mining at depth that the ore-deposits follow contacts of intrusions of a diorite-porphyrite which does not outcrop at the surface. In the upper levels the ore-bodies are in augite-porphyrite at or near the contact of it and the monzonite. These rocks are so similar when fine-grained it is very difficult for the layman to distinguish between them. Accurate maps and descriptions of their occurrences found in the mines and drill-holes will be a tremendous aid to the carrying-on of mining operations. To the diamond-drill is the condition of the Rossland mines due to-day. Without its invaluable aid in exploration it is very doubtful if the ore-bodies at depth would have ever been found, as prospecting for them would have otherwise been too costly.

"Some idea of this may be obtained from the fact that even with its aid the development-work in the *Centre Star* and *War Eagle* mines alone totals, drifting and crosscutting, twenty-four miles; raising, two and two-fifths miles; sinking, one and one-half miles. Figuring this out in feet, as is ordinarily done, and comparing it with some of the ordinary mines of the country, the vast size of the mine can readily be realized.

"In the South Belt the *Richmond* group is being steadily developed, and during the coming year this promising territory will be proven up, and from the surface indications looks very promising for a new era for Rossland. If this property proves satisfactory, without doubt a new lease of life will be given to this part of the camp, and many of the old properties worked in the early days will be reworked in earnest.

"The ore-bins are being rebuilt at the *Centre Star*. A new bin was built at the end of the row, with a concrete foundation to the solid rock. They will be torn down one at a time and replaced with bins of this type. The use of concrete instead of timber is an indication of the idea the company has of the permanency of the mines."

OFFICE STATISTICS—TRAIL CREEK MINING DIVISION.

Mineral claims recorded	57
Certificates of work	51
Certificates of improvement	9
Bills of sale	23
Free miners' certificates (individual)	150
" " (company)	6

The above shows an increase over several previous years, and the mining conditions are in a very healthy condition throughout the district.

TRAIL CREEK MINING DIVISION.

NOTES BY WM. FLEET ROBERTSON, PROVINCIAL MINERALOGIST.

The year's developments in the larger mines in Rossland camp were more than ordinarily successful. In the Consolidated Mining and Smelting Company's *Centre Star-War Eagle* group and its *Le Roi* mine results were decidedly satisfactory. At the former, the chief developments were on the Nos. 13 and 14 levels of the *War Eagle* mine, there being at the close of the year considerably more ore in sight than at the beginning. At that depth the ore is more basic but has a better average value, running higher in gold though lower in copper. The ore-shoots are very large, so the outlook for long-continued production is good. In the *Le Roi* much ore has also been developed, this being in several different parts of the mine; the ore reserves were fully twice as large at the end of 1913 as at the corresponding period of 1912, with the average value well maintained. One of the compressors in the *Black Bear* power-house—a 40-drill machine—was electrically equipped during the year and a rope-drive added, the change having been made from steam. This machine is operated in connection with both the *Le Roi* and *Centre Star* group mines. The total development-work done in 1913 was rather more than 15,000 feet, of which nearly 10,600 feet was in the *Centre Star* group and more than 4,400 in the *Le Roi*. Near the *Black Bear* power-house the company has established a concentrating plant, chiefly for testing ores from the various properties it is interested in; the equipment includes appliances for different flotation methods and for cyaniding.

The Le Roi No. 2, Limited, also had an encouraging year in respect of developments underground, having found good ore at a depth of 1,500 feet—ore of a character indicating that the veins may be expected to prove to be more freely mineralized in both gold and copper than has hitherto been the case. This applies to ore-shoots developed on other levels as well, so that the general outlook for the company's mines is regarded as assuring. There is also good reason to look for favourable developments in the northern part of the company's ground, where not much exploration has yet been done, results of prospecting indicating the probable occurrence of shoots of good ore there. Development-work done in the company's *Josie* group totalled 5,010 feet, and diamond-drilling 15,075 feet. From nearly 40,500 tons of mixed ore mined there was sorted out about 5,000 tons of waste, leaving approximately 19,000 tons of ore that was shipped crude to the smelter and 16,500 tons of mill ore. In addition, 1,700 tons of ore came from the deep-level development. The mill ore yielded nearly 1,600 tons of concentrate. Shipments to Trail totalled 22,300 tons, this quantity including the concentrate mentioned. The crude ore shipped averaged 0.643 oz. gold and 1.199 oz. silver to the ton, and 1.94 per cent. copper; the concentrate contained 0.818 oz. gold and 18.1 lb. copper to the ton. Ore was mined on all levels from 200- to the 900-foot, both inclusive; also from the 1,100- and 1,500-foot levels. The last mentioned corresponds in depth with the 1,650-foot level of the adjoining *Le Roi* mine, and the 1,100-foot with the No. 9 level of the *War Eagle*.

The smaller mines in Rossland camp did not ship much ore. The *Giant-California* sent 102 tons to the smelter, the *Nickel Plate* 96 tons, and the *Phœnix* 23 tons. There was little progress made in the South Belt other than that of the Richmond Consolidated Company, which erected mine buildings, constructed a head-frame over the *Lily May* shaft, installed a 16-drill compressor and a steam-hoist, and, late in the year, reported having found a good-sized body of ore on the *Lily May* 200-foot level.

Trail Smelting-works.—The Consolidated Mining and Smelting Company made many improvements to its lead- and copper-smelting works at Trail, thereby increasing both its ore-treatment capacity and efficiency. Important changes were made in the copper-smelting department. The old No. 2 copper blast-furnace was taken out and a larger one constructed in its place. The new furnace has been built with an arched top and flat flue instead of

having the old-style goose-neck flue over the furnace. Four of the five old furnaces are to give place to three new ones of the style of the one now in operation, the dimensions of which are 42 inches by 35 feet at the tuyere level. There are twenty-eight standard tuyeres on each side of the new furnace. A second large furnace is being built in place of No. 4, which has been taken out. The object of doing away with the goose-necks is to leave clear space for an overhead travelling electric crane for handling purposes on both furnace floors. The two old lead stacks are being removed and three blast-furnaces are being built for lead-smelting; the dimensions of the latter are 45 by 216 inches at the tuyeres, and each furnace will have wrought-iron jackets with fourteen tuyeres, also cast-iron jackets with single tuyeres, as have been in use on the old furnaces. Height from tuyere centre to feed-floor level is 17 feet 6 inches. Conveyors and larger electric locomotives have been provided to facilitate handling ores, fluxes, coke, etc., from bins to furnaces, and other changes have been made to reduce cost of handling materials. Another No. 11 Root blower has been added to the blowing plant; this one to give 401 cubic feet a revolution and to be driven by two 300 horse-power induction motors. In the lead-sampling mill two more sets of Traylor heavy-duty rolls have taken the place of lighter rolls, to ensure finer crushing. The Huntington-Heberlein roasting and sintering plant has been rearranged; besides the seven H.H. roasters, there are thirty-six converter-pots, and these have been conveniently placed in four parallel rows of nine each. Two Wedge roasters have recently been added to the plant. A concrete bin has been built in a convenient place between the roasters and the converter-pots, and a steel conveyor now takes the roasted ore from the roasters to the bin. A Niles 20-ton crane, operated electrically, lifts the pots and places them under the discharge-gate of the bin, and, when filled, replaces them on their stands. Then, after the charge has been sintered, it takes the pots and dumps the sinter on a floor, from which the broken material is lifted by a large-size Hayward clam-shell bucket to grizzly and revolving trommel, whence it is taken by a conveyor to storage-bins. A gas-producer supplies fuel to the roasters, and gas has been substituted for gasolene as fuel for the Dwight-Lloyd sintering-machines. Many other improvements have been made and still others are being prepared for.

The following notes, taken from the annual report of the Le Roi No. 2, Limited, for the fiscal year ended September 30th, 1913, give some interesting information regarding mining and smelting costs in the Rossland District:—

"*Mining Operations and Financial Results.*—Total amount of ore and waste moved was 5,1625 tons, comprised as follows:—

	Tons.
Mixed ore	30,864
Second-class ore	2,578
Mill ore	7,133
Waste	11,050
Total	51,625

"By hand-sorting this tonnage was resolved into:—

	Tons.
Shipping ore	19,023
Mill ore (milled)	16,530
Waste to dump	12,214
Waste disposed in old workings	3,858
Total	51,625

"In addition to this, 1,701 tons were extracted from the *Le Roi* drift. Approximately 3,500 tons of mixed ore remain lying broken in the stopes.

"Stoping costs for the year totalled $104,764.63, or $2.90 per ton of ore; diamond-drilling cost in all $24,142.90, or $0.67 per ton of ore; in all, $128,907.53, or $3.57 per ton of ore.

"Details are as follows:—

Ore production—	
Labour	$0 78
Explosives	35
Illuminants	03
Sundries	06
Ore-sorting	15
General expense	43
Power plant—	
Labour	08
Supplies	47
Mine, general—	
Labour	46
Supplies	09
Diamond-drilling—	
Labour	30
Carbon	23
Supplies	14
Cost per dry-ton ore mined	$3 57

"There has been written off for depreciation in all $102,623.34, equivalent to $2.84 per ton of ore, as follows:—

Mine machinery and plant	$0 02
Mine equipment	09
Surface improvements and buildings	02
Mine exploration and development	2 15
Other accounts	56
Total	2 84

"Total cost per ton of ore mined, including depreciation, is therefore $6.41.

"*Returns from Ore Shipments.*—19,023 tons were shipped, the contents of which were:—

Gold	12,232 oz.;	average per ton,	0.643 oz.
Silver	22,807 oz.;	" "	1.199 oz.
Copper	736,743 lb.;	" "	38.72 lb. (or 1.94 per cent.)

"The gross value of the ore shipped was $372,907, or $19.60 per ton, composed as follows:—

Gold, 0.643 oz., at $20	$12 86
Silver, 1.199 oz., at 60 cents	0 72
Copper, 38.72 lb., at 15.5 cents	6 02
Total	$19 60

"The total smelting charges on the above, direct and indirect, have been $115,472, or $6.07 per ton.

"*Concentration.*—16,530 tons of low-grade ore was crushed, the average contents of which were 0.12 oz. gold and 11.05 lb. (0.55 per cent.) copper per ton; 1,595 tons of concentrates was produced, averaging 0.818 oz. gold, 0.635 oz. silver, and 18.1 lb. (0.905 per cent.) copper, or $19.62 per ton. The tailings averaged 0.046 oz. gold and 10.2 lb. (0.51 per cent.) copper per ton. The cost per ton treated was $1.09. Smelting charges, direct and indirect, totalled $10,173.74, or $6.38 per ton of concentrates.

"Mining costs worked out at $3.57 per ton and smelting charges at $6.07 per ton, making a total, after allowing $2.48 for development and depreciation, of $12.48 per ton, as against $12.18 per ton for 1912."

BOUNDARY DISTRICT.

REPORT OF J. D. GALLOWAY, ASSISTANT MINERALOGIST.

The Boundary District in 1913 again maintained the premier position in the Province in respect to the tonnage of ore mined, which exceeded by far that of any other district. The tonnage mined, however, shows a small decrease from that of 1912, and the total recovered value of the metals a large decrease from that of the previous year. The smaller tonnage is accounted for mainly by a lessened output by the mines of the British Columbia Copper Company, a condition which will probably be altered in the near future, due to the acquisition by the company of new properties. The decrease in total value is accounted for by the smaller tonnage, by the lower copper-content of the ore smelted, and by the lower prices of copper and silver which prevailed during 1913, all of which contributed.

The ore-output for the district during the past year was 1,844,795 tons, as compared with 1,989,084 tons in 1912. The ore-output of the mines in the Greenwood and Grand Forks Mining Divisions was 1,773,094 tons, as compared with 1,918,628 tons in the preceding year.

It has been customary to include the production of Osoyoos Division with that of the others above mentioned, but, leaving that out for the present, the recovered output of metals from Greenwood and Grand Forks Divisions in 1913 was as follows: Gold, 60,336 oz.; silver, 394,000 oz.; and copper, 28,621,230 lb.

For statistical purposes there will be added the output from the Osoyoos Division, which is, as usual, mainly from the Hedley Gold Mining Company's mines, but is this year assisted by a small production from the *Lakeview-Dividend* property. The total value of the metalliferous output (including $844,696 from Osoyoos) was $6,688,902, which is only exceeded by that of the West Kootenay District with a total value of $7,012,407.

GREENWOOD MINING DIVISION.

The town of Greenwood has for fifteen years past been the centre of various mining operations. In addition to the low-grade copper ores of the district, a number of small veins of high-grade ore have been worked to a greater or lesser extent. In the hill between Greenwood and Phœnix, a number of these small veins which were quite rich were worked extensively for a time. From 1903 to 1907 about seventeen of these properties were in operation—all within a radius of three miles of the town—but now all have ceased work. The small high-grade veins were worked from the surface a short distance down with varying success, but for one reason or another they were eventually abandoned. Generally speaking, the veins are too small to be worked at a profit, unless near the surface, where mining was cheap, and where a certain amount of surface enrichment had taken place; the veins are also heavily faulted, thereby increasing development charges. It seems almost certain that, at and near the fault-lines, secondary enrichment has taken place, resulting in pay-ore which shades away into barren quartz between the fault-planes.

Attempts have been made to reopen some of the properties by long crosscut tunnels which would cut the veins at considerable depth; three of these tunnels were visited, only one of of which was being worked.

Greenwood-Phœnix Tramway Bore.

This company was incorporated in 1909 to finance the driving of a crosscut tunnel from Greenwood to a point underneath Phœnix, a distance of about two miles. The object was to cut a number of small veins outcropping on the surface, which had, to some extent, been opened up, and possibly to strike some large bodies of low-grade ore underlying the large surface deposits at Phœnix. A substantial bonus was obtained from the town of Greenwood. The tunnel was started on the *Nelson* claim, about one mile north of Greenwood and almost directly below the *Strathmore* property, the vein in which would be the first encountered. Other claims on the route were *Defiance, Don Pedro, Crescent, Last Chance*, etc., all of which showed small veins of high-grade ore. A small electrically driven 2-drill compressor was installed and work commenced under the superintendency of Duncan McIntosh; the tunnel had been driven 3,000 feet when the work was stopped. One vein was cut at a point 1,700 feet from the portal, which is undoubtedly the *Strathmore* vein, although it is much farther in the hill than was expected; this vein was drifted on for a short distance north and south, but did not show sufficient size or values to be profitably mined.

E.P.U. Tunnel.

The *E.P.U.* is a property situated on Twin creek, a short distance up from Greenwood. A quartz vein from 6 to 12 inches wide, carrying in places high gold values, had been developed by a shaft 200 feet deep and shipments of ore, aggregating several thousand dollars, had from time to time been made. The bottom of the shaft shows a strong vein, but the values are quite low. At this point it was decided to run a crosscut tunnel to tap the vein at depth, on the strength of the time-worn but erroneous theory held by most prospectors that veins "always improve in value with depth." At the time, the property possessed a hoist, pump, and steam-drill capable of sinking to at least 400 feet. Capital for the driving of the tunnel was supplied by a complicated share system, partly cash and partly in work. The tunnel was first driven about 100 feet in a direction nearly parallel to the vein; then, from a point about halfway in the tunnel, another crosscut was started at an angle of about 35 degrees to the former; the tunnel then twists and turns, and nothing but an accurate survey will tell which way it is going at the end. It should be noted here that the vein, as exposed, is in granite, while the tunnel, which is 1,700 feet long, is entirely in metamorphic rocks (altered sediments and volcanics). A few granitic dykes, probably apophyses from the main body, are seen in the tunnel. Of course, the vein on this property may be of economic value, but the tunnel did not prove anything.

Argo Tunnel.

This tunnel, which was commenced by Olie Lofstad, to strike veins on the *Starveout* and *Barbara* claims, is now in 900 feet and nothing of consequence has been struck yet. Provided the vein had not faulted, one of them should have been found at this distance, but, as it is highly probable that the veins are faulted, the company is not discouraged, and three men are at work steadily. This tunnel has the merit of being driven straight.

Tiptop and Bay.

This property, which has two veins, a small one carrying gold-silver, and the other high-grade copper minerals, is situated about half-way between Greenwood and Phœnix. It was worked in former years and some high-grade ore shipped, but it was not being worked at the time the writer was in the district; a short time later, however, a deal was negotiated between the owners and some Spokane people to recommence work, which work is now progressing, and $7,500 is to be spent on it.

B.C. Copper Co.

The British Columbia Copper Company, operating various mines and the smelter at Greenwood, has been progressing steadily and successfully all year. This company is now operating the following properties: The *Mother Lode*, four miles from Greenwood; the *Rawhide*, at Phœnix; the *Lone Star* and *Napoleon*,

in the State of Washington just south of the International Boundary-line; various claims on Copper mountain, Princeton District; the *Queen Victoria* and the *Eureka*, near Nelson; and the *L. & H.*, near Silverton. Practically all the ore for the smelter at Greenwood comes from the first two mentioned properties, with occasional shipments from some of the others. All the others are in process of development, and before long it is confidently expected that the annual tonnage treated by this company will materially increase. The profits from the Greenwood operations, instead of being paid out in dividends, have been utilized to acquire and develop new property, the wisdom of which policy will soon become apparent. In order to finance the heavy outlay that will shortly be necessary on the Princeton properties, the company has arranged to borrow $1,000,000 from New York bankers.

The writer is indebted to Frederic Keffer, consulting engineer; Oscar Lachmund, general manager; and Mr. Norcross, mine superintendent, for much of the following information and other courtesies.

At the *Mother Lode* mining operations have been carried on steadily all year; for the last two years the work has been mainly the cleaning-up of old pillars and floors extending downwards from the glory-hole to stopes 400 feet deep. The system of mining adopted is to drill a large number of holes into a certain section of ground and then fire them simultaneously by an electric current. In this connection it is interesting to note that in August a blast, which is claimed to be the largest in the history of mining, was set off. The scene of this blast was a number of pillars and floors, with a total height of 300 feet, on the east side of the old glory-hole. In the course of previous stoping many holes had been already drilled in these pillars, and for six months before the blast many more holes were drilled in advantageous places. In all, 4,834 holes of an average depth of 14 to 15 feet were driven. It required 49,550 lb. of 40-per-cent. anti-freezing powder to charge these holes. The holes were wired in series of forty to a group; 87,048 feet of electric wire being used. To prevent any possibility of accident, everybody was taken off the hill and three safety-switches were placed in the circuit, all of which had to be connected before the spark could pass. As the scene of the blast was quite close to the head-frame and shaft, some anxiety was felt as to the result, but fortunately these fears proved groundless, and the blast was a complete success; between 400,000 and 450,000 tons of ore being broken down.

A photograph of the blast as seen on the surface accompanies this Report.

This system of mining results in a material decrease in the cost of mining, but at the expense of the grade of the ore, since, as a consequence, large quantities of waste are broken down with the ore. Officials of the company now state that mining costs are in the neighbourhood of 50 cents a ton, which is indeed a notable achievement. In an attempt to bring up the grade of the ore, which has dropped very low in the last few years, a picking-belt has been installed; all the ore travels along this belt to the ore-bins and two men pick out the waste. As there are four classes of waste rock, namely, actinolite, porphyry, limestone, and jasperoid, which are clean waste, without any values, it is a clear gain to remove this, for it is cheaper to pick out this rock than to allow it to go to the smelter. An officer of the company stated that during the month following the installation of the picking-belt the ore treated at the smelter went up 0.2 per cent in copper-content; from this it can be seen that this innovation is a decided success.

A large portion of the *Mother Lode* and the adjoining property have not yet been diamond-drilled, and now the company is commencing systematic prospecting in this way, in the hope of proving up new ore-bodies. The shaft headworks and ore-bins are situated on part of the old ore-body, and if this is proven to be extensive enough the plant will be moved away and the entire ore-body "glory-holed" out.

The smelter of the British Columbia Copper Company, situated at Greenwood, was not operated to full capacity during the past year, for the greater part of the time only two out of the three furnaces being in operation. The reason for this was that at the company's mines ore shipments were deliberately curtailed in an endeavour to keep up the grade of the ore, which of late has dropped very low. Operations at the smelter were in no way changed from previous years and no important improvements were effected. Owing to the decrease in total tonnage smelted, it follows that smelting costs a ton were higher, as overhead charges remained the same; also the lower copper-content of the ore, together with the lower market price of copper prevailing during 1913, made the actual cost of producing copper a pound higher than in any previous year. In fact, this cost was greater than the price realized for the copper, so that at first glance it would seem as if the company's mines had been operated at a direct loss. This is not exactly true, however, as the ore from the company's mines is such excellent fluxing-ore that, by using it as the basis of the smelting, a large tonnage of refractory custom ore was bought and smelted, from the results of which a very fair profit was realized. The discovery of new and richer ore-bodies in the *Mother Lode* mine, which have not yet, however, been proven to any extent, may alter this condition of affairs in the ensuing year.

The following extracts are taken from the Annual Report of the British Columbia Copper Company for the fiscal year ended December 31st, 1913:—

Report of Newman Erb, president:—

"Six hundred and twelve thousand nine hundred and seven tons of ore were treated at the company's smelter, which consisted of—

353,422 tons of British Columbia Copper Co.'s ore and
259,485 tons of custom ore.

"There were produced—

8,296,902 lb. of fine copper;
137,051.72 oz. of silver;
26,640.629 oz. of gold;

the proceeds of which, with miscellaneous earnings, amounted to $1,904,694.52.

"The net result of operations was $111,896.49, exclusive of which during the period covered by the reports, there was set aside as reserve for depreciation $40,000.

"The balance to the credit of Profit and Loss Account at December 31st, 1912, is shown as $965,736.81. During the year your directors decided to appropriate $465,736.81 out of this account for depreciation, not heretofore taken up on the company's books, which deducted from Profit and Loss Account left a balance of $500,000.

Profits for the year were $151,896.49. Deducting dividend No. 6, paid January 15th, 1913, amounting to $88,756.35, and $40,000 charged off for depreciation, the net surplus earnings for the year were $23,140.14, which were added to surplus account.

"During the fiscal year the company paid for and on account of new properties, in their exploration and development, $295,074.18, making a total of expenditures for this account within two years of $524,563.64, and to date of issuance of this report, approximately $600,000. . . .

"To provide funds for the payment of properties now under option, their development and the installation of a proper concentrating plant, it is estimated that a total of $1,000,000 approximately will be necessary.

"In view of the prevailing financial conditions which have existed for the past year, your Board has found it difficult to provide the money required, and a plan was devised, as indicated in circular letters of February 9th and 24th, which were mailed to all shareholders, under which the necessary money could be obtained.

"The quantity of ore disclosed, with its higher metal contents, will assure a greater stability of the company than at any time heretofore; at the same time, if the shareholders fail to avail themselves of their rights under the plan submitted, an opportunity of vital importance to them will be lost, and your Board will be confronted with conditions which it may be unable to overcome; on the other hand, if availed of, the prospects of the company, with the values created, will be better than ever.

It was found desirable to provide for the organization of a new company for the purpose of financing our requirements, and when all or nearly all of your company's shareholders shall have exchanged their stock, the new company will for all practical purposes be merged and become identical with the British Columbia Copper Company, Limited.

"It is found impossible, and it is unreasonable to expect that the shareholders who prefer not to exchange their stock, or subscribe to the debentures, under the plan, should be placed upon an equality as to future earnings, with those who do; and while the plan does not so provide, it is probable the future acquisition of mining properties, their development and operation, will devolve upon the new company.

"Your Board has been conscious throughout of its responsibilities and duties to the shareholders, and has been called upon to deal with a difficult situation, as stated above, on account of the unfavourable general financial conditions, and unavoidable delay in the development of a sufficient tonnage to justify the submission of a more satisfactory plan at a time when its success could have been better assured. Your Board is, however, fortunate in having been able to interest Messrs. Hayden, Stone & Company in your company and have them identified with its future management and success."

From the report of Oscar Lachmund, general manager :—

"*Mother Lode Mine.*

"The grade of the ore was lower than heretofore, the yearly average having been :—

Gold, 0.03194 oz. per ton; silver, 0.1714 oz. per ton;
Copper, 0.8147 per cent.; silica, 34.81 per cent.; iron, 13.58 per cent.;
Lime, 22.78 per cent.; sulphur, 2.15 per cent.

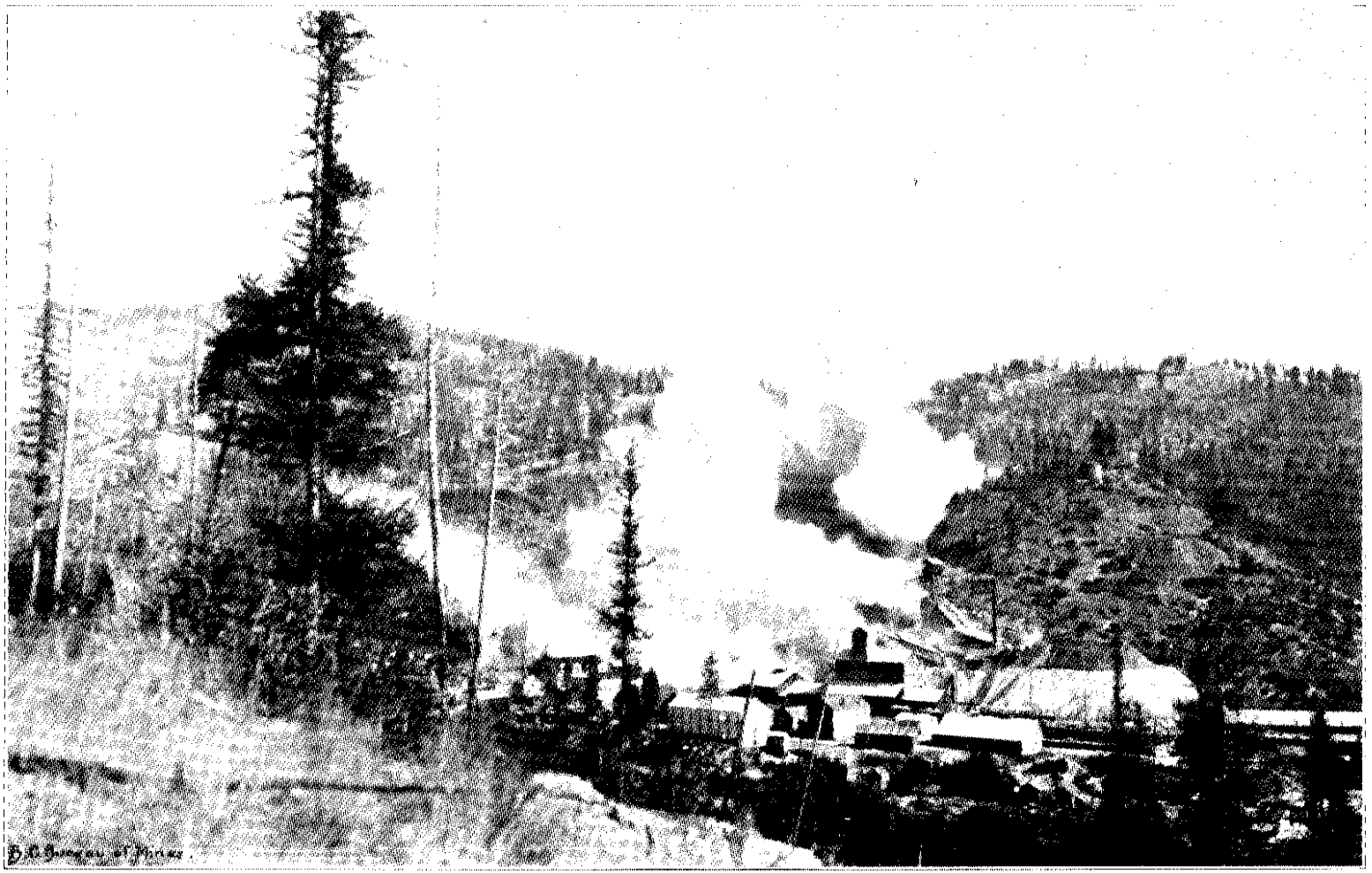
The average number of men employed per day was	95
Men working underground	58
Men working on surface (including diamond-drillers)	37

"*Costs.*—These were higher than last year, due chiefly to three reasons, namely :—

1. Lower tonnage available, hence reduced shipments.
2. Increased development-work.
3. Ore-sorting.

"Considerable new construction-work was done, all of which was taken into operating account. A segregation of various items is appended.

Mining and handling	38.00 cents per ton.
Supplies (explosives, etc.)	19.20 "
Miscellaneous (taxes, etc.)	8.82 "
Total cost per ton f.o.b. mine	66.02 cents.



Blast of 25 Tons 40-per-cent. Powder, Mother Lode Mine—B.C. Copper Co.

"*Development.*—Numerous drifts and raises were driven to tap the large masses of broken ore in the mine. In this manner some ore was recovered which had been accounted as lost, due to heavy caves of waste rock. The rock was withdrawn and put over the dump in train-loads.

"The contract system on drifts, crosscuts, and raises was attempted towards the close of the year, with the result that costs were materially reduced on this particular class of work, and the miners made a substantial gain in wages.

"Diamond-drilling operations were started in November, and some 1,200 feet of boring done. The results were very gratifying and are mentioned later on.

"*Ore Reserves.*—About two years' supply of available ore was claimed for the mine as of January 1st, 1913. These figures have not been changed materially, notwithstanding the shipments during the year. This is due in part to over-conservative estimates for the previous year. Reclamation of 'lost' ore has been a factor, also the disclosures by diamond-drilling in the territory to the south of the shaft. The present indications are that commercial ore-bodies of exceptionally good grade exist here. Absolute tonnage estimates are as yet out of the question. The assays show a higher gold and sulphur content than the regular mine-run of ore. The *Mother Lode* ore, being self-fluxing, will admit of the admixture of considerable amounts of revenue-bearing sulphide and siliceous ores, thereby lengthening the life of the mine correspondingly.

"*Smelter.*

"Owing to shortage of ore, the smelter was unable to operate at more than 82 per cent. of actual capacity. During a period covering about four months, at two different times, it was attempted to run three furnaces; the balance of the year the two large furnaces were in operation. As against this the individual furnace efficiency was the highest ever attained at this plant. The slags showed lower metal losses than for any previous year.

"Costs were higher for several reasons: Shortage of ore; extra labour on coke stock pile, occasioned by various periods of coke shortage; many expensive renewals and repairs to plant and machinery, which were taken up in operation expenses; same overhead expenses as when running full capacity.

"*General Operating Cost.*

"The yield in gold, copper, and silver from the company ores was less than ever before. A comparative table is shown below as against the results for 1912.

	1912.	1913.
Yield of copper per ton of B.C. Copper Co.'s copper-bearing ores	13.600 lb.	12.175 lb.
Yield of gold and silver in B.C. Copper Co.'s ores	$ 0.762	$ 0.573
Average price realized for copper	16.664 c.	15.071 c.
Cost of producing copper from B.C. Copper Co.'s ores, crediting expenditure with gold and silver contents of ore; per lb. of fine copper	12.855 c.	17.903 c.
Cost per ton of handling ore, including all expenses from 'ore in place' to sale of the contained metals	$ 2.4596	$ 2.8108

"The company ores, being self-fluxing, represented the base of the smelting operations, all operating profit having been derived from the purchase of custom ores.

"In conclusion, the writer desires to call attention to the three causes which have worked against the large profits as compared with those of the previous year, namely:—

Reduced ore tonnage.
Lower grade of ore.
Lower prices of copper and silver."

Concentrator at Boundary Falls.

The successful treatment of the ore from the *Lone Star* mine in the State of Washington, has been a difficult problem for the officials of the British Columbia Copper Company to solve, but it is now hoped that the patent oil-flotation process of the Mineral Separation Company of San Francisco will prove efficacious. A certain amount of the ore has already been smelted direct, but the high percentage of alumina and silica in it makes it a very unsuitable ore for the company's smelter. Experiments by straight water-concentration have shown that not more than 40 to 50 per cent. of the values could be saved, which is, of course, too low to be considered.

The process now decided on is a partial water-concentration and a treatment of the tailings by the oil-flotation scheme. In the spring of 1913 construction-work was commenced on a 75 to 100 ton a day mill at Boundary Falls. The water-concentration part of the mill was practically completed when the plant was visited by the writer in October, but the flotation equipment had not arrived. The ore is conveyed from the mine to the mill by a Riblet aerial tramway 28,450 feet long, which delivers it to ore-bins situated above the crushing plant. The crushing plant consists of crushers, rolls, and a Hardinge conical mill. The product from the Hardinge mill will be treated on Franz and James tables, making concentrates which will be shipped to the smelter, and tailings which will go to the oil-flotation part of the plant. It is expected that the mill will be in operation early in 1914. Electric power to run the plant is obtained from the West Kootenay Power and Light Co., which supplies the whole district.

At the *Lone Star* mine development-work has shown up about 300,000 tons of ore, with an average assay of about: Copper, 2.034 per cent.; gold, 0.046 oz. to ton; silver, 0.168 oz. to ton. Only the southern part of the property has been diamond-drilled, and it is probable that a much larger tonnage will be shown up by further development-work. Pending the completion of the mill, work has been suspended at the mine.

While this mill is primarily intended to treat *Lone Star* ore, it will be also used as an experimental plant to test ores from other properties, especially Copper mountain, that the company is developing.

The *Napoleon* mine and mill, owned by this company, and situated in the State of Washington, has not been operated to any great extent during the year.

Jewel.

The *Jewel* mine is situated in Long Lake camp, about eight miles in a northerly direction from the town of Greenwood, from whence it is reached by a good wagon-road. The property, consisting of the *Jewel* and a one-half interest in the *Denero Grande*, is owned by the Jewel-Denero Mines Company, of Edinburgh, Scotland. The other half interest in the *Denero Grande* is owned by C. J. McArthur, of Greenwood, B.C. The claims were staked about 1896, and in 1897 were bonded by Leslie Hill for the British Columbia Prospecting Syndicate. In 1898 Mr. Mahon took charge for the Jewel Development Syndicate and carried out most of the existing development-work. Subsequently the company was reorganized to the Jewel Gold Mines, and, under the superintendency of William Rowe, 2,000 tons of ore was mined and shipped to the Granby smelter. This ore was hauled five miles by wagon-road to a railroad siding at Eholt, and thence to the Granby smelter. The ore, being highly siliceous, was used by the smelter for converter linings, and so the mining company obtained an extremely low treatment rate. After this another reorganization took place which put the present company in control. Mr. Roberts was sent out in 1905, did a little work, and a lot of experimenting to determine a suitable mill design to concentrate the ore.

After much delay, construction was commenced in 1909 on a 15-stamp mill which was intended to save the values, in part as concentrates, and the balance by a sand-leaching cyanide treatment. The mill was eventually finished in 1912, but did not work satisfactorily. Mr. Roberts's successor, Mr. Banks, a New Zealand mill expert specially engaged by the company, installed a tube-mill and changed the mill system to an all-sliming cyanide treatment; alterations were completed in June, 1913, and the mill in now working successfully.

Mr. Banks went away in August, and H. D. Quinby is now manager, while Wm. Rowe is again mine superintendent.

The vein, a strong, well-defined fissure, striking north and south and dipping quite flatly to the east, is filled with quartz carrying galena and iron-pyrites, together with traces of chalcopyrite and arsenopyrite. Values are in gold and silver in the ratio of 7 to 1. Some free gold and rich tellurides have been found.

The property is situated on the contact between a grey granodiorite and a series of highly altered metamorphic rocks, which are probably partly of sedimentary and partly of igneous origin. This older series consists largely of green schists, together with greenstones, quartzites, and argillites. Some of the rock looks like fine-grained diabase, but is considerably altered. The district is heavily cut by granite-porphyry and black lamphrophyre dykes, which are of age generally subsequent to the vein formation. The vein does not follow the contact, but cuts the granite and also the schistose rocks. In the granite the fissure appears to have been well defined, and here the vein generally consists of a quartz filling, with very slight alteration of the wall-rock. In the schists the action which produced a clean-cut fissure in the granite seems to have only had the effect of producing a shattered zone or series of minute parallel cracks. Throughout the schists the "vein" consists of small stringers, together with large "blebs" of quartz scattered here and there in an irregular manner. It is probable that in this portion of the vein the principal action was one of replacement of wall-rock by mineralizing solutions flowing along the minute cracks. The result is that, on account of the unsuitability of the wall-rock for replacement, this portion of the vein has practically no ore-shoots of commercial size. The black lamphrophyric dykes, which vary from a few inches to 20 or 30 feet in width, have in some instances faulted the vein a few feet to the east, i.e., a normal fault. Another series of faults, later than the dykes, has also affected the ore-body. These faults, to some extent, parallel the vein, and that they are later than the black dykes is evidenced by the latter being faulted. Taken in all, the relation of dykes, faults, and mineralization is quite complicated, especially where the vein is entirely in the schistose rocks, and it would take some time to work out in detail the exact relation.

The contact of the granite with the schists is not very regular, as long tongues of granite extend some distance into the other formation. It may be that the shattering of the vein in proximity to the contact is only local, and that at some distance away, and wholly within the schists, the vein again becomes normal.

In this connection it should be noted that a supposed extension of the *Jewel* vein occurs on the *Enterprise* and *Ethiopia* claims lying to the north. These claims were not visited, but from reliable sources it is learned that the vein on both properties corresponds very closely with the *Jewel* vein in appearance, size, strike, dip, and other particulars, while the formation in which they occur is described as being analogous with the schistose rocks of the *Jewel* vein. These claims were developed to some extent ten years ago, but, as the ore is low grade and refractory, work was discontinued. The successful treatment of the *Jewel* ore may result in their being reopened.

The main shaft, 320 feet deep, is situated on the *Jewel* within 50 feet of the *Denero Grande* line; at this point the vein is wholly in granite. Drifts have been run from three levels to the north and to the south, into the *Denero Grande* property, for a short distance. From 100 to 300 feet north of the shaft the vein enters the schists, where, as before stated, it rapidly splits up. On the No. 2 level a great deal of drifting has been done following various stringers in the schists. One drift, going 1,000 feet north of the shaft, has a crosscut at its end running east and west, i.e., at right angles to the supposed course of the vein, for 300 feet without encountering any ore-shoots. In the granite the vein runs from 2 to 12 feet in width, with an average of about 4 feet. Values are from $8 to $9 to the ton. Inasmuch as the company has been unable to secure the other one-half interest in the *Denero Grande*, practically no work has been done on this property, except running the south drifts from the main shaft a short distance beyond the line. The surface of the *Denero Grande* is covered with a heavy mantle of wash, which makes surface prospecting difficult.

About 1,000 feet north of the main shaft is the Rowe shaft, 150 feet deep; at this point the vein is in the schists. This shaft was full of water at the time of visiting the property, but Mr. Rowe says that the vein, although small, is well defined at the bottom. Two other shallow shafts, between the two former ones, were also full of water and could not be examined.

Assay-tonnage plans prepared by both Mr. Mahon and Mr. Roberts show, at the present time, some 25,000 to 30,000 tons of ore practically blocked out, of an assay value of $8.50 to $9.

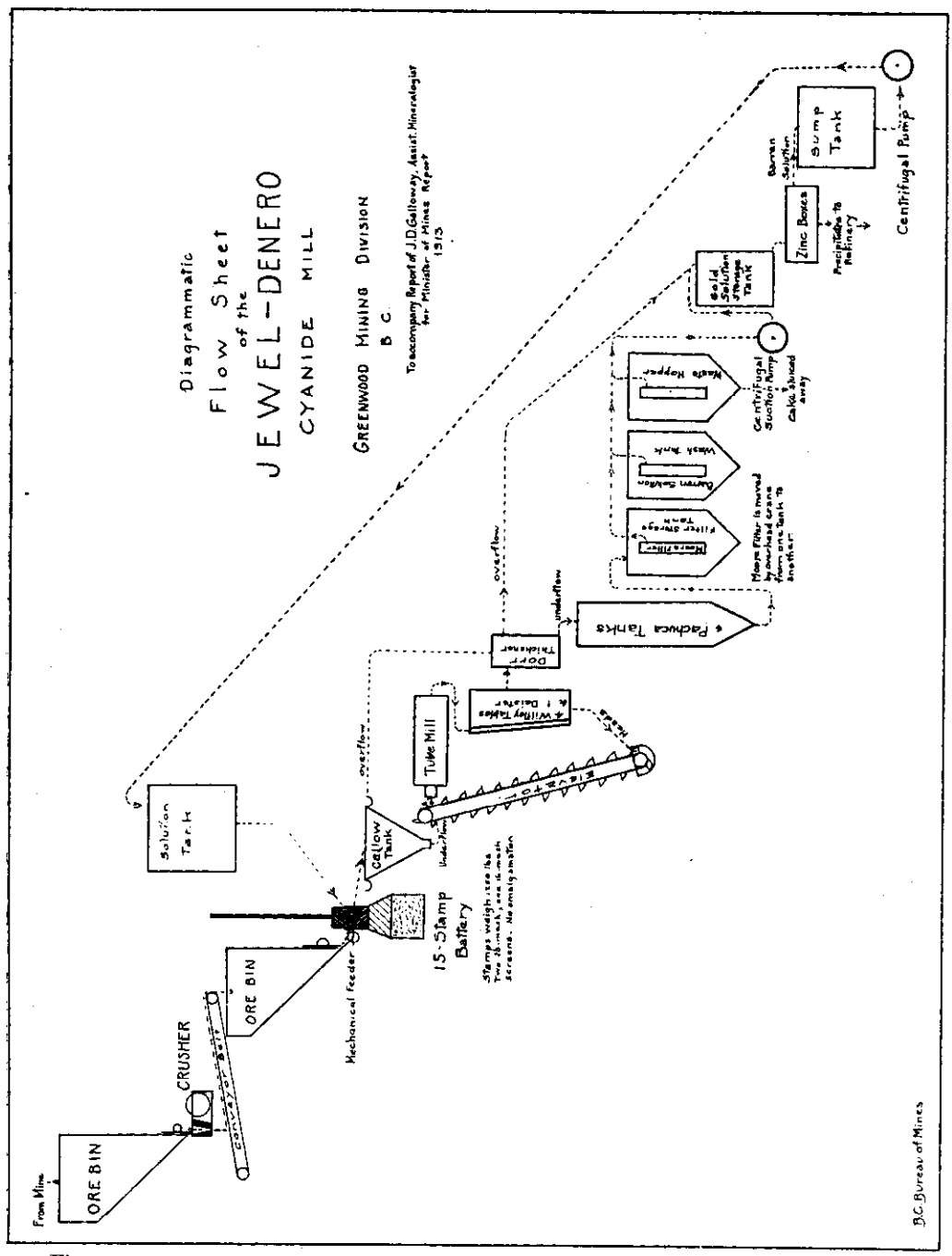
The shaft is now being sunk to the 400-foot level. The total drifting to date amounts to about 31,000 feet, of which about one-half is on the No. 2 level and the balance divided between Nos. 1 and 3 levels.

It is to be hoped that exploratory work will be pushed forward in the *Denero Grande*, as in that direction conditions seem very favourable for a good shoot of ore.

The mill is situated on the hillside overlooking Long lake, about a quarter of a mile from the shaft, to which it is connected by tramway. Electric power is obtained by means of a branch line from Greenwood, which taps the main power-line of the South Kootenay Water Power Company. An electric hoist is installed at the main shaft, which will be large enough for some time to come. The mill machinery is entirely motor-driven and is so advantageously situated on a steep hillside that the ore goes through it entirely by gravity. The one only elevator in the mill is necessary to return a portion of the tube-mill product for retreatment.

The stamps weigh 1,250 lb.; two 20-mesh and one 12-mesh screens are used. No amalgamation is used and the stamps are simply crushing-machines. Cyanide solution is introduced at the stamps instead of water, and is strengthened as required at the Pachuca tank; 50 tons of ore is being treated in twenty-four hours. During July, August, and September, 3,855 tons of ore was treated, yielding bullion to the value of $32,570.32, and with $1,300 remaining in slag from the refinery. This gives an average recovered value of $8.78 a ton. The average tailing loss was $1 a ton, giving an extraction of 89.7 per cent. The concentrating-tables were put in the mill in the first place with the intention of making a high-grade concentrate to ship to the smelter, but this scheme did not work satisfactorily. As arranged now, the heavy particles of galena and iron which carry the silver and gold in very minute particles are separated on these tables and returned for recrushing in the tube-mill. It will be seen that by this process it is impossible for any heavy *mineral* grains to pass through to the cyanide system until they are ground to an absolute slime. The Pachuca tank is fitted with compressed-air agitation. Ore is being stoped from the three levels in the main shaft, and about thirty-five men are employed between the mine and mill.

The following is the present mill flow-sheet :—



Figures as to mining and milling costs have not been given out by the company, but they are said to be making a fair profit.

Big Copper. This property, situated in Copper camp, about eight miles westerly from the town of Greenwood, was staked many years ago, being one of the early locations in the Boundary District. It is owned by Thos. Moran and

associates and has been worked at different times in the past years. The British Columbia Copper Company bonded it once, but, after some exploratory work, allowed the bond to lapse. In October of 1912 the Granby Company effected some sort of a bond or option with the owners, permitting them to prospect the property by diamond-drilling. A drill was set up and boring commenced on November 16th. Work was discontinued in December for the winter, but will probably recommence in the spring.

The ore-deposit occurs in a limestone and appears to be developed adjacent to a large dyke cutting the limestone. The gangue is about half silica and half limestone, and is coloured a deep red with iron-oxides (hæmatite). The copper occurs mainly as native copper, but some sulphides are also present. The whole deposit is much more heavily oxidized than is usual in the district, which, in part, may be accounted for by a capping of Tertiary lavas which probably covered it during the larger part of the glacial period; as, a short distance away, these lavas can be seen in patches which represent erosion remnants of a once extensive flow. Oxidation with a development of gossan or iron-cap to a considerable depth was probably a common occurrence in ore-deposits throughout British Columbia in the long period of quiet preceding glacial times, but in most cases this has been almost entirely removed by the scouring action of the glaciers. In rare instances a protective action has been exercised by a capping of recent rocks or by some topographic feature of the district. The form in which the copper occurs here—namely, native—points strongly to the possibility of its being in some way derived from the Tertiary lavas, as this form of copper is nearly always genetically associated with lava rocks. On the other hand, the large blackish dyke cutting the limestone would seem to have been the mineralizing agent. The deposit does not look like a typical contact metamorphic one, as many of the usual features are absent. Sufficient time was not available to study the showing closely and the above notes are the result of an hour or two's inspection.

Development has been mainly by open-cuts and short tunnels. Several hundred tons of ore were shipped to the smelter some years ago, but the exact amount and values could not be learned. It is probable that the ore is quite low grade, although probably higher than the other low-grade copper ores of the Boundary, but, on the other hand, the deposit is not of such great size as the others. More development-work will have to be carried out before any estimate of tonnage could be made. The results of the drilling already done by the Granby Company have not yet been made public; it seems likely that they will give the property a thorough testing.

The *King Solomon*, an adjoining property, was also seen; this claim has a small vein of high-grade copper ore shown up by an open-cut and surface stope (underhand) for a distance of 200 feet. The vein is cut off by a gouge seam a few feet from the surface, and the indications point strongly to it being faulted, and that it would be found in place farther up the hill, but no attempt to recover it has been made. Several cars of very fine ore were shipped from this open-cut, but exact figures are not available. The property would seem to be well worth further work, but the owner, D. C. Corbin, apparently does not wish to do anything himself, nor yet to turn it over to any one else.

None Such. This property is situated on the hillside a short distance above Boundary Falls. It was worked some years ago, and hand-sorted ore was shipped to the Greenwood smelter by means of a wagon-road to a railroad siding one mile away. A quartz vein varying from 2 to 6 feet in width and striking north-west is developed by two tunnels several hundred feet long; values are mainly in gold and silver associated with iron-pyrites and a little galena. It would appear that this vein is quite low grade on the average, so that it would not pay to ship the ore direct to the smelter. A thorough sampling and testing of the ore for some milling plan would be necessary to determine

whether the property is worth exploitation, and it was evident that some one had recently been sampling the vein quite extensively, but who it was could not be learned. A good deal of ore (or at least quartz somewhat mineralized) is shown up by the tunnels, and the question is now one of values. With the completion of the concentrator at Boundary Falls (two miles away) it should be easy to give the ore a thorough testing, if assays disclose it to have sufficient values. No work has been done on the property for years, and it is not known just who are the owners. A sample taken from the dump of material, which looked to be at least not higher than the average, assayed: Gold, 0.18 oz.; silver, 0.70 oz.

Another claim near by, for which a 2-stamp mill was taken into Boundary Falls twenty years ago, was also looked at. Several shallow shafts and "gopher-holes" were made on this property a long time ago, all of which are badly caved in. The vein striking north and south appears to be 10 to 16 inches wide, and carries galena and iron-pyrites in a quartz gangue. A sample from the dump assayed: Gold, trace; silver, 0.10 oz.

The advent of the concentrating-mill at Boundary Falls may possibly result in some of the various abandoned properties around Greenwood receiving some further attention.

COAL FORMATION.

The Kettle river occupies a broad valley between Rock Creek and Midway, a distance of about eleven miles. A sedimentary formation, probably of Tertiary age, is seen here and there along the valley and on the adjacent foot-hills. Outcrops of this formation are found near Rock Creek; on both sides of the river near Jackson's ranch, from three to five miles below Midway; up Meyers creek and at points east of Midway; but no work has been yet done to show that the different outcrops are parts of a continuous basin. The series consists of sandstones, shales, conglomerate, and some bands of very black carbonaceous shale. For many years past it has been considered possible that coal-seams would be found in these rocks, and considerable money has been spent in prospecting the bands of black shale in the hope that they would lead to coal-seams. The first workings were near Rock Creek, but these were not successful, and for some years the claims have lain idle.

Dr. R. A. Daly, of the Geological Survey of Canada, comments on the Rock Creek coal formation as follows: "Seams of lignitic coal are embedded in the sandstones and shales of the Rock Creek Tertiary, but none of them yet discovered is thick enough on the surface outcroppings to be worth exploitation." *

Midway Coal-mine.

The showings on which the most prospecting has been done are about three miles up the river (westerly) from Midway and opposite Jackson's ranch, where a number of claims were staked many years ago by John East and others. These claims were secured, about 1906, by Midway and Greenwood people, who organized the Boundary Mining and Exploration Company to take over the property and develop it. At the present time A. E. Watts, of Wattsburg, B.C., is president and Fred Knight, of Spokane, secretary-treasurer. A good deal of the stock has been sold in small holdings in Spokane, Vancouver, Victoria, towns in Iowa, etc.

The coal-bearing formation at this point is exposed on the northerly side of the valley on a low hill rising from the flat land of the river-valley. To the north for a short distance it rests unconformably on igneous rock, and is also intruded by dykes and sills of augite-porphyrite. To the south, or going towards the river, it is covered over with gravel, soil, etc. To the east and west it is apparently missing, as the igneous rocks take its place. About two miles farther to the west there is another outcropping of the formation, and it is probable that these different croppings represent erosion remnants of what was originally one continuous basin.

* Geological Survey Summary Report, 1902.

It is claimed that sandstones occur across the river on the south side two miles away, and if so it is possible that the formation extends under the river gravels and forms the floor of the valley.

The management claims to have "nine seams of coal" exposed in a rock-cutting on the wagon-road which traverses the property. While "seams" are so exposed, it would be more accurate to describe these as seams of carbonaceous shale rather than as seams of coal, for the percentage of coal contained is quite negligible.

The so-called "main seam" is a strata or seam of carbonaceous shale from 2 to 9 feet in width, with a sandstone foot-wall and a shale hanging-wall. A tunnel (No. 1) 575 feet long has been driven on this seam, and at a point 200 feet from the face a raise goes up 30 feet. A short incline has been sunk from the tunnel-level, but, as this was full of water, it could not be examined. Stringers or lenses of coal from 1 to 4 inches in width occur throughout this seam, but in the most favourable places the amount of coal present does not exceed more than 10 to 15 per cent. of the total material in the seam. The following analyses are of typical average samples taken across the whole width of the seam:—

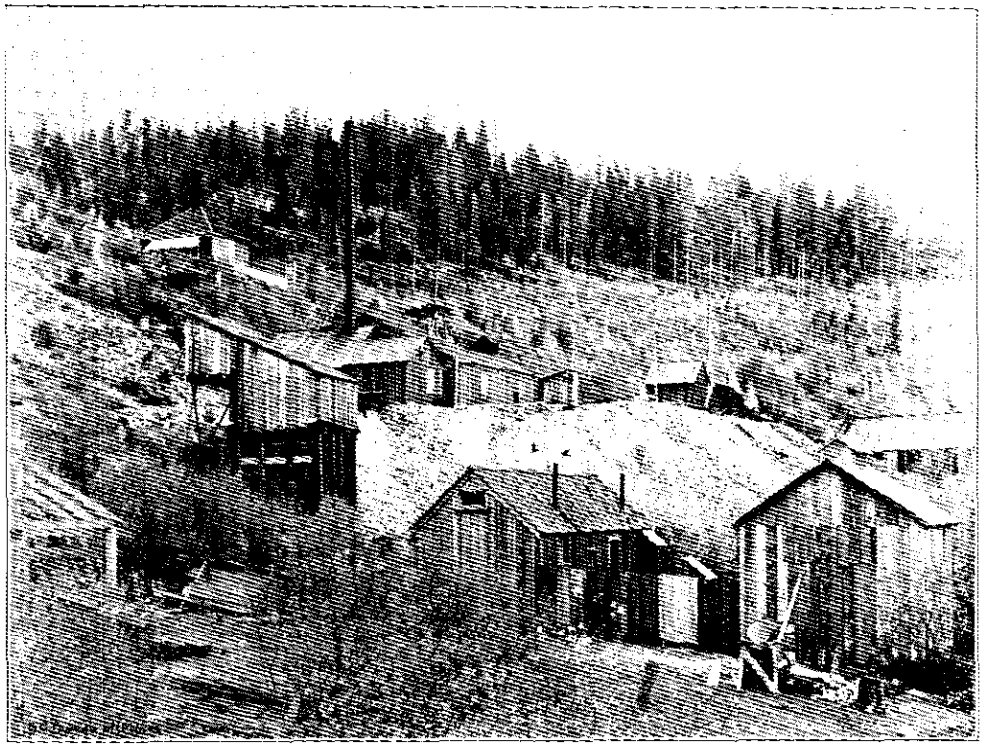
Location.	Moisture.	Vol. M.	F.C.	Ash.
Top of raise in main tunnel. Width sampled, 4 feet	2.0	8.9	10.6	78.5
Face of main tunnel. Width sampled, 3 feet	1.8	10.8	17.9	69.5

While, of course, higher analyses might be obtained from selected samples of the stringers of coal, these are unimportant in quantity, and the samples of which the analyses are given truly represent the seam as it would have to be mined, and is a fair representation of the quality of what is described in the printed annual report of the company as its "coal-seams of from 2 to 9 feet in thickness"—the statement laid before the public.

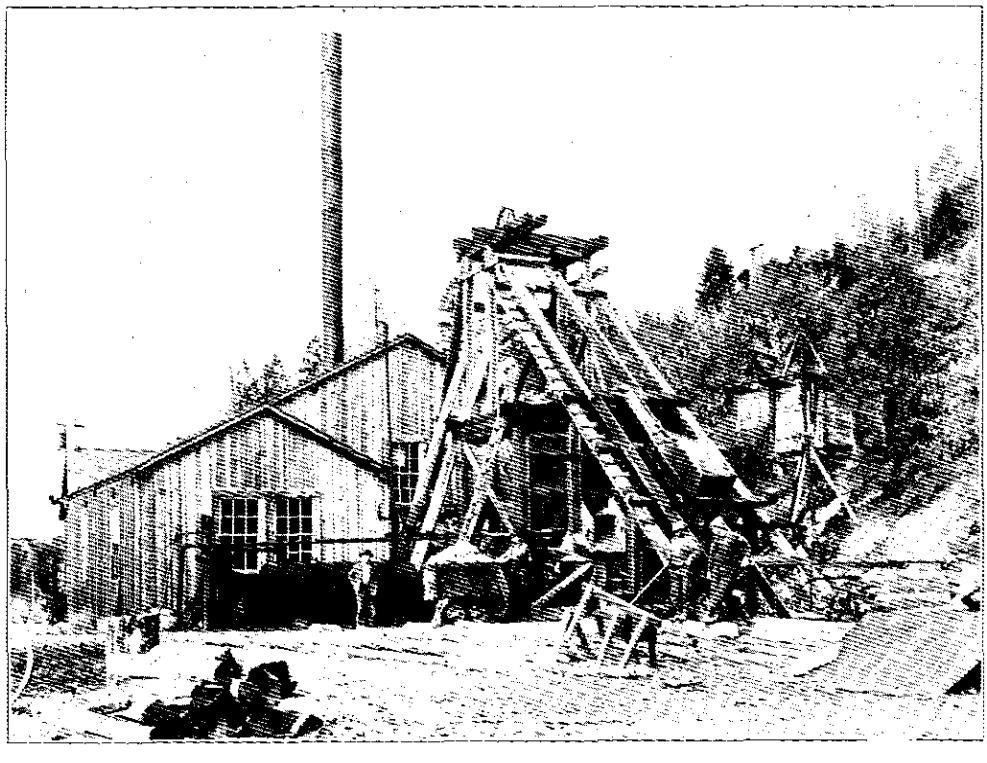
In July of this year (1913) a small explosion occurred in the raise from the main tunnel and two men were slightly burned. Inasmuch as the company had not followed the requirements of regulations in regard to certificated men, etc., and also did not report the explosion, the Government prosecuted, with the result that the officers were convicted of negligence and fined. The company appealed the case, but again lost. During these proceedings the mine was closed down, but when the property was visited in October preparations were being made to recommence work. It was stated to be the intention to sink an incline from a point halfway in the main tunnel, and a boiler and small steam-hoist were being set up. The work was being carried out under the supervision of Mr. Beach, but James Touhey, who holds a second-class coal-mining certificate, is there also, to comply with the Government regulations.

A short distance east of the main tunnel a crosscut tunnel (No. 2) has been driven; this commences in porphyry, and at 75 feet from the portal cuts the sedimentary formation at an angle of 45 degrees, while about 75 feet farther in it again enters the porphyritic rock. A black-shale seam in the middle of the sedimentary strata has been drifted on for about 100 feet each way. The showing here is similar to that in the main tunnel, but less favourable as less real coal is in evidence. No samples were taken from this working.

A short distance from the mouth of this tunnel (No. 2) a double-compartment incline shaft has been started with the intention of striking the black seam at some depth; it is down 65 to 70 feet, but has not yet struck bed-rock and is entirely in surface gravel. A few other holes and cuts expose black seams on the surface, but they are of no importance.



Jewel-Denero Mine—General View—Greenwood, M.D.



Jewel-Denero Mine—Shaft-house—Greenwood M.D.

As to the future of the field, it is impossible to say anything very definite. The location of the present workings of this company seems to be on the edge of the coal-basin, where it is cut off and cut through by igneous rocks. At present, this company has not any coal-seam of commercial value, and to the writer it seems more than doubtful that, as is hoped by the management, the present seams of carbonaceous shale will turn to coal at depth. If commercially valuable seams of coal exist in the basin at all, they will probably be found to the south-east, in the centre of the sedimentary basin, where one drill-hole in the centre of the basin would have done more to prove the field than all the existing work.

ROCK CREEK.

Rock Creek was the scene of extensive placer-mining operations in the "sixties," but of late years very little has been done. One man was engaged for a time this year running a bed-rock drift, but it is understood that he did not meet with much success. The district is now becoming an important apple-raising and farming centre, and a very desirable class of Old Country settlers are rapidly acquiring all the tillable land.

A number of claims in the Rock Creek District were reported on by the Provincial Mineralogist in 1901, but since then comparatively little work has been done. Only two properties were visited by the writer—namely, the *Riverside* and *Steeves* group.

Riverside. This property, situated four miles north-west of Rock Creek on the east bank of the Kettle river, is owned by a Phœnix company, which acquired it about two years ago from the heirs of the original locator, Benjamin Perkins. For several years back small shipments of hand-sorted ore have been made from time to time. This summer two men were at work for four months, and four cars of ore were shipped, netting about $300 a car, after freight and treatment charges had been paid. The property is favourably situated for shipping ore, as the Kettle Valley Railway runs through it and a siding and ore-bin have been put in to facilitate the shipment of ore in bulk. Work was discontinued in October and nothing will be done until next summer.

The formation in which the veins occur in this district appears to be a rather impure, altered dolomitic limestone. In places the rock is almost a serpentine, probably representing a complete alteration from limestone. Two parallel veins are exposed on the *Riverside*, striking about north-west and dipping very flatly to the north-east. In places these veins are almost horizontal, and again they have a pitch of 45 degrees. The veins which are of the "sheared-zone type" and formed by silicification and replacement along fracture-planes, are from a few inches up to several feet in width. The gangue is predominantly silica, but considerable lime also occurs, both as secondary calcite and included wall-rock; while the ore minerals are galena, sphalerite, pyrites, and a little chalcopyrite. In some places the veins are well defined with distinct walls, and in others they are more irregular and indefinite. The main vein on this property is developed by a tunnel 200 feet long, at the end of which it has disappeared; probably faulted. A short distance from the face of the tunnel a winze has been sunk 35 feet, which unfortunately, was full of water when the property was visited. It is claimed that the vein shows up nicely at the bottom of this winze and carries good values. Practically all the ore above this tunnel has been stoped out, the work this summer cleaning up the last of it.

The other vein is developed by a very flat incline, the lower half of which was full of water. This vein is not as well defined as the other, and the values are probably somewhat lower. Throughout the workings seen, consisting of the incline and drifts to either side, with a few small stopes, the vein probably averages about 4 feet in width.

If, as claimed, these two veins would average from 2 to 4 feet in width and from $15 to $20 a ton in values, and if some suitable concentrator was erected, it should be possible to operate them at a profit; much further development is, however, necessary before anything definite could be told.

Steeves Group.

This property, consisting of the *Emmaline*, *Imperial*, and two other claims, is owned by E. L. Steeves. The vein is very similar to those on the *Riverside*, but it is not so clearly marked. Mineralization extends from a few inches to several feet in width. The vein dips at about 10 to 20 degrees to the east and strikes north and south. The gangue is quartz and lime carrying sulphides of iron, lead, zinc, and copper. The walls seem to be 15 to 20 feet apart, and in places the ore is up to 8 feet in width. The following samples were taken:—

Location.	Gold.	Silver.
	Oz.	Oz.
Face of tunnel, 4 feet wide	0.06	1.80
Average of ore-dump, upper tunnel	0.08	10.60
" lower "	0.02	5.20

The *Sunnyside*, a claim up James creek, half-way between Westbridge and Rock Creek, was worked for a time this summer and one or two cars of ore shipped. The showing is said to be somewhat similar to that on the *Riverside* with values about the same. The ore shipped was, however, carefully hand-sorted, bringing it up to between $40 and $50 a ton. Time was not available to go to see this property.

West Fork of Kettle River.

This section was visited in 1901 by the Provincial Mineralogist and reported on by him in full. Some work has been done since that time, but on most of the claims no change has taken place. The construction of the Kettle Valley Railway up this valley, which has now progressed to the Arlington lakes, fifty miles from Westbridge, is to some extent stimulating an interest in mining throughout the district. The *Sally*, one of the best-known properties, was taken up last August under lease and bond and is now being worked steadily. The *Carmi*, another important claim, was bonded in December by Victoria people, but as yet work has not been commenced. In 1910 L. Reinicke, of the Dominion Geological Survey, completed the field-work of a topographic and geological sheet embracing Beaverdell, Carmi, and nearly all the mineral claims of importance in this district. His final report has not yet been published.

Wallace mountain, lying east of Beaverdell, is the most important mineral area in the district. The silver ores of Wallace mountain consisting of galena, sphalerite, ruby-silver, tetrahedrite, and rarely arsenopyrite, occur in true fissure-veins in a granite formation. The native silver occurs generally along fracture-planes, in thin plates, and at times is found in the wall-rock away from the vein. The veins, which strike east and west and dip south at varying angles, are from a few inches up to several feet in width; the walls are generally fairly well defined, although, in places, the wall-rock is slightly crushed and shows evidences of kaolinization and silicification. The vein-matter is largely altered and silicified granite, together with bands of quartz; the regular banding and crustification of the quartz and sulphides in certain places suggests definite fissure-filling, while, again, the action appears to have been almost entirely replacement of the granitic wall-rock. The veins are cut by a well-developed series of faults striking north and south and dipping westerly; the displacement varies from 2 to 150 feet, and probably more. In places, a fault-plane at a very steep angle is seen cutting another fault-

plane at a flat pitch. In the early stages of prospecting much time and money was wasted in looking for the faulted veins in wrong directions, but now the fault systems are fairly well understood. It has been noted that at, or near, a fault-plane the vein is quite often enriched, and also along the fault-planes considerable mineralization is in evidence; this would suggest a concentration and enrichment subsequent to the vein formation. This excessive faulting of the veins has proved a great drawback to the district, as, in many instances, the owners have been forced to cease operations before the faulted veins were picked up again.

Sally Group.

This property is owned by a company of which Robert Wood, of Greenwood, is the principal stockholder, and includes the *Sally*, *Rob Roy*, and several other claims. There are at least two veins on the *Rob Roy* and two or three on the *Sally*, all of which have been developed by adit tunnels from 100 to 500 feet long. On each vein numerous faults occur, and in most of the tunnels the vein has not been recovered at the face. There seems little doubt, however, that intelligent work would soon find the veins again.

The No. 1 tunnel on the *Rob Roy* is in 200 feet; in the face the vein is 28 inches wide, half of which is quartz. A sample across the full width gave 0.02 oz. gold and 57.6 oz. silver to the ton. The No. 2 tunnel on the *Rob Roy* is in 500 feet; the vein is lost at the end of this tunnel in a heavy fault showing a crushed gouge 2 feet thick; considerable ore has been stoped above this tunnel, and a good deal of low-grade ore is still available. A crosscut tunnel has been started to tap these veins at greater depth and is in 370 feet, but, as yet, is not in far enough. A considerable tonnage of second-class ore has been sorted out and is on the dump. An average sample of the dump at the No. 2 tunnel, where there are about 1,000 tons of ore, assayed: Gold, 0.04 oz.; silver, 31.2 oz. to the ton.

The main *Sally* vein is developed by a tunnel 500 feet long, at the end of which the vein was cut off by a heavy fault. Numerous small faults occur in this tunnel, but the vein was always picked up by drifting to the south. From the end of the tunnel the fault-plane has been followed to the south for 150 feet, and there the work was stopped without finding the vein. There is evidence, however, on the surface that this fault has a throw of about 200 feet, so it would be necessary to drive another 50 feet to pick up the vein. A lot of high-grade ore was stoped from this working, all being hand-sorted before shipment, leaving 1,500 to 2,000 tons of second-class ore on the dump. The average value of this is said to be from $10 to $12 a ton. There are several other tunnels, open-cuts, etc., on other veins, all of which show some mineralization. From one open-cut on another vein two car-loads of high-grade ore were taken out. A tunnel 200 feet long was driven on this vein lower down the hill, but practically no ore was found. The present leasers are driving on this vein higher up the hill and are taking out some very nice ore.

The future of the *Sally* group is dependent on the finding of the veins along the successive faults. Where and when the veins will be found properly in place is a matter of development-work, but the ore, when found, is sufficiently rich to net a handsome profit over operating expenses. When formerly worked the ore was hauled by wagon fifty miles to the railroad at Midway, while now it is only three miles to the railroad at Beaverdell; this, of course, makes quite a saving in handling costs. As has been previously mentioned, quite a tonnage of second-class ore has been taken out in the mining operations, and a mill of some type is needed to concentrate this ore to a shipping grade: experiments are now being made to determine what kind of mill would be suitable.

Rambler.

The *Rambler* lies almost two miles and a half south-east of the *Sally*, on the south side of Dry creek. There are three veins on this property partially developed; ore to the amount of $11,000 has been shipped, but

for some years past the property has been idle. The main vein is developed by a shaft 85 feet deep, in which the vein is cut off by one of the usual faults; a crosscut tunnel was started to tap this vein, which struck one small vein about 150 feet from the portal and the main vein should be about 80 feet farther ahead. The main vein shows up very nicely, in places showing from 6 to 14 inches of solid high-grade ore. The third vein is opened up by means of a shallow shaft, which was full of water at the time of visiting the property; it is similar to the others, but with less high-grade ore.

Bounty Fraction. The main vein on this property is developed by a shallow shaft and open-cuts; a crosscut tunnel was started to strike this vein and another small vein encountered; this was drifted on both ways, and at the end of each drift the vein was cut off by a fault. Three cars of ore were taken out of this working and then the work was stopped. The crosscut is not in far enough yet to strike the main vein.

Buster. An incorporated stock company owns this property, but has not worked it for some time; it is developed by a shaft 90 feet deep, which was full of water when the writer was there. It is claimed that the lead shows up well in the bottom of the shaft; the vein is from 1 to 3 feet in width, and is said to carry values from $10 to $30 a ton.

Bell. On this property there are two veins and a small stringer; one vein is from 12 to 18 inches wide, and is said to carry average values of from $25 to $30 a ton; a shaft 45 feet deep is said to have the vein at the bottom. The other vein is from 8 to 12 inches wide, with values from $25 to $35 a ton; the stringer carries some very high-grade ore, but it is almost too small to be considered, being only an inch or two wide. A crosscut tunnel has been started and is in 300 feet; it will require to be driven at least another 100 feet before it strikes the first vein.

CARMI.

The town of Carmi, situated about four miles up the West fork from Beaverdell, is a small place started about 1900 by reason of the opening-up of the *Carmi* mine, half a mile away. The *Carmi* was formerly owned by L. W. Thurston, of London, Eng., but is now held by F. J. Finucane, who took it over in payment of debt. The building of the Kettle Valley Railway through the district helped the town for a short period, but at the present time no work is going on close at hand. A few ranches are held along the river, but the elevation, climate, and soil are unsuitable for any very extensive farming.

Carmi Group. This group consists of the *Carmi* and the *B.A. Fraction*, both Crown-granted claims. Adjoining the *Carmi* on the north side is the *Butcher Boy*, also Crown-granted, owned by Robert Kerr, James Dale, and others. The main vein, striking east and west and dipping south, through the *Carmi* and *Butcher Boy*, is a well-defined fissure from 2 to 15 feet wide and cuts a gneissic granite formation; it is exposed on the surface here and there for a distance of 2,500 feet, and is apparently free from any large faults, although small displacements occur. The vein-filling is for the most part quartz, but in places large "horses" of more or less altered granite or dyke matter occur. Iron-pyrites is the chief mineral occurring in the quartz, but this is in quite small quantity, while in some shoots small occurrences of galena and zinc-blende are found. A black hornblendic dyke parallels the vein in a great many places and probably has had some influence on the formation of the ore, as it is in places also mineralized; the values are in gold apparently associated with the iron-pyrites.

The main shaft on the *Carmi*, on the western end of the property, has been sunk 250 feet, and 200 feet of drifting, together with some stoping, done from it; another shaft is down 46 feet on the *Butcher Boy* claim. A tunnel driven on the vein has been started at about the river-level on the eastern end of the *Carmi* claim, and is in about 100 feet. The property is equipped with a 10-stamp mill and two concentrating-tables and an experimental sand-leaching cyanide plant. In 1899 and 1900, 900 tons of hand-sorted ore, averaging $26 to the ton, was shipped to the smelter at Greenwood; the mill was erected after this, and a small amount of ore treated, but shortly afterwards operations ceased and the mine has since been closed.

No attempt was made to sample this property, as such would have taken considerable time, and in any case the shafts were full of water; the property has been thoroughly sampled by engineers at different times, and it is said that average values for the whole vein are from $6 to $8 a ton; some shoots, however, carry much better values—up to $20 a ton. It is understood that the report of the last engineer who examined the property was favourable, but for some reason his principals declined to go ahead with the option they held.

A small shipment of hand-sorted ore was made from the *Butcher Boy* several years ago, but the returns from this ore are not known.

It would seem as if the *Carmi*, while low grade, might be made to pay if operated on a fairly large scale with a mill of some type, probably cyanide treatment, which would save a high percentage of the values.

BOOMERANG CAMP.

About eight miles above Westbridge a large number of claims were staked ten or twelve years ago in what is known as Boomerang camp. Boomerang creek comes in on the east side of the West fork, and while some claims were staked along this creek, the main showings are on the hills opposite on the west side of the river. The best-known claims are probably the *W.S.* and *Boomerang*, situated half a mile west of the river, and the *Iconoclast*, three miles farther west. The more important claims in this district were worked sufficiently to secure Crown grants and then allowed to remain idle, while a large number that were staked have reverted to the Crown. A short stop was made on the way from Beaverdell to Midway to secure samples from the *W.S.* and the *Boomerang*, but no other claims were visited; the writer is, however, familiar with the camp through previous visits and work done there.

The main rock formation is granite intruded here and there by dykes and small bosses of a porphyritic rock; the veins for the most part strike east and west and are apparently well-defined fissure-veins varying from a few inches to several feet in width, the vein-filling being quartz with sparing quantities of galena and iron-pyrites. The values are chiefly in gold, which seems to be associated with the galena, as these values always go up when the galena-content increases. A large number of the veins are, however, extremely low grade, and, as in most gold veins, the values are very irregularly disseminated in pockets or shoots. The low grade of the ore, together with the lack of railway transportation, resulted in the practical abandonment of the camp, but now that the Kettle Valley Railway is running through the district it is possible that some of the properties would warrant further work.

Boomerang. On the *Boomerang* which is staked up the hill from the river, a ledge of white quartz from 2 to 6 feet wide crops out, on which several holes, open-cuts, etc., have been put down; very slight mineralization with iron-pyrites and traces of galena are in evidence, but it is likely that values would be quite low. A sample as nearly average as possible taken from several dumps returned: Gold, 0.08 oz.; silver, 0.8. oz. to the ton.

W.S.

This property is staked on a continuation of the *Boomerang* lead up the hill, and a shaft 50 feet deep has been sunk on this vein near the western end of the claim. At this point the vein lies in a contact between granite and porphyry; it seems likely that this contact is only incidental, as in other places the vein leaves the porphyry and is wholly within the granite. The vein, which is four feet wide at the outcrop, pinched to a seam at about 30 feet down, and continued that way for 15 feet and then commenced to come in again; the bottom of the shaft shows about 18 inches of quartz, which is widening out; the shaft was full of water at the time of visiting the property, but the above statements are known to be true. The ore taken from the shaft has been piled in three dumps, and average samples of each of these were taken as follows:—

No. 1 dump (outcrop ore), 12 tons: Gold, 1 oz.; silver, 7 oz.; total value, $23.50 to the ton.

No. 2 dump (main dump), 25 tons: Gold, 0.34 oz.; silver, 2.3 oz.; total value, $7.95 to the ton.

No. 3 dump (ore taken from bottom of shaft where vein is coming in), 3 tons: Gold, 0.64 oz.; silver, 0.2 oz; total value, $12.90 to the ton.

This gives an average value for the ore extracted of: Gold, 0.56 oz.; silver, 3.73 oz.; or a total value of about $14 a ton.

This vein cannot be traced for any distance on this claim, as, to the east of the shaft, it is covered with wash, while to the west, it is apparently capped by the porphyry. Five hundred feet to the west a small vein crops out, which is probably an extension of the main one and is entirely within the granite formation; this small showing is prospected by some open-cuts and a 15-foot shaft, the cuts showing the vein to be faulted, while in the shaft the vein pinched to two seams about 18 inches apart, and in between is a filling of kaolinized granite. A sample of this altered granitic vein-matter returned only traces.

Two other leads are exposed on the property, paralleling the main lead, and north and south respectively from it; on each of these showings a 10-foot shaft has shown the veins to be cut off a few feet from the surface, and so apparently they are merely slides from somewhere.

The main vein warrants further development-work, as, if it is continuous with the present values and size, it could be made to pay nicely; the ore could probably be milled by a combination amalgamation and cyanide treatment, or possibly by straight concentration. Supplies and the necessary machinery can now be brought in cheaply by the railway and the concentrates shipped.

MAIN KETTLE RIVER DISTRICT.

The mineral claims along the Kettle river were examined in considerable detail by Wm. Fleet Robertson, Provincial Mineralogist, in 1901, who came right down the river from Monashee to Westbridge, making frequent stops wherever mineral locations had been taken up. His report is in the Minister of Mines' Report for 1901, and it would perhaps be advisable to here note a few extracts from it:—

"It is apparent from the locations that have been made, that there is a mineralized belt extending from the Kettle River valley at about Canyon City in a westerly direction across country to the headwaters of the West fork of this stream, passing through Beaverdell and Carmi, and probably continuing in the same line at least as far as the Osoyoos valley.

"Although the actual contact could not be found, it was noted that just about this point there was a change in the general formation, in passing southward from the fine-grained igneous rocks of the upper Kettle river to altered sedimentaries, and still farther south to quite unaltered sedimentaries, while at Rock Creek there was an occurrence of coal formation.

"The values so far found are chiefly in gold, in association with iron-sulphides, usually arsenical. Some galena has been discovered, and where found is quite high in precious metals, but as it is usually associated with iron-sulphides it is not very clear just where the values are carried, not that it matters much from a practical standpoint.

"Copper and zinc sulphides also occur as associated minerals, but not in quantities to be of value as such alone. The geological conditions along this belt seem very favourable for the occurrence of mineral, and such superficial work as has been done indicates that the ore found carries good gold values, so that, taken altogether, the section is well worth the serious attention of the prospector."

Since the above was written very little work of any kind has been done in the main Kettle River section, and it would seem well to emphasize the fact that it is a promising field for the prospector.

The writer made a hurried trip to see some copper-showings on Canyon creek, a tributary of the Kettle river, which, although located in 1899, were not examined by the Provincial Mineralogist in 1901. About 1900 these showings attracted attention because of the high-grade bornite ore discovered, but since that time, when they were Crown-granted, no further work has been done.

COPPER CAMP.

This camp is situated about five miles from the mouth of Canyon creek, or, as it is locally called, Copper creek. There is some confusion in regard to names here; a small creek entering the Kettle river at what is known as "Canyon City" (although at the present time there is only one building on the townsite) is locally known as Canyon creek, while what is really "Canyon creek" coming in 23 miles farther up the river is called Copper creek.

From the main river-valley a somewhat rough trail runs up Canyon creek to the camp. The canyon extends for about a mile, along which the trail is over a talus slope from the cliff, but past that the creek-valley widens out, the hills taking on gentler slopes, which are fairly well timbered.

The rock formation is nearly altogether of igneous origin, showing all variations from acid granite to very basic rocks, and also here and there lava rocks capping the older plutonics.

Lottie F., Messina Group.

This group of claims, situated five miles up from the mouth of Canyon creek, is owned by Geo. Rumberger and associates, of Phœnix. The formation in which the ore occurs is limestone, more or less altered near the contact with the igneous rocks. The area of limestone seems quite small and is entirely surrounded by porphyrite, granites, and more basic igneous rocks, which are apparently later than, and intrusive into, the older limestone. Andesites and basalts, lavas of probable Tertiary age, occur here and there over the district, capping the older formations. The limestone, together with some schists, is probably all that is left of an extensive series of sedimentary rocks now nearly obliterated. It is possible that farther up the creek these sediments have a greater development than on the *Lottie F.*, but this was not seen. Small quantities of high-grade bornite-ore occur here and there throughout this limestone. At a point near the line between the *Lottie F.* and the *Pinwin Fraction* a shaft has been put down 50 to 60 feet, from which about 18 tons of nice ore has been taken out. This shaft was full of water and could not be examined, but it is said that it has gone right through the bornite and is in barren limestone at the bottom. Several other holes from 5 to 10 feet deep show varying quantities of bornite at the surface, but decreasing at the bottom.

The following samples were taken :—

	Gold.	Silver.	Copper.
	Oz.	Oz.	Per cent.
Average of ore-dump from main shaft	0.08	2.30	10.50
Picked high-grade ore from dump, main shaft	0.30	4.10	33.80
Average sample of waste from dump, main shaft	Trace.	0.20	
Average sample from 10-foot prospect-hole	Trace.	Trace.	0.50

The picked high-grade sample from the main ore-dump was taken in order to ascertain if it carried high gold values, as was said to be the case.

The occurrence of bornite without any chalcopyrite at all would suggest that the bornite is of primary origin, but it may be that it is secondary, and that further work would reveal the chalcopyrite at greater depth. The deposit is a typical contact metamorphic one, with a development of the usual lime-silicate minerals, garnet, epidote, etc. The mineralization is more in evidence close to the contact, and also there the limestone is highly altered. It would seem to be reasonable to suppose that the ore would persist in depth as far down as the limestone goes, so that the fading-away of the ore in the bottom of the shaft may be only temporary. The ground is by no means extensively prospected, and if the property were in a more accessible locality it is highly probable that more work would be done on it.

To the north of the *Lottie F.* there is a large showing of red oxidized rock which seems to be badly decomposed granodiorite. Iron-pyrites probably exists in the unaltered diorite, which has been oxidized for some distance below the surface. This showing has been staked and a tunnel run in to crosscut underneath the iron-capping. A general sample of the oxidized material returned: Gold, trace; silver, trace.

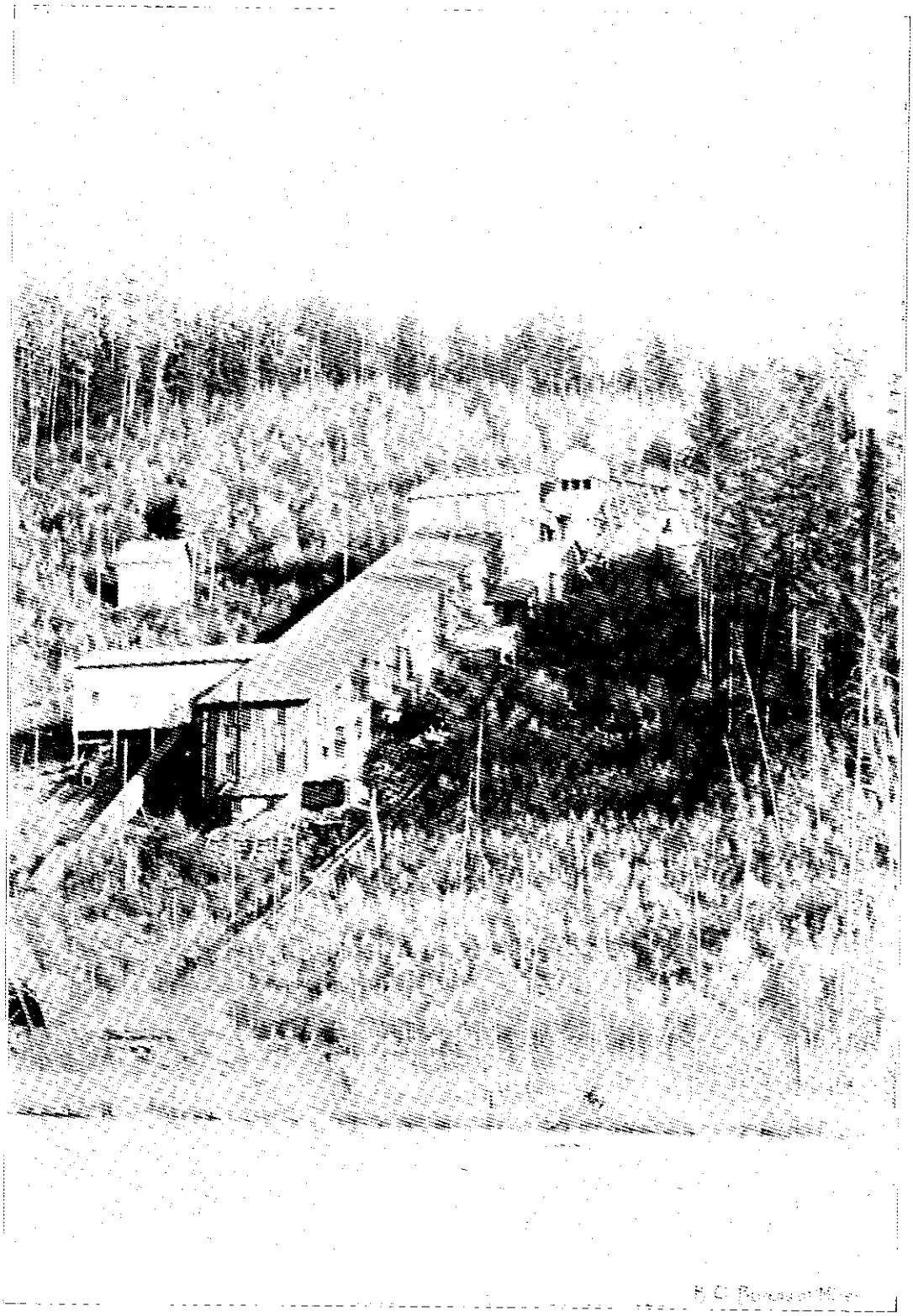
Time did not permit of an extended examination of the district, but a brief visit was made to Canyon camp, at the head of Deer creek. In this camp, which is situated on the divide between the main Kettle river and the West fork, a number of claims were staked and considerable work done prior to 1901. In 1901 the Provincial Mineralogist examined and reported on this camp; since that time no further work has been done.

The formation is mainly igneous, consisting of porphyries and granitic rocks with frequent cappings of Tertiary lavas. Several quartz veins carrying arsenopyrite, pyrrhotite, etc., have been prospected, and also some bodies of pyrrhotite occurring in lenses in granodiorite. Good values are reported, but it seems probable that average samples would be low grade.

The *Mogul* claim has a small quartz vein occurring in granite, on which a shaft about 50 feet deep has been sunk. This was full of water and the timbers all caved in. The vein is apparently 10 inches to 2 feet wide, and a sample taken from the dump, intended to be an average, assayed: Gold, 3.85 oz.; silver, 0.60 oz. to the ton. Another sample taken from a lens of pyrrhotite in granite, which is opened up by a 10-foot prospect-hole, returned: Gold, 1.08 oz.; silver, 0.10 oz. to the ton.

The *O.K.*, *Silver Dollar*, and several other claims had a good deal of work done on them in past years, but after Crown-granting they have been allowed to remain idle.

The *Belcher* claim, which is on the pack-trail on the main river a few miles above Canyon City, has a nice-looking quartz vein 10 to 20 inches wide, developed by a shaft 50 feet deep. A sample across 10 inches of the vein assayed 0.30 oz. gold to the ton, and another of the dump gave 0.16 oz. gold to the ton.



Jewel-Denero Mine—Stamp and Cyanide Plant.

These random samplings merely indicate that the quartz veins of this section seem to carry more or less gold, and indicate that possibly some of them may have pay-shoots of workable ore. The writer believes that the district has not yet been thoroughly prospected, and that it would repay further systematic work.

The Kettle River valley from Westbridge up to the mouth of Canyon creek is generally a fine wide valley, with good ranches here and there; the land is suitable for growing hay, and the benches and flat hills up from the river provide suitable summer grazing for cattle. It is a valley that should, before long, be entirely taken up, as it is quite suitable for mixed farming. The elevation at Canyon City is about 2,100 feet, and twenty miles farther up the river is not more than 300 feet higher. For a few miles immediately above Canyon City the valley narrows and there is no land, but above this and on up to and probably beyond Canyon creek (Copper creek) there is a fine valley about a mile to a mile and a quarter wide. Six miles below Canyon creek Christian Bros. have a good ranch; this summer they packed a mower in over the trail and cut 30 to 40 tons of hay. It is to be hoped that the wagon-road will soon be put through from Canyon City at least to Canyon creek to open up this country.

GREENWOOD MINING DIVISION.

REPORT OF W. R. DEWDNEY, GOLD COMMISSIONER.

I have the honour to submit the annual report on mining operations in the Greenwood Mining Division for the year 1913.

B.C. Copper Co.

Through the courtesy of Oscar Lachmund, general manager of the British Columbia Copper Company, I give you hereunder a summary of the company's operations during the year 1913:—

Ore Shipments.

Mother Lode	294,215 tons.
Queen Victoria (in Nelson Mining Division)	28,055 "
Rawhide	237,701 "

Ore smelted.

Canadian	564,679 tons.
Foreign	48,228 "

Production of Metals.

Gold	26,557 oz.
Silver	136,735 "
Copper	8,296,707 lb.

Granby C.M.S. and P. Co.

The following is a summary of the Granby Consolidated Mining, Smelting, and Power Company's Phœnix operations for the year 1913, kindly sent to me by J. J. Strutzel, of that company:—

Ores produced.

Old Ironsides mine	1,037,579 dry tons.
Gold Drop mine	189,964 "

Development.

Old Ironsides mine—		
Sinking	10	feet.
Raising	4,450	"
Drifting	4,781	"
Gold Drop mine—		
Raising	2,215	"
Drifting	1,344	"
Total	12,800	"
Diamond-drilling	15,971	feet.

During the year the machine-shop was improved by the addition of the following new equipment: One 22-inch Barnes drill; one 2½- x 26-inch Acme turret lathe; one 24-inch Style D. New Haven lathe; one No. 3 Cincinnati universal miller; one No. 2 Cincinnati universal grinder; and one No. 12 Higley cold saw.

In the mines, the equipment was augmented by the purchase of one 6-ton Westinghouse locomotive, equipped with two 500-volt Type K motors.

West Fork District.

Alex. Robinson, who is in charge of the *Sally* and other mines, on the West fork of Kettle river, was good enough to send me a report on mining in that section:—

"This district, embracing all the country drained by the west branch of the Kettle river, has for years been practically at a standstill, as far as mining is concerned.

"The operations on the *Sally*, *Carmi*, and *Rambler* mines in past years demonstrated that even the high-grade ore encountered on these properties would not offset the heavy costs of transporting ore to the smelters and of supplies to the mines, necessitating as it did a sleigh-haul of between fifty and sixty miles, in addition to the cost of moving the ore from the mine to the foot of the mountain.

"The long delay in the construction of a line of railway discouraged mine and claim owners, with the result that gradually the place was abandoned, and what was at one time one of the most promising mining camps in the Interior became only a wilderness of abandoned claims and deserted cabins.

"With the advent of the Kettle Valley Railway, however, there are signs of a revival of interest in the mining business of this locality. The *Sally* and other properties, belonging to the Vancouver and Boundary Creek Mining and Development Company, have been bonded and work resumed with a crew of eight to ten men. Four car-loads of ore have been extracted from the lead on the *Rob Roy* claim, and considerable development-work has been done on the No. 2 lead on the *Sally* claim. As the railway now passes within three miles of the property, thus lessening the cost of transportation, it is not necessary to sort the ore so closely as was formerly the case, and it is now possible to ship large amounts of ore that in the past had to be left on the dump. The value of the ore shipped so far averages about $50 a ton from the mine. In addition to this, shipments from the old dumps are being made to the local smelters at Grand Forks and Greenwood, the higher grade, of course, going to the smelter at Trail.

"In addition to the *Sally* group, the *Rambler* claim on the same hill has been bonded, and work will be under way in a few days. Shipments from this property in the past to the Trail smelter ran from $79 to $184 a ton, car-load lots, and as it is a large, well-defined lead, there is every probability that it will develop into a steady profitable shipper.

"On the opposite side of the river, the *Carmi* and *Butcher Boy* mines, which a few years ago shipped upwards of 1,000 tons of ore, are likely to again resume operations. Arrangements have been made whereby work will be resumed in the spring, repairing the stamp-mill and flume, and putting the shaft into working condition.

"Perhaps the most encouraging feature is the remarkable number of inquiries that are coming in regarding the chances of acquiring mining properties in this district, and it is significant that of three mining engineers who visited the West Fork country this summer, two of them secured properties, and the third was only deterred by failure to agree with the owners on terms of payment; and there is a very general feeling that the coming spring will be a busy season in the mining business in this locality."

Argo Mine, Greenwood.—Work was kept up continuously on the *Argo* mine during the year. The tunnel, 6 x 7 feet is now in about 900 feet; 25 feet of low-grade copper-ore was struck when the tunnel was driven 500 feet, but this was not followed up. Good indications have been found in the face of the tunnel, and Ola Lofstad, the enterprising president of the Argo Mining and Tunnel Company, Limited, believes he has not far to go before he strikes the lead.

Big Copper Group.—The Granby Company began diamond-drilling on the *Big Copper* group of claims, situated in Big Copper camp, near Deadwood. I have been unable to obtain particulars as to the result of their operations, but understand work will be resumed this spring.

Jewel Mine.

H. D. Quinby, acting-manager for the Jewel-Denero Mines, Limited, sent me the following report on the *Jewel* mine, the only gold-mine in active operation in this Division, and situated about eight miles from Greenwood:—

"The Jewel-Denero Mines, Limited, is a Scotch company with headquarters at 71 George Street, Edinburgh, Scotland. During the past year an average of fifteen men was employed on the surface and twenty-five men underground. The total dry short tons of ore extracted and treated in the mill since remodelling same in July was 8,095; the wages paid during the year were $32,187.72. The total fine ounces of gold produced was 3,317.114; the total fine ounces of silver produced was 16,458.62. The total gross value was $78,281.33; the net value was $75,934.24."

A new wagon-road from Greenwood was built to this mine in 1913, with a very much better grade than the former road.

PLACER-MINING.

In the Greenwood Mining Division, the scene of so much placer-mining in past years, not one new location was recorded during the year. Two claims were re-recorded, and one placer mining lease is at the present time in good standing.

OFFICE STATISTICS—GREENWOOD MINING DIVISION.

Free miners' certificates issued	211
Locations	75
Certificates of work	194
Transfers	31
Filings	13
Certificates of improvement	9
Crown grants	6

GRAND FORKS MINING DIVISION.

NOTES BY J. D. GALLOWAY, ASSISTANT MINERALOGIST.

The town of Grand Forks, situated at the junction of the main Kettle river and the North fork, is a progressive and thriving place, in part supported by a rich farming country tributary to it, and in part by the larger smelter of the Granby Consolidated Mining, Smelting, and Power Company. This smelter treats nearly 4,000 tons of ore a day, employs nearly 400 men, and has a monthly pay-roll of about $40,000. The ore for the smelter is obtained almost entirely from the company's mines at Phœnix, twelve miles away, but, in addition, a little custom ore is also treated. No mining is going on in the immediate vicinity of Grand Forks, but the North Fork district is tributary to the town, and any developments in that locality will help its growth.

Granby M. S. and P. Co.

Granby Consolidated.—The Granby Company has again had a very successful year, although both tonnage and values recovered show a decrease from those of 1912. The smelter was operated at full capacity throughout the year, and the slight decrease of tonnage from that of the previous year is not the result of any lack of ore, industrial troubles, or any other serious cause, but is accounted for by the slightly higher silica-content of the ore, which reduced to a very small degree the daily capacity of the eight furnaces. The decrease in values is accounted for in part by the lower grade of the ore treated, and in part by the lower price of copper, which, for the year, averaged nearly 1 cent. a pound less than in 1912. The ore now being treated at the smelter from the company's mines at Phœnix only gives a recovery of about 17.5 lb. copper to the ton, as against 20 for the previous year. On the other hand, the mining and smelting costs of the company are less now than ever before, so that it is possible to handle a lower grade of ore and still leave a profit. The ore reserves at the mines at Phœnix are gradually being depleted, but 5,000,000 to 6,000,000 tons are yet available.

During the calendar year 1913 the Granby Company mined and smelted 1,227,544 tons of ore from its own mines in Phœnix camp. This compares with 1,250,689 tons in 1912. Development-work in the company's mines was carried on as usual; the total for the year amounting to 12,800 feet of drifts, crosscuts, and raises. Diamond-drilling amounted to about 1,300 feet a month, the cost of which is charged to development-work. This charge is about 14 cents a ton, bringing the cost a ton of ore up to 75.4 cents, which compares with 78 cents in 1912.

The entire holdings of the Snowshoe Gold and Copper Mines, consisting of the *Snowshoe*, *Pheasant*, *Fair Play Fraction*, and *Alma Fraction*, 117 acres in all, have been purchased by the Granby Company. It is planned to run a drift from the *Curlew* tunnel through the *Snowshoe* ground, and from this mine all the available ore and handle it through the *Curlew* terminals, which at present handle ore from the *Curlew*, *Gold Drop*, etc. An option was also secured on the *Big Copper* property, six miles from Greenwood, and diamond-drilling carried on from October until December, when work ceased for the winter. The showing on this claim is a body of more or less silicified limestone carrying iron-oxides and native copper.

At the smelter at Grand Forks everything has proceeded very smoothly, without any important change being made. The method of handling the slag by granulating and elevating it on belt-conveyors to a height of 100 feet, which has been in operation for two years, is working satisfactorily, and, it is claimed by the management, is cheaper than the old hot-dumping system. The average cost of handling the slag from each ton of ore treated is about 5½ cents. The eight furnaces, together with the converter department, were run practically continuously throughout the year, with only occasional stoppages of one of the furnaces for minor repairs.

The official returns from the company for the calendar year 1913 show that there was mined and smelted 1,227,544 tons of ore, of which the "assay-value" contents was: Gold, 48,656 oz.; silver, 345,221 oz.; and copper, 29,814,512 lb.; while the contents actually "recovered" by the smelting operations was: Gold, 39,714 oz.; silver, 259,116 oz.; and copper, 21,219,546 lb.

The company employed during the year a daily average of 484 men about the company's mines, of which 367 were employed "underground" or mining, and 117 were employed on the surface.

The following extracts are taken from the annual report of the Granby Company for the fiscal year ended June 30th, 1913:—

"TREASURER'S REPORT.

"Following is a summary of the year's business:—

"*Produced.*

"22,688,614 lb. of copper fine, sold at average price of.....	$ 0.16039
324,336 oz. of silver fine, sold at average price of	0.61179
47,266 oz. of gold fine, sold at average price of	20.00
The total amount realized equals	$4,782,691.20

"*Costs.*

"Working expenses at mines and smelter, freight, refining, selling, and general expenses	$3,402,972 19	
Foreign ore purchased	165,119 71	
		$3,568,091 90
Cost per ton, including all expenses	$2 65	
Cost per pound of copper after deducting value of gold and silver	10.6c.	

"*Profit and Surplus.*

"Net profit for year ending June 30th, 1913		$1,214,599 30
Less—Dividends paid during year	$ 449,955 46	
Discount, interest, and expenses, issue of $1,500,000 Series A Bonds	80,665 62	
Depreciation	829 05	
		$531,450 13
Net surplus for year ending June 30th, 1913		$ 683,149 17
Surplus carried over from last year		2,516,121 56
Total surplus at credit June 30th, 1913		$3,199,270 73"

Report of C. M. Campbell, assistant superintendent of mines:—

"*Shipments.*

"These are the largest on record, a tonnage of 1,261,088 having been shipped. The following table shows an analysis of the ore shipments to date:—

	Above No. 3 Tunnel.	Victoria Shaft.	Gold Drop.	Totals.
Prior to July 1st, 1912.....	4,731,637	2,362,303	881,254	7,975,194
Year ending June 30th, 1913.....	545,121	505,623	210,344	1,261,088
Totals to date	5,276,758	2,867,926	1,091,598	9,236,282

"*Development-work.*

"The totals for the different places and the totals to date are as follows:—

	Sinking.	Raising.	Drifting.	Total.
Gold Drop	10	1,620	779	2,409
Ironsides	176	4,286	4,646	9,108
Totals for year	186	5,906	5,425	11,517
Total to date	2,472	39,044	66,332	107,848

"Diamond-drilling for the year amounted to 14,996½ feet and the total to date is 76,141½ feet.

"*Costs.*

"The average cost per ton, crushed, on cars, including development, was 75.4 cents. This was a reduction from the previous year of 1.7 cents. Extra wages paid during the period of high copper.

"*Ore in Sight.*

"New ore developed during the year amounted to 441,072 tons. The present condition of the ore reserves is therefore as follows:—

	Gold Drop.	Ironsides.	Total.
Ore developed	1,302,000	13,547,684	14,849,684
Mine has produced and shipped	1,091,598	8,144,684	9,236,282
Remaining ore	210,402	5,403,000	5,613,402

"*Grade.*

"Returns from the smelter show a recovery of 17.68 lb. of copper per ton of ore. Details are given below. Owing to the low-grade nature of the new ore added to the reserves, future calculations will have to be based on a recovery of 17 lb.

"*Table showing Recoveries from Granby Ore for Year ending June 30th, 1913.*

Period.	Dry, Tons smelted.	Metals recovered per Ton.		
		Cu. Lb.	Ag. Oz.	Au. Oz.
July, 1912	107,427	16.38	0.192	0.034
August, 1912	109,355	17.72	0.199	0 035
September, 1912	108,484	18.85	0.211	0.039
October, 1912	112,247	17.75	0.20	0.038
November, 1912	100,671	18.0	0.214	0.034
December, 1912	105,796	18.1	0.20	0.033
January, 1913	100,881	17.5	0 204	0.03
February, 1913	96,971	18.0	0.223	0.032
March, 1913	107,931	18.1	0.233	0.031
April, 1913	104,848	17.7	0.236	0.033
May, 1913	106,755	16.67	0.223	0.032
June, 1913	103,324	16.9	0.20	0.03
	1,264,690	17.68	0.208	0.0326"

Report of W. A. Williams, superintendent of smelters:—

"*New Construction.*

"During the past year we have built an addition to the warehouse, giving us larger storage-room, at a cost of $2,000. We have and are at this time putting in a new water service, getting better drinking-water for the men around the works. This will cost, when finished, $2,500.

"The slag-stacking system is now complete and working smoothly. Total cost of same was $63,985.28. Average cost handling slag for the year per ton of ore was 5½ cents.

"*Blast-furnace Department.*

"We ran steadily in this department for the full year. We averaged 7.94 furnaces in continuous operation for 365 days.

"The furnace department smelted:—

Granby ore	1,264,690	tons.
Foreign ore	15,179	"
Converter slag and matte	48,078	"
Flue-dust	4,422	"
Average per cent. of coke used per ton of ore	13.36	per cent.

"From tonnage standpoint, operations were good; tonnage for the year being 1,279,869 tons ore, against 739,519 tons for 1912 and 984,346 tons in 1911.

"Average smelting cost for the year was $1.214, as against $1.256 for 1912. All the machinery in this department is in good repair and being operated to full capacity at present time.

"*Converting Department.*

"Costs are lower this year per ton ore. Machinery all in good repair.

"This department produced 22,683,181 lb. copper in 1913, as against 13,226,360 lb. in 1912 and 17,858,860 lb. in 1911.

"This department handled 34,500 tons of 32.9 per cent. matte.

"Taking the year as a whole, from the operating end it shows very well. We have handled a larger tonnage than previous years, and we have handled higher silica slags with less copper loss. Our costs are less than any previous year since we began operations.

"Railroads handled all material satisfactorily. There was no difficulty with labour."

FRANKLIN AND GLOUCESTER CAMPS.

Franklin and Gloucester camps, which are adjacent to one another and two miles apart, are situated on the East fork of the North fork of the Kettle river. They are distant about fifty miles from the town of Grand Forks, to which they are connected by a fairly good wagon-road. The Kettle Valley Railway has been surveyed into the camps and is constructed as far as Lynch creek, twenty-three miles up the North fork from Grand Forks.

The earliest locations in these camps date back to about 1898, and since then a large portion of the district has been staked; a number of properties are now held by Crown grant and many by annual assessment. From 1904 to 1907 the district was quite active and considerable work was carried out, but of late years very little has been done. The impression seems to have gained ground that the camp had been tested and condemned, inasmuch as some of the large companies had bonded claims and then thrown them up, but this idea would seem to be erroneous.

A detailed study of the areal and economic geology of the district was made by Dr. Chas. W. Drysdale, Geological Survey of Canada, in 1911, but his report has not yet been published.

In October, 1913, while visiting the Boundary District, the writer drove to the camp from Grand Forks in order to see the *Union* property, which was reported to be looking very favourable. Only two days were spent at the camp, and besides the *Union* a few other claims were looked at, as will be noted later. The *Union* is the only property in the camp which has been worked during the past year, with the exception of annual assessment work.

Union

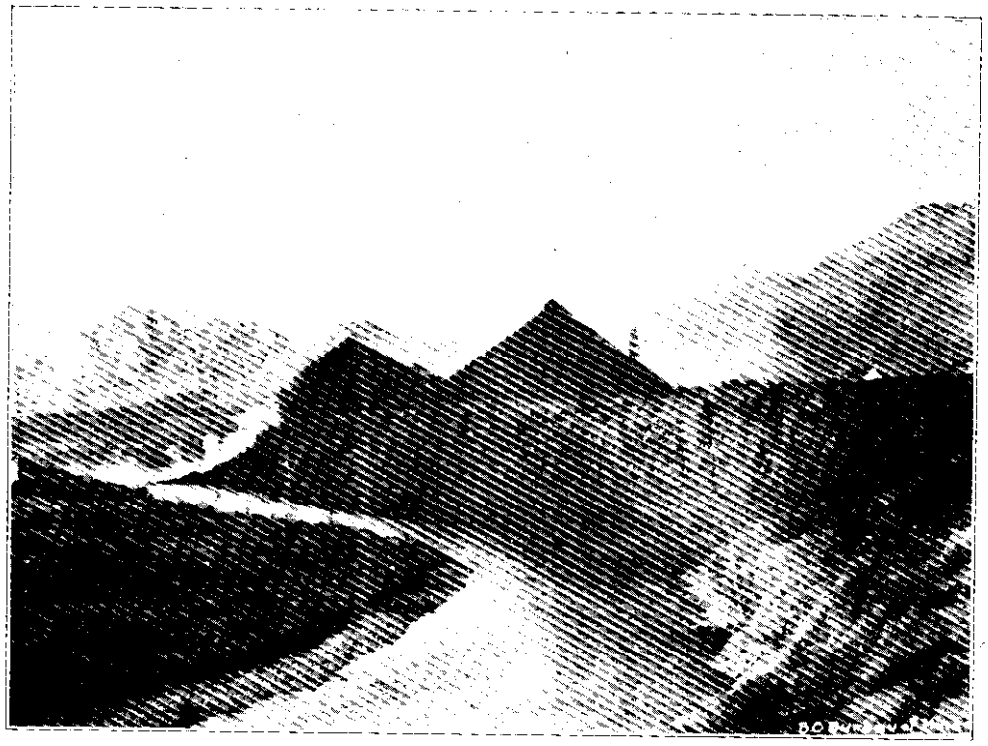
This property consisting of the *Union*, *Paper Dollar*, and two other claims, is owned by Louis Johnson, Patrick Maginnis, John C. Henderson, and the heirs of Mike McDonald; all original locators. Most of the work has been done on the *Union*, and Crown grants for the group are being applied for. For some years annual assessment-work had been done on a mineralized zone carrying galena with silver values. Paralleling this, and separated from it by a strip of waste from 3 to 5 feet wide, is another so-called "vein" of dark-blue silica carrying small quantities of iron-pyrites. This vein had been observed, but no attention was paid to it until last year a sample was assayed which gave astonishingly high values in gold and and silver. During the summer of 1913 work was commenced on this vein, and from an open-cut on the surface five cars of ore were shipped to the smelter. In this open-cut the vein is striking about east and west up and down the hill, and is about 8 feet wide. The vein, while consisting largely of silica, does not appear to be a true quartz vein, but is rather a very complete replacement of limestone, probably along a fissured zone. At the time of visiting the property it was snowing hard, with about 6 inches of snow on the ground, so that it was difficult to learn much about the formation, but limestone seems to be the predominating rock in the vicinity.

The vein-matter is about three-quarters quartz, the balance being calcite and iron-pyrites, with a little hæmatite and garnet. The gold values are probably associated with the iron-pyrites, while the silver would seem to occur as silver-sulphide, and possibly in part as ruby-silver. The ore is very deceptive in appearance, as it shows very little mineralization and would hardly be taken at first glance to be high-grade ore. The ore as shipped to the smelter in car-load lots assays about $60 a ton.

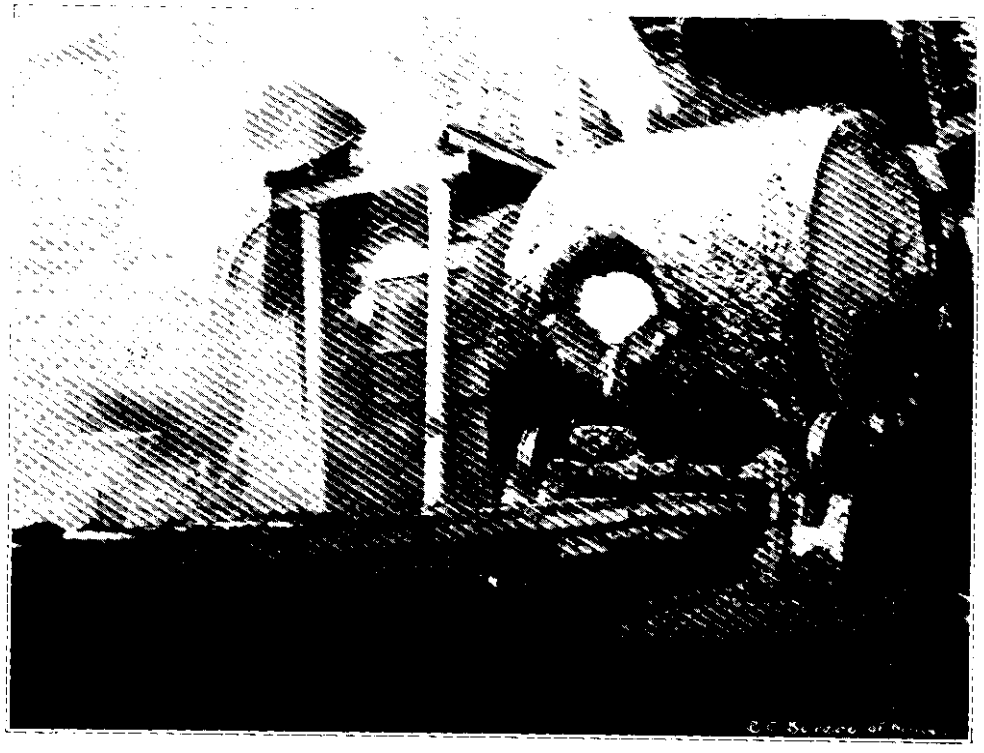
A tunnel is now being driven 85 feet lower down the hill to get under the rich ore in the surface open-cut. This tunnel, which at the time of examination was in 80 feet, was first started to prospect the galena vein, but by deflecting slightly it now has in the face 3 feet of similar material to that of the vein exposed above, and 3 feet of the waste rock lying between the two veins. The true width of the rich vein is not shown in the face of the tunnel, as it continues into the hanging-wall. It was claimed by the owners that this 3 feet of vein in the face would assay $13 to $20 a ton; a sample taken at this point, by the writer, assayed 2.34 oz. gold and 12.9 oz. silver, while another sample taken along the vein for a distance of 30 feet back from the face assayed 0.80 oz. gold and 35.2 oz. silver, so that the owners' statement was quite conservative. A sample taken across 8 feet of the vein (full width) in the surface cut assayed 1 oz. gold and 59 oz. silver.

Another tunnel 500 feet down the hill has been started on the *Paper Dollar* claim, which is in 15 feet, and shows siliceous material in the face. A sample taken of the face only returned a trace of gold and 0.20 oz. of silver.

So far, the actual mining of the ore from the open-cut has been a small matter, as, with a vein of that size, one long hole breaks down a considerable quantity of ore. The ore, with practically no hand-sorting, is sacked, hauled down the hill on a go-devil, and hauled by wagon twenty-seven miles to the Kettle Valley Railway at Lynch creek, and thence to the Granby smelter at Grand Forks. The entire freight and treatment charges amount to nearly $30 a ton, which is very high.



Granby Co.'s Smelter—Grand Forks—Piles of Granulated Slag.



Granby Co.'s Smelter, Grand Forks—one of the Copper Converters.

The present surface showings are exceedingly favourable, and all indications point to this property having a very promising future. At the present time no large tonnage of ore has been shown up, but, in the event of this being done, a concentrator of some type would probably prove effectual in reducing the high treatment costs. Or the completion of the railroad, which is already surveyed into the camp, would make a difference of about $12 to $14 a ton in transportation charges.

During the winter months the owners have erected new mine buildings with the intention of vigorously working the property during the ensuing year.

Maple Leaf. On this claim surface cuts disclose a considerable amount of chalcopyrite ore in bunches and a good deal of copper-stain scattered here and there. The ore is apparently developed in a limestone gangue at and near a contact of this rock with a quartz-porphyry. A shaft down 20 or more feet, which was full of water, is said to run out of the ore at the bottom. From a very hasty examination it looks as if the shaft were dipping in such a way as to take it away from the contact, and hence away from the possible occurrence of the ore, but this is hardly an opinion, merely a suggestion. A crosscut tunnel lower down the hill was driven 150 feet without striking any ore. The material at the face of this tunnel is mainly silica and somewhat similar in appearance to the high-grade ore of the *Union* property. A sample taken, however, only returned traces of gold and silver. From the surface showings it seems reasonable to assume that, at some place, the ore has a downward extension, and it is possible that future development will reveal it.

Banner. This was one of the first claims staked in the camp, by Frank McFarlane, and first worked by J. P. Graves & White under bond from the locator. A 10-foot shaft sunk by McFarlane showed 8 to 12 feet of silica and lime rock mineralized with sulphide of copper, iron, zinc, and lead. A tunnel 200 feet long was run by Graves, which cut a siliceous vein 32 feet wide (on the dip), showing slight mineralization throughout; but the values were thought too low, so the bond was thrown up.

The company developing the *McKinley* property moved over a diamond-drill in 1908 and put down four holes, but the results obtained are not known.

Gloucester Group. This group is owned by Thomas Newby and partners. It was bonded by the Old Dominion Copper Company, which carried out some development-work and then allowed the bond to lapse. A shaft 60 feet deep discloses a nice vein of chalcopyrite in a granodiorite formation. The shaft was full of water, but, Mr. Newby says, the vein shows up nicely in the bottom. The Dominion Company ran a tunnel for a distance of 215 feet to crosscut this vein, which brings it 50 feet farther in the hill than the bottom of the shaft, and then raised 93 feet from the end of the tunnel, the face of which is 30 feet above the bottom of the shaft, without striking any ore. It is probable that the vein is badly faulted, thus accounting for its non-appearance. The vein as exposed in the shaft looks very well, and it is claimed that the values are sufficient to make a good paying property if the continuance of the vein could be located.

The *McKinley*, on which a good deal of work was done by a company under the control of Augustus Heinze, was not visited.

The whole camp has been held back by the non-completion of the Kettle Valley Railway from Lynch creek, a distance of twenty-seven miles. The railway is waiting until sufficient tonnage can be shown up, and the owners are waiting for the railway to afford cheaper mining facilities. The discovery of high-grade ore on the *Union* has revived interest in the camp greatly, and should result in some new work being carried on next summer.

GRAND FORKS MINING DIVISION.

REPORT OF S. R. ALMOND, GOLD COMMISSIONER.

I have the honour to submit the annual report on mining in the Grand Forks Mining Division for the year 1913.

Since my last report only one property has joined the shipping-list, and that is the *Union* in Franklin camp. The ore from the *Union* is shipped to the Granby smelter here, at Grand Forks, partly by wagon and partly by car; the first part of the haul is by wagon to Lynch creek, a distance of over twenty miles; there the ore is loaded on to Kettle Valley Railway cars and conveyed to the smelter, a distance of another twenty miles. The cost of the haul is in the neighbourhood of $12; the treatment charges I do not know, but it is reported that the ore averages about $60 in gold and silver, the main values being in the latter metal; therefore, even with the big expense of haulage, leaving a goodly margin of profit.

In consequence of the *Union* shipments to the Granby smelter, considerable interest has been taken in the camps in and around Franklin, and interests in claims have been changing hands at fair figures.

In Wellington camp the only change that has taken place has been the purchase by the Granby Company of the *Snowshoe* mine.

Of the *Rawhide* mine, the only property worked by the British Columbia Copper Company in the Grand Forks District, the *Nelson News*, in its annual mining report, says:—

"The *Rawhide* mine at Phœnix adjoins the *Snowshoe*. The ore-body extends through the old *Snowshoe* mine, purchased by the Granby Consolidated Mining, Smelting, and Power Company this year, into the *Curlew* and *Gold Drop* claims of that company. It is one of the two greatest ore-bodies of the camp, and the ore is the characteristic chalcopyrite in a gangue of garnet and epidote.

"On the *Rawhide* claim the area of the ore-bearing zone is about 14 acres and the main ore-body is from 35 to 75 feet in thickness. The most of the ore lies near the end of the claims of the Granby Company. The mine is developed by six tunnels and a shaft, and all the ore is brought out the main tunnel. A large Hadfield crusher set underground is used to crush the ore.

"The 1913 output of the mine was 238,455 tons, against 267,347 tons in 1912 and 50,450 tons in 1911. It is mined by the glory-hole and stoping system, similar to that of the Granby."

Of the City of Phœnix and vicinity, where most of the ore for the Grand Forks smelter is obtained, the *Nelson News* says:—

"Phœnix, the highest incorporated city in Canada, is perhaps at the present time the most prosperous city for its size in Canada. The city lies at an elevation of 4,800 feet above sea-level, and its population is estimated at about 2,000. Mining, the chief industry, is handled on a most extensive scale by what is known as the glory-hole system. The Granby Consolidated Company mines and ships to the smelter each day an average of 4,000 tons of ore. The company operates three properties here, the *Granby*, the *Snowshoe*, and the *Gold Drop*. The British Columbia Copper Company operates the *Rawhide* property near here, which has a daily output of 600 tons. The former company ships to its smelter at Grand Forks, and the latter to its smelter at Greenwood.

"The pay-roll of the camp runs considerably over $100,000 each month, and the greater portion of this amount is spent at home. Thus in the past twelve months the enormous sum of over $1,200,000 has been distributed among the working-men of Phœnix. No wonder the city is enjoying unprecedented prosperity. The financial stringency, so prevalent in other places, is unheard of here.

"Even though the altitude is high, Phœnix is a healthy and most delightful place in which to live. There are good schools and teachers; a good hospital with competent physicians and nurses; four churches to look after the spiritual needs of the people; an opera-house that cost $25,000, built and run by the Miners' Union; and a skating-rink that cost $10,000. There are numerous hotels, stores, restaurants, a weekly newspaper, a brewery, and other business firms incidental to a first-class city.

"Phœnix looks ahead to the year 1914 with the full anticipation of a continuation of the abundant evidences of prosperity noted in the foregoing paragraphs."

The Boundary has produced a total of 16,000,000 tons of ore up to the present time.

OFFICE STATISTICS—GRAND FORKS MINING DIVISION.

Free miners' certificates issued	154
Locations	110
Certificates of work	132
Certificates of improvements	5
Transfers	11

OSOYOOS MINING DIVISION.

NOTES BY J. D. GALLOWAY, ASSISTANT MINERALOGIST.

HEDLEY.

Nickel Plate.

The Hedley Gold Mining Company, owning and operating the *Nickel Plate* mine, and the Daly Reduction Company's stamp-mill and cyanide plant have had a very successful year, increasing slightly the output for 1912. Returns for the year show that 70,796 tons of ore of an average assay value of $12.03 was treated. The total assay value was $852,261.26, of which $802,330.40, or 94 per cent., was extracted.

The capacity of the 40-stamp mill and cyanide plant has been gradually increased until now it is treating from 225 to 250 tons a day. This has not been effected at any expense to the percentage of extraction, as the recovery is now higher than ever before. Amalgamation was discarded three years ago, and now the bulk of the values are saved as concentrates on Frue vanners and Deister tables. The tailings from these tables are reground, classified into sands and slimes, and cyanided. About 60 cents a ton are lost in the sand tailings, while the slime-tailings losses are about 20 cents.

From seventy to seventy-five men are employed at the mine, of which number one-third are kept on development-work, the balance stoping ore. At the present time a large ore reserve is in sight, calculated mainly on extensive diamond-drill work. No drilling was done this summer, as the two drills belonging to the company were being used by the Exploration Syndicate No. 2 on adjoining property. The main working entrance for the mine is now the *Dickson* incline, which is down 500 feet and will eventually be carried to 3,000 feet.

For some time past the 800-horse-power water- and steam-power plant of the company has hardly been able to supply the demands on it. Considerable trouble is experienced with the flume in winter time by the water freezing up, etc. In order to obviate these difficulties and also to get sufficient power for all purposes, the company is making plans for developing power on

the Similkameen river. A flume 2.5 miles long, with a penstock and necessary machinery, is projected, which would give 1,500 to 1,700 horse-power at extreme low water. The exact location of the power plant is not as yet settled owing to some confliction in regard to existing water rights, but it is understood that it is to be somewhere below the town of Hedley. As soon as a decision is given in regard to the titles, construction-work will be commenced.

Last year a number of the prominent shareholders of the Hedley Gold Mining Company formed the Exploration Syndicate No. 2 to acquire and develop claims adjoining and in the vicinity of the *Nickel Plate*, and in the spring of 1913 bonds were secured on about fourteen claims on the Twenty-mile Creek slope of Nickel Plate mountain.

This mountain is made up of heavily bedded limestones, quartzites, and argillites, intruded by sheets of igneous rock, varying in composition from andesite to gabbro-diorite a short distance away. The ore-deposits, as best shown in the *Nickel Plate* mine, are contact metamorphic deposits developed along the contacts between the sediments and igneous rock. As a number of these ore-bodies have been discovered in the *Nickel Plate* which never cropped on the surface, it has long been considered that many of the claims on the mountain would repay systematic prospecting by diamond-drill. The high prices demanded by prospectors for their claims has held up the development of a number of promising properties, but it is a matter of congratulation that at least some of them are to be exploited.

The properties under bond by the Exploration Syndicate are for the most part situated on very precipitous bluffs, and presented some difficulties in commencing drilling operations. Pipes supplying water and compressed air were laid across the mountain from the *Nickel Plate* mine to run the two drills supplied by the same company. Three holes, respectively 703, 716, and 1,400 feet, were put down before freezing weather at the end of September compelled a stop.

It is known that some of the cores show mineralization with arsenopyrite, pyrites, and pyrrhotite, but T. Walter Beam, who is in charge of the work for the syndicate, was not prepared to make any statement as to values or quantities of ore discovered. Some of the bonds call for partial payments before spring, and the action of the syndicate in this matter will give some indication of the results attained.

Osoyoos.

Dividend-Lake View Property.

The Dividend-Lake View Consolidated Gold Mining Company, Limited, owns the following properties: The *Dividend*, *Dividend Fraction*, *California*, one-third of the *Bull's Eye*, *Lake View*, and *Orient*, situated six miles from the town of Oroville, Wash., and two miles north of the International Boundary. John C. Fisher, one of the original locators, still has a small interest in the property, the balance of the stock being held in New York. Mr. Tremaine, of New York, is president of the company. Joseph Trainer is foreman at the mine, but Mr. Fisher makes occasional trips from Spokane to supervise the work.

This property was first opened up by George Nadin in 1901, with very little success. Later, in 1908, the Granby Consolidated Mining and Smelting Company bonded it and carried out considerable development-work, including a long crosscut tunnel. Failing to find any large ore-bodies, that company allowed the bond to lapse. About two years ago the present company acquired control and has been at work more or less continuously since. Some work was done on the *Lake View*, but, at present, operations are confined to the *Dividend*.

The deposits are of the contact metamorphic type developed in a limestone gangue near the contact with an igneous rock, which is probably a diorite. The usual lime contact minerals are in evidence, together with pyrrhotite, magnetite, arsenopyrite, and chalcopyrite.

Dividend.—The first work on this property, consisting of an incline shaft 60 feet deep and a short tunnel tapping it, was carried out under the supervision of George Nadin. For various reasons, the property was at that time unsuccessful, and for some time after was not worked. In 1908 the Granby Company drove a crosscut tunnel 450 feet to strike the downward extension of the small ore-body uncovered in the upper tunnel and shaft. This tunnel did not strike any ore, and to the writer it seems apparent, from a consideration of the surface strikes and dips, that this tunnel passed to the west of one ore-body and to the east of another. In other words, it paralleled and ran between two steeply dipping lenses of ore. Of course, these lenses of ore may not be continuous downwards; but the point is, this tunnel does not prove their discontinuance.

The first work by the present company was to raise from the lower tunnel to the upper one, coming through at the bottom of the incline shaft. From this point a drift was started eastwards and good ore was encountered immediately. At the time of visiting the property in the beginning of October, this drift was in 50 feet and showing good ore all the way. The present direction of the drift is such that, if kept on, it will come out in a bluff to the south-east about 100 feet farther, where good ore crops out. It is the intention of the foreman to crosscut easterly or south-easterly from the lower tunnel in the expectation of finding a downward continuation of this ore-body.

Another lense of ore to the west is exposed in a line of surface cuts and trenches. The ore-bodies are comparatively small and very indefinite and irregular. The main one is so far proved to be about 60 x 60 x 5 feet, but even this is only exposed on two sides and it may not be continuous throughout. The encouraging feature, however, is the high grade of the ore, which carries gold values from $17 to $30 a ton.

The ore is dumped down the raise to the lower tunnel, trammed out to a sorting-table where waste is picked out, and thence to the ore-bin below. A 5-ton auto-truck is used to haul the ore to the Great Northern depot at Oreville, Wash., from whence it goes to the Granby smelter at Grand Forks. The ore, being high in iron, lime, and sulphur and low in silica, is a valuable fluxing-ore for the smelters, thereby enabling the company to get low smelting rates.

Eight cars averaging $17.14 a ton were shipped in 1912. Work was suspended in December owing to bad weather and not restarted until June, 1913. In August shipments were commenced again, and by October 6th eight more cars had been shipped, carrying the following values:—

Car No. 1	$15.59 a ton.
" No. 2	21.65 "
" No. 3	21.09 "
" No. 4	26.03 "
" No. 5	25.65 "
" No. 6	24.06 "
" No. 7	28.93 "
" No. 8	31.73 "

All values are in gold, the copper-content only amounting to 0.2 to 0.6 of 1 per cent.

Lake View.—The ore-body on this property is of a similar character to that on the *Dividend*, but is nearly a blanket formation. The ore again occurs in bunches or lenses spread about in a rather irregular manner. The Granby Company ran the upper tunnel a distance of 275 feet, together with numerous drifts and crosscuts. The ground is badly crushed and sheared and in places has a distinct schistose structure. A lower tunnel was run by the present company to cut the ore-body, but all the drifts and crosscuts from this tunnel appear to be under the ore-body. This ore-body may have a downward extension, but so far it has not been discovered. The ore is mainly magnetite and pyrrhotite and a little chalcopyrite

carrying small values in copper and gold. The average value is about $4 to the ton, and Mr. Fisher estimates between 40,000 and 50,000 tons that can be cheaply mined by means of the lower tunnel.

Lone Pine Group. This group of claims is partly on the Washington side and partly on the British Columbia side of the International Boundary-line, and has lately been bonded by Mr. Jennings, of Oroville. On the American side a large blanket vein of quartz is exposed by surface cuts, shallow shafts, and short tunnels. The vein is rather broken up and is apparently broken over flatly, as it lies all over the hillside. It is hard to get at the true width, but it is of considerable size, in places being up to 10 or 12 feet. Galena and iron-pyrites and a little tetrahedrite occur in places, but it is probable that the whole vein would be quite low grade.

On the Canadian side, what is probably the same vein has been shown up by a crosscut tunnel to have a width of at least 80 feet, and possibly greater. At this point the vein is more clearly defined, and is seen to be striking nearly north and south and dipping east. The rock on both sides of the walls is a dark basic rock, possibly a gabbro or a pyroxenite. A few ore samples were taken, but they give but a poor idea, as extensive sampling would be necessary to determine the values throughout. Taking the whole vein, the values would be probably very slight, but it is quite possible that here and there throughout, pay-shoots of payable ore may be found. The following samples were taken:—

Description.	Gold.	Silver.
	Oz.	Oz.
Open-cut, 8 feet (American side)	0.04	*Nil.*
Open-cut, near 50-foot shaft, 5 feet (American side)	Trace	"
High grade ore from shaft, picked (American side)	0.02	24.4
General average in tunnel vein 80 feet wide (Canadian side)	0.03	*Nil.*
High-grade picked ore from tunnel (Canadian side)	0.02	4.4

FAIRVIEW CAMP.

Fairview was not visited by the writer when going through the Similkameen District in the fall as it was found out at Hedley that no work of importance was being done at that camp. The *Susie* property, owned by Geo. A. Guess and partners, was developed for a time during the summer, and from him the following information was obtained in a letter received January 22nd: A quartz vein from 20 to 50 feet wide, lying between granite walls and striking north and south, has been exposed on the surface for about 250 feet. It is developed by three shafts: No. 1, 100 feet deep; No. 2, 10 feet deep; and No. 3, 15 feet deep in wash down to the vein, and a cross-drift from it exposing 20 feet of quartz. The work this summer consisted of retimbering and sinking the No. 1 shaft from 70 feet down to 100 feet. Several years ago about 400 tons of the outcrop ore was stoped out, and from this 7 tons of hand-picked ore was shipped to the Tacoma smelter, which returned 1.80 oz. gold and 41.8 oz. silver to the ton. Mr. Guess in his letter says that "the shaft throughout shows an average of $8 in gold and silver.

OSOYOOS MINING DIVISION.

REPORT OF RONALD HEWAT, MINING RECORDER, FAIRVIEW, B.C.

I have the honour to submit herewith the annual report of the mining operations in the Osoyoos Mining Division for the year 1913.

The mining operations in this district during the past year have been confined chiefly to Hedley and Kruger mountain. The mining operations in Camp Hedley are as follows:—

CAMP HEDLEY.

While there has been nothing of surpassing interest transpiring in the camp during the year 1913 to distinguish it from former years, it has nevertheless been one of the most important in the history of the camp for the steady progress made and for the inauguration of new enterprises in connection with the affairs of the Hedley Gold Mining Company that will have most important bearing on the future of the camp.

The *Nickel Plate* mine was the only property of the Hedley Gold Mining Company operated during the year. All the ore extracted during the year, which enabled the company to distribute $360,000 in dividends among its shareholders, was from the *Nickel Plate*, while the *Sunnysides* properties, which formerly contributed their share of the tonnage extracted year by year, were this year, owing to insufficient power, left untouched. When ample power is provided by the installation on the Similkameen river which is now under way, a further exploration of *Sunnysides* ground will be possible, and is expected to add materially to the ore reserve, for in past years the *Sunnysides* workings accounted for a large output.

Mine Development.—Not since 1905, when No. 4 tunnel was driven during M.K. Rodgers's management, has there been witnessed the amount and character of development which will have to do with the future of the mine as that done in 1913. It is true much new ground has been opened since the present company took over the property in 1909, but it was in ground adjacent to existing workings, and was almost invariably in ore, and consisted in cutting stations, blocking out ore bodies, and putting in chutes, which is work that is really to be classed with ore-extraction rather than mine-development.

The development-work prosecuted in 1913 was of a different character, and consisted in sinking a new incline which is known as the Dickson incline, and is designed to serve as a great highway for the ores of the *Nickel Plate* mine for years to come. It starts in No. 4 tunnel at a point 800 feet from the portal, and is being driven at an angle of 30 degrees from the horizontal, while the great ore-bodies which it is meant to serve have a dip of about 23 degrees. It is 8 x 16 and will have double track and manway and will be about 3,000 feet deep. During the year it was sunk a depth of nearly 700 feet and a station cut at 600 feet. For the first 200 feet it was in ore, and it is expected that for the rest of its depth the ore will all be above it.

No. 5 incline, which was sunk for extraction of the ore in the centre of No. 2 ore-body, has been driven down in it for five levels, with drifts right and left and huge stopes opened out from each. All the ore above it in No. 2 ore-body will doubtless come out by No. 5 incline, but the ore below it will in all probability be dropped downward to the Dickson incline when completed, and come out that way. In outside development much was done at the mine during the year in the way of surface improvements. Formerly, when No. 1 ore-body, which was thought to be the *Nickel Plate* mine, was being worked from No. 3 tunnel, all the mine buildings were situated on, or near, the trolly-track leading to the mouth of No. 3 tunnel. Now that the lower or No. 4 tunnel has become the thoroughfare into the mine-workings, it has been found that, for convenience, the blacksmith-shop, machine-shop, ware-

house, store, etc., should be centred near the mouth of No. 4 tunnel, and during the summer and fall of the past year the removals were effected.

The following statement is taken from the annual report of Hedley Gold Mining Company for the year 1913 :—

Statement of Operations and Earnings for 1913.

Date.	Tons milled.	Assay Value.	Recovery at Mill.	Expenditures.	Profits.
January	6,002	$14 12	$79,382 87	$37,158 44	$42,424 43
February	5,620	14 58	76,441 94	38,245 45	38,196 49
March	5,507	14 50	74,140 53	33,269 08	40,871 45
April	6,044	12 50	71,611 40	33,252 64	38,358 76
May	6,007	13 28	75,906 40	29,728 08	46,178 32
June	6,087	10 89	61,611 38	27,793 90	33,817 48
July	5,905	12 10	65,763 50	33,619 36	32,144 14
August	5,892	9 53	52,889 78	28,782 95	24,106 83
September	5,430	11 74	60,246 05	33,866 15	26,379 90
October	5,830	10 39	57,344 24	33,631 50	23,712 74
November	6,403	10 27	61,992 31	33,933 85	28,058 46
December	6,069	10 93	65,000 00	33,794 11	31,205 89
	70,796	$12 03	$802,330 40	$397,075 51	$405,254 89*

*Including $7,402.23 interest earned on funds of this company during 1913.

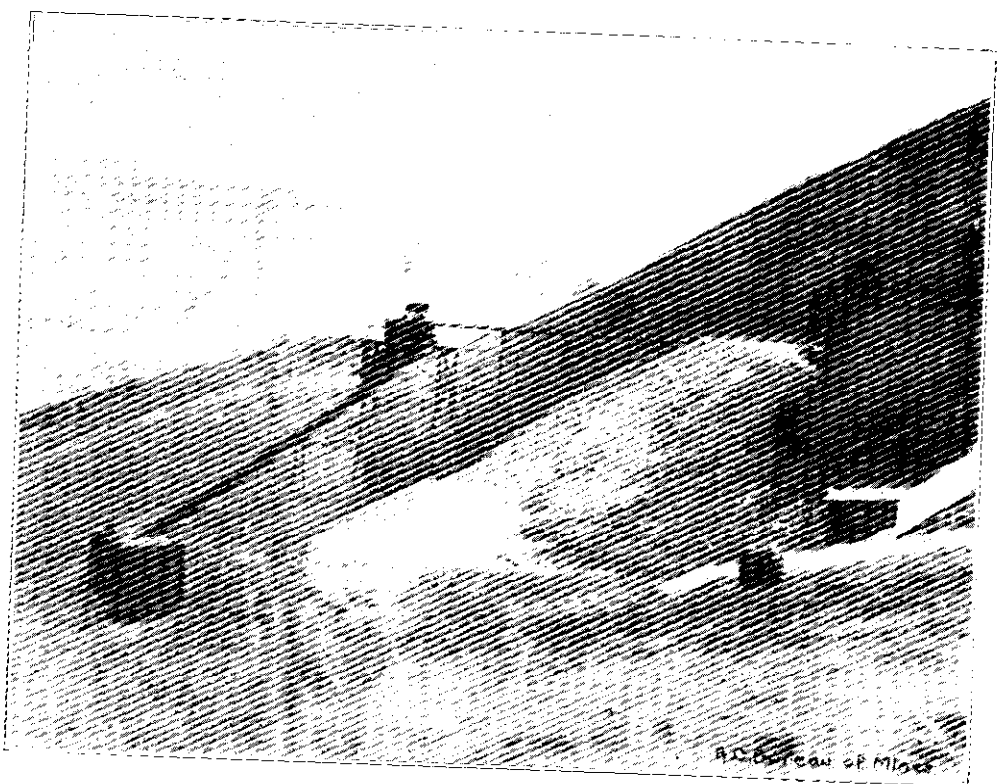
The percentage of extraction for the year was 94 per cent., and 77 per cent. of it was recovered in the concentrates and the balance in the cyanide. Amalgamation was discontinued some years ago; this does not necessarily mean that there is no longer any free gold in the ore, but, as the alleged lessening of free gold caused them to abandon amalgamation, all the free gold there may be in the ore is caught in the concentrates.

The mill returns for the year give a production of $802,330.40, which added to former output brings the yield of the mine to December 31st, 1913, to over $5,300,000.

Improvements to Plant.—In addition to the new buildings which have already been referred to, there have also been some improvements to the plant. The gravity-tramway has been overhauled and 70 per cent. of the ties replaced by new ones, and a new headgear installed at the ore-bins. This, with the new headgear put in over a year ago at central station, which had been formerly a source of continual trouble, but which during the past year has been working faultlessly, places the gravity tramway in excellent working-order. The principal improvements in the plant at Hedley have been at the power-house, for there has been little, if any, at the mill. A new hoist was installed at the tipple to handle the heavier volume of freight traffic to and from the mine. In the auxiliary plant advantage was taken of the period of high water to overhaul, and the battery of boilers has now been suspended on iron girders resting on concrete piers. A new roof was also placed over the section of the power-house in which the boilers are contained.

Power-dam.—But the most important improvement during the year was that which was commenced for the installation of a new power plant on the Similkameen river. The site finally chosen for it is a few feet below where Twenty-mile creek empties in. The dam will be 220 feet in length, of concrete, made up of nine piers with stop-logs between, which may be put in or taken out as the river rises or falls, and the intention is to keep a head of water in the dam at all times equal to the river in flood. A flume 7 x 8 and 18,000 feet in length will deliver the water to the power-house below, with a fall from the fore-bay of about 70 feet to a Doble water-wheel and direct-connected generator, which will generate electricity at 6,600 volts and develop about 1,500 effective horse-power.

Osoyoos lake.



Dividend-Lakeview Mine—Osoyoos M.D.

OTHER PROPERTIES.

Apart from *Nickel Plate* operations, the most important occurrence during the year was the exploration by diamond-drill of the *Red Mountain* claim, which was one of a group of claims in the canyon of Twenty-mile held under bond by Exploration Syndicate No 2, made up principally of members of the United States Steel Trust. Other claims under this bond were the *Florence* and *Duffy* groups, and something over $40,000 was spent. Work on these will in all probability be resumed in the spring.

The Oregon.

Much work was also done on the *Oregon*, the owners of which kept a small force on almost continuously for about ten months and did much valuable development-work. This consisted of 80 feet of tunnelling from the face of a former tunnel which had been driven over 100 feet. There was also 30 feet in cuts, the latter being all in ore, and some of it yielded under assay unusually high value.

The *Golden Zone* and *Pollock* were both idle the entire year.

The report of J. C. Fisher, manager for the Dividend-Lakeview Mining Consolidated Gold Mining Company, as to the operations of that company on its claims on Kruger mountain for the year 1913, is as follows:—

"We have installed no new machinery since my last report, but hope to have at least a 5-drill compressor during this present year.

"The mine-work has been almost entirely in the nature of exploring, and we have only taken out enough ore to pay that expense, which it has done and left some money in bank.

"We have pretty clearly demonstrated that on the *Dividend* we have three ore-bodies, one extending about east and west, another about south-east and north-west, and another, the largest one, nearly due north and south, and lying alongside of an eruptive dyke of diorite that has evidently been responsible for all three ore-bodies.

"We have run a drift at the 66-foot station for a distance of 119 feet, all the way in ore; we have shipped fifteen cars of ore from this drift and done very little stoping to get the ore; in some places we stoped as high as 16 feet, with a width of ore of 12 feet.

"We picked up the second ledge from this level and have gone into the ore for 15 feet without getting across it; it is commercial ore, but lower grade than the No. 1 ledge; will not ship much of it until we get a railroad to the mine, which we hope to have in the near future.

"The big ledge is about 40 feet wide, and we have only opened it in various places across and along it.

"The hauling of ore with auto-truck has been very satisfactory and costs us about $1 per ton, including depreciation and repairs; the haul is about seven miles to Oroville, Wash., on the Great Northern.

"I have not yet figured the cost per foot of our development-work, but it will not be high, as we have been rather economical in operation.

"The total tonnage shipped this year (1913), 905.13 tons; total net value to us, $14,543.69. Distribution of values as follows:—

Gold	$14,427 94
Silver	28 91
Copper	86 84
	$14,543 69

"The ore is pyrrhotite, slightly arsenical and carrying most of its values in gold. We have not shipped any ore from the *Lake View* property this year, which is a somewhat similar ore, with the values about evenly divided between gold and copper."

Gold Dust Group.

John W. Douglas, vice-president of the Gold Dust Mining Company, Limited, whose properties consist of the *Gold Dust*, *Gold Dust Fraction*, *Peacock*, *Headlight*, and *Bull's Eye Fraction*, situated on Kruger mountain, reports as follows:—

"During the year 1913 very little work was done on the property of this company until near the close of the year, when a tunnel was driven on the middle vein, attaining a depth of about 240 feet. The tunnel was started in a nearly vertical bluff at the top of the talus, so that depth was obtained very rapidly. Within a few feet of the portal of the tunnel there was encountered about 30 inches of ore that gave returns of 10.3 per cent. copper, 1.5 oz. silver, and 0.90 oz. gold. This tunnel was extended by hand-drilling about 50 feet.

"A vigorous campaign of development is planned for the coming year of 1914, and it is probable that a 5- or 7-drill compressor plant will be installed and good camp buildings erected to accommodate from twenty-five to forty men.

"A temporary telephone-line will be erected from the mines to Oroville, which will serve us until the Dominion line is built from Penticton to the International Boundary, where it is to be met by a line built by the Pacific States Telegraph and Telephone Company, and thus give the Penticton, Fairview, and other British Columbia points a good telephone connection with the outside world. We will then tap this line at Osoyoos, B.C., which is about a mile and a half distant from camp.

"The *Gold Dust* property has three fissures coming through the bluff above mentioned; we are at present developing the middle fissure.

"A part of the plan of this company is to fan the hill pretty thoroughly with the diamond-drill as soon as the present tunnel has been extended to the 100-foot station; this will enable us to locate our various ore-bodies that show in the surface workings and allow us to plan for the permanent openings through which the ore can be extracted with greatest economy.

"There is some suspicion that some of the rarer metals also exist in our ores, and determinations are now being made for them."

CAMP FAIRVIEW.

The old 60-foot shaft on the *Susie* mine in Camp Fairview was cleaned out by the owner, H. A. Guess, and the shaft was extended another 26 feet. A shaft was also begun on the north end of the lead. The ore consists of gold-bearing quartz assaying about $8 in gold and silver.

The length of the lead has not yet been determined; there is 5 feet of good pay-ore on the foot-wall. Mr. Guess intends doing more development-work in 1914.

Nothing has been done on the other claims in my mining district except the annual assessment-work.

OFFICE STATISTICS—OSOYOOS MINING DIVISION.

Location records	102
Certificates of work	110
Free miners' certificates	156
Certificates of improvements	11
Conveyances	10
Placer-mining leases	7

VERNON MINING DIVISION.

REPORT OF L. NORRIS, GOLD COMMISSIONER.

I have the honour to submit my annual report on mining operations in the Vernon Mining Division for the year ending December 31st, 1913.

During the past year considerable work has been done on the *Minerva*, *Zilpah*, *Black Bess*, and *Tough Nut* claims, about six miles north-west from the old *Monashee* mill-house on Monashee mountain. They cover the ground originally staked in 1899 as the *Morgan*, *Kokanee*, and *Dividend* mineral claims by George Doyle, James Reiley, and Fred. Williamson, respectively, and are now owned by J. H. Hutcheson and E. H. Daniels, of Rossland; T. H. Williamson and Angus Wood, of Vernon; and Rembler Paul, of Kelowna. Across these three claims, running approximately north-west and south-east, with a dip of about 45 degrees to the south-west, is a well-defined ledge of free-milling gold-quartz of a width of about 24 inches. Out of forty assays made of the rock, I am informed that the average of the five lowest is $20.50 per ton. In addition to this, there are indications pointing to the presence of a large body of arsenical-iron ore which runs parallel to and separated from the quartz ledge by about 100 feet of country-rock; it assays about $10 to the ton. The development-work so far consists of seven open-cuts of an average depth of from 5 to 12 feet, and three shafts, 10, 12, and 20 feet deep respectively. The present owners have bought the 2-stamp mill erected on the *McPhail* group, near Monashee, by the Cherry Creek Gold Mining Company in 1904, and are now engaged in transporting it to their property. It will be erecetd on the *Tough Nut* claim, and it will be driven by water from Porcupine creek, a tributary of Cherry creek.

Over the hill and east from the *Monashee* mill-house lies the placer ground where A. L. Marsh drove, single-handed, 2,500 feet of tunnel in a vain attempt to reach bed-rock in the bottom of the gulch. A practical miner, and a man much above the average, mentally and physically, he came here in 1883 from San Francisco, where in a business venture, he lost a large fortune, previously acquired in mining in Nevada. Being convinced that a second fortune awaited him if he could reach bed-rock, and having no funds and being unable to interest capital in the project, he attempted to work it himself. Commencing in 1889, he worked at it for twelve years, when he found that the timbers he first put in were beginning to rot and fall in and he had to abandon the tunnel. For the first 150 feet it runs under a slide, then for 175 feet through blue clay, after which it runs through some clay, but mostly coarse gravel, with a few boulders. His actual achievement, if encountered in the pages of a novel, would be deemed incredible, and had he been successful many would have heard of it, but as it is the story of his amazing pluck will probably never be told. Mr. Marsh is now seventy years of age and still has unbounded faith in the ground.

On Shorts creek, on the west side of Okanagan lake, seventeen miles from Vernon, S. C. Smith, J. H. Christie, E. J. Fewings, and C. E. Smyth hold four coal leases of 640 acres each, which have been surveyed as Lots 4221, 4222, 4223, and 4224, on which they have expended $10,000 in development-work and surveys. This property, which is well worth further exploitation, lies east and west along the north bank of the creek. The point lowest in altitude and nearest the lake is the south-east corner of Lot 4221, which is approximately five miles west from the lake, at an altitude of 650 feet above the lake. The nature of the ground from the creek north is that of a sheer mountain-face having a rise in places of 2,000 feet in half a mile. The dip of all strata is west, at an angle of from 16 to 30 degrees. Five seams of coal

have been exposed. The character of the strata shows a marked similarity in many respects to the Nicola coalfield, fifty miles to the west. The coal is bituminous, and some assays gave as high as 65 per cent. in weight of a firm coherent coke.

OFFICE STATISTICS—VERNON MINING DIVISION.

Free miners' certificates	163
Mineral claims recorded	27
Placer claims recorded	2
Certificates of works	26
Transfers recorded	8
Coal leases	4

YALE DISTRICT.

KAMLOOPS MINING DIVISION.*

REPORT OF E. T. W. PEARSE, GOLD COMMISSIONER.

I have the honour to submit the annual report on the Kamloops Mining Division for the year ending December 31st, 1913.

In the Kamloops Division very little has been done, except assessment-work, which on most claims has been kept up. Such reports as I have received from different owners are included herein, but very little response has been made to my request for returns.

Placer-mining on Louis creek was not as energetically prosecuted this year as during the previous season. The parties interested find that the gold is too fine to be handled to advantage without machinery.

The feeling throughout this district generally, towards the end of the season, seems to have been that mining operations would soon take a livelier turn.

Nothing has been done in the coal-mining or prospecting line during the past season.

KAMLOOPS CAMP.

O. S. Batchelor reports that he has completed a 5-stamp mill, situated about four miles north of Kamloops, on the bank of the North Thompson river. The mill consists of a large Blake ore-crusher, a self-feeder, a 5-stamp battery, and Frue vanner, driven by a 25-horse-power steam-engine, a 25-horse-power locomotive type of boiler supplying steam. A cyanide addition is being put up. The plant will treat ore from mines near the Thompson river.

Work is being done in the *Wheal Tamar* tunnel; a large tonnage of 3-per-cent. copper ore carrying gold is available for extraction from this tunnel.

SEYMOUR ARM CAMP.

Hugh Sinclair reports as follows:—

"We have only done assessment this year, as there is much ore exposed on the vein now, and to show much more, which will have to be in depth, we would have to have some better means of transportation in the way of a road. I might say that we are petitioning the Government for a road into that country, and hope the petition will be considered in a favourable light."

F. A. McLeod reports as follows:—

"We had from five to seven men working from June 15th to October 12th, and I may say that we got some good work done on the group this year, and the claims are looking better as more work is done. We spent $1,600 on developing this year, and the most of the work was done on a tunnel which is in 66 feet on the *Camp McLeod* claim, and in which the ore is improving as work is done; we have proved both veins the full length of the four claims. We have a very strong copper ledge, and if we had capital, I am sure it would prove a mine. The *Copper King*, adjoining us, has proved the ledge to cross its four claims, with a strong ore-showing; this makes nine claims; the lead is proved, and it has a width varying from 25 to 300 feet, and

See also Report by W. M. Brewer, M.E., herewith.

what is needed now is more depth. A wagon-road to Deep creek would give access to the land and timber in the valley, and would give a company a chance to get into the camp with supplies and carry on more development on the claims; there is plenty of timber and water-power and good land in the valley. We had a Government mining engineer visiting this camp this summer, a Mr. Brewer, and we were very pleased to see him in the new district; he stayed overnight in our cabin after looking over and sampling our property, and he seemed to think we had a good chance for a camp of staying qualities."

F. N. Daniels reports as follows:—

"The *Cotton Belt* partners have done no work this year. Mr. Beattie has done assessment-work on his claim, as well as Gillman & Homan. F. McLeod and partners, of Salmon Arm, are the only ones who have done work of any amount; they have run some 60 feet of tunnel on what is known as the *McLeod* ledge; it is in ore all the way, showing some fine-looking galena and chalcopyrite with a very little zinc-blende.

"Sinclair & Munger have done the assessment on their claims, which show very rich-looking copper ore as copper-pyrites. This ledge is known as the *Copper* ledge, and apparently underlies the *Cotton Belt* ledge about 1,600 feet. Bass & Robilard have done the necessary assessment on their claim. The work on the *Tartar* claim, owned by Mr. Bjorkmen, of Salmon Arm, who has a shaft about 60 feet deep on the *Cotton Belt* ledge, shows some fine coarse-cube galena in a ledge of about 8 feet. There would be much more work done on all these claims if the trail was anything like good; as it is, it costs 8 cents a pound to get supplies packed from here to the claim.

"Mr. Brewer, of the Provincial Mines Department, paid a visit to this camp in August or September, and, I am informed, says there are wagon-roads building to properties that did not give near as good showing as these. I am sorry that I cannot give you the work done nor the names of the claims the work was done on, but many of them have been changed and I have lost track of the names."

E. G. Wallinder writes as follows:—

"I beg to report the following improvements during 1913 on *Iron Mask* and *Erin* properties, owned by the Kamloops Copper Company. Installation of transmission-line and electric power equipment on *Erin* and *Iron Mask*, $4,800; building and surface work, $1,100; shaft sinking and development, $22,000. At present we are renovating the *Iron Mask* shaft to the 600-foot level, and will sink not more than 200 feet this spring."

OFFICE STATISTICS—KAMLOOPS MINING DIVISION.

Free miners' certificates	398
Certificates of work	109
Records (mineral)	121
" (placer)	31
Bills of sale, etc.	56
Certificates of improvements	9
Total receipts	$3,011.43

KAMLOOPS MINING DIVISION.

REPORT BY W. M. BREWER, M.E.

After completing my examination of the Lillooet Mining Division, I proceeded on horseback to the Kamloops Mining Division, on which I beg to submit the following report:—

FRASER RIVER.

During my ride along the east bank of the Fraser river to Pavilion creek, a distance of about twenty-four miles to the north, I had a good opportunity to note the work of construction along the line for the Pacific Great Eastern Railway, on which sub-contractors were grading to about Mile 17 from Lillooet and making fairly rapid progress. As this line of railway follows the sinuosities of the Fraser river, the grade for the greater part of the distance being cut in the steep bank below the first bench, the scenic wonders of this route will compare very favourably with other railways in British Columbia.

At Pavilion creek the wagon-road to Ashcroft branches off to the south-east, leaving the Fraser river and railroad line, and from there follows up Pavilion creek, along the north shore of Pavilion lake, and through the Marble canyon, where the well-defined contact between grey granite and crystalline limestone (from which the canyon takes its name) forms such a prominent feature of the geology near the west end of the lake.

After passing through the Canyon the road crosses the divide between the head of Pavilion creek and the head of Hat creek and enters within the boundaries of an Indian reservation, where the absence of the well-cultivated ranches that had been noted along the road all the way from near Lillooet is noticeable, until the eastern boundary of the reserve is crossed some distance down Hat creek, and there the presence of the farmer is again observed.

From Marble canyon the wagon-road follows a south-easterly course for some distance nearly along the line of strike of the "Cache Creek series" of rocks, as classified by the late Dr. George M. Dawson, and comprising the massive limestones of Marble canyon with some associated red and green shale, epidotic and chloritic rocks, quartzites and argillites.

I call attention to this feature here because the same series will be mentioned later in this report in connection with some of the mineral claims I examined.

I followed Hat creek down to its junction with the Bonaparte river, about fifteen miles north-westerly from Ashcroft.

BONAPARTE RIVER.

Some years back, prospecting and some serious developing-work were attempted on occurrences of copper ore located about five miles up the river above the mouth of Hat creek, but these efforts to open a mine, I was informed, had been suspended, nothing having been done recently, for which course various reasons were assigned; lack of transportation and difficulty in interesting capital to carry on further development being the main ones, I was assured.

The Provincial Mineralogist examined the most important of these developments—the *Maggie* mine—and his notes thereon were published in the Report for 1907, page 134.

These workings were not visited by me, since these developments had already been reported on and very little has since been done, and because, from the best information I could obtain, they are now in such a condition from caving as would prevent any attempt at examination from being successful.

THOMPSON RIVER.

I arrived in Ashcroft on September 4th and left on the morning of the 5th for Savona; and riding along an old road that crosses the Bonaparte river near its confluence with the Thompson river, I ascended to one of the high benches or plateaux which are characteristic to this section of the Province, and on which the growth of bunch-grass makes splendid pasture. I travelled along that bench north-easterly until I entered Semlin valley, and rode along the main wagon-road between Cache creek and Savona, on the north bank of the Thompson river and near the line of the Canadian Northern Railway.

The Semlin valley is of considerable width and one of the most productive and picturesque in British Columbia; to the north it is bounded by a range of high hills made up of volcanic rock, and to the south by the Thompson river.

At the east end of the valley, after crossing Eight-mile creek, a large acreage (4,000 acres) of young orchards have been planted by the Barnes Estate, a fruit-lands company having its headquarters at Walhachin, a station on the Canadian Pacific Railway across the Thompson river. Here a well-designed, and apparently effective, system of irrigation has been installed, the water used being brought in a large ditch, sixteen miles long, from the Deadman river, which empties into the Thompson near Savona, at the foot of Kamloops lake.

Arriving at Savona, I met Sam Macartney, a pioneer who was interested in the attempts, made some years back, at mining cinnabar on Copper creek, a stream that flows into Kamloops lake on the north side, about five miles east from Savona, and arranged with him to accompany me, at a later date, on an examination of that section.

I left Savona on the morning of September 6th and rode across the hills to Cherry creek, a stream that flows north from Big Fish lake and empties into Kamloops lake about twelve miles to the west from that city.

Copper King.

The old *Copper King* mine is located about two miles from the mouth of the creek; this was worked intermittently some years back, and some shipments of good-grade copper ore made to the Trail and Tyee smelters, but for the past six years or so the mine has been idle. I made an attempt to examine the old workings, consisting of a shaft full of water and a crosscut adit, some 500 feet in length, which had been driven in a very crooked course nearly like the letter "S"; the portal was such a short distance below the brow of the hill, where the outcrop of carbonate-copper ore occurred, that at the face the adit could hardly have had more than 60 feet of backs.

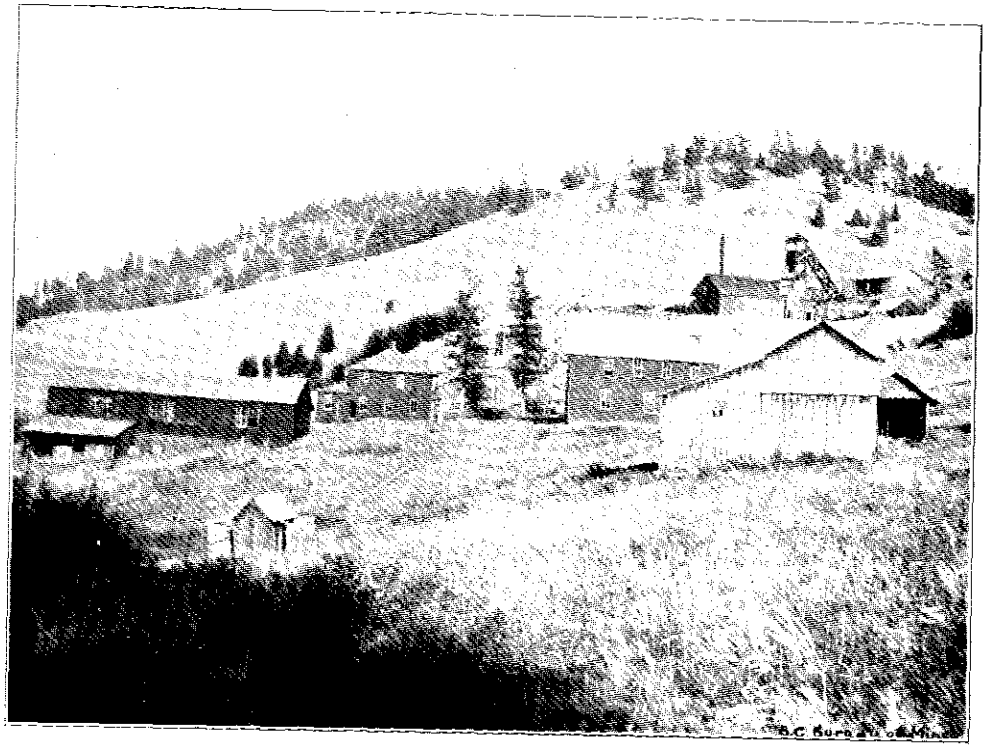
In the adit I noticed several narrow seams of copper-stained gouge, but no evidence of an ore-body until near the face, where rocks were falling every few minutes and preventing any attempt of a close examination. Apparently all the ore available above the adit level had been mined, and but little effort made to prospect for more.

The country-rock in the adit closely resembled diorite, but a short distance away had a schistose structure, very hornblendic in places. About 100 feet below the portal of the adit, where a bunker had been built, I noticed that the foundation had been excavated in a ledge of light greenish-coloured felsitic rock, and near it, on the hillside, occurred a quantity of gossan; this had been cut into at one point where it was about 4 feet thick overlaying the country-rock.

Glen Iron.

This property, which is one of the oldest in this section of the Province, occurs in a prominent bluff overlooking Kamloops lake near Cherry creek, the base of which is cut by the Canadian Pacific Railway track, with which the workings were connected by an aerial tramway of antiquated design. The property has been idle for some years; in fact, it had only been worked at times for the past ten years as

Seymour Arm—Shuswap Lake.



Iron Mask Mine—Kamloops.

a source of a supply of iron ore flux for the Trail and Nelson smelters. The workings show magnetic iron ore, filling fissures in an igneous country-rock that resembles diorite, carrying quite a percentage of actinolite. The walls of the fissure are "slickensided" and its maximum width is about 25 feet.

The ore had been mined in the main workings from an open-cut to a depth of about 150 feet below its outcrop, and of about the same length. Apparently no effort has been made to ascertain whether or not the body maintains continuity to any greater depth, although it would seem that such would prove to be the case.

KAMLOOPS DISTRICT.

From September 7th to 11th, inclusive, my time was occupied in examining several properties in the neighbourhood of Kamloops, the first being the *Iron Mask* mine.

Iron Mask.

This property was acquired about three years back from the Kamloops Mines, Limited, an English corporation that worked it from about 1903, by E. G. Wallinder and associates, of Duluth, who formed the Kamloops Copper Company, and at the time of my visit were working a force of about twenty miners. The property is situated on Coal hill, at about 1,600 feet higher elevation than Kamloops lake, and at a distance of six miles by wagon-road in a south-westerly direction from the city of Kamloops.

The property comprises the following mineral claims: *Iron Mask*, *Erin*, *Copper Queen*, *Emeroy*, *Sunrise*, *Prince of India*, *Kentucky*, *Neighbor*, *Gladiator*, *Excelsior*, *Jumbo Fraction*, *Bonnie Jean Fraction*, *Delta Fraction*, *Lucky Strike Fraction*, *Cycle Fraction*, and *Ben Hur Fraction*. These cover a solid block of ground about one mile long in a north-east and south-west direction by three-quarters of a mile in a north-west and south-east direction, but up to the present time the workings, of any magnitude or importance, have been confined to the *Iron Mask* and *Erin* claims. Considerable work was done about 1903 on the *Lucky Strike Fraction*, but was later suspended and never resumed.

The present company, during my visit, was busily engaged in electrifying the mine throughout, having made an arrangement with the city of Kamloops by which 10,000 volts are to be transmitted to the transformer-house at the mine, where it is stepped down to 440 volts. This transmission-line was completed in October, when I returned from the North Thompson district.

This electricity will furnish power to run all the machinery on the property, as follows: Hoist, 125 horse-power; pump, 35 horse-power; compressor, 75 horse-power; concentrating-mill, 75 horse-power; carpenter-shop, 10 horse-power; besides lighting the premises. Heretofore steam-power has been employed, generated from coal brought in from the outside; but, when the cost of coal at the Crowsnest mines, with freight to Kamloops and haulage by wagon to the property, is considered, it is expected that the new arrangement, together with improvements in the concentrating-mill and mine, will reduce the cost of production and haulage to the railroad almost, if not quite, $2 a ton of ore mined below the cost under the old arrangement.

The transportation problem between the mine and siding on the Canadian Pacific Railway, a distance of about three miles and a half and about 1,600 feet lower elevation, has always been a difficult one to solve. Years ago horses and wagons were used, then a traction-engine hauling two loaded cars, and at present an auto-truck with a capacity of hauling 5 tons at a trip and making four round trips each day, which the management considers gives the best results as to costs, but, of course, cannot be used on snow or muddy roads, which here prevail probably about four months in the year.

At the time of my visit, Mr. Wallinder, the president and general manager, was absent in the East, but his assistant, N. W. Pilger, formerly of Butte, Montana, rendered me all the assistance possible in making a thorough examination of this, at present, the only producing mine in the Kamloops District.

The former owners had installed a small smelter and concentrator, both of which have been dismantled for some time. The present owners, about two years ago, built a new mill, equipped with two 6-compartment Faust jigs, jaw-crusher, and rolls, while the water pumped from the underground workings is used for concentrating.

During the installation of the new machinery no work is being done in the *Iron Mask* workings, which were full of water, and all mining was confined to the *Erin* mineral claim, which will be described farther on in this report.

The maps of the underground workings of the *Iron Mask* claim were placed at my disposal, as it was impossible to make an examination because of water filling the shaft.

From these I ascertained that the shaft had been sunk to a depth of 600 feet, I was informed, in ore all the way down, which has been stoped out except for about 65 feet between the sixth and fifth levels.

The ore-body filled a wide fissure in an igneous rock, resembling diorite, with the foot-wall well defined, but on the hanging-wall side there occurs, next to the solid ore, a black crushed material of considerable thickness designated by a former manager as "conglomerate," but this I believe to be a misnomer, as I could find no conglomerate on the surface, and where I could examine the material underground it had more the appearance of crushed vein-filling material which carried no values. The strike is N. 65° E. and dip nearly vertical.

From the plan, this ore-body had been stoped a length of 170 feet between the third and second levels and a width of 5 feet; on the fourth level the stope is 175 feet long, with a width varying from 5 to 20 feet, while on the fifth and sixth levels a greater maximum width was reached.

It is noticeable that the ore-body has a decided pitch towards the east. On the third level the stope towards the west is 60 feet long, and that towards the east is 110 feet long; below that level no stopes were opened towards the west, while those towards the east are 175 feet long, showing that, while the ore-body had maintained its length, it had a pitch, irrespective of the dip, towards the east, which fact is important when taken in connection with some surface work done on the *Emeroy* claim, adjoining the *Iron Mask* on the east.

About 700 feet N. 65° E. from the *Iron Mask* shaft another shaft, about 40 feet deep, has been sunk on the *Emeroy* claim on an outcrop of copper-carbonates at a slightly higher elevation, and in this a well-defined vein 5 feet wide, carrying copper carbonates and oxides, with a strike N. 65° E. and dip 70 degrees towards south-east. Both the walls are of igneous rock, apparently similar to the foot-wall on the *Iron Mask* vein. No work has been done to establish the relationship, if any, with that vein, nor do any outcroppings occur on the surface between the two. The ore does not carry as much iron-content as did the *Iron Mask* vein on the surface, and it appears as though the zone of oxidation is deeper.

Several prospect-holes have been opened along a line of outcroppings of copper-carbonate ore, to the south and south-east from the *Iron Mask*, a few hundred feet distant. In these outcrops narrow stringers of copper-sulphides occur with the carbonates, but the showings do not indicate as strong veins as on the *Iron Mask* and *Emeroy*, already described.

So far as values are concerned, I was informed that these varied from 5 to 9 per cent. copper, with low gold and silver values, also that the ore recovered from the stopes on the *Iron Mask* had been shipped to the Trail smelter by the former company, but there were no records of tonnage available.

Since the purchase by the present organization, shipments had only been commenced recently, because, pending the final payment of the purchase price, it was agreed to confine the operations to development-work only, and the final settlement had only been recently consummated.

P.S.—During the year the company shipped about 560 tons of ore of an average assay value of nearly 4 per cent. copper, with about $1 in gold and silver.

Erin.

The *Erin* is one of the claims in the *Iron Mask* group and is located to the north of and adjoining that claim. The following work has been done on the claim: An incline shaft sunk to a depth of 130 feet (by September 6th, 1913), with a drift 200 feet long on the 80-foot level, also a crosscut into the hanging-wall 150 feet long, and a winze sunk, all in ore, 65 feet deep, at a point 90 feet west from the shaft.

The strike of the fissure is N. 39° E. and it dips at an angle of 65 degrees towards south-east. The solid ore at the bottom of the shaft, 130 feet deep, is fully 5 feet wide, with only the foot-wall exposed. From the 80-foot level the ore, as stoped nearly to the surface, was 8 feet wide, with a further width of low-grade vein-matter from 10 to 15 feet, and in the hanging-wall there is still mineral penetrating the cleavage-planes of the igneous rock, but the foot-wall is well defined and solid.

The material on the hanging-wall side between the ore and wall is similar to that occurring in connection with the *Iron Mask* ore-body, which had been designated as "conglomerate," as noted before in this report. The walls are a fine-grained igneous rock.

At the time I made the examination, 20 tons a day were being shipped from this claim to the Trail smelter, carrying about 5 per cent. copper to the ton of ore. All of this ore is thoroughly oxidized, even to the bottom of the shaft (130 feet deep), which is quite dry. A considerable proportion of the ore is cuprite or red oxide of copper, with malachite and azurite.

Mr. Pilger, the superintendent, informed me that, in the future, or as soon as the electrical machinery was installed, work would be resumed on the *Iron Mask* workings, and in the meantime development would be continued on the *Erin* claim, but that the shipment of ore would be confined to such tonnage as was won by development, which, during my visit, was equal to the hauling-capacity, of 20 tons a day of the one auto-truck.

Bill Nye.

To the east and south-east from the boundaries of the *Iron Mask* group, Coal hill extends for some considerable distance, the southern slope being made up of a series of foot-hills with small alkali lakes occupying the depressions between the ridges, the summits and sides of which afford excellent bunch-grass pasture. On the foot-hills there is usually a light growth of timber, but on the extreme summit of Coal hill, at an elevation of 3,200 feet above sea-level, there is a supply of good timber, chiefly pine, of dimensions well adapted for mining timbers, but usually not large enough for saw-logs.

On one of these foot-hill benches, at about the same elevation as the *Iron Mask* workings or 1,600 feet above Kamloops lake, is situated the *Bill Nye* claim, owned by Messrs. McArthur and Harper and John H. Morrison, of Kamloops. The western boundary of this claim adjoins the eastern boundary of the *Iron Mask* group of claims.

Along the side of the ridge several open-cuts have been made, from a few feet long and deep to one 60 feet long and from 10 to 12 feet deep, and a shaft sunk to a depth of 40 feet. This shaft was close-timbered to prevent the ground from caving, but at the time of my visit these timbers were considerably decayed and the sides had caved in, so much so that examination was impossible without a lot of work which time did not permit.

The open-cuts exposed some bodies of copper-carbonate ore, usually more than 10 feet deep, disseminated through the gravel that makes up the ridge. None of the cuts had been sunk sufficiently deep to reach bed-rock, although Mr. Morrison, who accompanied me, informed me that, in the shaft at the bottom, a vein of copper ore was exposed between well-defined walls.

The material in the long open-cut that crosscut the formation, while showing copper-carbonates disseminated through the entire length, was evidently too low grade to permit of being worked, unless some system of concentration could be devised.

Apparently, almost at any point along the ridge, the same prospects could be obtained by trenching, but deeper work is necessary to determine whether an ore-body of commercial value occurs in the solid rock that underlays the thick bed of gravel.

Golden Star. This is one of the pioneer claims, having been Crown-granted previous to 1899, and is at present owned by Messrs. McArthur and Harper, of Kamloops. It is situated on the same ridge south-easterly from the *Bill Nye* claim. There are several trenches on the slope of the ridge that crosscut the formation, and at one point near the eastern boundary of the claim, and at the base of the ridge just above the water-line of an alkali lake, a deep open-cut has been made, from the face of which a short adit was driven and a winze sunk for about 18 feet.

This work had been done about ten years ago and was so badly caved it could not be examined this year, but when the work was being done I made an examination for the Tyee Copper Company of Ladysmith, also for the General Electric Company of New York. In the notes relative to these examinations, I find that in the open-cut and adit crosscut there was a zone, several feet in width, composed partly of surface gravel cemented together and partly of igneous rock, badly shattered and broken up; this material was permeated with copper-carbonates and some chalcopyrite. There were no well-defined walls exposed nor any well-defined vein shown in the winze, but that all of the rock in the winze carried more or less copper ore disseminated through it, especially in the numerous cleavage-planes; the values, though, were too low grade to be considered commercially at that time. The strike of this mineralized zone is nearly east and west.

Evening Star. The *Evening Star* claim is situated to the south-east from and adjoining the *Golden Star*. It is owned by Messrs. McArthur and Harper and John H. Morrison, of Kamloops, and is also one of the pioneer claims of the district. Near the western boundary and only a short distance from the work on the *Golden Star* claim, an adit 150 feet long has been driven into the base of the ridge mentioned, which crosscut, apparently, the same mineralized zone as was cut on the *Golden Star* claim, but this adit was driven farther into the solid rock, and there showed that, apparently, a concentration had taken place; there were also indications of vein-structure which possibly might show improvement at a deeper level. In order to prove this, a shaft was sunk, vertically 55 feet deep and then as an incline, on the dip of the vein, to 90 feet deep. The data relative to the shaft were given to me by John H. Morrison.

Lost Chord. The *Lost Chord* mineral claim, which is located on the summit of Coal hill, at 1,880 feet elevation above Kamloops lake, is owned by W. W. Wood, of Kamloops. The work done consists of a series of open-cuts made in a general line N. 41° W. to S. 41° E., in each of which is exposed outcroppings several feet wide, carrying copper-carbonates with some bornite ore associated with an eruptive rock, classified by Dr. Geo. M. Dawson as gabbro, but locally called diorite. As there were no deeper workings, very little information could be gleaned. The important feature about the occurrence of this ore is the fact that the outcroppings are found in the same general line of strike as other occurrences, notably on the *Python* mine, on which more work has been done

about 2,500 feet distant to the north-west from this claim and in the same formation, and a line run from one claim to the other, passing through the *Noonday* claim, would intersect the various showings on each. A typical sample, not to be considered an average, taken from one open-cut assays: Gold $2.40, silver 0.5 oz. to the ton; copper, 5.7 per cent.

Python Group.

The *Python* group of mineral claims consists of the *Noonday*, *Python*, *Python No. 2*, and *Copper Head*, and is owned by the Python Syndicate of Kamloops. The *Python* and *Noonday* claims were the first staked on Coal hill, in August, 1896, by the late Robert Buchanan, of Kamloops, and a shaft was sunk 56 feet deep, also a drift run 30 feet previous to September, 1897, when work was shut down, but was resumed by the Python Mining Company, Limited, in 1899, and continued until the fall of 1903, since which time it has only been carried on intermittently, and, I am informed, the property has passed into the ownership of the Python Syndicate.

On the *Python* claim the shaft is now 123 feet deep, with drifts on the 56-foot and 110-foot levels, as well as crosscuts, but instead of continuing to sink, the system of work was changed to driving an adit crosscutting the formation, for the reason that, in addition to being troubled with an excessive supply of water, the ore has dipped away from the shaft, at 110 feet down, towards south-west. At that level a crosscut 68 feet long was driven, and this showed the vein to be very much broken up and apparently replaced by a stockwork of stringers and narrow veins of ore in crushed country-rock having a width of about 8 feet.

The next work done was driving No. 1 adit to crosscut an ore-body that outcrops on the surface about 225 feet west from the shaft; this outcrop had been previously prospected by an open-cut 5 feet deep, in which is exposed a mineralization over a width of 40 feet; much of this shows copper oxides and carbonates, but careful sorting or concentration would be necessary.

I was informed by Wentworth F. Wood, under whose superintendence the work was done, that the adit has been driven about 600 feet, but, owing to serious caving near its portal, I was unable to make any personal examination. This adit has apparently drained the water from the shaft, as the latter is now dry and has been, Mr. Woods says, since the adit was driven 300 feet in from the portal, where a narrow fissure, with a stringer of mineral, was intersected out of which a large flow of water gushed.

Vein-matter, he informed me, was exposed about 40 feet from the face of the adit and was continuous to the face, which, by survey, is 190 feet vertically below the outcrop. On the dump I found a considerable tonnage of low-grade ore apparently carrying an excess of iron in its contents. I took a sample of the ore from the shaft at the 110-foot level where it shows a width of 8 feet, which assays: Gold, trace; silver, trace; copper, 2 per cent.

The mineralization on the *Python* claim appears from surface trenches to maintain persistent continuity along the strike. Its occurrence can hardly be designated as vein-structure, but rather as a stockwork, having a maximum width of over 40 feet of low-grade ore, with about 8 feet, as shown in the upper drifts and crosscuts from the shaft on the 56-foot level, yielding better values and possibly representing a concentration from other portions of the body.

There has been expended, altogether, about $30,000 on this property, which, in addition to the work described, is equipped with a commodious log bunk-house; frame building for dining-room, kitchen, and office; frame shaft-house 25 feet, gallows frame and whim; good blacksmith-shop; three-rail tramway 500 feet long laid with 12-lb. rails; as well as ore-bunkers.

The ore, as mined years ago, was too low grade to pay, when the cost of wagon-haulage to the railroad, together with railroad freight, were considered, but with better transportation facilities it would seem as though this property should become a producer, as there is certainly a large tonnage of low grade ore exposed in the mine and on the dumps, while the tonnage that would probably be available if some method of concentration was successfully adopted would, in my judgment, increase the total very largely, although I did not attempt to measure up the ore reserves or sample the mine systematically.

Noonday.

The *Noonday* claim adjoins the *Lost Chord* on the north-west and is owned by the Python Syndicate of Kamloops. Near the south-east corner of the claim a vertical shaft has been sunk to a depth of 75 feet, on an outcrop carrying copper-carbonates, apparently of low grade. There are indications that this ore-body is an extension of the one on the *Lost Chord* claim, having the same general line of strike and dipping in the same direction. A short distance down the shaft the ore dipped away from it, towards the south-west; sinking was continued vertically, it apparently being the intention to crosscut to determine the continuity of the ore with depth, but, as such has not yet been done, no data of value could be obtained.

Wheal Tamar.

This claim, owned by O. S. Batchellor, of Kamloops, is situated at the summit of a butte at an altitude of 3,000 feet, and is about two miles, almost due south-east, from the *Evening Star* claim and the same distance south from the *Python* group. The mineralization, consisting of outcroppings showing copper-carbonates, does not appear to follow any regular line of strike or any well-defined vein system, but covers a large area of the summit of the butte, the various openings being found over about 5 acres. These consist of four shafts, an adit and several shallow trenches, both crosscutting and along the lines of strike of several outcroppings of low-grade copper-carbonates associated with the surface gravel which covers a portion of the summit; in the other portions natural exposures of the eruptive country-rock occur. I could not determine any continuity of ore between the various exposures or outcroppings as no system appeared to have been followed in doing the work, although there may possibly be shown continuity of a low-grade ore-body between shafts Nos. 1, 2, and 4, which have been sunk along a north-east and south-west line. Shaft No. 1 was sunk 60 feet on an outcrop where carbonates showed associated with surface gravel; it is closely timbered, and with water in it when I visited the property. Shaft No. 2, 50 feet deep, is situated some little distance south-west from shaft No. 1; this was sunk in country-rock stained with copper-carbonates and sometimes showing a little ore in the cleavage-planes of the rock taken out, as well as in the walls of the shaft. There was so much water in the bottom that no examination could be made. Shaft No. 4, 18 feet deep, is situated some distance north-east from shaft No. 1, and was sunk in an outcrop of low-grade ore, presumed to be an extension of the body on which shaft No. 1 was sunk. Shaft No. 3, known as the "Craven" shaft, is 50 feet deep, with a crosscut driven 50 feet in a northerly direction from the bottom, in which are exposed several stringers of ore, in an eruptive country-rock, from the thickness of a knife-blade in the cleavage-planes up to 12 inches. An adit has been driven into the base of the butte, for about 100 feet, so Mr. Batchellor informed me, to crosscut the formation, and under the No. 1 shaft this will have over 100 feet of backs, but it is necessary to drive about 100 feet farther to reach that point.

As the portal of this adit was badly caved, it was impossible to make any examination, but Mr. Batchellor said he intended to drive farther during next winter. It is quite possible—in fact, I should judge, is probable—that the extension of this work will expose an ore-body in a fissure in the country-rock, as there is so much evidence of mineralization on the surface, also of considerable movement suggesting fissuring. All of the ore so far found appears to be

quite low grade, but if a large tonnage could be shown carrying iron-content with the copper similar to the output from the *Iron Mask*, it would prove a popular supply for a smelter and could be mined very cheaply.

Monte Carlo.

The *Monte Carlo* claim is situated south-east from and adjoining the *Wheal Tamar* and is owned by D. J. Rogers, of Kamloops. A shallow shaft has been sunk on an outcrop carrying copper-carbonates with a little bornite, which, judging from the quantity of ore on the dump, was followed down, but, as the shaft was full of water, no examination could be made.

Mother Lode.

The *Mother Lode* mineral claim is situated about half a mile north-west from the *Iron Mask* mine at an elevation of 1,400 feet above Kamloops lake, and is owned by Benjamin Savage, of Kamloops. There are several parallel outcroppings of copper-carbonates on the surface which are exposed by long trenches crosscutting the formation, and appear to have their lines of strike north-east and south-west and dip nearly vertically.

On two of these outcrops shafts have been sunk, one 50 feet, the other 22 feet deep, both of which had a good deal of water in, but, from as close an examination as could be made, each of the ore-bodies averages about 3 feet wide, having vein structure and filling between well-defined walls, and apparently, well worth being more thoroughly prospected by systematic development-work.

The ore on the dumps showed an admixture of copper-carbonates and chalcopyrite with a little bornite, and appeared to carry good copper values.

Kimberley.

The *Kimberley* claim is situated about three miles, in a direct line south, from the town of Kamloops and near the south-east extremity of Coal hill, being at an elevation of about 3,200 feet above sea-level, or about 2,000 feet above Kamloops lake. Although some $20,000 has been expended on this claim, the showings, so far as ore is concerned, are very unsatisfactory, as the results proved after an adit had been driven about 200 feet in the hill, and, at another point, where an open-cut had been made 25 feet deep, about 20 feet wide at the bottom, and over 100 feet long.

All of this work was done in an igneous rock, very much fractured near the surface, but with no appearance of a well-defined ore-body, simply small quantities of pyrite in the cleavage-planes, and copper-stains through the massive rock, with occasionally crystals of calcite, either embedded in the rock or filling narrow gashes, and where these occurred the rock would be found permeated with iron-pyrites.

Apparently the work had been done on the assumption that the entire mass carried sufficient values to pay for mining and smelting, but, upon this theory being found to be an error, the owner, Mr. Beckman, a wealthy German, abandoned the proposition and has since left Kamloops for the Old Country.

COAL.

About three miles due south from the town of Kamloops, near the northern base of Coal hill, there occurs an area of sandstones and shales dipping to the northward at an angle of about 20 degrees, in which formation coal-outcroppings were discovered, and partially prospected several years ago, in the banks and bed of a small stream which flows through the ranch formerly owned by Mr. Guerin. During 1906 or 1907 further prospecting-work was done and several tons of coal mined and used at the *Iron Mask* mine while under the management of Captain J. Argall, but this work was later stopped. As Captain Argall was absent from Kamloops during my visit, I was unable to obtain any reliable information on the subject.

This occurrence of coal is referred to by Dr. Geo. M. Dawson in his report on the Tertiary rocks of Kamloops lake for 1894, and the following geological section, including the coals as seen by J. McEvoy, of the Dominion Survey, in 1892, is given in descending order:—

Coal	3 inches.
Shale	5 "
Coal	12 "
Clay	4 "
Coal	2 "
Shale	6 "
Coal	3 "
Shale and clay	5 "
Coal	5 "
Shale and sandstone	12 "
Coal	2½ "
Sandstone	8 "
Coal	3 "

Dr. Dawson in his report* says: "The beds with which the coal is associated undoubtedly pass under the basaltic agglomerates composing Mount Dufferin to the northward, and if the coal should be found to occur there in workable thickness, this would prove a more eligible field for exploration than that to the southward of Guerin's, even if the coal-beds of the last-mentioned locality were much thicker than any yet developed."

No one, however, has yet followed this suggestion, and it is referred to in this report because, if successfully followed, the results might prove of benefit to the town of Kamloops and vicinity, more especially if the coal would coke, because then the low-grade copper ores could be smelted locally, and bring properties that to-day cannot be worked profitably, into the ranks of producing mines.

Hilltop.

The *Hilltop* claim, owned by O. S. Batchellor, is located on the north side of the Thompson river, about three miles and a half from the town of Kamloops, at an elevation of about 1,000 feet above the river. There are apparently five distinct veins of quartz occurring in a country-rock somewhat resembling that classified by Dr. Dawson as the Cache Creek series, and made up of argillites, cherty quartzites, greenstones, serpentines, and associated limestones, but in this immediate locality no limestone was noticeable. The veins have their lines of strike almost parallel to each other and nearly east and west, and dip at angles of about 60 degrees towards south.

The main work is a shaft, 25 feet deep, sunk on the summit of a rather steep hill. The vein-matter is well-oxidized quartz, averaging about 3 feet in width, from which I took a sample across the vein near the bottom of the shaft.

In addition to the shaft, there are four open-cuts to the west from the shaft and one to the east; in three of these apparently the same vein is exposed, but in two others, one 18 feet long by 8 feet high at the face, and the other 25 feet long and 10 feet deep, lower down the hillside, no vein is yet exposed, these having, so far, only been made as cross-cuts through surface soil and broken rock. The lowest of these would have at least 150 feet "backs" if driven under the shaft. Each of the upper cuts are 10 feet deep, and in each of these a vein of oxidized quartz shows quite strongly; in the cut to the east, 75 feet from the shaft and 12 feet deep, the vein is also exposed, showing the same width and conditions as in the shaft.

At a point about 120 feet south from the shaft another quartz vein, 2 feet wide, outcrops, and between this and the shaft there are three other veins exposed by open-cuts. These where exposed, vary in width, the widest being 5 feet and the narrowest 1 foot.

* Geological Survey of Canada, Vol. VII., 1894, page 169B.

SKETCH MAP
of part of
KAMLOOPS MINING DIVISION

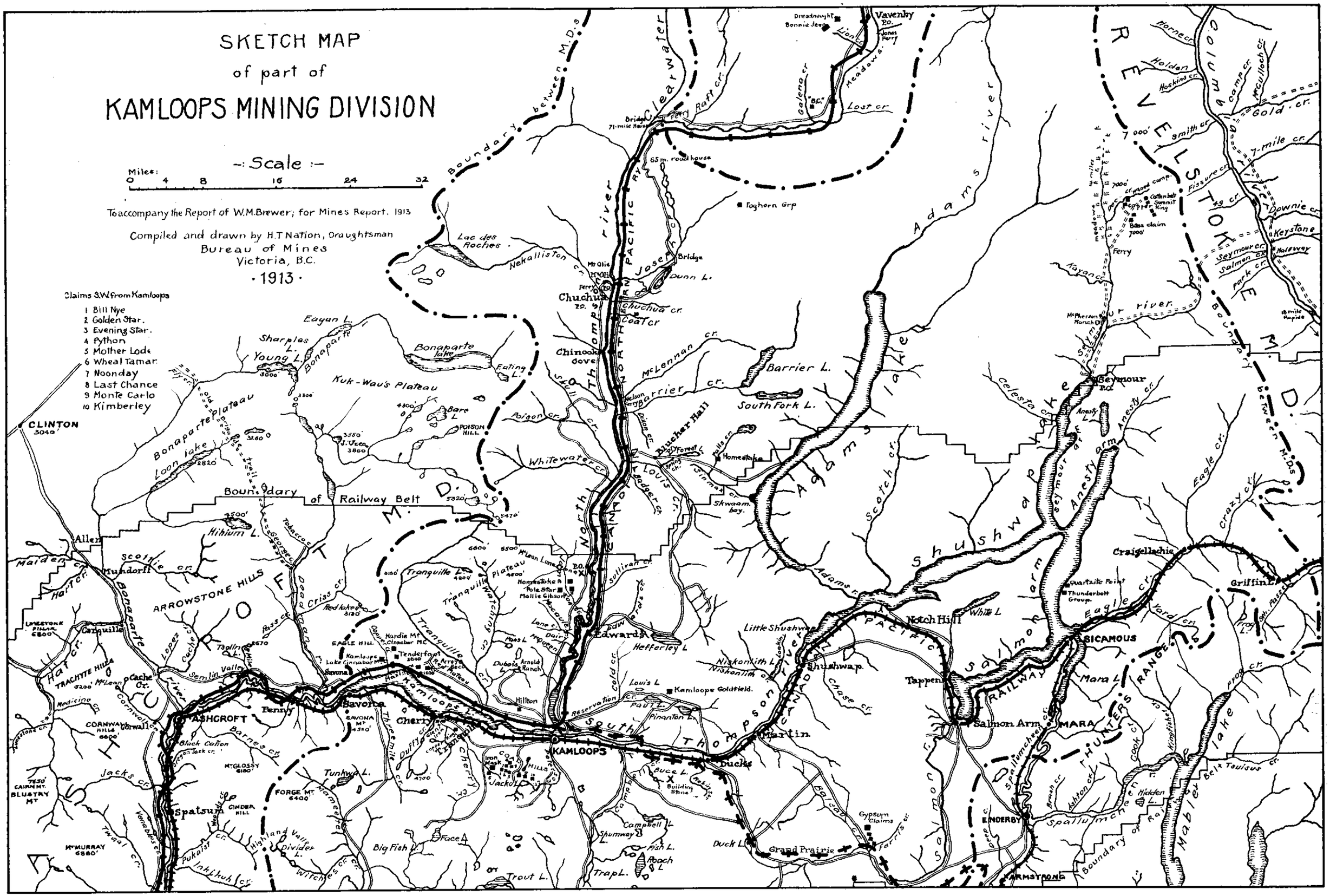
-: Scale :-

Miles: 0 4 8 16 24 32

To accompany the Report of W.M.Brewer; for Mines Report. 1913

Compiled and drawn by H.T Nation, Draughtsman
Bureau of Mines
Victoria, B.C.
·1913·

Claims S.W. from Kamloops
1 Bill Nye
2 Golden Star.
3 Evening Star.
4 Python
5 Mother Lode
6 Wheal Tamar
7 Noonday
8 Last Chance
9 Monte Carlo
10 Kimberley



The same character of quartz occurs in each of the veins, and if the average values are sufficiently high would be a good proposition to operate. The sample taken by myself assays only $3.20 in gold to the ton, but this was not taken to be considered as an average, but merely as a typical sample of the vein at one point to ascertain if the quartz was gold-bearing.

TRANQUILLE CREEK.

This creek flows into Kamloops lake about seven miles westward from the *Hilltop* claim. In 1862 it was worked for placer-mining, and Dr. Dawson, in his report for 1877-78, mentions the fact also that these placers yielded considerable gold.

A dredging plant was later installed on the creek, but to-day all the machinery is piled up near the mouth on the flat immediately adjacent to the creek-bed.

I mention this fact because Mr. Batchellor claims that he found the auriferous quartz veins on the *Hilltop* claim after prospecting the country from the vicinity of Watching creek, a tributary of the Tranquille, emptying into the latter about eight miles above the mouth, to the *Hilltop*.

Kamloops-Gold-fields.

This claim is situated near the South Thompson river on the north side and a short distance from the Harper ranch, about fifteen miles north-east from Kamloops, and at an elevation of about 2,700 feet. It is owned by the Gold Security Company of Kamloops, and was examined on October 15th after my return from up the North Thompson river.

On the summit of a ridge there occur outcroppings of a wide quartz vein in a country-rock resembling diabase, but so badly weathered as to be difficult to classify. The strike is east and west and dips at an angle of 50 degrees towards the south.

A shaft has been sunk, 55 feet deep, on an incline following the foot-wall of the vein; in this the vein shows persistence on the dip, but varies in width from 6 feet to 1 foot, and is composed of quartz very much stained with iron-oxides.

To the east along the strike are two shallow prospect-holes, one 50 feet distant from the shaft, the other 100 feet, in both of which a quartz vein is exposed which appears to be an extension of that on which the shaft is sunk.

To the west from the shaft, about 300 feet distant and 100 feet lower elevation, an open-cut has been made, 40 feet long, to the portal of an adit which has been driven 30 feet under cover with the purpose of drifting on the vein, but this has been driven in the foot-wall under the ore-body. At the portal, though, where the face of the open-cut is about 10 feet high, the vein is not as well defined as in the shaft. The vein material is somewhat mixed with country-rock, and the ore-body, as exposed, is split into three sections, each about 3 feet wide, with the one that carries the best values dipping at an angle of about 40 degrees instead of 50 degrees as in the shaft, so that, while the line of strike is the same as the shaft vein along the summit, it appears questionable whether or not the ore-body exposed in the open-cut belongs to the same vein.

About 40 or 50 tons of ore are on the dump at the mouth of the open-cut; this shows more iron-pyrites in the quartz than at the shaft, and some of this ore had been sacked for shipment, but a shipment of 3 tons taken from the shaft made to the Trail smelter some years ago only returned $10 a ton, which, considering the wagon-haul to Kamloops and railroad freight rate, was not sufficient values to ensure profitable operations, consequently, the balance was not shipped. I took a sample of the typical mineral on the dump, but not an average, which assayed $24.40 of gold to the ton.

Descending the hillside below the open-cut and adit, quartz outcroppings can be traced for more than another 100 feet.

HARPER'S LIME-QUARRY.

On the Harper ranch, near the barn buildings and about one mile towards south-west from the *Kamloops-Goldfields* mineral claim, an extensive limestone bluff occurs from which limestone was quarried and burnt some years ago. This product, I was informed, was used in the town of Kamloops, but operations were stopped, presumably because the fifteen mile wagon-haul to Kamloops, together with the limited capacity of the old kiln (the ruins of which still stand), made the costs too great to leave a profit.

BATCHELLOR'S STAMP-MILL.

At a point four miles up the North Thompson river from Kamloops, and on the west side of that river, O. S. Batchellor has built a stamp-mill, also equipped with a Frue vanner concentrating-table, and operated by steam-power generated in a 20-horse-power boiler. This machinery had been installed some years ago on the *British Empire* mineral claim at Vernon, and, after lying idle for a long time, was purchased by Mr. Batchellor and hauled over to its present location to mill the ores from the *Hilltop* and the *Kamloops-Goldfields* properties.

Arroyo Seco. This claim is situated about sixteen miles north-west from the town of Kamloops and on a high bench near the escarpment of basaltic rocks known as the Red Plateau, situated west from Tranquille creek. It is reached by a new wagon-road recently constructed from the crossing of Tranquille creek around the northern side of Battle bluff, where it reaches an elevation of about 1,800 feet above Kamloops lake and the grade of the Canadian Northern Pacific Railway.

An outcropping of copper-glance and bornite ore occurs on the bank of a deep gulch; this outcropping, on the surface, was about 18 inches wide and about 14 feet long, having its line of strike east and west and dip vertical. An open-cut was made the length of the outcrop to a depth of 4 feet and about the same width; in this the solid ore is 12 inches wide, in the face and bottom of the cut, with the walls composed of diabase containing crystals of feldspar so well defined in places as to give the rock a porphyritic structure.

In order to further prospect the occurrence, an adit has been driven into the bank of the gulch from a point 60 feet below the open-cut, but, although this is 80 feet in length, no ore had as yet been exposed, except a few pieces in some crushed country-rock next to a slickensided wall that apparently corresponds with the wall on the north side of the vein, as shown in the open-cut; the slickenside is well defined nearly the length of the adit.

E. D. Cox, who resides near by and had done the work described above for the National Finance Company of Vancouver, informed me that there were several other outcroppings of copper ore near Battle bluff, and from there westerly to Copper creek, a distance of about eight miles, but no work had been done on any, except on a group owned by Fredericks & Phillips about a mile to the south-westward from the *Arroyo Seco* claim, and also on the *Tenderfoot* property on Copper creek.

Maxine Group. This group comprises the following mineral claims: *Toto*, *Winner*, *Bernice No. 2*, *Maxine No. 2*, and *Red Eagle*, and is owned by Fredericks and Phillips, the latter a retired merchant who resides in Kamloops, while Mr. Fredericks lives on his ranch on the north shore of Kamloops lake near the mineral claims, and about a mile west from Battle bluff, and some fourteen miles by the Canadian Northern Pacific Railway from the town of Kamloops.

This group of claims is located in a solid block with the southern boundary along the north shore-line of Kamloops lake, and all the work has been done on the *Maxine No. 2* claim at a point 1,650 feet from the lake-shore, and about 500 feet higher elevation, so that an aerial tramway, about 1,650 feet in length, might have its lower terminal immediately over the grade of the Canadian Northern Pacific Railway.

Outcroppings showing copper-carbonates and some chalcocite can be found at different points for a distance of about 300 feet along a general line of strike almost true north and south. At the point where work has been done, a vein 4 feet wide, carrying copper ore, has been exposed in an open-cut; this vein has a well-defined foot-wall of diabase rock, and a hanging-wall of the same character, except that, to some extent, this is impregnated with small particles of native copper. The line of strike is N. 5° W. and the dip, nearly vertical, towards the east.

This exposure is near the top of the bank of a deep gulch, and 30 feet lower an adit has been driven 33 feet long, crosscutting the formation on the foot-wall side of the vein, and through 3 feet of copper ore, carrying bornite and chalcocite, to the hanging-wall which contains small particles of native copper; but the crosscut has not been continued into this wall to show to what extent the impregnation reaches, and whether or not it is sufficient to warrant mining any of it in connection with the ore-body.

Instead of drifting at that level, another adit was driven about 40 feet lower; this is 115 feet total length; 55 feet of that length is drifting along the vein, the balance crosscuts the formation on the foot-wall side. On this level the fissure shows persistence, but the ore-body shows lenticular structure and is quite narrow along the roof of the drift, but widens out in the floor. A winze has been sunk 14 feet deep from the floor of the drift, in which the ore in the vein appears to be widening.

The crosscut was driven beyond the vein, and at a point about 10 feet from it there is exposed a narrow cross-vein with 10 inches of ore dipping at an angle of about 40 degrees and towards the main vein. A shallow winze was sunk that showed that this vein, if the flat dip continues, will probably form a junction with the main vein, but work has not been continued far enough to determine many particulars as to persistency or extent. Taken as a whole, the proposition evidently has much merit and is thoroughly well worth being systematically developed.

A sample taken from the ore-body exposed in the upper adit across 3 feet assays: Gold, 40 cents; silver, 1.4 oz. to the ton; copper, 24.5 per cent. A sample of the diabase hanging-wall impregnated with some native copper assays: Gold, *nil*; silver, *nil*; copper, 1.8 per cent.

COPPER CREEK CINNABAR AND COPPER.

From the *Maxine* group I rode down the grade of the Canadian Northern Pacific Railway along the north shore of Kamloops lake to Copper creek, where mining for cinnabar and copper was carried on some years back and a plant was erected for treating the cinnabar ore.

This creek derives its name from the fact that the Indians have from time immemorial known it as a locality where native copper was found. Specimens are yet found in the serpentinous decomposed rocks to the east of the stream which show some of this native copper, but whether the quantity is sufficient to be of economic value is questionable. The vicinity, though, should be an attractive one for prospectors, as but comparatively little systematic prospecting has been done, although the occurrences of both copper and cinnabar ore have been known since about 1890.

Copper creek empties into Kamloops lake about six miles from the western end of the lake and about the same distance west from the *Maxine* group. Occurrences of both cinnabar and copper ore are found in the mountains near the mouth of Copper creek, that border the north side of the lake, at elevations from about 400 to 1,500 feet above the lake.

Cinnabar ore occurs on both sides of Copper creek, but "copper ore in place," so far, has only been found on the east side of the creek on the Tenderfoot Copper Mining Company's property directly overlooking the railway grade and at about 800 feet higher elevation.

The country-rock of which the hills bordering on this lake are chiefly composed is a dark greenish blackish eruptive, containing pyroxene and olivine very much decomposed at the surface.

Two companies, both with headquarters at Kamloops, the Kamloops Lake Cinnabar Mining Co., Limited, and the Hardie Mountain Cinnabar Mining Company, were organized several years ago to operate properties containing cinnabar ore, and a third company, the Tenderfoot Copper Mining Company of Kamloops, was organized to operate a claim named the *Tenderfoot*, on which copper ore (bornite) occurs, but neither of these has been actively operated for a long time.

Lack of transportation facilities has been assigned as the chief reason for this so far as the *Tenderfoot* property is concerned, but this will shortly be removed when the grade of the Canada Northern Railway is built along the lake shore, almost within half a mile from the mine-workings.

Previous to 1901 the Kamloops Lake Company carried on extensive operations and erected a short three-rail tramway connecting with a long surface tram, also a plant for treating cinnabar ore. In this plant some quicksilver was produced for a short time, though I could obtain no record as to the quantity, but was reliably informed that the plant was closed down for various reasons, but chiefly because of an excessive leakage of the quicksilver owing to faulty construction of furnace, which could not be remedied except by erecting a new plant.

The old workings which I examined would indicate that the ore of commercial value was found in pockets in veins composed of quartz and calcite, and where one of these was discovered an open-cut was made on the vein and all the available ore was mined out by underhand stoping; then that cut was abandoned and search made for another lense or pocket, where the same operations were repeated. At the time of my visit no ore of any consequence was exposed in any of the faces in the several cuts or drifts. These drifts are all quite short, not more than about 20 feet long. A long adit had been driven under the other workings at about 50 feet lower elevation, apparently with the idea of opening the property more systematically, but this was too badly caved in to afford any opportunity of a close examination.

The workings on Hardie mountain, on the east side of Copper creek, were not examined, as, from all the information I could gather, these were in such condition as would prevent an examination. It would appear, though, that these properties have not been thoroughly prospected, and that when transportation facilities by the completion of the Canada Northern Pacific Railway are provided, a more thorough and systematic exploration might be desirable.

Tenderfoot. On this claim the workings could not be entered because of having caved in at the entrance of the adit, but on the dump there were several tons of bornite copper ore of good shipping grade. This property is referred to by Dr. Dawson in his report for 1894, and he says that some prospecting-work had been done at that time, resulting in the discovery of a vein from 12 to 15 inches wide, carrying some bornite ore in a gangue of dolomite with some white feldspar.

The long adit I have mentioned was driven on the vein about 1906 or 1907 and I was informed by some miners who had worked in it that the ore-body was well defined and sufficiently strong and persistent to warrant more extensive development.

CONCLUSIONS RELATIVE TO KAMLOOPS DISTRICT.

From my examinations in this district I am of the opinion that with better transportation facilities between the various properties and the railways, and a lower railway freight rate, there are several properties that show ore-bodies of sufficient extent, carrying low-grade copper values with a little gold and silver, which might be operated at a profit.

On the south side of the Thompson river there are three well-defined mineralized belts between Cherry creek, about seventeen miles to the west from the town of Kamloops, and the south-east base of Coal hill, near Jacks lake, distant about four miles south from the town of Kamloops. The claims I examined were those on which the most work had been done, but there are several others on which outcroppings of copper ore occur, on which sufficient assessment-work has been done to obtain Crown grants, but practically no systematic prospecting has been done nor any serious effort made to develop.

On the north side of the Thompson river there is, in addition to the copper and cinnabar ores already discovered in the neighbourhood of Copper creek and near Battle bluff, another zone or belt of country that extends from Tranquille creek to Harper's ranch, a distance of about twenty miles east and west, which is worth the attention of prospectors, since some placer gold has been taken from Tranquille creek and gold-bearing quartz has already been discovered in two places mentioned in this report; while the geological formation is apparently practically the same as the belt first mentioned, it is worthy of being thoroughly prospected, which, to the best of my knowledge, has not yet been done.

On September 15th I left the Kamloops District for Salmon and Seymour arms and found the wagon-road in excellent condition. This road nearly parallels the Canadian Pacific Railway and the South Thompson river as far as Shuswap, about thirty-six miles, and, despite the fact that it was one of the earliest settled sections in the Province by ranchers, I found that on many of the benches outside of the boundaries of the large ranches, homesteaders had located recently, and many of them were successfully engaged in dry-farming.

On September 16th I left Shuswap. The wagon-road branches towards the north-east and into the mountains which border the south-east side of Shuswap lake, the west end of which is at Chase, three miles east from the village of Shuswap. A steep hill is ascended for about a mile to the bench above. The north side of this bench terminates in a precipitous bluff that forms the south bank of Chase creek, which empties into the Shuswap lake at the town of Chase.

The formation of this hill is micaceous schist, with which is associated some gneiss and grey granite with much hornblende in large well-defined crystals, and this prevails all the way to Salmon arm, a distance by wagon-road of thirty-seven miles from Shuswap.

After crossing Chase creek the road forks, one fork branching towards the south-east to China prairie, at the head of Chase creek, the other continuing towards the east to Salmon arm. This road, which is good enough for automobiles the entire distance to Salmon arm, has been built through a well-timbered pass in the mountainous section about two miles back from the lake. After riding through the pass for about four or five miles, I entered a plateau which is the divide between the main Shuswap lake and Salmon arm, where I found a series of several lakes with large timothy and clover hay meadows on the portages between the lakes, as well as some fields of grain, orchards and vegetable-gardens, all of which are apparently well cultivated, evidently by prosperous farmers, judging from the good buildings, large haystacks, as well as the horses and cattle that were pasturing in some of the meadows.

In addition to the older settlements I passed some lands that had recently been taken up by homesteaders, who were busily engaged in clearing land and had already erected cabins and barns.

About ten miles from the town of Salmon Arm the road descends into the wide valley which extends along the lake-shore and near the mouth of the Salmon river, where the road is bordered by farms. A large Indian reserve is entered some few miles from the Salmon river, which appears to cover an immense acreage and extends across the mouth of the Salmon river to the west boundary of the town.

The valley of the Salmon river towards the south averages about a mile wide, and is thickly settled, with large well-cultivated orchards, as well as fields of oats, wheat, timothy, clover, and vegetables.

Mount Ida.

I examined the *Mount Ida* group of claims on September 18th; it is located at an elevation of about 1,000 feet above Shuswap lake, on the side of Mount Ida, about five miles south-east from the town of Salmon Arm. The apex of Mount Ida has an altitude of 5,200 feet and is reached by wagon-road to the base of the mountain, and thence by good horse-trail. The group composes the *Everglade*, *Excelsior*, *Leah Rose*, *Alida*, and *Eva* mineral claims, owned by the Mount Ida Mining and Development Company of Salmon Arm, of which Alex. Miller, of the same place, is president and general manager.

The rock formation in the immediate vicinity belongs to the rock classed by Dr. Dawson as the "Shuswap series," made up of mica-schist, grey gneiss, crystalline limestone, and quartzites. In this occurs a system of parallel ore-bodies, from 18 inches to 7 feet wide, composed of galena in a quartz gangue; these appear sometimes to be contact deposits between the micaceous schist and quartzite, and at other places between the schist and marble. The strike of these generally is approximately north-east, and dip from an angle of 65 degrees to almost vertical towards the south-east.

All the development-work has been performed on the *Everglade* mineral claim, and consists of 346 feet of underground work, as follows: Upper adit 130 feet long, at an elevation of about 1,000 feet above the lake; this crosscuts the mica-schist formation for about 100 feet, then a seam of quartz between 6 and 7 feet wide carrying quite an appreciable percentage of galena, then limestone forming the footwall. From this point a drift has been run, but, owing to caving of the roof from slacking, this could not be closely examined; however, I was able to take a sample from the face typical of the ore-body, but not intended to represent an average of the entire ore-body as it would be mined. This sample assays: Gold, trace; silver, 7 oz. per ton.

A lower adit had been driven 230 feet with the intention of driving under the upper adit, at a vertical depth below it of about 260 feet, but has not yet been driven sufficiently far to reach the point aimed at. Near the face of this adit the water that percolates through the strata and cleavage-planes of the country-rock is blood-red, evidently from iron stains, and there is also a considerable quantity of iron-pyrites disseminated through portions of the rock, apparently indicating that a mineralized zone might be looked for as the work progressed. At the portal of this adit a body of quartz carrying some galena was exposed, but this had the appearance of having been broken off and having slipped from a higher elevation.

An ore-body outcrops at a point about 50 feet vertically above the upper adit, where a shaft was sunk 16 feet deep, in which is exposed a quartz vein, 18 inches wide, carrying galena; it is apparently wider on the north-east side of the shaft than on the south-west side. It is doubtful whether this is the same ore-body as is exposed in the upper adit, although it may be.

Two other outcroppings of the same character of ore occur, one at about 100 feet lower elevation than the shaft referred to, and another about 60 feet still lower down the mountain, but a short distance north of a direct line between the two last mentioned. On the first of these a shallow open-cut has been made, while on the last named there is an open-cut and shaft; this has been sunk about 15 feet deep below the bottom of the cut, in which is exposed an ore-body about 3 feet wide of quartz carrying galena.

Unless a body of solid galena of some extent can be found, it is hardly probable that this property could be operated at a profit by shipping the crude ore direct, but as a concentrating proposition this would appear to be an ideal one.

A very good supply of timber, especially of cedar and some pine, excellent for mining timbers, is on the mountain about 300 yards distant from the mine-workings, but at a lower elevation.

There are, I was reliably informed, a number of other mineral claims in the vicinity on which the same character of ore occurs under very similar conditions, but, as I did not meet any of the owners nor any one who was conversant with the locations, and as no work was being done on any, I did not have an opportunity of making an examination of them. From the best information I could gather, though, there had not been done any such quantity of work as had been performed on the *Mount Ida* group.

On September 19th I left Salmon Arm for Seymour Arm, but in order to reach the latter I had to ride back over the road to Shuswap and thence to Chase, from which point the stern-wheel steamer "Andover" plies up Shuswap lake and touches at several points, but not at Salmón Arm.

SEYMOUR ARM.

The village of this name is situated at the extreme northern end of the Seymour arm of Shuswap lake, and about forty miles by water from Chase, which is situated at the extreme southern end.

Seymour Arm has no wagon-road connection with any other point on the lake, but there are some roads, built by the Government, to the homes of settlers in the vicinity, and one to a logging camp on the Seymour river, about three miles from the village, where it connected with a pack-trail up the North fork of the river. This was my route to the section locally known as the Cotton-belt summit, situated, about twenty-five miles by the trail, a little east of north from Seymour Arm. This trail I found to be in about as bad a condition as it could possibly be; in fact, so bad that the prospectors near the summit have been paying 8 cents a pound for packing in supplies during the summer.

On September 21st, Sunday, this section was visited by a continual downpour of rain. During the day, after some delay, I secured a pack-horse and supplies, and, with Joe Blais, of Kamloops, who is interested in the Cotton-belt country accompanying me as a guide, made all preparations for an early start on the following morning, September 22nd, which we accomplished.

SEYMOUR RIVER TRAIL.

After crossing the Seymour river about two miles from the village on a good ferry, we left the wagon-road and rode along an old trail in a general northerly direction through a belt of good cedar timber for about two miles; bordering the trail, but about 50 feet lower elevation, the river-valley is quite wide and would appear to be made up of good soil, but needing drainage. Beyond we entered a section of country through which destructive forest fires and windstorms in the past years had played havoc. The valley here was not so wide, and much of it was covered by rock-slides from the high mountains on each side. These mountains, which are for the most part composed of mica-schists and gneiss, are stated by Dr. Geo. M. Dawson to belong to the Gold range.

About four miles from Seymour arm, at a point where the trail crosses a wide creek, a tributary of the Seymour river, there are, mixed with the gravel in the bed of the creek, many oxidized iron boulders of various sizes, well rounded and water-worn, indicating the presence of some of the varieties of iron mineral, most probably iron-pyrite, with possibly ore-bodies carrying gold, silver, and copper, at some point up the creek, which has, I was reliably informed, produced some placer gold in years gone by.

From this point the trail is along a rocky ridge where no attention has been paid to grade, consequently the traveller is continually crossing steep ridges and depressions, while it is very crooked and soft in places, causing both horses and men much discomfort; this might be excusable if such a trail was unavoidable; but, however, in this instance, a little more time occupied in cruising out the route might have resulted in the construction of a trail with good grade.

Beyond McPherson's homestead the valley commenced to widen out along the North fork of the Seymour river, which we were now following, having left the main river before we reached McPherson's. The trail led down from the ridge to the valley near the mouth of Kayan creek, about thirteen or fourteen miles from Seymour Arm by the present trail, but not over nine miles, and possibly less, by the route that should have been followed. From there to the portion of the valley called the meadows, a distance of about three miles, we passed through heavy timber.

The Meadows we found were well named, and apparently at one time formed the bed of a lake or extra wide portion of the river, which had gradually filled in with silt until to-day it represents a valley on the west side of the river averaging half a mile wide and sometimes wider, for a length of fourteen miles. This is covered by a light growth of willow-brush and luxuriant wild grass, which, cured in a favourable season, furnishes hay for the trappers' and prospectors' horses.

The east bank of the river is quite precipitous, and a short distance back the mountains reach an altitnde of 2,000 feet above the level of the valley; the slopes are very heavily covered with the same varieties of timber as we had been riding through south of the Meadows.

At the south end of the Meadows we had to cross the river on a raft ferry, which, notwithstanding the fact that the Provincial Government had a short time before sent in a new cable and hired men to construct a good ferry, we found to be in bad condition. The work had been done in such a careless, shiftless way that the raft itself was waterlogged and the cable not properly stretched, so that crossing was not at all pleasant, as the water was boot-high on the raft and the first raise in the river will probably carry it away by breaking the cables. The river is about 200 feet wide at the crossing and was quite low at the time, which was fortunate for us.

After making the crossing we started to climb the steep heavily timbered bank, and continued to do so for four hours until we had reached the cotton-belt summit at an altitude of about 7,000 feet, and about 2,000 feet above good timber. This summit is a portion of the divide between the Seymour and Columbia rivers, and was crossed by the pioneers to the Big Bend and other portions of the latter river twenty years ago, when a trail from the head of Seymour arm, that followed up the East fork of the Seymour river, was used instead of the one travelled up the North fork.

Cotton-belt Group.

The *Cotton-belt* group of mineral claims is located along the extreme summit of the same name, in a park-like plateau, several miles in length north-west and south-east and about half a mile wide, with Deep creek cutting through it on the north. The surface is dotted over with little lakes of good water and is covered with much grass, not exactly of the bunch-grass variety, but belonging to the same species, and is a favourite range for caribou.

The group of claims, all of which are Crown-granted, comprises the *Cotton-belt*, *Joe*, *Boyne*, *Harrison*, *Victoria*, *Jessie*, and *Wellington*. There was no one on the property from whom information as to present ownership could be obtained, and the names of the claims were taken from a plat on a portion of an old application for certificates of improvements, posted on a lone tree near the discovery post on the *Harrison* claim, the plat being the only portion perfectly intact and legible.

The group derived its name from the fact that mineral was first discovered on the *Cotton-belt* claim by a negro prospector who was one of the pioneers at the Columbia River placer mines, and located the *Cotton-belt* claim while on a trip from Seymour Arm to the Columbia by the old trail I have referred to along the East fork of the Seymour river.

There are several very prominent outcroppings of gossan, especially on a hillside on the *Cotton-belt* claim, which is the farthest location in a north-west direction. From that point the other claims are located in a south-easterly direction along the summit, extending a distance of nearly two miles.

I followed the line of strike north-west and south-east towards the south-east and found that every few yards trenches had been made and shallow pits sunk, in all of which the gossan outcroppings, from 3 to 5 feet in width, had been exposed in a mica-schist country-rock. There was no question as to continuity, because between the various trenches there was a depression in the ground into which I picked up in many places and invariably could uncover the same material, always about the same width and in a direct line. Some of this gossan was sufficiently magnetic to attract the needle in a compass. In the deepest pits where the unaltered ore occurred I found a solid complex mass that had been, I was told, considered to be galena, but carrying so much magnetite, apparent to the naked eye, that it appeared as though unless treatment by magnetic separation was adopted the galena ore would be too little to pay.

The most work has been done on the *Cotton-belt* claim, where an adit 60 feet long had been driven on the vein, which was still exposed in the face, fully 3 feet wide. At that point the adit would have about 50 feet of backs, which would be increased considerably if driving was continued. This adit is under an outcropping 5 feet wide, the most prominent on the property, because it occurs as a bluff. The vein in the adit dips at an angle of 45 degrees towards the south-west.

Both walls are well defined and composed of mica-schist, more or less garnetiferous. There are a few inches of gouge between each wall and the ore. The deeper pits, before referred to, some of which are from 10 to 15 feet deep, all showed very similar characteristics with regard to the vein-structure, dip, and strike.

About 200 feet from the vein and on the south-west side there occurs a belt of crystalline limestone; this lies parallel to the vein in the mica-schist, and is found to be extremely persistent, so much so that down the mountain the same bed of limestone can be traced with little difficulty and is found 2,000 feet below the summit.

I took a sample from the drift on the *Cotton-belt* claim typical of the ore, but not to be considered as an average, which assayed: Gold, trace; silver, 2 oz. to the ton; lead, 1 per cent.; zinc, 12 per cent.

Bass Claim.

On September 24th I made an examination of the *Bass* claim, owned by Al. Bass, of Seymour Arm. The claim is situated down the mountain from the *Cotton-belt* claim, at about 600 feet lower altitude. An outcrop of magnetite and galena ore about 3 feet wide, and with a north-west and south-east strike, is uncovered of considerable length, occurring in mica-schist country-rock; this is exposed in a clump of timber on a bench on the mountain-side, where the surface is generally covered with tundra and slide-rock, so that natural outcroppings of "rock in place" are very difficult to find along the line of strike. The dip, as seen in an incline shaft, is at an angle of 40 degrees towards the south-west.

Because of the overburden on the surface and the absence of Mr. Bass, who may have other outcroppings exposed which I could not find, I was only able to make an examination at the one point where he had done work; this was an incline shaft, about 50 feet deep, 7 feet long, and 5 feet between the floor and roof, sunk on the foot-wall of the vein, which is quite persistent to the bottom of the shaft and shows every indication of continuity to deeper levels. The ore-body has a width of fully 3 feet and carries more galena ore in proportion to the magnetite than on the *Cotton-belt* claims. It shows indications of straightening up at the bottom of the shaft, where it is 3 feet 6 inches wide.

A sample taken of the typical mineral, but not as an average of the ore-body, assayed: Gold, $2; silver, 7.2 oz.; lead, 35.5 per cent.; zinc, 0.5 per cent.

Copper King.

The *Copper King* group of mineral claims is situated at an elevation about 2,600 feet lower than the Cotton-belt summit, on the same side of the mountain as the *Bass* claim. The group comprises the *Chalcocite*, *Copper Queen* and *Copper King* claims and is owned by Joseph Blais, Hugh Sinclair, and Frank Munger, of Kamloops. Several outcroppings of quartz impregnated with chalcopyrite copper ore occur along a general line of strike N. 24° W. to S. 24° E., and, where the dip could be ascertained, this was at an angle of about 40 degrees towards the south-west. The line of strike of these outcroppings nearly parallels the course of Deep creek.

The most prominent outcrop of ore occurs on the *Copper King* claim, at a point about 800 feet above the bed of Deep creek, where the mountain-side is quite precipitous, and is usually covered to a considerable depth with slide-rock, in addition to which there is a very heavy growth of timber, so that natural exposures are only found where bold, bare, rocky bluffs occur; at other places considerable work is necessary to uncover the outcroppings of ore.

This class of work has been so well done on the *Copper King* and the adjoining group of claims to the eastward that outcroppings of ore have been uncovered in many places along the general line of strike for a total distance of about a mile and a half, or across two claims to the westward from the *Copper King* claim and three claims to the eastward from that claim, but there is a wide gap immediately east from the western portion of the *Grand Mogul* claim that joins the *Copper King* claim on the east where work of uncovering would be very heavy. Such conditions of persistency and possible continuity are apparent as to indicate the outcroppings may all belong to the same mineralized zone, but there are also indications of faulting about 3,000 feet to the eastward from that boundary of the *Copper King* claim and of a downthrow of possibly more than 100 feet.

At the place where the most important work has been done on the *Copper King*, near its eastern boundary, a large open-cut has been blasted into the face of a precipitous bluff, where an extensive outcrop of quartz carrying chalcopyrite copper ore was exposed. This cut has a face over 12 feet high; the floor is about 20 feet long by about 15 feet wide, and almost the whole face shows mineralization. There is apparently no permanent foot-wall exposed; in fact, the structural character of this ore body or bodies, as exposed in many openings I examined, does not suggest vein-structure as generally understood, but rather a zone with several bands or ledges of quartz gangue mineralized with chalcopyrite alternating with beds of mica-schist and crystalline limestone.

The quartz-seams are usually from 3 to 6 feet wide, with intervening country-rock about the same width, the entire mass having its line of strike N. 24° W., and dip of 40 degrees to the south-west, conformable with that of the country-rock above and below the mineralized areas; at least, such was the case at the several exposures I examined. Evidently the country-rock belongs to the series designated by Dr. Dawson as the "Shuswap," composed of mica-schists, gneisses, and marbles.

About 20 feet below the large open-cut referred to, another outcrop of copper ore has been uncovered. This may indicate another distinct ledge paralleling the one just described, or possibly that the mineralized zone reaches to that width at this point, as it does at some other places, but the conditions on the hillside between the two points is such that work of stripping the surface would be very great and require considerable time; in fact, I suggested that an adit be driven into the mountain-side on this lowest outcrop which would crosscut the entire banded structure.

On the face of the open-cut first mentioned, there is exposed a total width of ore of about 12 feet; a proportion of this is solid chalcopyrite of good grade, in kidneys of various sizes disseminated through quartz gangue, with the balance of the quartz impregnated with particles of chalcopyrite up to the size of wheat-kernels. From its appearance the entire body of quartz should be easily amenable to concentration. It is to be regretted that, while the surface prospecting has been well done, no systematic development-work has been done to determine by crosscutting and drifting the structure and extent of this ore-body.

No attempt was made by me to sample the various openings to obtain an average sample, but I did take a sample typical of the mineral as exposed in the big cut, which assayed: Gold, trace; silver, 0.2 oz.; copper, 7.3 per cent.

Camp McLeod Group.

This group adjoins the *Copper King* group, already described, on the east; it comprises the *Grand Mogul*, *Camp McLeod*, *Steeple Jack*, and *Eagle's Nest*, and is owned by Fred A. McLeod, J. H. Lund, and associates, of Salmon Arm. The claims are staked in a line from north-west to south-east nearly paralleling the course of Deep creek, but on the mountain-side about 800 feet above the creek and about 2,600 feet below the *Cotton-belt* summit.

This group of claims was first staked because of the discovery of outcroppings of galena ore mixed with magnetite, but later there were found some outcroppings of copper ores similar to those occurring on the *Copper King* group to the westward. These occur on the same mountain-side at about 300 feet higher elevation than the outcroppings of galena and magnetite ore, and were first discovered on the *Grand Mogul* claim, joining the *Copper King* claim. No work other than surface prospecting has been attempted on this lead of copper-bearing ore, but the result of this work has demonstrated that apparently the lead continues through the *Camp McLeod* group with as much persistency as through the *Copper King* group. The outcroppings showing the galena ore have been opened by a series of trenches for a distance along a general line of strike, N. 24° W., for a distance of over 2,000 feet, or across the *Steeple Jack* and *Eagle's Nest* claims, starting from the south-east line of the *Camp McLeod* claim.

The occurrence of galena has received very much more attention from the owners than the copper-bearing ore-body, and, in addition to the thorough surface prospecting mentioned, an adit was being driven on the vein during my visit. The portal is under an easily seen outcropping of oxidized material composed of iron, galena, and copper ore, so much oxidized as to have the appearance on the surface of yellow ochre. This occurs on the steep bank of a creek flowing from the mountain-side in a series of falls. Close to the portal of the adit the bed of this creek shows evidence of the faulting referred to in my description of the *Copper King* group, and the vein of galena has not yet been exposed on the west side of this small creek, although the outcropping is so prominent on the east side, and from that point towards the same direction has been exposed in so many places along the line of strike as to suggest continuity; in fact, for at least 700 feet from the small creek my examination convinced me that for that distance the continuity on the surface is determined; the width of the vein varies from 3 to 14 feet wide. The structure is that of a contact vein dipping at an angle of 35 degrees towards the south, occurring between gneiss as a hanging-wall and crystalline limestone

as the foot-wall. The adit has been run as a drift on the ore-body; it was 6 feet 6 inches high, 5 feet wide, and 62 feet long at the time of my visit (September 24th), and was being driven as rapidly as possible with one shift of miners and blacksmiths.

The ore-body is continuous along the drift, and the entire face is all ore without either the foot or hanging wall being exposed. At the portal of the adit the foot-wall forms the floor, but in order to get grade the miners raised above it and have continued to do so; consequently all the material broken down is ore. The operators, who are the original locators, proposed driving to 65 feet, above which point the outcrop indicates that the ore-body should be 10 feet wide if the same width as exposed on the surface maintains its continuity with depth, and then crosscutting to expose both walls, after which the camp would be closed down for the winter.

I took two samples, one typical of the mineral in the face of the adit. This assayed: Gold, 0.02 oz.; silver, 5 oz.; lead, 11 per cent.; zinc, 16.5 per cent.; iron, 33.5 per cent. a ton.

I also took a sample across an outcrop 3 feet wide on the *Steeple Jack* claim from a point nearly 700 feet south-east from the adit described above. This assayed: Gold, trace; silver, 4.8 oz.; copper, 8.1 per cent.; lead, 1.6 per cent. These samples were not taken to represent an average of the ore-body.

Considerable open-cut work has been done on the copper lead along the line of strike from the *Copper King* claim and on the *McLeod* group, and at one point, especially on the *Grand Mogul* claim, near its western boundary, where this lead is exposed for 20 feet wide, it shows the same banded structure as referred to in my description of the *Copper King* claim, and a total width of ore of about 12 feet, with the beds dipping conformably with the dip of the country-rock, and at an angle of about 40 degrees towards the south-west. I did not take any sample from this work, because the one taken from the *Copper King* represented the type of the ore, and as it was not practicable, in the time at my disposal, to systematically sample these ore-bodies to obtain an average, I did not attempt it. Some idea of the difficulties under which prospectors have been working can be gained from the fact that packing supplies last summer from Seymour Arm to McLeod's camp cost 8 cents a pound, but even with that handicap, which, however, should be overcome by a good trail, this is a good country for thorough prospecting.

On September 25th I left McLeod's camp for Seymour Arm, in company with Mr. Blais as my guide.

QUARTZITE POINT, SHUSWAP LAKE.

On September 26th we took passage on the steamer "Andover" to return to Chase, at the foot of Shuswap lake, but stopped off at Quartzite point, about twenty-four miles to the southward from the head of Seymour arm, on the request of J. R. Linton, of Enderby, who had acquired a group of mineral claims known as the *Thunderbolt* group, located at and near the point.

Quartzite point, locally called Marble point, is a prominent landmark along the east shore of the lake. It is composed of a very wide ledge of white, glassy, vitreous quartz, which rises to considerable height a short distance back from the shore. The country-rock is mica-schist, belonging to the formation designated by Dr. Dawson as the "Shuswap" series.

Across the lake on the west shore is a great bluff of crystalline limestone. I was informed that some years ago operations were carried on in quarrying and burning limestone, but these were suspended and have never been resumed.

Thunderbolt Group.

This group consists of eight claims named *Thunderbolt Nos. 1* to *8*, located on the mass of quartz just mentioned as forming the point. The general appearance of this quartz would hardly commend it as possessing any gold-bearing value, but, as Mr. Linton had done quite a little work, in good faith, I examined the proposition, having ample time while the steamer was making other calls and returning. Two adits had been driven into the quartz, one about 300 feet above the lake, the other on the lake-shore. The upper adit is 25 feet long, the lower one 60 feet long. I took a sample from each and selected the most likely-looking portions, but each of these assayed in gold only a trace.

Near the lower adit, on the north side, is an outcrop of iron ore on which, several years ago, a pit was sunk 12 feet wide by about 12 feet long at its mouth, tapering to 4 x 5 feet at a depth of 8 feet, below which sinking had been continued, but to what depth I did not ascertain, as it was full of water. This merely showed that, although the outcropping exposed a body of impure iron ore in mica-schist of considerable width, this had narrowed to inconsiderable proportions at 8 feet depth.

After completing this examination we proceeded to Chase, at the foot of the lake, arriving at 6.30 p.m. On September 27th I rode to Kamloops, forty miles distant, arriving the same evening.

GYPSUM AND BUILDING-STONE.

After my return to Kamloops until October 3rd, I was engaged in examining the gypsum-deposits on Balean creek, a tributary of the Salmon river, which empties into that river about eight miles from the hotel at Grande Prairie, and about forty-six miles south-east from the town of Kamloops. I also, on the same trip, examined some building-stone at Buce lake, about thirteen miles south-east from Kamloops.

The deposits of gypsum extend along a comparatively long ridge from near the mouth of Balean creek and up that creek on the north-east side, a distance of a mile and a quarter by section-lines. The line of strike is N. 35° W. and dip apparently nearly vertical, with slight inclination towards the north-east.

I commenced my examination at the most north-westerly point at which any considerable quantity of gypsum has been discovered, so far as known at present, this being a mile and a quarter above the mouth of Balean creek, and where the creek-valley is narrow, and where the gypsum-deposits are very accessible, being at an elevation of about 400 feet above the valley and about half a mile distant from the wagon-road. As the Canadian Northern Pacific has surveyed for a line from Kamloops to the International Boundary, which line is reported to cross the Salmon river near the mouth of Balean creek, this when completed will afford excellent transportation facilities. At the present time the nearest railway is the Canadian Pacific Railway, and the nearest station either Ducks or Martins, the distance to the first-named being about twenty-four miles, or to the last mentioned twenty miles.

The ridge on which gypsum occurs is cut by deep gulches every few hundred yards, and it is on the points between these depressions and near the heads of these gulches where the gypsum outcroppings are very prominent, but in the depressions the overburden of soil and grass hides the rock formation.

Where the rock formation can be observed it consists of argillites and limestones, named by Dr. Dawson as the "Nisconlith series." The walls on both sides of the gypsum, so far as the limited amount of work enables one to determine, are argillites, and in some places the gypsum apparently reaches a maximum thickness of nearly 300 feet between the walls. The work consists of several open-cuts, in all of which very pure gypsum is exposed.

There is no difficulty in tracing the gypsum outcroppings to the mouth of the creek, where the most work has been done, which consists of a series of open-cuts and one adit 45 feet long crosscutting the deposit of gypsum, the thickness of which has not yet been determined, as the entire length of the adit shows a solid mass of gypsum, massive and not well stratified, with the face still in that material.

A typical sample taken by myself from open-cuts near the north-west end of the known deposits assayed: Water, 20.8 per cent.; sulphur-trioxide, 46.2 per cent.; lime, 32.4 per cent.; silica, 0.4 per cent.; iron, trace; magnesia, trace; and shows, when compared with Dana's analysis, that this material is almost theoretically pure.

Balean creek would furnish good water-power, and there is also a sufficient supply of timber in the neighbouring hills for mining and other purposes.

The title to the deposits of gypsum, because they are situated within the Railway Belt, is a leasehold granted by the Dominion Government, under which there have been acquired the following holdings: 80 acres acquired by Joseph Blais and Hugh and James Sinclair, of Kamloops; 40 acres by the Manitoba Gypsum Company; and 40 acres by William Warrant, of Vernon; each tract of 40 acres being a quarter of a mile along the strike and half a mile wide.

Buce Lake Stone.

The building-stone I examined is located on the edge of one of the Buce lakes, two bodies of alkaline water about thirteen miles south-east from Kamloops, and about two miles in a direct line from the Canadian Pacific Railway where it crosses Campbell creek between Kamloops and Ducks stations. The title to 120 acres in the Railway Belt is held under lease from the Dominion Government by J. J. Carmen, L. D. Bennett, and J. Couture, of Kamloops. The stone is generally white, but sometimes shows bluish and pinkish tints, and in the quarry is so soft as to be easily cut with a saw, but after exposure to the air becomes quite hard and is apparently well adapted for building purposes. The surrounding rocks are volcanic, chiefly basalts. The most accessible and prominent outcropping of this stone is in a bluff on the shore of the small lake mentioned, where nature has exposed a face to quarry from over 30 feet high and about 60 feet long at the base. The same material can be traced for about half a mile to the westward, but no work has been done to determine the extent of the deposit, but it is apparently very considerable.

From an analysis of a sample I took from the face of the bluff, this rock would appear to be a quartz-porphyry tuff. The analysis shows it to be made up of: Silica, 63.5 per cent.; iron-oxide, 3.5 per cent.; alumina, 14.6 per cent.; lime, 6.3 per cent.; magnesia, 0.2 per cent.; loss on ignition, 7 per cent.; alkalies by difference, 4.9 per cent.

North Thompson River to Louis Creek.

On October 3rd I left Kamloops and rode up the North Thompson river along the east side to make an examination of several properties on which ore carrying values in gold and silver had been reported.

The wagon-road parallels the line of the Canadian Northern Pacific Railway from the Indian reserve, opposite Kamloops, to Mile 88, and the grading was completed to above Mile 109 from Kamloops.

The North Thompson valley, on both sides of the river for about thirty miles up, is of considerable width. Much of the land has been farmed for several years, but on the east side for eight miles north from Kamloops an Indian reservation restricts settlement. Back from the valley and between it and the higher mountains are a series of benches covered with bunch-grass and sparsely timbered with pine, birch, and cottonwood trees; but after passing

Mile 30 on the railway the valley narrows down and fairly high mountains form the river-banks for about five miles, when the valley again widens out. The growth of timber along this stretch of country shows a marked improvement over that to the southward; yellow pine predominates, and much of it is of sufficient dimensions for saw-logs.

The rock formation for some miles after leaving Kamloops is mostly volcanic, fine grained and of greenish tint, but with these are associated blackish cherty rocks and dark-banded hard shales, while overlying these is a wide bed of limestone, then blackish cherty quartzites and argillites. Beyond these, at about Mile 30, argillites and schists with intrusive dykes of volcanic rocks prevail, with granite forming the higher mountains on the east side and where the grade of the wagon-road follows along the mountain-side for two miles.

I reached Goudreau's road-house, store, and the Louis Creek post-office about noon on October 4th, and afterwards looked over the placer claims that had been recently located on that creek. Mr. Goudreau took up 160 acres of land several years ago, and to-day has one of the most flourishing ranches in the district.

LOUIS CREEK PLACER GROUND.

Dr. Dawson, in his report of 1877-78, refers to the occurrence of placer gold on this creek, and says it had been found in paying quantities and worked as early as 1861, so that the little excitement that caused a miniature stampede last July, after a prospector named Robert Le Roi brought in some placer gold he had panned from the gravel in the creek-bed, was only a case of "history repeating itself." Louis creek empties into the North Thompson near Mile 36 on the Canadian Northern Pacific Railway. It has its source in Hefferly lake, distant about twenty miles to the south-eastward, and flows through a plateau country fairly well settled with farmers. Nearer the mouth the banks become more steep and the creek flows through a canyon for some distance, widening again about a mile from the mouth.

Fifteen placer claims were staked on the creek earlier in the year, and these extended from a point about half a mile above the mouth to the canyon, a distance of some two miles. Quite a little gold was taken out in sluice-boxes by individual miners, several ounces of which I was shown by Mr. Goudreau, who owns five claims on the creek; the particles he had were somewhat flaky, but not too light to be easily saved in a sluice-box.

During a brief visit made to some of the claims on the creek, I was accompanied by C. C. Kiddle, who was working about three-quarters of a mile above the mouth. He told me, at that time there was only one other man working, and he was about a mile and a half farther up, but that a short time previous there had been several, and that Captain Fison, who owned some claims, had cleaned up considerable gold. So far as I could see, the prospects did not look very bright for individual miners, although, if properly tested and found to carry sufficient gold, it might offer attractions as a dredging proposition, but not for hydraulicking, chiefly because there are not any good dumpage facilities.

So far, bed-rock has only been exposed for a short distance at one point, about three-quarters of a mile above the mouth, where it was 4 feet deep, but at several other points where attempts had been made to reach bed-rock these had failed. Where the bed-rock was exposed it is perfectly smooth, with the trend or line of strike the same as the course of the creek; consequently there was no chance for the gold to accumulate, as there would be if the course of the creek crosscut the bed-rock, when it would act as riffles and hold gold.

ADAMS LAKE.

On August 5th I left Goudreau's road-house and rode towards Adams lake, following a good wagon-road that branches off from the main North Thompson road at a point about half a mile north from the mouth of Louis creek. For a mile or so, a pretty stiff climb has to be made on

to the divide between Louis creek and Dixon creek; the latter, a tributary of the Barriere river, flows towards the north-west through a fertile plateau that has been successfully farmed for several years.

From this divide I rode along the wagon-road, with a favourable grade descending towards Louis Creek valley and near the confluence of that creek with Spring creek. This last-named creek flows out from Forest lake, situated about three miles easterly from Blucher Hall post-office at the forks of the wagon-road. The right-hand fork follows up Louis creek to the eastward a short distance, then southward to Hefferly lake; thence to the westward down Edwards creek, to the main North Thompson wagon-road near the mouth of Edwards creek, fourteen miles from Kamloops. The left-hand fork follows up Spring creek through a canyon, locally named Raven's avenue after the earliest settler in the Adams Lake valley, to Forest lake (elevation 2,250 feet), and the head of Pass or Ska-am creek (named Sinmax creek on the Shuswap Sheet of the Geological Survey of Canada); thence down the creek to Ska-am or Agate bay, on the west side of Adams lake, about twelve miles up from the south-east end of that lake.

At a point three miles and a half west from Ska-am bay on a small stream locally known as Falls creek, tributary to Pass creek, is located the old *Homestake* silver-mine, which is referred to in Dr. Dawson's report for 1894 as having been examined during that year by Mr. McEvoy, of the Dominion Geological Survey.

Homestake Group.

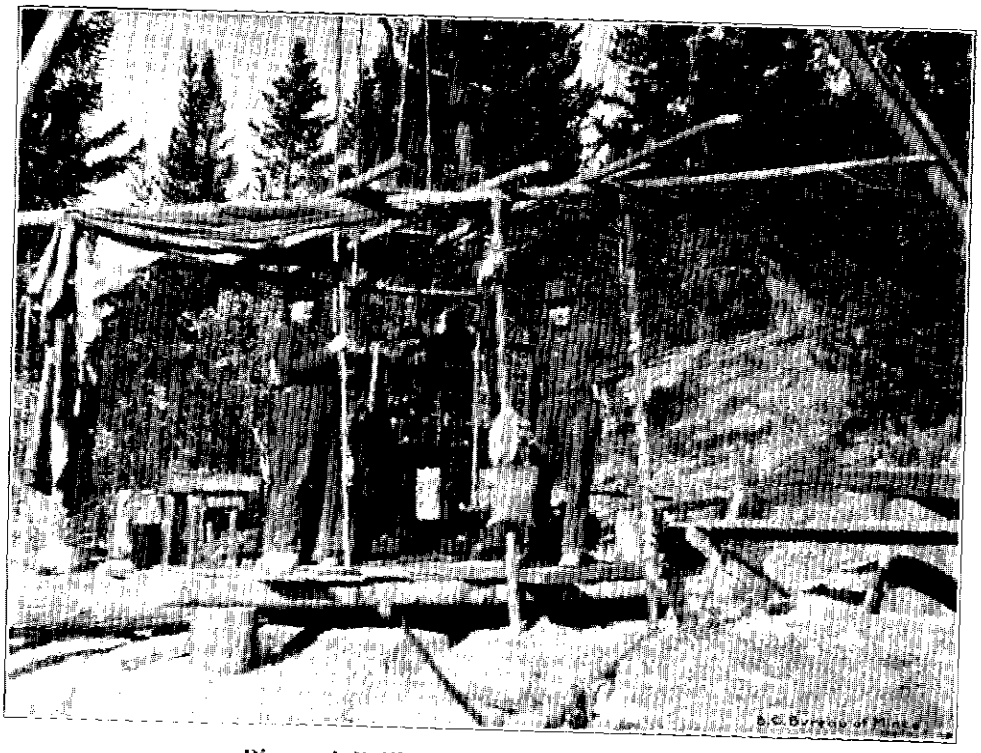
Here I found the country-rock to be schist, classified by Mr. McEvoy as talcose-schist. Similar schists comprise the rock formation towards the north-west and extend to Louis creek. The mine-workings are located on the bank of Falls creek, about 1,500 or 1,600 feet above Adams lake, and are reached by a good trail from the wagon-road.

The group comprises the following named full-sized mineral claims: *Homestake*, *Troublesome*, *Argentum*, and *Maple Leaf*, which are Crown-granted; also the following named fractional claims: *Lytton*, *Eureka*, and *Baryta*, also Crown-granted; these are owned by a syndicate composed of Richard Marpole and Harry Abbott, of Vancouver; F. J. Fulton and Wentworth Wood, of Kamloops; and Peter Olson, of Seattle, Wash.

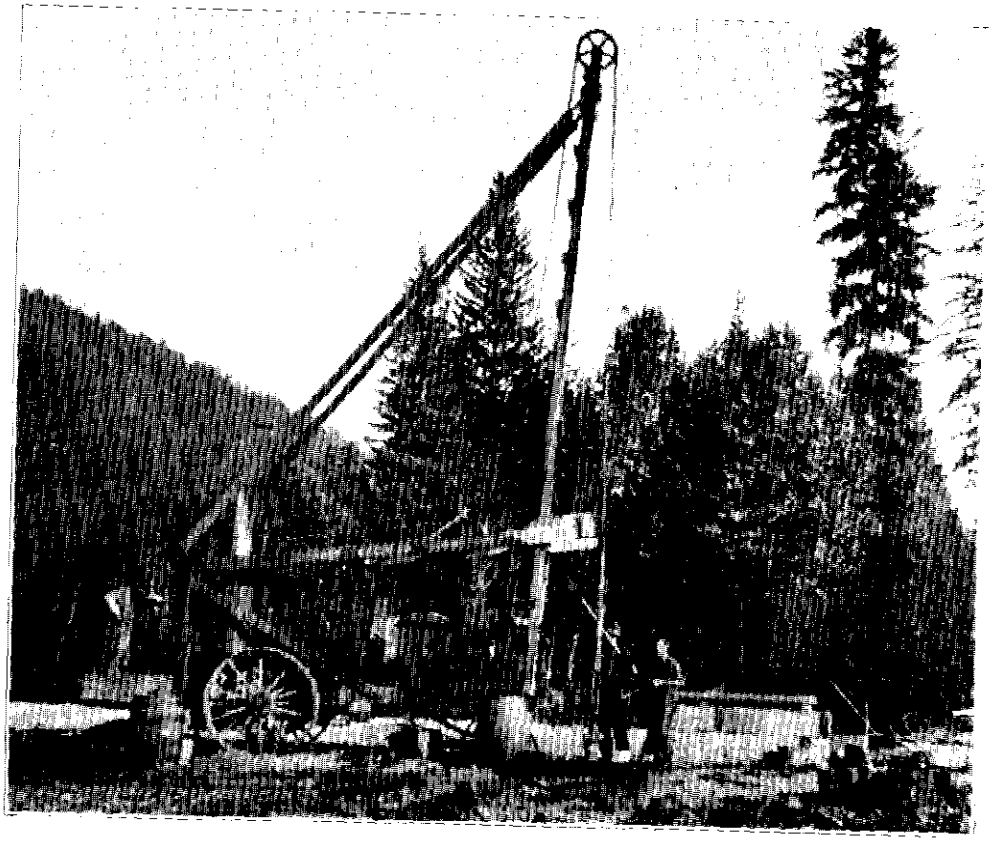
The summit of the main mountain-range is about 2,000 feet above Adams lake, but there is a series of subsidiary ridges made up of schists, very much weathered; this is cut through by some narrow, rather deep waterfalls having their source in a swamp on the extreme summit; consequently this subsidiary ridge appears as several pinnacles, and amongst these are prominent outcroppings of barite as well as several quartz veins. One of these barite outcroppings is a bluff about 30 feet wide; another towards the south-east, but several hundred feet distant, shows a width of about 11 feet. This latter outcropping was selected for development, and all of the work so far done has been confined to that part of the property which is on the *Baryta Fraction* claim.

The old workings, which I found in fairly good condition for examination, consist of an adit driven as a crosscut for about 190 feet, then as a drift along the ore-body for a distance of 40 feet, on the north side of Falls creek, about 1,000 feet above the valley. At a point 181 feet in from the portal a body of barite and schist was exposed, and after crosscutting 12 feet of this the direction of the adit was changed, and the mineralized body was drifted on for about 40 feet along the strike N. 60° E.; the dip of the body is at an angle of 30 degrees towards the north.

From this drift an upraise was made to the surface on the incline of the dip of the mineralized body; this upraise exposed a thickness of about 5 feet of barite, and the quantity



Diamond Drill on *Copper Mt.*—*B.C.C. Co.*



Placer Prospecting with *Keystone Drill*—near Coalmont.

on the dump, where there are about 500 tons of barite carrying values in gold and silver, would apparently account for the continuity of at least that thickness of ore through the upraise.

No attention has apparently been paid to some quartz veins which outcrop and have their lines of strike north-west and dip 30 degrees towards the north-east, conformably with the trend and dip of the mica-schist country-rock.

I took a sample typical of the ore on the dump, but not intended to represent an average; this assayed: Gold, $1.20; silver, 7 oz.; copper, trace. Mr. Wood claims an average value for this dump of: Gold, $1.60; silver, 15.95 oz. a ton, obtained from sampling each car of ore as it was taken from the upraise.

The transportation facilities are today very poor, and are prohibitory regarding the shipment of medium grade ore, because, even with the completion of the Canadian Northern Pacific Railway along the North Thompson river, there would be a wagon-haul of eighteen or twenty miles from the mine to the railway, and shipment by way of Adams lake would mean so many transfers and handling as to offer little, if any advantage over the wagon-haul, especially when the ore could not be hauled in bulk, as on wagons, but would require sacking if shipped by the lake route.

Judging from the surface exposures and underground work, as far as it has gone, it would appear as though the bodies of barite carrying values were quite extensive, and that possibly some of the quartz veins might be mined at a profit, and certainly, if the transportation question could be solved, the property is well worth further systematic prospecting and development.

Mr. Wood claims to have obtained values from some of the quartz, but that these were found to be irregular and pockety. I could see no evidence that any systematic prospecting or sampling had ever been done on any of the occurrences of quartz, and as he was not with me to show me where he took samples, I did not take any, as such might have been misleading unless systematic sampling was done, which was impossible at the time.

Falls creek flows down the mountain-side in a series of steep falls, one at least being 300 feet vertical; this creek would furnish sufficient water-power, if properly developed, to operate all necessary mining machinery.

The supply of good timber for mining purposes within the boundaries of some of the claims of the group is plentiful, and some of it would make good saw-logs, but that proportion would not be very considerable.

Fortuna Group. This group of mineral claims is situated about twelve miles to the westward from the *Homestake* group, and in the mountain immediately north from Blucher Hall post-office. The mine-workings can be seen from the wagon-road about 200 feet above it. The group comprises the *Fortuna Nos. 1, 2, 3,* and *Fortuna Fraction,* owned by the Fraser River Copper Mining Company, which worked the property in 1907 and 1908 under the superintendence of William J. Smith, of Wild Horse, Alberta.

The locations were staked on a well-defined, wide gossan outcrop above the summit of a foot-hill of the main range, about 500 feet above the wagon-road, with its line of strike north-west, occurring in mica-schist country-rock. Two adits were run to crosscut this presumed underlying ore-body, one 40 feet long about 100 feet below the outcropping, and the other about 450 feet long at about 200 feet lower elevation.

I was shown over the property by Hedley V. Harding, a ranchman living near by, who had worked there during the period of active operations. In the upper adit no mineralized body was exposed, and the adit would need to be driven about 100 feet farther before it could

be expected to crosscut the material under the gossan, but in the lower adit three bodies of pyrrhotite were exposed, one at the portal, 2 feet wide; a second 90 feet in from the portal, 3 feet wide; and the third about 390 feet in, 16 feet wide; beyond this the adit has been driven about 40 feet into the country-rock. These bodies had parallel lines of strike towards the north-west, and parallel dips at an angle of 50 degrees towards the north-east.

I took a sample across the 16-foot body, but this only assayed a trace in gold, silver, and copper, I also took a sample across the 3-foot body, which also assayed only traces.

No drifting whatever had been done on either of these several bodies of pyrrhotite, and evidently the operators became discouraged at the lack of values and abandoned the work.

I returned to Goudreau's road-house at Louis creek on the evening of October 6th, and on the morning of the 7th left to continue my ride up the North Thompson river.

Louis Creek up North Thompson River to Mile 88, Canadian Northern Pacific Railway.

From Louis creek I followed the wagon-road to the forks, when I continued along the main river road, the right-hand fork leading to Adams lake. For about two miles I travelled along a road cut in a high clay bank, then I descended a rather steep incline to the flats which form the valley near the mouth of Barriere river, a tributary of the North Thompson; these are covered with a light growth of pine and birch. Here I found the Barriere townsite had been located and at which the Canadian Northern Pacific Railway had built a long switch, while the buildings on it consisted of a sawmill, store, and some cabins.

Beyond these flats I crossed the Barriere river on a good substantial bridge. It is from this river the town of Kamloops proposes to obtain water-power to operate the city's electric light and power plant, from which the *Iron Mask* mine is to receive power to run all of the machinery connecting with the mining and concentrating plants. At present the Kamloops plant is being operated by steam-power, but I was informed the water-power would be developed in the very near future.

The river is a bold, wide stream having considerable fall and sufficient volume to furnish extensive horse-power when properly developed. The transmission-line from the river to Kamloops will be about forty miles long.

On the first bench above the river-bed I passed the large well-cultivated ranch owned by C. A. Borthwick, and beyond that some smaller ones that had evidently been recently settled on, as men were in the course of erecting farm-houses and other buildings.

Beyond these I found the valley on the east side of the North Thompson much narrower; it is covered with a fair growth of timber, also with considerable slide-rock and large boulders from the nearby mountains. Judging from these, the rock formation is a greenstone, some of it quite schistose.

About eleven miles from Louis creek the wagon-road enters an Indian reservation, locally known as the "Chu Chua." This extends for eight miles along the east side of the North Thompson river, and averages nearly half a mile wide that entire distance. This is one of the choicest portions of the entire North Thompson valley, and several of the Indians are farming successfully, raising some cattle, horses, poultry, and crops, including wheat, oats, hay, and vegetables, but a larger portion of the land is in pasture. In the valley proper the growth of timber is confined to willow copses, but the benches and mountains are well timbered with pine and some cedar. This reservation is officially designated as "North Thompson Indian Reserve No. 1," of the North Thompson and Canoe Lake tribe, and comprises 3,220 acres, distant forty-five miles from Kamloops.

I arrived at Chu Chua post-office on the large ranch owned by George Fennell, who settled here eight years ago and owns about 2,100 acres of land, much of which is under cultivation; he runs a hotel and store and employs sometimes as many as from twenty to thirty men on the farm and in clearing land, the saw-logs from which he manufactures into lumber at his own sawmill—run by water-power with an undershot water-wheel—the sawmill being situated about four miles from Chu Chua on a tributary of Joseph creek. Mr. Fennell has erected a school-house on his land, the furniture and equipment for which were furnished by the Provincial Government—also, of course, the teacher. This settlement is about twenty miles distant by wagon-road from Louis creek.

During the afternoon of October 17th Mr. Fennell accompanied me to Coal creek, which flows from the east across the reservation by the main rancherie, to examine the occurrence of coal which outcrops about half a mile east from the rancherie.

CHU CHUA COAL, NORTH THOMPSON RIVER.

This occurrence of coal is mentioned by Dr. Dawson in his annual report of the Geological Survey of Canada for 1892-93, and he gives a section at the same place where I made my examination. This he gives as follows:—

Coal	6 inches.
Sandstone	2 feet (variable).
Coal	9 inches.
Sandstone	6 "
Coal	18 "

The following are the analyses of samples of this coal, the first and second columns being samples taken at that time by Mr. McEvoy, of the Geological Survey of Canada, and the third column of a sample taken by myself. All of these samples were taken from the 18-inch seam.

	McEVOY'S SAMPLES.		BREWER'S SAMPLE.
	Fast Coking.	Slow Coking.	Fast Coking.
	Per Cent.	Per Cent.	Per Cent.
Hydroscopic water	2.22	2.22	3.2
Volatile combustible matter	38.10	32.05	32.8
Fixed carbon	46.76	52.81	48.5
Ash	12.92	12.92	15.5
	100.00	100.00	100.00
Coke	59.68	65.73	Fair.

The line of strike of the coal-measures is N. 35° W., or nearly parallel with the course of the North Thompson river at this point. The dip at the place I took my sample was at an angle of 20 degrees towards the north-east.

Several years ago an incline shaft was sunk on the 18-inch seam, when several tons of coal were mined and burned on a stern-wheel steamer that plied the river at that time; but this incline has been allowed to cave considerably, so that I was only able to examine it for a few feet deep.

The incline was sunk in the bank of the stream locally named Coal creek, the Indian name for which is Newkykwotstoni creek. The local name of Chu Chua has been given to a larger creek that flows from the eastward and crosses the reservation about a mile to the northward from Coal creek. There is an abbreviation of the Indian name for this creek, which is Chukchukwald.

Foghorn Group.

Mr. Fennell informed me that he, with associates, owned the *Foghorn* group of mineral claims, situated on Whistler mountain, about twenty miles distant in a north-eastward direction, at an elevation of about 4,000 feet above the North Thompson valley. On this property an adit was being driven to cross-cut the formation, with the expectation of intersecting four quartz veins carrying galena ore that outcropped on the surface, but that up to date the adit, which is 180 feet long, had not been driven sufficiently far. I agreed to visit this, but as Mr. Fennell could not persuade any one to accompany me because of the snow known to be along the trail, and told me I would not be able to find the place without a guide, I did not attempt to make the trip. Even if I had I could not have examined the surface because of snow, and, as no ore was yet exposed in the adit, my trip would have been wasted.

On October 8th I left Chu Chua and continued my ride northward. A short distance beyond Fennell's store the course of the road changes towards the north-east, because the high mountains on the east side of the river are close in, with sheer precipitous sides, and the route selected for the wagon-road is through a pass over a high divide, on which there is a series of small lakes surrounded by meadow lands on which several farmers have settled, and near by is situated Fennell's sawmill. From there the road bears to the westward, then northward, along the west shore of Dunn lake, a fine body of water, apparently very deep, about four miles long and about a mile wide. The mountains on both sides are close to the lake, and the wagon-road has been blasted out about 60 feet above the lake. The rock formation is composed of diorites and greenstones; in these are several sheared zones where the rocks have schistose structure; these have a general north-west strike.

At the outlet of the lake, the stream, crossed by a good bridge, is wide, and runs swiftly towards Joseph creek, or Boulder as it is locally named, a tributary of the North Thompson, which is spanned by a substantial bridge about a mile distant. The flat or valley between the creeks is very rocky and well timbered.

At the crossing of Joseph creek I noticed that the sandstone formation and coal-measures outcrop on the east side; these show the same line of strike and approximately the same dip as at Coal creek on the Indian reservation, indicating the possibility of continuity of the coal-measures. On the west side of the creek are diorites and greenstones. Joseph or Boulder creek flows from the north-east to the bridge, where it changes its course, and from there flows west to the North Thompson, emptying into that river about four miles above Chu Chua.

The road follows along the north-west side of the creek for about a mile and a half on a steady up-grade to the summit, a high plateau, about 1,500 feet above the North Thompson valley, where there is a series of small lakes from which flows the West fork of Joseph creek. On this plateau several homesteaders have settled and were clearing off land for cultivation.

I descended from the west side of this plateau to the North Thompson river at the 65-Mile road-house on the railway and on Mosquito flat, on which the growth of cedar timber is very fine; the trees being tall, straight, and of good dimensions, have found a ready market for telegraph-poles along the line of railway.

This flat extends for about six miles or nearly to the 71-Mile House, and is of considerable width most of that distance. The opposite side of the river is heavily timbered, especially near the mouth of the Clearwater river, which empties into the North Thompson from that side, near the 71-Mile House.

The rocks, so far as I could observe in crossing a few spurs of the mountains that encroached on the river in places, were diorites, greenstones, and schists. At the 71-Mile House, a short distance above the mouth of the Clearwater, there is a first-class ferry across the North Thompson.

During this day's ride I passed many homesteads that had apparently been recently entered by settlers, and was informed that many more were settling along the Clearwater, some being thirty to forty miles up that river.

The Provincial Government is building a wagon-road to the southward on the west side of the North Thompson, also a bridge across the Clearwater to enable settlers to travel along that side of the North Thompson down to Mount Olie, the present end of the west side wagon-road from Kamloops. The distance from the mouth of the Clearwater river south to Mount Olie is about twenty miles. At the time I made my trip there were ferry crossings on the North Thompson at Nelson's ranch, ten miles south from Chu Chua; at Little Ford or Mount Olie, five miles north from Chu Chua by the river or railroad, but nearly ten by a rough, mountainous wagon-road; at Mile 71 on the railway and at Mile 86. All of these are subsidized by the Provincial Government, and are free between the hours of 7 a.m. and 7 p.m. of each day except Sunday; for crossing during the night or on Sunday the ferryman is entitled to collect reasonable compensation from passengers.

On October 9th I crossed the North Thompson at the 71-Mile House, which is really eighty-one miles by wagon-road from Kamloops, and rode up to the headquarters of Twohy Brothers at Mile 86, where the townsite of Vavenby has been laid out on the ranch formerly owned by Archie McCovrie, a pioneer who travelled up the North Thompson as early as 1871.

The river makes almost a right-angle bend at the mouth of the Clearwater, flowing directly from the east to the west instead of from north to south, as in the case below that point, while the Clearwater flows from north to south. About twelve miles above this bend the course of the North Thompson is again from north to south.

The railway-grade continues along the south bank of the river above the bend, but the wagon-road is along the north bank. No discoveries of any mineral have been reported between the 65-Mile road-house and Mile 86 along the North Thompson, but trappers have brought in rumours of the occurrence of silver-lead and other ores up the Clearwater about sixty miles above the mouth.

One recent arrival from there whom I met at the 71-Mile House informed me that, although some discoveries were reported, it would not be possible for me to make surface examinations, as I could not reach that section before the snowfall.

The first two miles, after reaching the top of the river-bank on a high plateau from the ferry crossing, the wagon-road is along a ridge some 700 or 800 feet above the level of the river, through a pine forest, where I found several homesteaders had recently settled and were clearing land. Beyond this I descended on to the first bench, where there are large hay meadows under cultivation.

Between Miles 5 and 6 from the ferry the Raft river is crossed on a good bridge where the valley, also the first bench, have considerable extent, both of which are well timbered. For about four miles from near Mile 7, calculating from the 71-Mile ferry, the river-valley is very narrow on the north side, but appears to be wide and well timbered on the opposite side.

The rock formation is not exposed along the wagon-road until Mile 10 from the 71-Mile ferry is reached, where the road-bed has been blasted out across a rocky point made up of slates of variegated colours, and these continue towards the east at least as far as Mile 86 on the railway.

Galena creek is crossed near Mile 11 from the 71-Mile ferry. It is claimed that some placer gold has been taken from the bed of this creek, which would appear to be possible considering the rock formation, but no diggings of commercial value have ever been found.

The Canadian Northern Pacific Railway grade crosses the North Thompson about a mile east from the mouth of Galena creek, and close to a big bend in the river where it has resumed its normal course from north to south. Here the railway company has built a temporary bridge about 900 feet long and had a big gang of men working on the substructure for a permanent steel bridge. The construction-trains were crossing the bridge and running to Mile 88, or six miles north from the bridge, while rails were being laid beyond, as grading was practically finished to Mile 109, and it was reported that, by early spring, the road would be finished to Mile 150.

Both the railroad and wagon-road traverse the valley on the west side of the river for about five miles north from the bridge. A very noticeable feature are the high gravel-beds, some at least 100 feet, which form the west bank of the river. These are being cut through by steam-shovels, and the gravel hauled away on long trains to be used as ballast along the unfinished portions of the railway road-bed.

Back from the valley is a mountain-range, some peaks of which reach an elevation of over 5,000 feet above sea-level; the foot-hills of this range above the first bench from the river have steep slopes on the east side barren of timber, but covered with a thick mantle of bunch-grass up to an elevation of about 1,600 feet above the valley; above that, and on the summit, is a fair growth of timber.

Bonnie Jean and Dreadnought Groups.

On October 10th I examined these groups of mineral claims, and found that on the east slope of the mountain, at an elevation of about from 800 to 1,500 feet above the river, there are rock-exposures in some deep gulches or canyons formed by watercourses from the summit. Quartz veins carrying gold values are exposed in the walls of these, and this discovery, made by a prospector named N. C. Morrison, had led to the staking of about twenty mineral claims, most of which were recorded during the present year and have as yet no work done on them. As the *Bonnie Jean* and *Dreadnought* groups, owned by Mr. Morrison and associates, have been prospected fairly systematically and to much greater extent than any others, these were all I visited.

The *Bonnie Jean* group comprises the *Bonnie Jean*, *Lizzie M.*, and *Hercules* mineral claims situated on the extreme summit of the mountain and staked from south-east to north-west.

The *Dreadnought* group comprises the *Olympia*, *Dreadnought*, and *Chieftain* mineral claims, situated along the slope of the mountain and staked from north to south, nearly paralleling the course of the river. There are several openings on the *Olympia* and *Dreadnought* claims, the most work done in one place being in a gulch on the *Olympia* about 800 feet above river-valley and overlooking the townsite of Yavenby.

An adit has been driven 117 feet, 102 feet of which is a drift a portion of the distance along a quartz vein having its line of strike N. 15° E., the remaining 15 feet being a crosscut from the portal across the vein under where it outcrops. The conditions in the drift near the crosscuts show that an intrusive dyke of volcanic rock has cut off the ore-body, but driving was continued in the hope of exposing the ore again beyond the dyke, which had not been realized at the time I visited the workings.

The line of strike in the crosscut is N. 15° E. and angle of dip nearly vertical. On the *Dreadnought* claim there are apparently two veins or leads of quartz, one having its line of strike N. 10° E., the other N. 30° W. There are five openings on this claim, four of which are on the first-named lead, the other on the last named.

The lowest or No. 1 opening, at an elevation of about 1,100 feet above the river, is an open-cut for about 30 feet to remove the surface and expose the rock; beyond this 6 feet has been driven under cover. In this is exposed a body of quartz 3 feet wide, with the hanging-wall

eroded away and foot-wall composed of schist, but so silicified as to be not too well defined and not showing any very clear line of demarcation. The line of strike is N. 30° W. and angle of dip 60 degrees towards the south-east.

The other openings are on the lead, which has its line of strike N. 10° E. These are all apparently on the same lead and are open-cuts through the surface to the rock, beyond which a short distance has been driven under cover into quartz, some of it carrying galena. No walls have yet been exposed in any of the openings, as the one on the east side, apparently the hanging-wall, has been carried away by erosion, and the adits have not been driven far enough to fully crosscut the lead and expose the boundary-wall on the west side. On the surface, stripping shows the width of quartz is 60 feet in one place.

Mr. Morrison informed me he had shipped 3,400 lb. of selected quartz to the Tacoma smelter from No. 2 open-cut, from which he obtained returns of $38.87 a ton in all values.

It was not practicable in the time at my disposal to systematically sample the openings, so I did not attempt to do so; but I did take one grab sample from the No. 3 opening, which, when assayed, yielded only a trace in gold. Compared with the values Mr. Morrison reported, this, of course, shows that the values must be very variable, but such variations are often found in quartz of this character.

On the *Bonnie Jean* group a well-defined gossan outcropping in schist country-rock extends along the summit of the mountain at an elevation of about 2,000 feet above the river.

Apparently the same ore-body is crosscut by a deep canyon at an elevation about 900 feet lower altitude than the outcroppings. An open-cut has been made in each wall of the canyon, exposing a vein of quartz heavily impregnated with iron-pyrites and some particles of galena. This vein is 3 feet wide and has well-defined walls. The line of strike is north-west and dip nearly vertical. A grab sample, not to be considered an average, assayed: Gold, $5.20; silver, 4.2 oz. a ton.

This section of country has every appearance of being well worth prospecting, but, up to date, there has been no work except that done by Mr. Morrison, and which demonstrates the occurrence of ore-bodies carrying values, with indications that such ore-bodies will be found to be persistent and of sufficient extent to pay to work on a commercial scale.

I met only one other prospector besides Mr. Morrison, and this was W. K. White, who staked the *B.C.* claim on Galena creek, about five miles by the wagon-road west from the *Dreadnought* and *Bonnie Jean* groups.

B.C. Claim.

About a quarter of a mile north from the wagon-road, and about 200 feet above it, there is an occurrence of several lenses of quartz carrying some galena, and iron-pyrites in slate country-rock. These have the same line of strike and dip as the slate at this particular point, the strike being north and dip 20 degrees east. Some open-cut work has been done and an adit started, but, while this under most conditions should not be considered sufficient to be conclusive, yet, in my judgment, in this particular case I should not consider that further work was advisable at this point, because the quartz lenses are merely fillers of narrow short gashes interfoliated between the bedding-planes of the slate; and, further, because at this point but very little depth can be gained except by sinking, which is hardly justifiable, since the quartz that I sampled assayed only a trace of gold, and I selected the sample because, with the other conditions I have described, high values were necessary to justify further work.

About 100 feet nearer the wagon-road, and also on the north side, there is an outcropping of brown iron mineral resembling limonite which has been stripped over an area of 30 x 15 feet. This I did not sample, because there was no indication of continuity beyond the stripped area,

and consequently, when looked at from the standpoint of an iron-ore proposition, this would have no value unless very much greater extent was shown, and even then it would be a sinking proposition, with mining costs so high as to make operations prohibitive.

On the afternoon of October 10th I started back down the North Thompson river, as I was unable to gain any reliable information relative to the discovery of any mineral deposits farther north, except some mica near Tete Jaune Cache, about 150 miles from where I was. Considering the lateness of the season and the fact that snow had been falling in the high levels for a week almost continuously, I did not deem it advisable to prolong my trip in that direction. As the bridge across the Clearwater was not finished, I had to cross at the 71-Mile ferry and ride down the east side of the river, and cross either at the Mount Olie ferry, at the mouth of Nekaliston creek, to reach the west side of the river, or at Nelson's ferry, nine miles below Fennell's store and hotel at Chu Chua. I selected the latter, as I desired to cross the river in order to examine some old Crown-granted mining property on Jamieson creek, a tributary of the North Thompson emptying into that river eighteen miles north from the town of Kamloops.

On October 12th, after crossing the river at Nelson's ranch, I found an excellent wagon-road that was built some years ago for the accommodation of several ranchers who had settled in the country before any railroad was thought of along the North Thompson. South from Nelson's ranch a short distance, the eastern slope of Skull hill, which reaches an elevation of 4,500 feet above sea-level, is so close to the river that the wagon-road had to be built over a pass on the divide between Peterson and Fish Trap (or Skull) creeks at an elevation of about 2,500 feet above the level of the river.

The rock formation is volcanic, with basalts on the eastern slope of Skull hill, but, after crossing the pass, granites in which hornblende crystals are very prominent is the prevailing rock, while diorites and greenstones are of frequent occurrence.

The benches near the North Thompson are reached a short distance from the mouth of Fish Trap creek, and from there the wagon-road parallels the river, but is built along the first bench back from it, and does not descend into the valley proper until near Alex. McLean's ranch, twenty miles north from the town of Kamloops.

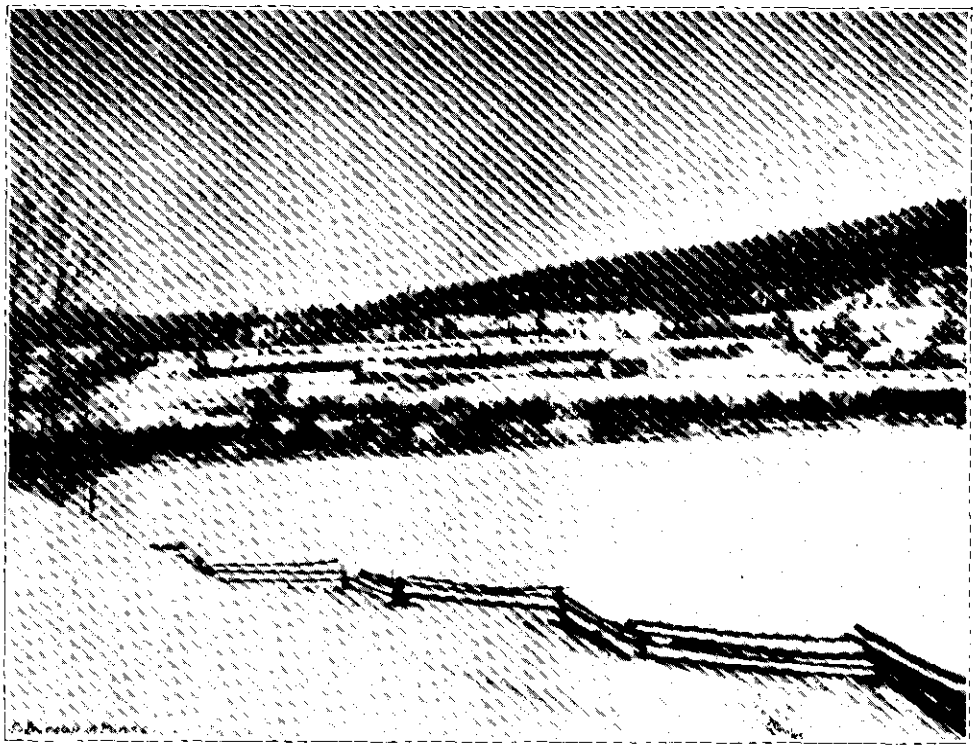
McLean's Limestone-quarry.

On a portion of Alex. McLean's ranch there is an immense bed of limestone, and several years ago this furnished much of the lime used for building purposes in Kamloops. The kiln in which Mr. McLean used to burn the limestone is still in fair condition, and with good transportation facilities it would appear that a profitable business could be opened up.

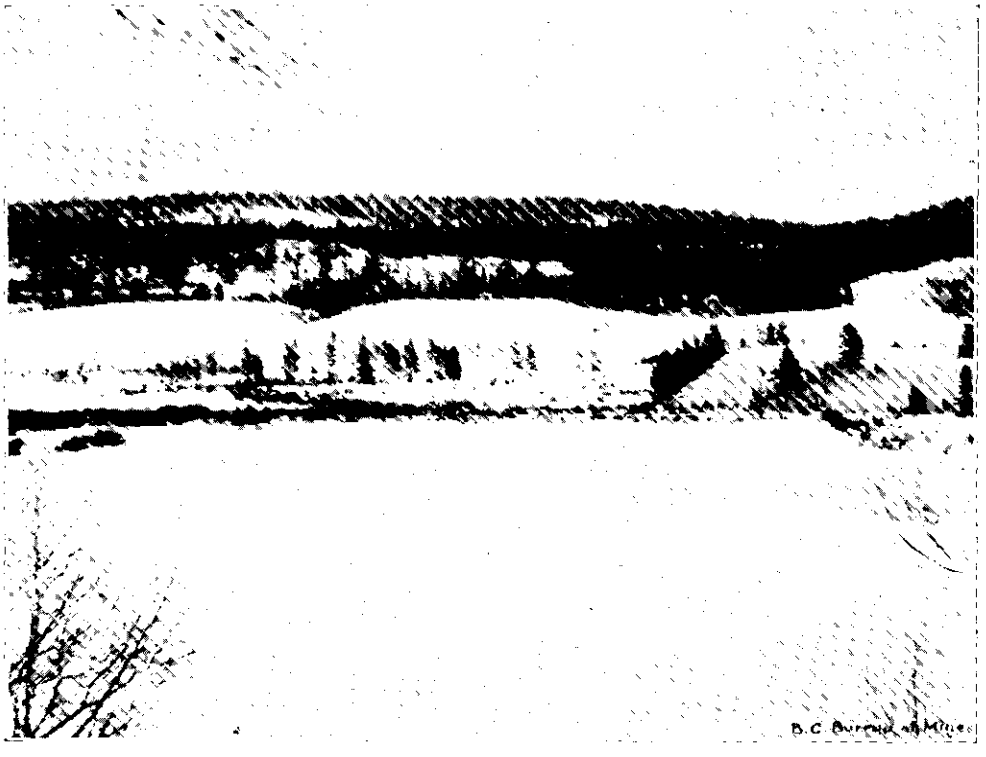
This limestone can be quarried at the lowest possible cost, because the height of the bluff is such that a face 100 feet high and more than 100 feet long can be obtained with little difficulty, the rock transported to a kiln on the bank of the North Thompson at a nominal cost, and the lime shipped either by water down the river or by the Canadian Northern Pacific Railway down the opposite side of the river by using an aerial tramway for conveying the barrels across.

Jamieson Creek Quartz.

Three miles and a half south from McLean's ranch Jamieson creek empties into the North Thompson, and on October 13th I met Thomas Bullman, of Kamloops, who owns interests in the *Homestake* group of claims. Accompanied by that gentleman, I examined the group, which is situated on the north side of Jamieson creek, about two miles towards the west by trail from the wagon-road, and at an elevation of about 1,000 feet above the level of the valley.



Aspen Grove Post-office, February, 1914.



Looking across Aspen Grove Valley.

The rock formation at the lower elevations ascending from the creek-bottom are hardened argillites, slightly micaceous, but at higher altitude the mountain is made up of granite very much decomposed and traversed by a number of quartz veins. Similar rock formation and structure is found on the south side of the creek, where the granite runs out in dykes among the schistose argillites.

Some years ago several mineral claims were staked on either side of the creek which have been Crown-granted, but on which no work has been done recently. The most prominent of the properties are the *Homestake* and *Molly Gibson* on the north side of the creek and the *Polestar* on the south side.

The *Homestake* claim is owned by Mrs. Kate Manson and Thos. Bullman and Oliver Redpath, of Kamloops. The *Molly Gibson* claim adjoins the *Homestake* on the south and is owned by Andrew Noble, of Kamloops, while the *Polestar* claim is owned by J. A. Mara and J. Ogden Graham, of Victoria, and Andrew Noble, of Kamloops.

On the *Homestake* claim, and continuing with apparent persistence through a portion at least of the *Molly Gibson* claim, are several veins of quartz carrying iron-pyrites with a little galena, blende, and tetrahedrite.

These veins have been prospected by several open-cuts, shafts, and an adit 150 feet long; the latter had been driven so near the top of a ridge on which the quartz outcroppings occur as to be of little value, because it hardly exposes rock in place, being in surface gravel for most of its length. In all the other openings quartz veins were exposed, but the work done was not sufficient to enable me to determine any essential facts with regard to conditions at a depth more than a few feet, as the shafts where the greatest depth was reached were full of water.

As nearly as I could judge, there are five distinct veins crossing the summit of a ridge, at an elevation of about 1,000 feet above the valley. One of these outcrops is 20 feet wide, and can be traced for about 300 feet across the ridge; the others are from $2\frac{1}{2}$ to 6 feet wide.

In order to really form a thoroughly reliable estimate of the value of these mineral claims, considerable time and the expenditure of quite a little money would be necessary for a systematic sampling.

There is no question about the quartz carrying some value, as Dr. Dawson, in his report for 1894, gives the result of an assay of a sample taken from the *Homestake* as: Gold, $22; silver, 32.2 oz. to the ton. Two "grab samples" taken by myself, but not to be considered as representing an average, yielded: No. 1—Gold, $2.80; silver, 3.5 oz. to the ton. No. 2—Gold, $0.80; silver, *nil.*

From other assay certificates submitted to me by Mr. Bullman, I found he had returns running from $3.20 to $92.40 in gold, and from 4.5 to 62 oz. in silver to the ton.

Assay returns from eleven samples taken at various times on the *Polestar* mineral claim, on the south side of Jamieson creek, where a quartz vein 8 feet wide occurs, shows that ore from it yielded: From gold $1 and silver 1 oz. to the ton to gold $139 and silver 18.20 oz. a ton.

On this claim an incline shaft has been sunk, said to be 50 feet in depth, but it was full of water and consequently could not be examined. The impression conveyed from an examination of these occurrences of auriferous quartz veins is that sufficient evidence of value is apparent to encourage a systematic scheme of development being adopted, and thereby determine the necessary material facts.

From October 14th to 17th I visited the *Kamloops-Goldfields*, *Kimberley*, and *Mother Lode* claims near Kamloops, which are described earlier in the report. I also made a trip to Lac Du Bois, about fifteen miles by wagon-road north-westerly from Kamloops, to see some claims staked by W. G. Arnald.

LAC DU BOIS.

I found that Mr. Arnald had been doing quite a good deal of work on a wide outcrop of iron-stained igneous rock that resembled diorite, but with the hornblende in very well-defined and distinct crystals. From this he claimed to have obtained values in silver, but a sample I took, typical of the character of the rock, when assayed showed only a trace in gold and silver

At another place, on the bank of a small creek, he had made quite a large open-cut in decomposed yellow material resembling clay, with nodules of a dark-coloured mineral substance mixed with it, which he said assayed well in lead and silver, but a sample taken by myself assayed only traces in gold and silver.

Mr. Arnald has staked a large number of claims and is most industrious in doing assessment-work, so that it is to be regretted he has had no better results for his hard work.

ASHCROFT MINING DIVISION.

REPORT H. P. CHRISTIE, MINING RECORDER.

I have the honour to submit the annual mining report and office statistics for the Ashcroft Division during the year 1913.

The mining situation remains practically unchanged from last year; assessment-work is being kept up on all the principal claims and some other work has been done, but no ore was shipped.

The prospects have been favourably reported on by experts, and the work done generally has given satisfactory results.

OFFICE STATISTICS—ASHCROFT MINING DIVISION.

Free miners' certificates	94
Locations recorded	95
Certificates of work issued	61
Bills of sale recorded	15

YALE MINING DIVISION.

REPORT OF L. A. DODD, MINING RECORDER.

I have the honour to submit herewith the annual report and statistics for the year ending December 31st, 1913.

PLACER-MINING.

A large expenditure was again made by the Siwash Creek Mines, Limited, on their group of leases on Siwash creek. The work, which consisted of continuing the sluices at a depth through the tunnel and up the creek for the purpose of reaching the bed-rock, has been carried on without interruption, except such as occurred from the various runs of high water. The position is now such that rises in the creek will not, in future, cause delay in the work.

The formation was not, however, as expected from the surface indications, and it has been found that the bed of the ancient channel is only to be reached by carrying the sluices far up the stream and farther to the south. The old channel has been located by shafts and borings; these borings have been found to indicate satisfactory deposits, and it is now only a matter of time when the sluices will have to be carried up into the bed of the original channel in order to reach the pay-streak.

It is the purpose of the company to continue this work during the ensuing year; A. C. Stewart, who has a large experience in placer-mining in the Yukon and Alaska, is in charge.

DREDGING.

The combination shovel and dipper dredge built for gold-dredging purposes is now lying just below Hope on the Fraser. It is the intention to test it out on a hydraulic lease granted to A. E. Hanford, of Seattle, and the results are being eagerly looked forward to by parties interested in dredging generally, as it is of a type hitherto untried on the Fraser.

QUARTZ-MINING.

Assessment-work generally has been done, but beyond the work done on the *Aufeas* group, near Hope, very little else has been accomplished, although about the usual number of locations have been made.

The Mount Baker and the Yale Mining Company's group of Crown-granted claims on the North fork of Siwash creek has been optioned by an English syndicate. I am informed that it is the intention to rebuild the small mill and run some 1,500 tons through as a test. It is considered that, if as little as $4 a ton is recovered, the future of the property is very bright, as development-work shows a sufficient supply of ore now in sight for working on a large scale.

On Hidden creek there seems to be a continuation of the Siwash creek formation; only assessment-work has been done. A good trail was built by the holders of a number of the locations and supplies may now be taken in by pack-horses from Spuzzum.

On Spuzzum creek J. A. Jamieson and associates performed the assessment-work on their claims, which are said to carry molybdenum and some gold.

On the *Murphy* group, situated on the Provincial wagon-road about a mile east of Hope Station, quite a lot of work was done in the way of uncovering the ledges and crosscutting the same at intervals.

The construction of the Kettle Valley Railway has caused some activity in the Coquihalla valley and on Ladner creek, and a number of locations have been made.

At the *Aufeas* group, on Wardle creek, a tributary of Silver creek, work began in February and has been continuous, except for a few weeks' shut-down in September. A tunnel has been driven 385 feet; several small veins were cut before the main ledge was reached. On the latter drifts have been run north and south, a total distance, at the end of December, of about 175 feet; from the southern drift an upraise has been begun. All the workings are in ore, and the tunnel gives a depth of approximately 450 feet from outcroppings on the surface. A temporary cable has been put up from the tunnel-mouth to the camp, whence the ore will be hauled to the Canadian Northern tracks at Silver creek, a distance of about a mile and a half, a mile of which is level graded road (Hope-Princeton Highway). There is about 250 tons of ore ready for shipment. The plans for 1914, the execution of which will begin in April, include a permanent aerial tram from the mine to the Highway.

23-MILE CAMP.

On the *Diamond* group F. Fritz worked in the spring and early summer and did about 60 feet of open-cutting, uncovering a ledge varying from 35 to 80 feet, containing chalcopyrite.

On the *Lucky Boy* group C. O. Collins worked, from spring till mid-autumn, making about 12 feet of open-cut, besides a lot of open-cutting. There is exposed a 14-inch vein of mispickel, samples of which assayed well in gold.

On the *Silver Daisy* group W. Robinson worked till late in the autumn, and has a wide vein stripped carrying galena, with values in silver.

The cost of transportation is still an obstacle to the camp's progress; conditions will be improved when the Hope-Princeton Highway reaches the Klesilkwa summit.

OFFICE STATISTICS—YALE MINING DIVISION.

Free miners' certificates issued	162
Special free miners' certificates issued	1
Locations recorded	122
Certificates of work	99
Leases granted	1
Bills of sale, powers of attorney, options, etc., recorded	62
Filings	13

Revenue.

Free miners' certificates	$ 954 25
Mining receipts, general	2,356 55
Other sources	1,558 00
	$4,868 80

NICOLA MINING DIVISION.

REPORT OF W. N. ROLFE, MINING RECORDER.

I have the honour to submit herewith the annual report and statistics of the Nicola Mining Division for the year ending December 31st, 1913.

Conditions with regard to the metalliferous mines situated in the Aspen Grove camp remain unchanged so far as active work is concerned, but a number of locations have recently been made, in view of the possibilities of a bond being taken on the majority of the claims in this section by one of the large copper-smelting companies operating in the Province, while assessment-work has been well kept up through the year.

Considerable interest is being taken in a group of iron claims situated about two miles south-east from Nicola, on which is shown a body, of unknown extent, of hæmatite ore suitable for the manufacture of Bessemer steel, but further work on the property is necessary to determine approximately the amount of ore available.

With regard to the coal-mines situated in and around Merritt, the development-work done by the Nicola Valley Coal and Coke Company, Limited, has been confined to the opening-up of two new mines on the east side of the property, known as seams Nos. 7 and 8.

The Inland Coal and Coke Company, Limited, continued to make steady progress, and notable additions have been made to the plant and equipment during the year, so that, when market conditions warrant, the property will be in a position to make an output of 1,000 tons of coal a day.

OFFICE STATISTICS—NICOLA MINING DIVISION.

Locations recorded	64
Free miners' certificates issued	78
" " (special)	1
Certificates of work	103
Certificates of improvements	..
Bills of sale	16

NICOLA MINING DIVISION.

NOTES BY J. D. GALLOWAY, ASSISTANT MINERALOGIST.

The Nicola valley has long been famous as a stock-raising country, but of late years it has also been coming to the front as a producer of a considerable tonnage of coal. The town of Merritt is the centre of the coal-mining district, in which, at present, four companies are operating—the Nicola Valley Coal and Coke Company, the Inland Coal and Coke Company, the Pacific Coast Collieries, and the Diamond Vale Collieries, Limited. The last company owns a considerable area of likely coal land, but is not working continuously.

The Nicola Valley Coal and Coke Company is maintaining a steady output of slightly over 300 tons a day, mining during the past year 113,605 tons of coal, most of which is bought by the Canadian Pacific Railway for the locomotives. Mining in this property is handicapped and made more expensive by numerous faults and flexures, but at the present time a considerable reserve of coal has been developed. During the year two new openings were commenced on seams near the top of Coal gulley; No. 7 slope having been sunk 500 feet and developed in such shape as to give an output-capacity of nearly 200 tons a day from a 16-foot seam of excellent coal. No. 8 has a 6-foot 6-inch seam which looks well, but is not as yet developed to any extent. This company is in a position to ship a much larger tonnage of coal than is at present being done, but lack of market and high freight rates—conditions which will be materially altered in the near future—prevent a sale of its maximum capacity.

The Inland Coal and Coke Company increased its output very considerably during the year, and is now taking the leading place in the district as a shipper, the daily output exceeding 350 tons a day, over 114,000 tons (2,240 lb.) having been mined this present year. The most important development-work during the year was the driving of a new slope, No. 5.

The Pacific Coast Collieries Company carried out development-work throughout the year, shipping some 500 tons of coal; while the Diamond Vale Collieries operated for a short period during the early part of the year producing over 6,000 tons of coal.

The mineral showings in the vicinity of Merritt and Nicola have not received much attention lately. One claim, a mile below Merritt and owned by Robt. Henderson, shipped a car-load of copper ore which carried fair values in copper and gold. It is understood that engineers of both the Granby and British Columbia Copper Company have examined this property with a view to bonding it, but, as far as is known, no deal has yet been made.

The mineral camp at Aspen Grove, twenty miles south of Nicola, is in this Division, but during the past year only a small amount of annual assessment-work was carried out there. The writer did not visit this camp on his first trip through the district, but later on, in February, a week was spent, under the adverse conditions of 3 feet of snow, etc., examining the more important claims.

ASPEN GROVE MINERAL CAMP.

Aspen Grove sprang into prominence about 1900, and for a few years afterward was prospected spasmodically by the original locators. A little outside capital was interested in the camp at the start, some of the claims being bonded and others acquired by stock companies; but it may be said that the camp has never yet been thoroughly tested by actual work done by any company with sufficient capital.

W. Fleet Robertson, Provincial Mineralogist, reported on this district in 1902, and in 1910 Chas. Camsell, of the Dominion Geological Survey made a brief examination of the Aspen Grove district. R. A. Johnson, also of the Survey, examined the camp in 1904, his observations being reported in the Survey Report of that year.

Location.

Aspen Grove camp is situated in the Nicola Mining Division, about eighteen miles south of Merritt and thirty-six miles north of Tulameen. The camp occupies a mineralized zone eight miles long by two miles wide, lying on a low divide between the Nicola and Tulameen valleys, the elevation varying from 3,000 to 3,500 feet. The camp lies along the east side of the valley in low rolling hills and consists of about sixty Crown-granted mineral claims and 100 other claims held by annual assessment. The whole district is rolling country, properly described as mountain pasture land, much of which is covered with bunch-grass. The higher benches are timbered with bull and jack pine, while down in the valleys willows, poplar, etc., are plentiful. The country is ideally situated for mining, with enough timber for mining purposes, and transportation is secured by good wagon-roads. The winters are not very severe, a snowfall of about 3 feet being the average, which lies on the ground from three to four months.

Geology.

The main formation in this district is a series of highly altered volanic rocks, with which are interbedded some bands of crystalline limestone, the whole being referred to Dawson's Nicola series and Camsell's Tulameen series. In the mineral zone these older rocks are usually covered by more recent volcanic rocks consisting of basalt, breccias, amygdaloids, and andesite, which probably are analogous to Dawson's Oligocene Volcanic series. The copper minerals apparently are associated with the the later lavas, in which they occur in fracture-planes in the breccias and in the amygdaloids. A small amount of copper is disseminated irregularly throughout the rock, but it is only along certain favourable lines that sufficient concentration has taken place to give hope of commercial ore. In several instances, notably on the *Big Sioux* and the *Golden Soverign*, small masses of native copper have been found, together with high-grade chacocite ore. The genesis of the copper ore would appear to be linked up in some way with the later lava-flows, but sufficient examination was not made to arrive at any definite conclusions. The copper occurs mainly as chalcocite, together with a little native copper and occasionally chalcopyrite, and bornite. The latter lava-flows have a distinct and very permanent north-and-south strike and dip to the west at rather flat angles.

Golden Soverign Group.

This group of claims is owned by J. E. Bate, Mrs. J. E. Bate, S. J. Bate, and R. J. Armstrong. On the *Soverign* a crushed or brecciated vein 2 feet wide, striking north and south and dipping westerly, is exposed by a long open-cut; in places this carries some high-grade chalcocite and native copper. From the end of this cut a vertical shaft was sunk 88 feet, but the dip of the vein soon carried it outside the shaft. It is claimed that a crosscut from the 30-foot level encountered the vein at a distance of 7 feet from the shaft, and that it contains some good ore; but as the shaft was full of water this could not be examined. It had been intended to crosscut from the bottom of the shaft to get the vein, but work was stopped before this was accomplished.

It was also claimed that the whole of the country-rock for a distance of 100 feet westerly from the vein carried appreciable copper values, but this could not be verified. Several open-cuts at different places show a little copper-stain. A sample across 4 feet in one of these cuts gave only a trace of copper.

A sample taken across 10 feet on the *Yankee*, one of the *Golden Soverign* group, returned 0.25 per cent. copper.

Big Sioux.

This group is owned by H. Schmidt, who carries on a little development-work every year. It is developed by a shaft 32 feet deep, a crosscut tunnel 150 feet long, and numerous open-cuts. From the shaft about 50 tons of ore is on the dump. A rough sample taken from this dump, which represents

selected ore from the workings, assayed 11.5 per cent. copper and 0.5 oz. silver. The crosscut tunnel has not yet disclosed any ore. In one open-cut a sample was taken across 20 feet which assayed 1.5 per cent. copper and 0.1 oz. silver.

The ore on the dump extracted from the shaft, looks very favourable, but it is not known how much ore occurs in the bottom of the shaft. The property would seem to warrant further development-work.

Hit or Miss. The only showing seen on this property was a shaft 10 feet deep, in which the rock shows traces of copper. A sample across 6 feet gave 0.6 per cent. copper.

Copper Standard Group. This group is owned by Eastwood and partners. On the *Copper Standard* claim an open-cut has been made into a bluff, and from the end of this a shaft put down 50 feet, with a crosscut from the bottom 56 feet to the west. Twenty-five to thirty tons of the best ore has been saved from these workings; a sample taken from this gave 1.0 per cent. copper and 0.4 oz. silver.

Copper Jack. The *Copper Jack* and the adjoining *Hattie*, are owned by the Bank of Montreal and are Crown-granted. Two open-cuts were seen on this property which show evidences of copper, from one of which a sample across 6 feet returned 0.3 per cent. copper. Another sample was taken from the *Noble Five*, an adjoining claim, across 3 feet which gave 2.4 per cent. copper.

Cincinnati Group. This group is owned by J. E. Bate and partners and is Crown-granted; it is developed by several open-cuts and shafts therefrom 10 to 15 feet deep. A sample from one open-cut across 6 feet assayed 1.5 per cent. copper. A sample from a second exposure across 5 feet assayed 2.3 per cent. copper. A crosscut tunnel has been driven 400 feet to cut some of the ore-bodies. At the start this tunnel passes through a mineralized layer 6 to 8 feet wide, dipping very flatly to the west; from this point on, the tunnel had not encountered any ore. A sample across 8 feet of the ore at the portal of the tunnel assayed 1.1 per cent. copper.

Bank of England. This claim has an open-cut from the end of which a shaft is down 25 feet. A sample was taken across 6 feet, as far down the shaft as was possible, which assayed 1.7 per cent. copper.

Medal Fraction. This claim has several open-cuts, also showing evidences of copper. A sample was taken from the best-looking one across 10 feet, which assayed 0.5 per cent. copper.

Portland Mining Company. This company acquired, some years ago, a group of claims from Mr. Bate, and for a time carried on development-work. A vertical shaft was sunk 115 feet, and from the bottom a drift was run 106 feet in a north-westerly direction. Very little ore is in evidence in the surface cuts, but from the shaft about 100 tons of picked ore has been saved. A sample was taken of this which may or may not represent an average, which assayed 0.4 per cent. copper. The stock of the company is nearly all held by a few people in Indiana; they have not done any work for some years and claim to be waiting for assurances of transportation. A small steam-hoist is on the property, but was never used, as it was placed there after the shaft was sunk.

Tom Cat Group. There are five claims in this group, owned by Wm. Murray; considerable open-cutting and stripping has been done, which has exposed a good deal of copper-bearing rock. A sample taken across 7 feet in one cut assayed 2.4 per cent. copper; another one across 10 feet assayed 1.6 per cent. copper; and a picked sample of high-grade ore gave 3.9 per cent. copper. The showings on this claim look well and warrant further development-work.

Summary and Conclusions.

On this trip fourteen claims or groups of claims, were examined, including all those which are considered locally to be of most importance.

At the outset a few rich stringers of chalcocite and native copper attracted attention, but it is now apparent that these are too irregular to be of economic importance. Small quantities of copper minerals are disseminated throughout the country-rock adjacent to and between the rich stringers, and it is in the possibility of finding a large tonnage of this low-grade copper ore, with possible further concentrations, that the future of the camp lies.

Only five of the samples taken gave copper values above 2 per cent., and of these three were known to be taken from selected ore. Such preliminary prospecting as has been done indicates the possibility of large zones of low-grade copper ore—that is, ore running from 1 to 2 per cent. copper. The gold and silver values throughout are quite low, probably never in excess of $1 a ton, and usually much lower.

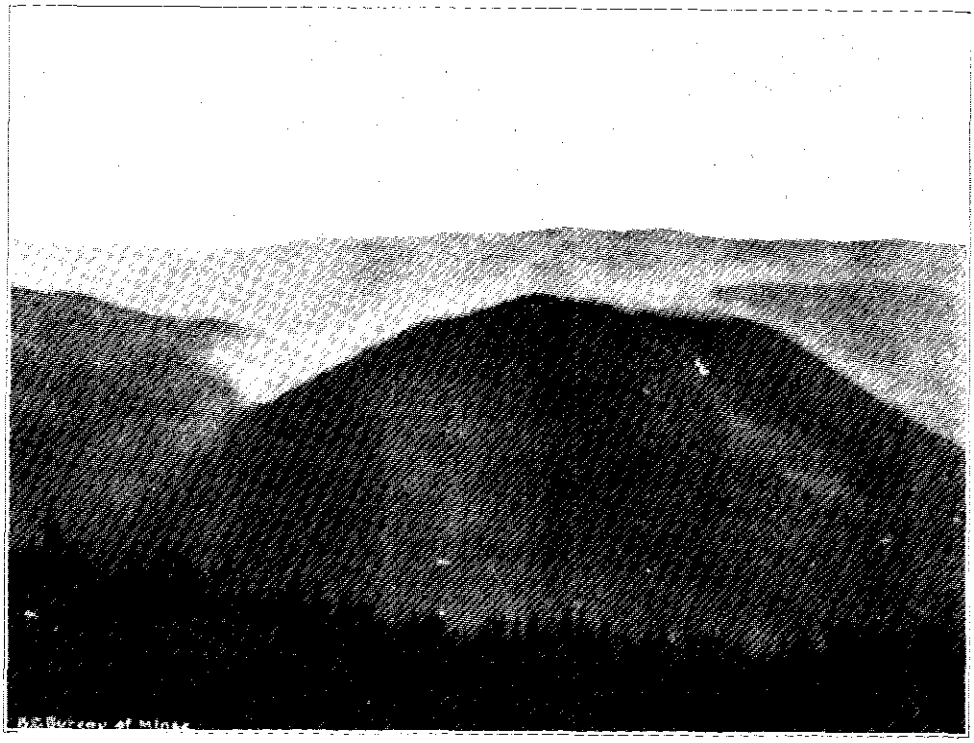
The camp has certain quite favourable surface indications, but as yet the development-work has not been sufficient to disclose the extent or values of the ore-bodies, nor to prove definitely that these are of commercial value. It has been claimed that lack of railway transportation has handicapped the camp and retarded development, but the writer does not consider this need have been the case; development-work in the shape of diamond-drilling and surface prospecting could have been carried on without difficulty with the transportation facilities at present afforded by the numerous good wagon-roads. In this connection it might be noted that Copper mountain, which is twelve miles from the railway at Princeton, has been extensively prospected by the British Columbia Copper Company, and a large tonnage of ore shown up by diamond-drilling and surface work.

Another feature that deserves mention is that, assuming large bodies of low-grade copper ore were later proven to exist (and it is safe to assert that when any considerable tonnage shall be developed it will be quite low-grade), then the treatment of this ore will be a serious problem. As most of the ore is highly siliceous, smelting would be expensive on account of the necessity of large quantities of fluxes; and, as the copper occurs mainly as chalcocite, it might prove very difficult to save by water concentration. It would seem that the ore from this camp would have to be treated locally, as very little of it would be high grade enough to ship direct to smelters at a distance.

Engineers representing different companies have examined the camp at different times, and while they all admit that the surface showings are favourable, none of the companies has yet taken hold. One company considered a bond on a large number of claims, but was unable to come to terms with the owners, who demanded a cash payment before work was commenced. It would seem that the only chance for the development of the camp would be for the owners to offer a very liberal bond, with ample time allowed for development-work before any payment had to be made.

The camp has progressed very little since it was reported on in 1901 by Mr. Robertson, and to-day is in about the same position as it was then.

The writer can do no better than quote his opinion at that time, which is as correct now as it was then: "It seems probable that, in this great extent of copper-bearing rocks, *concentrations will eventually be discovered which will permit of profitable mining.* At present these remain to be found, but it would seem as though this was one of the most promising fields in the Province for prospecting."



Treasure Mt. Summit Camp—Similkameen M.D.

Treasure Mt. Mining Co.—Lower Crossent Tunnel.

GYPSUM-DEPOSIT AT MERRITT.

On the hills on the west side of the Nicola valley opposite the town of Merritt a gypsum-deposit has been known for some time. A number of claims are staked on it and some development-work has been done on them, but none during the past year. In 1911 a small quantity was mined and shipped to cement plants in the prairie provinces.

The gypsum occurs as a superficial surface deposit of soft earthy material, in places very pure and again contaminated with calcite, sand, etc., spread over the hill in irregular patches. It generally is thickest on little knolls and hog-backs, where it sometimes attains a thickness of 10 feet. The deposit is not continuous over the whole hillside, but is very irregular in its distribution.

The origin of the gypsum is doubtful, but it was probably precipitated from hot springs following the period of Tertiary volcanism. At one time the deposit was probably extensive, but erosion has taken away all but a few patches.

The development-work consists of numerous holes and cuts scattered over the hillside; the gypsum quite often is exposed at the surface, but in some places is covered over with from 2 to 4 feet of wash. The present development would not appear to be extensive enough to warrant putting up a calcining plant to prepare plaster of Paris, but a market, however, for it in the raw state may be obtainable as a fertilizer and at different cement plants; the operation of the cement plant at Princeton may afford a market for some of it.

SIMILKAMEEN MINING DIVISION.

NOTES BY J. D. GALLOWAY, ASSISTANT MINERALOGIST.

In the following report it has been assumed that most of the country traversed is sufficiently well known to make it unnecessary to write up all minor details, as would be the case in reporting for the first time on a new district. An exception to this is the section of country on the upper waters of the Tulameen river, including Summit camp, which has not yet been reported on in the Annual Mines Reports.

Throughout this trip all ore samples taken were as near an average of the particular section sampled as possible, unless where it is specially stated that they were picked high-grade ore. Of course one or two samples taken from any property, while giving an idea of the values at those points, may or may not represent the average grade of the whole ore-body. In a trip of this nature it is impossible to sample any property as thoroughly as would be necessary for valuing it for sale or purchase. It follows, therefore, that the following assays should be accepted with the reservation that at least some of them may not be truly representative.

It is a pleasure to the writer to record his appreciation of the unfailing courtesy, kindness, and assistance extended by all whom he came in contact with who were in any way connected with mining in the districts visited.

TULAMEEN DISTRICT.

The Tulameen district lies in the south-western portion of the Province, forming a part of the Similkameen Mining Division. The Tulameen river, from which the district takes its name, is a short rapid stream rising in the Hope range, and, flowing north-easterly, joins the Similkameen river at Princeton. In the "eighties" this section produced a considerable amount

of placer gold and platinum, the high tide of production being reached in 1886, when the sum of $193,000 was taken out, principally from Granite creek, the largest tributary of the Tulameen. Since that time placer operations have gradually decreased, until now the annual output is practically *nil*. Several attempts at large-scale hydraulic mining have been attempted, but, so far, without material success; the present placer-workings will be described later on.

Prospecting for lode gold and platinum in-place commenced in 1898, and later attention was turned to various copper and copper-gold showings on Boulder, Bear, Champion, and Kelly creeks. The silver-lead showings in Summit camp first attracted attention about 1900.

Coal-croppings at Collins gulch and on the North fork of Granite creek had been known for years, but only lately have they been systematically developed.

The district has not progressed as rapidly as was at first anticipated, but a steady growth from now on seems assured. Most of the ore-deposits are comparatively low grade, necessitating adequate transportation facilities. The advent of the Kettle Valley and the Vancouver, Victoria and Eastern railways, which are now rapidly pushing construction-work, will materially aid in developing the district. The Vancouver, Victoria and Eastern Railway is now running trains into Coalmont twice a week; the Kettle Valley road as at first surveyed did not go into Princeton, nor the Tulameen district proper, but the route is not definitely settled, and it seems possible that it may be so changed as to do so.

Dr. G. M. Dawson made a hurried trip through part of this country in 1888 and recorded a few notes on the economic geology of the placer deposts.* Professor F. J. Kemp spent three months in 1900 investigating the geology of the platinum-bearing placers and rocks, his observations being published as a special bulletin of the United States Geological Survey.

Wm. Fleet Robertson, Provincial Mineralogist, visited the Tulameen in 1901, his notes being recorded in the Minister of Mines' Report for that year. In 1909 and part of 1910 Charles Camsell, of the Geological Survey of Canada, made a detailed study of the areal and economic geology of a part of this area. His report, with accompanying maps, has just been issued.†

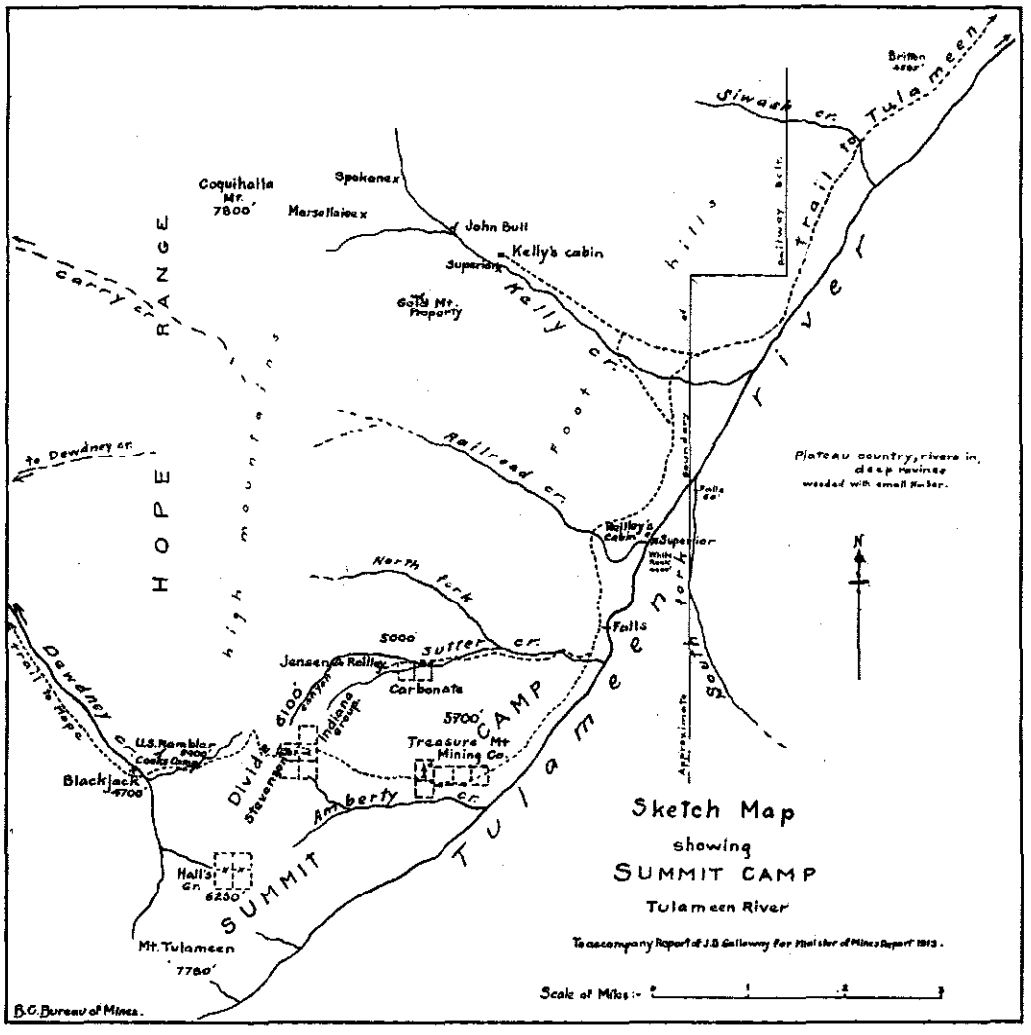
As has been before pointed out, the principal objective point in this district was the Summit Camp properties, firstly, because they had not yet been reported on, and, secondly, because some very favourable reports had already caused a slight boom. Having finished with Summit camp, certain other claims were looked at on the return trip down the river. Two important camps, Law's and Independence, were not visited on this trip, because they are fully described in Mr. Camsell's report, and since his examination in 1911, in which the writer assisted, no appreciable amount of work has been done. For the same reason showings on Olivine mountain and Champion creek were also omitted from the itinerary.

SUMMIT CAMP.

Location.

Summit camp is situated on the divide between the headwaters of the Tulameen river and of Dewdney creek, which flows into the Coquihalla river, which in turn empties into the Fraser river at Hope. The camp is about twenty-five miles from Tulameen village and about the same distance from Hope, and is connected with both places by pack-trails; at the present time, however, the Hope trail is absolutely blocked by windfalls and wash-outs. Prospecting on the Hope side of the summit would be greatly stimulated if this trail was cleaned out and fixed up for pack-horses. A wagon-road has been commenced and is now completed for five miles above Tulameen village.

* Geological Survey of Canada, Annual Report, 1887-88, Vol. 3.
† Geological Survey of Canada, Memoir No. 26.



Topography.

The vicinity of Summit camp shows the characteristic rugged topography of the Hope range, but north-easterly from there, or down the river, the country slopes away into typical interior plateau country. A view from a high point in Summit camp looking towards Princeton (easterly) shows an undulating rolling country of rounded and flat-topped hills, which give little idea of the many deep valleys which dissect the country. The sides of these valleys are precipitous and heavily wooded, being in places an almost impossible tangle of underbrush. Looking southerly and westerly from Summit camp, there stretches a sea of mountains, the Hope range, with sharp pinnacles, here and there, which are generally points above the line of glaciation.

Mount Tulameen at the head of Amberty creek has an elevation of 7,600 feet, but the claims, which are staked on spurs and foot-hills running out from the higher peaks, are at elevations from 3,500 to 6,000 feet. Glaciation is evidenced to a height of from 6,000 to 6,500 feet, but only a few sharp peaks project above this elevation; the timber-line is at about 6,500 feet.

The winter is long, with a snowfall of from 5 to 15 feet, but a fairly good summer season of about five months can be counted on. Snow-storms may and do occur any time in the year; snowslides might cause trouble at some of the properties, but this danger is slight.

An extensive bush fire, about twenty-five years ago, burned off the greater part of the timber, but on the Sutter Creek slope, considerable mining timber is still available.

Falls on the main Tulameen and also on the North fork would supply electric power, whenever needed.

Geology.

Charles Camsell, G.S.C., made a reconnaissance survey of the district in 1910 and has provisionally classified the rocks.* A series of slates, quartzites, argillites, and dolomitic limestones, which are referred to the Carboniferous period on account of lithological similarity to rocks of that age at Hedley, is the oldest formation and has a considerable development in the district. The general strike of these rocks is N. 20° W. and they dip at high angles. A series of sandstones, shales, and conglomerates, probably of Cretaceous age, rests unconformably on the Carboniferous rocks. Both these formations are intruded by sheets and dykes of a porphyritic rock, the composition of which has not yet been determined. The Cretaceous rocks are bordered by granitic and syenitic dykes and bodies of quartz-porphyry and diorite towards their eastern boundary.

A number of fissure-veins, probably formed subsequent to and genetically connected with the porphyritic intrusions, strike across the other formations in a general north-east and south-west direction. The dip is, as a rule, to the north-west at angles varying from 60 to 85 degrees. These fissures are more correctly fracture-planes along which extensive replacement has taken place, but in places the banded structure of quartz and associated minerals shows that the fissures were open and that true fissure-filling took place. Well-defined walls are usually in evidence, and the gangue rock between is mainly siliceous material. Here and there are found "pay shoots" or bunches of solid, or nearly solid, galena and sphalerite, carrying high silver values. The altered, partially replaced gangue rock, which, together with more or less quartz, forms the gangue material of the veins, carries small quantities of galena, sphalerite, and iron-pyrites. It is claimed that in places this material carries sufficient value to be regarded as "concentrating ore," but this seems doubtful. Up to date, only very small lenses of high-grade ore have been discovered, but further development may reveal larger bodies.

The veins are well defined and can often be traced some distance on the surface. In the limestones and slates of the Carboniferous formation the veins are most clearly defined and can often be traced for several hundred feet on the surface.

Indiana Group. This property, controlled by A. Phillips, of Spokane, is situated on the eastern side of the divide between Amberty and Dewdney creeks. The vein consists of three parallel stringers, from an inch to 6 inches in width and about 20 feet apart, lying between walls of quartzite and argillites. The material between the stringers is unaltered country-rock and can hardly be called vein-matter, although it is considered so locally. The central, or main, stringer is developed by an adit tunnel 250 feet long, with two short crosscuts from it; the first crosscut is 21 feet long, from the end of which a drift is run on the northerly stringer for a distance of 30 feet. The second crosscut, 16 feet long, is 10 feet from the end, but has not struck any ore. The vein in the main tunnel is quite small; at the face it is about 3 inches wide. A sample taken for a distance of 10 feet along the vein from the face back, assayed: Gold, 0.08 oz.; silver, 23.8 oz.; lead, 3.6 per cent

* Geological Survey of Canada, Summary Report, 1910.

Judging from the ore-dump, only about 5 or 6 tons of ore has been taken out of these workings, but it is claimed that considerable ore, taken out when the tunnel was being driven by contract, was thrown over the waste dump. A sample, which must be considered a picked high-grade sample, of this dump assayed: Gold, 0.03 oz.; silver, 21.2 oz.; lead, 19.6 per cent.

Stevenson Group. This group, consisting of the *Summit No. 1* and other claims, is owned by Colonel Robert Stevenson, of Princeton. The claims are located up the hill from the *Indiana* property and very nearly on the divide, at an elevation of about 5,100 to 5,800 feet. Most of the work has been done on the *Summit No. 1* and consists of open-cuts and shallow shafts. The main vein is supposed to be an extension of one or more of the leads on the *Indiana*. On this a large open-cut has been made, showing a well-defined vein, 6 to 8 feet between walls, running along a contact between porphyry and quartzite. From the open-cut a hole is sunk about 8 feet, a total distance of about 20 feet from the surface; this hole was full of water at the time of examination, but a miner who had worked there stated that in the bottom there was 9 inches of solid galena and several small stringers of ore. The sides of the open-cut show 8 to 10 inches of good-looking ore; a sample across 10 inches at this point assayed: Gold, 0.03 oz.; silver, 14.8 oz.; lead, 5.8 per cent.

Another open-cut, farther up the hill, shows a vein 4 to 5 feet wide, through which are disseminated a few stringers of ore from $\frac{1}{2}$ to 1 inch in width. A sample across 5 feet returned: Gold, 0.02 oz.; and silver, 5.2 oz. to the ton.

Hall's Property. This claim, owned by Messrs. Hall, Fraser, and others, is situated on the divide (6,000 feet) between Amberty and Dewdney creeks, on a long spur running out from Goat mountain (Mount Tulameen). The formation at this point is heavily bedded quartzites, some of the beds carrying considerable iron-pyrites; oxidation of this iron has resulted in red rusty bands of rock which are locally called "iron-caps."

The "vein" on this property is one of these rusty quartzite bands carrying a considerable percentage of iron-pyrites very completely oxidized. Several open-cuts on the Dewdney Creek side expose this vein, but none of them are deep enough to get below the zone of surface oxidation. An average sample across 4 feet assayed: Gold, 0.02 oz.; silver, 0.7 oz. to the ton. A surface cut on the Amberty Creek side shows a gouge seam between two beds of quartzite. Some iron and a few specks of zinc-blende occur in this seam, which is about 9 inches wide.

THE HOPE SIDE OF THE SUMMIT.

It was learned that George Cook and Ernest Rice were working on the Hope side, so a trip was made to their camp to see their showings. They were camped at the head of Dewdney creek, at what is known as Shannon flats; this place was conspicuous for having fairly good feed for the horses, which is decidedly scarce everywhere else.

U.S. Rambler. This property, which was staked two years ago by Ernest Rice, is situated above Dewdney creek at an elevation of 5,400 feet. The vein is a mineralized seam from 2 to 4 feet wide, striking N. 10° E. (mag.) and paralleling the strike of the altered sedimentary rocks in which it occurs. The vein-filling is, for the most part, altered country-rock carrying a little iron-pyrites and, in places, traces of galena and zinc-blende. It is developed by several open-cuts and a tunnel driven 50 feet on the vein. A sample taken near the face of the tunnel across 2.5 feet assayed: Gold, trace; silver, 0.5 oz.

Blackjack Group. These claims are owned by George Cook, Ernest Rice, and others. The main showing on the *Blackjack* is in an open-cut 20 feet from the bed of Dewdney creek, exposing a mineralized seam paralleling the strike of the sedimentary rocks in which it occurs. Small amounts of iron-pyrites and traces of galena and zinc-blende occur in the seam, which is from 10 to 12 inches wide, and consists of crushed and altered wall-rock. A sample taken across 12 inches only returned traces of gold and silver.

George Cook is working on a small showing of ore at the lower end of the claim, down the creek; at this place a black coarse-grained dyke running up and down the creek cuts the quartzite nearly at right angles. On both walls of this dyke, which is about 20 feet wide, some mineralization has taken place. Traces of zinc and galena occur, but so far the showing is of very slight value.

Ranger Basin.

A number of claims have been staked in what is known as Ranger basin, two or three miles from Cook's camp. From a description by Ernest Rice the showings are very similar to those just described, with practically no work done on them. It was not considered that the camp was sufficiently developed to warrant taking time to see it.

Treasure Mountain Mining Company's Property.

Two years ago this property, consisting of the *Silver Chief*, *Black Bear*, *Silver Cup*, and *Annex No. 1*, was acquired from the original owners, Jensen & Wade, by a Spokane company headed by A. Dornberg. The Spokane people incorporated a stock company, with a capitalization of $1,000,000, giving Jensen & Wade a block of stock in payment for the property, and guaranteed to spend a certain amount of money in development-work. The claims are situated on Treasure mountain, an oval elongated foot-hill lying between Amberty and Sutter creeks, and a short distance above the Tulameen-to-Hope pack-trail.

Two parallel leads, striking approximately N. 40° E. (mag.) and cutting quartzites, argillites, and limestones, had, by means of open-cuts, been exposed for some distance on the surface by the original locators. One of these veins is apparently in contact with a sheet of porphyry in one place, but this feature seems incidental, and does not necessarily indicate a contact vein. The two leads are shown up for several hundred feet on the surface by means of these open-cuts. The vein-matter is weathered to a considerable degree and stained red, black, and intermediate colours from the oxidation of the original iron-pyrites. This material is considered locally to be "lead-carbonates," but such is not the case, as assays of it return only traces of lead.

On taking over the property the company commenced sinking on the upper vein, but were driven out, at a depth of 65 feet, by a heavy flow of water. A crosscut tunnel was then started, which struck the lower lead (or possibly a third parallel one) at a point 63 feet from the portal; the crosscut was continued 30 feet farther without striking other veins. The vein which had been crosscut was then drifted on for a distance of 134 feet; this seems to be a strong persistent vein varying from a few inches to 4 feet in width, and in places carries a pay-shoot of sphalerite and galena. The upper vein is about the same size, but does not appear to carry as much high-grade ore.

At the end of the drift in the crosscut tunnel there is a 12-inch pay-streak of nearly solid sphalerite, and 3 feet of vein-matter as well; this pay-streak does not seem to favour either wall, but as a rule is midway between. Fifty feet from the commencement of the drift a small pocket of solid galena occurs, while here and there smaller amounts of ore are in evidence. The appearance of the heavy sulphide ore would indicate that the points of deposition were open places in the fissures.

The management then decided to run a lower tunnel to crosscut the vein at greater depth. At a point 955 feet (on the slope) lower down the hill, and directly below the upper tunnel, this crosscut was started. It was estimated that a horizontal distance of 600 feet would give a depth of about 450 feet on the vein. Until this time Mr. Dornberg had been in charge of the operations, but shortly after the commencement of this work J. C. Edwardes took over the superintendency. At the time of visiting the property the lower crosscut tunnel was in 500 feet and five men working steadily.

Values.

Description of Sample.	Au.	Ag.	Pb.	Zn.
	Oz.	Oz.	%	%
Pay-streak (12 inches), face of upper tunnel	0.02	6 8	Trace	42.9
Vein-matter (3 feet), face of upper tunnel	0.40	Trace	*Nil*	
Open-cut on upper lead	Trace	0.5	*Nil*	
Pay-streak (10 inches), 113 feet from mouth of upper tunnel	0.02	70.4	41.4	27.5
Sample (1 foot), open-cut, extension of lower vein	0.03	15.4	*Nil*	

In March, 1914, Mr. Dornberg visited the office of this Bureau and gave the following information in regard to the property:—

"The main crosscut tunnel encountered the vein at a point 585 feet from the portal. Two or three small stringers were first cut, but the main vein is several feet in width. The vein was drifted on for 20 feet in both directions; a pay-shoot of rich galena ore, 8 to 10 inches wide, is persistent in the lower workings. It is the intention of the company to open up on a large scale in the spring."

A selected sample of galena from the lower workings assayed 130 oz. silver and 74.5 per cent. lead.

REILLEY AND JENSEN'S CAMP.

This camp, which is really a part of Summit camp, is situated at the head of Sutter creek and on the north-westerly side of Treasure mountain. A number of claims have been staked in this locality, a few of them many years ago, but most of them quite recently. About forty claims have recently been staked, owned individually or collectively by J. C. Reilley, J. A. Carlsen, Jensen, Wade, M. A. Brisenham, and others.

This section is mostly covered by the Cretaceous belt of rocks, together with a series of intrusive dykes, generally of an acid type. Sufficient timber for mining purposes exists in this section.

Carbonate. This claim has an 18-inch vein of crushed silicified and recemented rock cropping out at the foot of a small bluff. As far as could be determined, the strike is about north-west. The wall-rock is a conglomerate carrying large pebbles. For reasons unknown, a tunnel was started on a talc seam 1 inch wide about 15 feet away from this vein. This tunnel has been driven 45 feet, and at the end has a crosscut 11 feet in the direction of the vein previously mentioned. The talc-seam is too small to warrant consideration, even if, as claimed, it carries $25 to the ton and nothing else is in evidence in the tunnel. The surface vein has not been sufficiently shown up to tell anything about it; a sample across 18 inches of which assayed: Gold, trace; silver, trace.

Roanoke. An open-cut on this claim shows a small stringer, ½ to 1 inch in width, of galena in quartz and alongside 3 or 4 inches of mineralized wall-rock. At present the vein is too small to be of much value, but with further development-work might improve. Jensen & Carlsen are the owners.

Morningstar, Vigo, and Lulu.

These are Crown-granted properties owned by the heirs of Dan Ross, one of the pioneers of the country. The showings on these claims were not seen, but the following description was given by J. A. Carlsen:—

"*Morningstar.*—Well-defined vein, traceable for 300 feet; fissure angles the formation and cuts through porphyry, black lime, conglomerate, etc. Solid ore in places from 2 up to 6 inches in width.

"*Vigo and Lulu.*—Two parallel veins 100 feet apart, one vein traced 200 feet. Partially mineralized with galena, iron-pyrites, and zinc. Width of vein (not solid ore) 12 to 16 inches. There is a 30-foot shaft on this vein, but no knowledge of conditions at the bottom. Second vein traceable 40 feet and is from 4 to 8 inches wide."

Reilley's Camp.

J. C. Reilley and partners have staked several claims near the mouth of Railroad creek, on the Tulameen, but very little work has been done on any of them. The formation consists mainly of igneous rocks—namely, quartz-porphyry, diorite, and syenite, in the form of dykes or stocks.

The showing on the *Superior*, on the south side of the Tulameen, which is considered the best of the group by Mr. Reilley, consists of a large quartz-porphyry dyke partially mineralized along fracture-planes. Iron-pyrites and traces of chalcopyrite occur in sparing quantities along narrow seams. Picked samples might carry fair values, but a sample across 5 feet only returned: Gold, 0.02 oz.; copper, *nil.*

The other claims were not visited, but, at the present stage of development, the whole group has not been proved of importance.

Kelly Creek Camp.

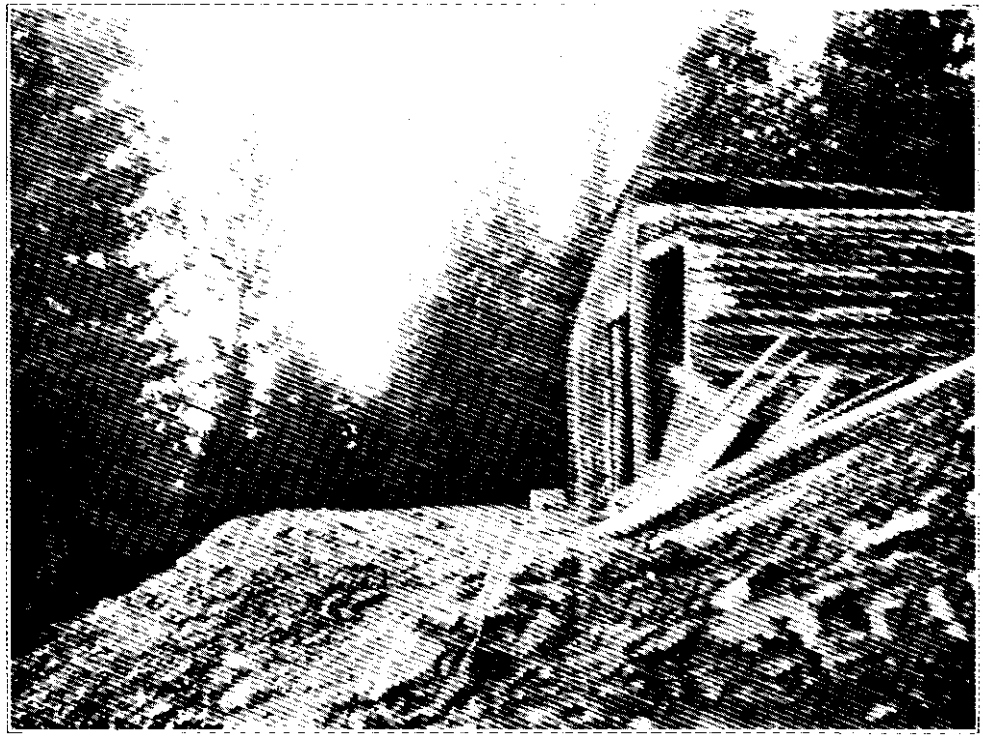
Kelly creek, which joins the Tulameen river about fifteen miles above the town of Tulameen, takes its name from James Kelly, who has for seventeen years past held claims in that vicinity. Kelly's cabin is situated four miles above the mouth of the creek, and the several claims are located for two miles farther up the creek. The ownership is somewhat mixed, being tied up in some way with a company formed to take them over three years ago. Mr. Kelly and the company both claim undivided authority, but the former seems to be in possession.

The formation in this district is a series of highly metamorphosed volcanic rocks in which small amounts of sediment are interbedded. These rocks, which generally have a schistose structure, are analogous with the Tulameen series, described by Mr. Camsell in his report on the Tulameen district.* They are intruded by apophyses from a granodiorite batholith lying to the north and east, and also by black lamphrophyric dykes. During or subsequent to the granitic intrusion, the schistose rocks were fractured and fissured, generally along east-and-west lines. Hot aqueous solutions flowing along these fractures caused replacement and silicification of the adjoining rock, together with the deposition of metallic sulphides. Pyrites, galena, sphalerite, and chalcopyrite are the chief minerals, but small amounts of tetrahedrite and chalcocite occur which are probably of secondary origin.

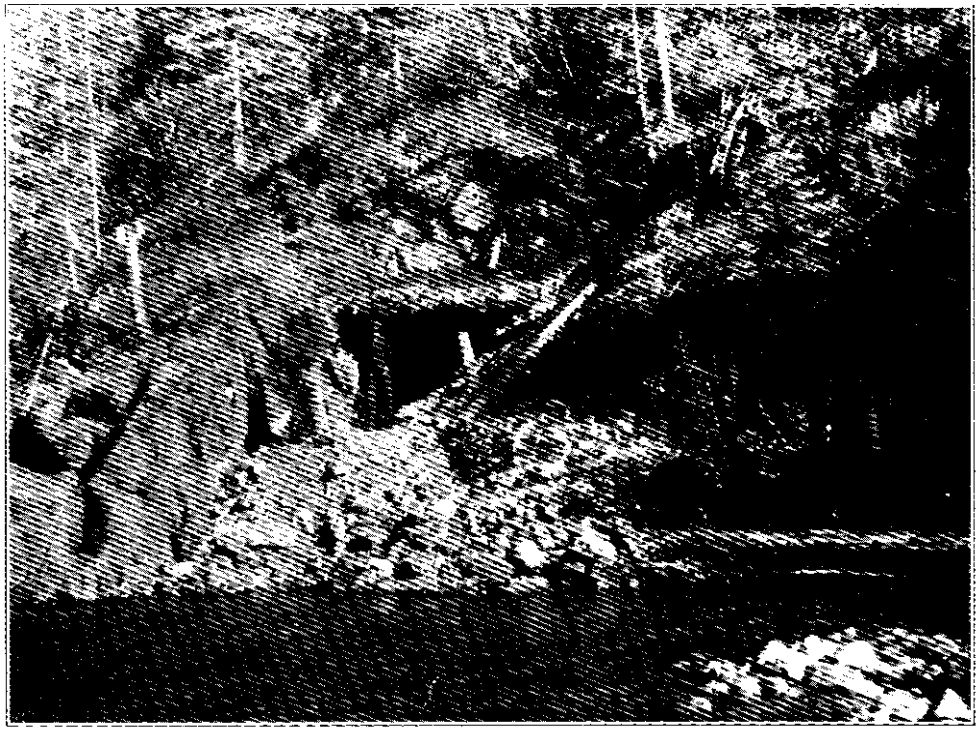
John Bull.

This claim, situated one mile from the cabin directly up the creek, has a small quartz vein striking N. 15° W. (mag.) and dipping 45 degrees to the west and cutting the schistose rocks. It is developed by a 20-foot open-cut, and from the end of this cut a tunnel extending 25 feet on the vein. The vein proper is from 6 to 10 inches wide, but there are also several stringers paralleling the main

* Geological Survey of Canada, Memoir No. 26.



Red Bird Mine—Similkameen M.D.



John Bull Mine—Similkameen M.D.

vein. The ore consists of iron-pyrites and chalcopyrite in a quartz gangue. At the face of the tunnel the vein is 8 inches wide; a sample across this width assaying: Gold, 0.70 oz.; silver, 0.50 oz.; while a picked high-grade sample returned 1.40 oz. gold. The vein has not been exposed at any other place on the surface.

Spokane and Vancouver. These claims are situated two miles above camp, with the croppings close to the bed of the creek. The development consists of two open-cuts showing a fractured zone in schistose rock sparingly mineralized with iron-pyrites. No regular vein occurs with definite walls, but small irregular quartz stringers carrying the pyrites are disseminated across about 3 feet; a sample across this assaying 0.12 oz. of gold.

Marsellaise. This claim, six miles from camp on the west fork of Kelly creek, is similar to the *Spokane* and *Vancouver*. A sample across 4 feet returned: Gold, 0.02 oz.; silver, trace.

Gold Mt. Group. This property is situated on Gold mountain, almost directly above the cabin, at an elevation of 4,900 feet. It is quite a steep climb from the creek, as the mountain rises abruptly. A quartz vein varying from 2 to 12 inches in width is exposed, which strikes east and west and dips slightly to the south. It is developed by an adit tunnel driven on the vein 125 feet long, and two open-cuts. Fault-planes, striking north and south, cause small jogs in the vein; to some extent mineralization has taken place along these fault-planes in the crushed gouge. The vein is faulted near the face of the tunnel and has not yet been recovered.

Galena, iron-pyrites, chalcopyrite, and arsenopyrite are the chief minerals in the ore, with occasionally small quantities of grey copper. A typical sample across 10 inches assayed: Gold, 0.02 oz.; silver, trace. A sample of picked high-grade ore from the dump returned: Gold, 0.42 oz.; silver, 20.0 oz.; copper, 4.9 per cent.

Superior Group. The *Superior* claim covers the ground on which Kelly's cabin is situated. The main working, consisting of an open-cut 100 x 5 x 15 feet, lies directly across the creek from the cabin. It is claimed that about 30 tons of high-grade ore taken out of this cut was washed down the creek by a flood caused by a cloud-burst.

The vein, which is a replacement along a fractured zone in schistose rocks, nearly parallels and is distant 30 feet from the contact of a body of diorite cutting the schists. From 4 to 6 feet of material, between fairly well-defined walls, can be considered vein-matter, of which perhaps one-third to one-quarter is stringers of quartz, the balance being somewhat altered and silicified wall-rock. The minerals, carried not only in the quartz proper but also in the vein-matter, are galena and iron-pyrites, with a little chalcopyrite and grey copper. In places the quartz stringers attain a width of 12 inches. At the upper end of the cut there is a seam of rusty oxidized talc 10 inches wide on the hanging-wall. The following samples give an idea of the values:—

Description of Sample.	Gold.	Silver.
	Oz.	Oz.
Rusty-talc seam (10 inches)	Trace	Trace
Upper end of cut (3 feet), average	Trace	Trace
Lower end of cut (4.5), average	Trace	0.6
Picked high-grade ore from dump	0.06	33.6

OKANAGAN CAMP.

This camp is situated on the north side of the Tulameen, between Eagle and Siwash creeks, at an elevation of about 3,000 feet. Four claims are held here by W. B. Marks, L. C. Barnes, and Albert Biner.

The deposit at this place occurs in the Tulameen series of rocks, which, at this point, consist of narrow bands of limestone associated with hornblende and chloritic schists, at or near the contact with a large body of granodiorite. The deposit is of contact metamorphic origin and is mainly developed in a narrow band of limestone; epidote, garnet, actinolite, etc., occur associated with chalcopyrite and iron-pyrites. Several open-cuts and a tunnel 35 feet long have been made on the *Okanagan*. The tunnel is driven on a lens of ore in a limestone band and shows 18 inches of ore at the face. A sample across this width assayed: Gold, 0.04 oz.; silver, 0.5 oz.; copper, trace. More development would be necessary in order to tell much about this property.

BRITTON CAMP.

For the last fourteen years Wm. Britton has held a group of claims a short distance beyond Eagle creek, on the north side of the Tulameen. The main showing consists of a little copper-stain along fracture seams in a pyroxenite rock close to where it is intrusive into rocks of the Tulameen series.

Having done only a small amount of surface prospecting, Mr. Britton decided to run a crosscut tunnel to tap the deposit at depth. After working for twelve years, alone, on the tunnel and driving it about 250 feet, without finding any ore, Mr. Britton has decided to stop. The whole proposition is an exhibition of great energy which, sadly, seems to have been misdirected.

A sample of the best ore on the surface taken across 5 feet assayed: Gold, trace; copper, 0.5 per cent. Mr. Britton is now working on some surface showings across the river, but these were not visited.

THOMPSON'S CAMP.

About five miles above Tulameen, Chas. W. Thompson is engaged in a search for diamonds, attracted thereto by the report of the Geological Survey of Canada that microscopic diamonds had been discovered in samples of chromite taken from Olivine mountain. Mr. Thompson, who is an experienced "diamond-digger" from South Africa, considered that if diamonds of commercial size exist at all in the rocks of Olivine mountain, then some of them would be found in the stream gravels of the Tulameen river a large part of which are formed from the erosion detritus of this mountain. He has obtained some very minute diamonds and rubies, and also small quantities of platinum, iridium, and gold, but has not succeeded in getting any commercial-sized stones. He is using a rocker, and then treats the fine screened material on greased plates, to which the precious stones will adhere. He is working almost in the bed of the river and takes his material from immediately on the bed-rock. His operations are not on a sufficiently extensive scale to prove profitable for the gold and platinum recovered.

RABBIT MOUNTAIN, BOULDER CREEK.

Boulder creek joins Otter creek a few miles above the town of Tulameen. Rabbit mountain is the section of country lying between Otter creek and the Tulameen and south of Boulder creek, and stretching north-westward, it forms the divide between Boulder and Bear creeks. Many claims have been staked on this mountain at different times, but on only a few has the annual assessment-work been kept up.

The formation here consists of chlorite schists, volcanic breccias, etc., belonging to the Tulameen series, which strike north-west and dip at various angles to the south-west. These stratified metamorphic volcanics are penetrated by sheets and dykes of granite and syenite porphyry, and are intruded on the north-east by a large body of granite.

The mineral deposits are replacements along crushed or fractured zones, and are closely associated, and probably genetically connected, with the intrusive porphyritic dykes. A few well-defined quartz veins also occur which are generally barren of values. Pyrite and chalcopyrite are the main ore minerals, with occasionally specks of galena.

Red Bird Group. This property, consisting of the *Red Bird*, *Reindeer*, and *Mountain View*, is owned by T. A. Connelley and partners. Most of the work has been done on the *Red Bird*, on which there are two parallel veins about 500 feet apart. The lower vein, which is from 2 to 4 feet wide, dips into the hill to the west at about 45 degrees and strikes nearly north and south. A crosscut tunnel 400 feet long taps this vein at a distance of 40 feet from the mouth; the tunnel was continued to strike the other (upper) vein, which crops out higher up the hill and is about 4 feet wide, but will require to be driven about 100 feet farther. Fifty feet beyond the lower vein the tunnel passed through a granite-porphyry dyke 12 feet wide, which shows slight mineralization with iron-pyrites. A winze 35 feet deep has been sunk on the vein from the tunnel-level, but this was full of water at the time of examination. The vein is said to be 4 feet wide at the bottom and well mineralized. Both veins have been traced for some distance on the surface by means of trenches and natural exposures. The following assays give an idea of the values:—

Description of Sample.	Gold.	Silver.	Copper.
	Oz.	Oz.	%
12 inches on hanging-wall of vein (lower)	Trace.	.....	.....
3½ feet of vein proper	0.02	0.8	2.4
Porphyry dyke (12 feet)	0.03	.....	.....
Ore from winze, taken from dump	Trace.	0.6	3.1

The claim is well supplied with mining timber, and the owners, besides building their own trail, have erected a very substantial log house. Mr. Connelley intends to work on the property all winter and will continue sinking the winze.

Shamrock. Adjoining the *Red Bird* on the north is Jack Thynne's property, the *Shamrock*. The vein, which is developed by open-cuts and a shaft 20 feet deep, is supposed to be a continuation of the upper vein on the *Red Bird*. A sample across 6 feet at the bottom of the shaft assayed: Gold, trace; silver, 0.1 oz.; copper, 0.4 per cent.

Another property adjoining the *Shamrock* on the west, the name of which is unknown, was looked at. The vein is similar to the others described, but smaller. At the bottom of a 24-foot shaft a sample taken across 10 inches returned only traces of gold and silver, with 0.6 per cent. copper.

Ora Fino Group. Mr. Flagler and two men were working on this group, so a hasty trip was made to see their showings. The claims, which are situated on Boulder mountain, midway between Boulder and Elliot creeks, are owned by Mr. Flagler and W. H. Armstrong, of Vancouver. The vein on the *Oro Fino* is a replacement and silicification along fractures similar to those previously described, and is from 4 to 8 feet wide. Development consists of open-cuts and a tunnel 30 feet long. A sample across 5 feet assayed: Gold, trace; silver, 0.6 oz.; copper, 6.2 per cent.

The following extracts, regarding Law's and Independence camps, are taken from Chas. Camsell's Report on the Tulameen district, Memoir No. 26, G.S.C. These extracts are taken almost word for word from the above-mentioned report, but are not placeed in quotation marks, as in some places the ideas have been abbreviated and also parts have been entirely omitted.

LAW'S CAMP.

The group of mineral claims known as Law's camp is situated on the western side of Bear creek and about three-quarters of a mile west of the forks of that stream. It comprises eight Crown-granted mineral claims and a number of others, on which the annual assessment work is still being done. It is connected with Tulameen by a somewhat indifferent wagon-road twelve miles in length.

The rocks, in which the mineral deposits lie, are limestones interbedded with mica, chlorite, and talcose schists belonging to the Tulameen group. These are intruded on the west by the Eagle granodiorite, and are cut by many apophyses from it and also by granite-porphyry and lamprophyre dykes, the former of which are highly mineralized with pyrite. The mineral deposits are situated in the stratified rocks on the eastern edge of the granodiorite and within the metamorphic zone affected by it and its apophyses.

The ore-deposits either are simple replacements or are of contact metamorphic origin, the latter being characterized by the formation of garnet, epidote, and hornblende. The gangue of the ore is, as a rule, calcite, with a small amount of secondary silica generally present. The ore minerals visible in the rock are phyrrotite, pyrite, galena, zinc-blende, and sometimes magnetite. The ores are valuable for their gold, silver, and copper contents. Selected samples give high assays, but average samples are comparatively low grade.

The claims on which the greatest amount of development-work has been done are the *St. Lawrence*, *St. George*, *Liverpool*, *Chicago*, *Morning Glory*, *Frisco*, and *London*.

St. Lawrence. This is the oldest claim in the camp and is the one on which the mine buildings have been erected. It is developed by two incline shafts, No. 1 and No. 2, respectively 16 and 55 feet in depth, and by an adit tunnel which in July, 1910, was 620 feet in length and had two short drifts running from it.

No. 1 shaft has a dip of 45 degrees to the west and shows 6 feet of ore, consisting of pyrrhotite, with lesser amounts of pyrite, chalcopyrite, and blende, lying between walls of schist.

No. 2 shaft, lying 100 feet north-west of No. 1 and dipping 52 degrees to the west, shows 6 feet of ore similar to that in the No. 1 shaft.

The adit tunnel enters near the bunk-house, and was run to strike, at some depth, the ore-body exposed in No. 1 and No. 2 shafts. It enters on a bed of mica-schist and follows the strike of the rocks for 476 feet, and then crosscuts them at a slight angle for 144 feet. No ore appears in the main tunnel, but a thin band about 12 inches in width was encountered in the drift which runs to the north.

St. George. This claim adjoins the *St. Lawrence* on the north and belongs to the same company owning the *St. Lawrence*—namely, the Similkameen Mining and Smelting Company. On this claim are a number of open-cuts and two shafts—No. 3, which is about 50 feet in depth, and No. 4, which is 182 feet in depth.

No. 3 shaft was full of water at the time of examination, but the ore on the dump was seen to consist of pyrrhotite, chalcopyrite, and pyrite in a gangue of calcite.

No. 4, the main shaft, is well timbered and equipped with a steam-hoist and pump and covered by a good log building; it dips at 60 degrees to the west and is 182 feet in depth. At the 100-foot level drifts run 50 feet in either direction along the strike of the vein, and at the bottom there are two crosscuts each about 35 feet in length. The walls of the ore-body are schist, while the ore itself is in a stratum of white limestone, which it has replaced either wholly or in part. The width of the ore-body varies up to 14 feet, and in places pinches to a narrow seam; as a rule, the ore favours the hanging-wall rather than the foot-wall. The ore minerals, which have replaced the limestone, are pyrite, pyrrhotite, chalcopyrite, and some zinc-blende, the gangue being calcite with some quartz.

The *Frisco*, *London*, *Liverpool*, *Chicago*, and *Morning Glory* claims all have mineral showings similar to those already described, but with less development-work. Numerous open-cuts, shallow shafts, and short tunnels disclose limestone replaced in part by sulphides of copper, iron and lead, generally in vein-like masses varying from a few inches to several feet in width.

INDEPENDENCE CAMP.

Independence camp comprises a group of mineral claims situated on the divide between Bear creek and the Coldwater river, and extending southward into the Bear Creek basin. The main workings of this camp are situated at an elevation of 2,900 feet above Tulameen and about 5,400 feet above sea-level. They are distant from Tulameen about 15 miles, and are connected therewith partly by wagon-road and partly by pack-trail.

To the east of the camp lies the main body of the rocks of the Tulameen group, which here consists of chlorite, sericite, and hornblende schists dipping at high angles to the west. To the west lies the Eagle granodiorite, which is intrusive into the rocks of the Tulameen group. Between these two formations, and cutting both, is a large dyke of granite-porphyry about three miles long and having a maximum width of about 1,200 feet; it is in this dyke that the principal ore-bodies occur.

The deposits of this camp are replacement deposits of the Butte type; they lie in fissures in the granite-porphyry along fracture-zones, and the formation of ore has progressed along these fissures, passing outward from them into the country-rock. Deposition of ore has been accomplished by ascending alkaline solutions carrying the various metals present in the ore-bodies.

The ore minerals are chalcopyrite, pyrrhotite, pyrite, together with lesser quantities of zinc-blende, chalcocite, tetrahedrite, molybdenite, and cuprite. The gangue of the ore is the granite-porphyry, which, however, has been so altered by ascending solutions that both the feldspar and biotite have often disappeared entirely and only the quartz remain. The secondary gangue minerals introduced into the fractures and the bounding wall-rocks are quartz, calcite, and sericite, and these are most abundant where the fracturing has been greatest.

The main workings in this camp are situated directly on the summit of the divide between Bear creek and the Coldwater river, and consist of over 1,000 feet of tunnels and drifts and 265 feet of shafts, together with a number of open-cuts and prospect-pits. The main tunnel is 500 feet long, driven in on the strike of the ore. At a distance of 390 feet from the portal is a raise of 126 feet to the surface. At 360 feet from the portal are drifts to either side, one being 145 feet in length and the other 342 feet. In the latter drift is a winze 53 feet deep. Most of this work was done by the Granby Company.

COALMONT.

Coalmont, the present terminus of the Vancouver, Victoria, and Eastern Railway, is a townsite plotted two years ago by the Columbia Coal and Coke Company in connection with

the opening-up of the coal claims situated in the Tulameen coal-basin. It is situated in the valley of the Tulameen river, four miles below the town of Tulameen and two miles above Granite creek, famous in the early placer days. The development-work on the coal-mines stopped in March, 1913; in August of the same year, however, the entire holdings of the Columbia Coal and Coke Company were acquired by a syndicate headed by A. McEvoy, of Vancouver. Work on a small scale was immediately started, and it is likely that before long the successful exploitation of the coal-basin may be consummated.

TULAMEEN COAL-BASIN.

Coal-croppings at Collins gulch were known for years, but until lately no attempt has been made to open up the coal. Ten or eleven years ago coal was also found on the North fork of Granite creek; it has since been proved that these and other intermediate croppings are all part of one small coal-basin. Various names have been applied, but the name "Tulameen coal-basin," adopted by Chas. Camsell, Dominion Geologist, seems the best.

The coal formation, consisting of sandstones, shales, conglomerates, and beds of coal, is referred to the Oligocene age and rests conformably on Oligocene volcanics, while it is in part capped over by a very recent basaltic flow. The total area of the basin is 3,700 acres, and of this it is estimated that 3,254 acres are underlain by coal.

There are at least three coal-seams exposed on the North Fork side, but all of these are not in evidence on the Tulameen side; at Collins gulch two, or possibly three, seams are showing; at the Bear's Den workings there are two seams; and at Fraser gulch only one is exposed, although another is said to have been encountered in diamond drilling. Analyses of the coal show it to be of fair bituminous grade, and that most of it is good coking-coal. The following analyses supplied by J. C. McDonald, the present manager, are typical of the clean coal:—

	(1.)	(2.)	(3.)
	Per Cent.	Per Cent.	Per Cent.
Vol. matter	36.49	36.90	36.00
Fixed carbon	50.26	55.70	48.40
Ash	6.95	4.50	8.93
Moisture	6.30	2.90	6.67
Coke	57.21	60.20	57.21

The principal coal-seams lie in a horizon of very fissile shales which occupy a middle position in the sedimentary series. The seams are quite large, but the coal is generally mixed up with slate and clay partings. But in each seam there is at least from 4 to 8 feet of clean coal, and in the large seam on the North Fork side there is probably a much greater thickness.

Mr. Camsell says: "Presuming that the 20 feet of workable coal exposed on the south side extends over the whole basin, and estimating 1,000 tons of minable coal to the acre, there are in this field over 65,000,000 tons that can be extracted. The total quantity of coal in the basin, however, may greatly exceed this figure."

About four years ago the Columbia Coal and Coke Company acquired coal claims covering nearly the whole of the Tulameen coal-basin. After a little preliminary work at Collins gulch they commenced on the North Fork side; four tunnels were run in on the seams, the longest for a distance of 800 feet. The coal at this point looked very favourable, but it was considered that the transportation from this point to the Tulameen valley, five miles away and 1,500 feet lower, would prove difficult. A successful attempt was then made to trace the coal from

Collins gulch easterly to a point directly above the Tulameen valley, called Fraser gulch; a small prospecting-tunnel (No. 4) was there run in, and although the coal was found to be considerably crushed and crumbling, this was considered to be due to surface weathering.

A diamond-drill was hauled up the hill and a bore started at a point approximately in the centre of the coal-basin; this hole went down 1,500 feet, the limit of the drill, without striking any coal. From the dip of the seams it is not likely that coal would be struck until a depth of 2,800 feet was attained. The company, however, having the utmost confidence in the existence of the coal, while drilling operations were in progress went ahead with plans to drive a crosscut tunnel to tap the seams from the Tulameen side. The townsite of Coalmont was laid out, a sawmill and compressor erected, and work commenced on the tunnel (No. 2). At a point 2,000 feet from the portal a seam of coal 10 to 12 feet thick was crosscut; this seam was drifted on 250 feet to the east, 850 feet to the west, rooms were cut out, and a raise put up to connect with the upper prospecting-tunnel (No. 4).

Unfortunately all the coal in these workings is very badly crushed, so much so that it crumbles to dust as soon as mined, and is quite useless for commercial purposes at the present time. In time to come, briquetting, or some other process, might render it marketable. The cause of this crushing is not very evident, but it is probably caused by excessive faulting along the seam, with attendant squeezing and crushing of the fibre of the coal.

The crosscut tunnel was continued a short distance beyond the seam encountered (which is undoubtedly the lowest seam of the measures on this side of the hill), and then from the end a horizontal drill-hole put in a distance of 1,200 feet. Mr. McDonald, the present manager, says that a second seam of coal was struck, which is also thoroughly crushed.

The company then decided to prospect the Bear's Den croppings, which lie about half-way between Fraser gulch and Collins gulch; a tunnel was driven in on the middle seam, and from this a crosscut made to the top seam. After exploring this top seam and raising to the surface it was decided to sink an incline shaft on it. This incline was sunk 200 feet below the tunnel-level, which was as far as the hoisting equipment was good for, and in the course of this work two faults were encountered. The coal is of fair quality, but crumbles rapidly on exposure to the air for a short time. These workings are apparently on the edge of the crushed zone extending westerly from Fraser gulch.

In view of the unfavourable situation of these workings and the doubtful character of the coal, it was considered inadvisable to attempt to mine coal at this point. Neither did Collins gulch present attractive features for the cheap mining of coal; there only remained the North Fork side, where several large seams of good coal had been partially developed.

The opening-up of the North Fork side would involve considerable expenditure for drilling, tunnels, a railroad, etc. The company therefore closed down in March to consider matters; the result being the sale of the property in August, as before stated.

At the end of August J. C. McDonald arrived at Coalmont to take over the management for Mr. McEvoy. His first work was to make a general survey of the whole property with a view to determine the most advantageous place to commence work; from the first the North Fork side was considered the most favourable place. At the time of visiting the property, in September, engineers were busily engaged surveying a narrow-gauge railroad that will run from the North Fork workings to a point above Coalmont on a maximum grade of 2 per cent. From that point an incline railway will carry the coal to a tipple in the valley below, on the south side of the river. The question of opening up the North Fork side has not yet been taken up, but it will probably be done by means of a crosscut tunnel, preceded probably by diamond-drilling to determine the exact location and quality of the coal.

GYPSUM.

A few small occurrences of gypsum have been noted at different places along the Tulameen valley; one of these, which is probably the largest showing, occurring nearly opposite the town of Granite Creek, was examined. The deposits consist of isolated patches, here and there, of earthy gypsum, generally deposited on top of boulder-clay, gravel, or slide-rock. The origin of this gypsum was probably by precipitation from hot springs following the extrusion of tertiary lavas which occur throughout the district. The deposits are too small to be of much value, as in each of the isolated occurrences there is not more than a few car-loads. Part of the gypsum is very pure and in part is mixed with clay, gravel, etc. One car-load from this showing was shipped to a cement-works in Spokane, and a market for the limited amount at present available may be secured by reason of the operation of the cement-works at Princeton. A small percentage of gypsum is mixed with the burned cement to govern the time of setting; alteration of the amount producing quick- or slow-setting cement as required. A similar deposit of gypsum occurs on the hill west of Merritt, in the Nicola valley. The occurrence at this place is of greater extent than any in the Tulameen valley, but still is rather irregular and patchy. A few shipments have been made to different cement-works from it, but no attempt has been made to burn the gypsum for plaster of Paris, and at the present time no work is being done on the property.

PLACER-MINING ON THE TULAMEEN RIVER AND TRIBUTARIES.

The placer gold and platinum production from the Tulameen district for 1913 was very small. A few ounces were obtained by some half-dozen Chinamen who annually work a certain bar above Eagle creek for about three months during the low water; they wing-dam successive portions of the stream-bed and clear up to bed-rock. It is interesting to note that they work over the same bar year after year, a fresh supply of gravel containing the gold and platinum being washed in each season during high water.

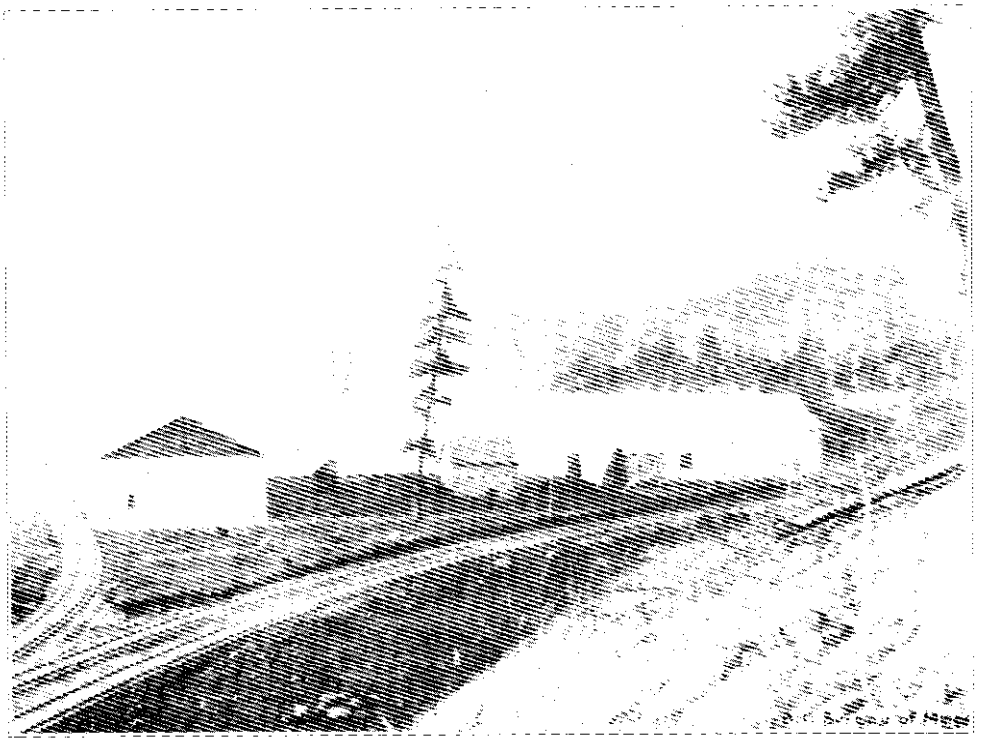
LAMBERT & STEWART, ON GRANITE CREEK.

About four miles from the mouth of Granite creek, Lambert & Stewart have been at work for some time past on a placer lease held by them. Their method is to dam the stream and sluice off below the dam down to bed-rock and run the material through sluice-boxes. Unfortunately, for three successive years the dam failed to hold and was washed out in the high water in the spring. The dam erected in the summer of 1912 withstood the high water of the following spring, and it was hoped that this year the sluicing operations would be successful. When the property was visited in September the work had proceeded fairly well, but a long flume intended to get to the bed-rock had instead encountered a layer of quicksand. R. A. Lambert, who is in charge of the work, then decided to sink a timbered shaft in this quicksand to get down to bed-rock; preparations were then being made for this work.

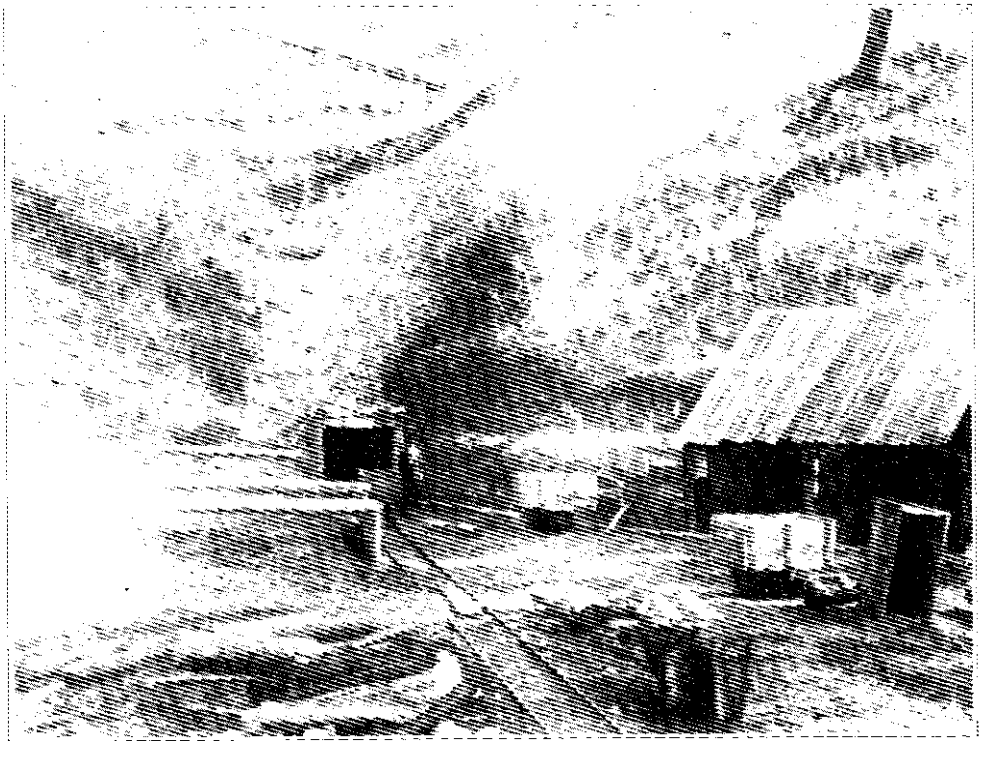
In the early placering days whenever bed-rock was reached pay-dirt was found, and, as the ground being worked has never been touched before, Mr. Lambert expects that quite a clean-up will be made when bed-rock is reached. The upper gravels contain very little value. Gold and platinum occur in this stream in the ratio of about 2 to 1.

PLACER LEASES ON THE TULAMEEN RIVER.

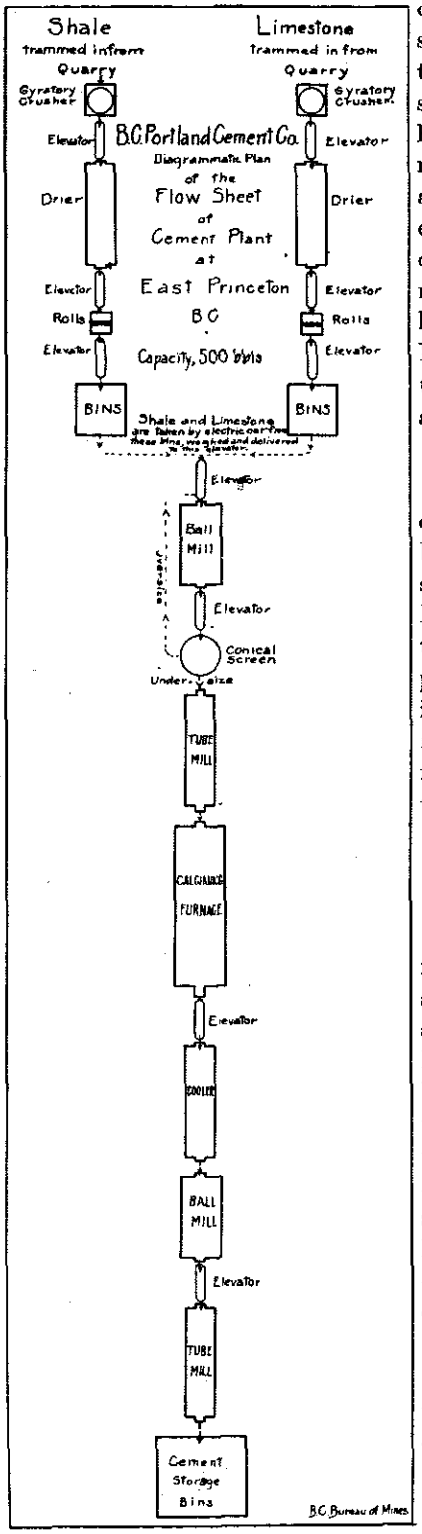
A few years ago a number of placer leases in the bed of the Tulameen river were taken up by different parties, and attempts made to induce capital to test the gravels by boring with a view to putting in dredges if pay-dirt was found. A strong Eastern syndicate has now secured options on twenty miles of these leases, held by W. C. Fry, Van Houten, J. S. Tenner, and Kirkpatrick, from the mouth of the Tulameen upwards to about Slate creek. This company sent in a Keystone drill outfit, with H. L. Meade in charge of the operations, and



Portland Cement Works—Princeton.



United Empire Colliery—Princeton.



commenced drilling in September, 1913. The first hole, started about a quarter of a mile below Coalmont and in the centre of the valley, was put down 100 feet without striking bed-rock. The method is to drive down a heavy steel pipe 6 inches in diameter (inside measurement), removing the gravel every 6 feet by churning up and drawing out with a suction pump. Any boulders encountered are broken up or drilled through by means of a heavy bit. The gravel extracted is run through a rocker and then panned, and a careful log kept of the hole, recording the material passed through, values, etc. Mr. Meade says it is the intention of his company to thoroughly prospect the ground, and, if sufficient values are found, a dredge will then be erected.

PRINCETON.

The town of Princeton is situated at the confluence of the Similkameen and Tulameen rivers; for some years back the town has been very quiet, but lately it has shown signs of improvement. The operations of the British Columbia Copper Company at Copper mountain, the opening of the new cement plant, and the steady progress of coal-mining in the vicinity are causing increased business in the town. The present projected route of the Kettle Valley Railway only comes within a few miles of the town, but this probably will be changed to come right into the town.

B.C. Portland Cement Co.

The British Columbia Portland Cement Company has recently completed a modern and up-to-date plant on One-mile creek, about three miles from Princeton; the total investment, including railway spur, being in the neighbourhood of $250,000. Associated with the company are L. W. Shatford, M.L.A., R. P. McLennan, and J. A. Harvey, of Vancouver. C. R. Briggs is secretary-treasurer and business manager of the company, and Mr. Robertson is superintendent of the plant at Princeton. The capacity of the plant is 500 barrels a day, for which a market is expected to be secured throughout the south-western interior of the Province, while the removal of the duty on cement entering the United States should enable the company to extend its trade into the adjoining State of Washington.

Limestone and shale, which are obtained from quarries in close proximity to the plant, are brought to the crushing-floor in hand-cars. The limestone-deposit consists of several narrow bands of limestone interbedded in metamorphosed volcanic rocks, which are exposed along the face of a bluff about 100 feet high. Mining

was commenced about half-way up this bluff by cutting out a roadway sufficiently wide to run hand-cars; a "coyote-hole" was then driven into the hill and the whole face shaken up by a heavy blast. The limestone is sorted out from the waste, loaded on hand-cars, wheeled to one end of the roadway, and dumped over to the bottom of the bluff; the waste being similarly disposed of at the other end. From the foot of the bluff two men load the limestone on to a hand-car and tram it to the crusher. The limestone is from 93 to 98 per cent. pure carbonate of lime.

The shale-deposit is a volcanic rock eroded and rebedded under water; in composition it has changed but little from the original volcanic rock.

The limestone-deposit at present being utilized is not of very great extent, and the present system of quarrying rather expensive, but it is claimed that the company possesses other larger deposits of limestone farther up One-mile creek. Abundance of shale is available.

The plant started operations early in the summer, but, owing to some necessary alterations to the boilers, had to stop, and only restarted in September. Coal for the calcining-furnace is obtained from the Princeton Coal and Land Company, and for the boilers from the East Princeton Coal and Land Company, formerly the United Empire Colliery.

East Princeton Coal & Land Company.

This property is situated a short distance from the cement plant. At present only a small tonnage of coal is being mined, which is shipped to the cement plant. At the time of the writer's visit to the cement plant the coal-mine was closed, so it was not visited.

Princeton Coal & Land Company.

This property is working steadily under the managership of Mr. Waterman. The main incline is now down 1,100 feet, and the manager says "that the coal is certainly improving in quality with depth." The coal in character is "lignitic coal" according to Dowling's classification, or "sub-bituminous" as it is locally called, but is rather high in ash at the surface. This ash-content is decreasing at depth, and this fact, together with the improvement effected by the screening plant recently put in operation, is causing the present output of the mine to be regarded as a quite good domestic coal. The output at the time of visiting the mine was from 150 to 180 tons a day, but this was expected to increase by Christmas to 250 to 300 tons a day. The company is now shipping some coal to Vancouver, where it is hoped to build up a market, and, in a year or two, when the direct railways to the Coast are provided by the Vancouver, Victoria and Eastern and the Kettle Valley Railways, to ship a large tonnage. These direct railway connections will reduce the railroad-haul from about 600 miles to 100, enabling the company to make a fair profit, which is impossible just now. The company has plenty of available coal, as at present only the top 8 feet of a 24-foot seam is being mined.

COPPER MOUNTAIN AND VOIGT'S CAMP.

These camps are situated twelve miles up the Similkameen river from the town of Princeton, and on the east side of the river. The first claims were staked in 1895, and before very long the whole district was covered by locations, many of which are now Crown-granted. For several reasons—namely, lack of transportation, low grade of the ore, etc.—this section has not yet evolved any producing mines, but the near future should see a change. The district was reported on by the Provincial Mineralogist in 1901 and by Chas. Camsell, of the Dominion Geological Survey, in 1906. In 1905 the British Columbia Copper Company secured a bond on the *Sunset* claim (one of the earliest locations) on Copper Mountain, carried out some development-work, made a small payment, and then allowed the bond to lapse. The difficulty at that time was that the company could not see a satisfactory solution of the problem of treating the ore, which is not amenable to water concentration and is too highly siliceous to be smelted direct.

In 1911 the British Columbia Copper Company returned to the camp and took options on a number of claims in Voigt's camp from Emil Voigt. Development-work by means of open-cuts, trenches, shallow shafts, tunnels, and extensive diamond-drilling was carried out until December, 1912. About this time the company and Mr. Voigt failed to come to an agreement in regard to terms and a deadlock has now ensued. As matters now stand, the British Columbia Copper Company has a half interest in fourteen claims of the group, and the balance tied up more or less.

The result of the exploratory work by the company in regard to tonnage and values has not been made public, but sufficient ore had been shown up on several claims to cause a very fair-sized offer to be made to Mr. Voigt, which, however, was refused. It is to be hoped that the conflicting parties will soon come to terms, as Mr. Voigt can hardly hope to do anything himself, and it is not likely that any of the other large companies would enter the tangle.

Shortly after this, the British Columbia Copper Company again obtained an option on the *Sunset* on Copper mountain, together with ten other claims—namely, the *Helen H. Gardner*, *Ada B.*, *Princess May*, and others. Active development-work has been carried out on these, and at the time of visiting the camp, on September 30th, 100 men and four diamond-drills were at work. The company has already obtained control of the *Sunset*, which is a stock company, and several payments have been made on the other claims. It is practically assured that all or nearly all of these claims will be taken up and the bond purchase prices paid. Up to date all the work done has been entirely prospecting by means of diamond-drill holes, trenches, hand-shafts, tunnels, etc., with a view to proving the lateral and, as far as possible, the downward extensions of the ore-bodies.

GEOLOGY OF THE DISTRICT.

The following extract is taken from Chas. Camsell's summary report of 1906 :—

"The country-rock is a batholithic intrusion of igneous rock of very variable composition, which has been intruded into and has almost entirely digested the older overlying sediments—limestone, argillites, and quartzites—so that these only now appear as inclusions or remnants in the igneous rocks. To the north and west it is overlaid by recent volcanic rocks. Along the southern and eastern border of the mineralized area the igneous rock is a diorite, which sometimes has a gneissic structure, and which frequently holds segregations of the dark minerals. To the north this rock becomes more acid and is cut by narrow veins of pink feldspar and quartz. Both the sediments and the igneous rock are intimately mixed with and cut by later dykes of different ages, whose sequence cannot yet be perfectly worked out. These dykes have a general north-and-south trend and are quartz-porphyry, rhyolite, andesite, felsite, and diabase, of which the first mentioned are apparently the most recent. The whole series, except the later dykes, is traversed by a set of fracture and fault planes running in an almost east-and-west direction."

The ore-bodies throughout the district are characterized by being extremely indefinite and without any well-defined boundaries. Certain of the deposits are of the contact metamorphic type, being found in the vicinity of the contact of the igneous rock with the old sedimentaries, while others seem to occupy fracture-zones in the igneous rock itself. Speaking generally, the whole mountain is more or less mineralized, but it is only along certain favourable lines that sufficient concentration has taken place to give rise to commercially valuable deposits. Chalcopyrite and bornite in small quantities can be found in the igneous rock, which is quite free from shearing, fracturing, or any dynamic change. The study of the ore-bodies is rendered more difficult on account of extensive faulting in the east-and-west direction, and a heavy layer of wash, in most places, makes surface prospecting difficult.

It has been pretty thoroughly established that the ore-bodies on the *Sunset*, *Helen H. Gardner*, and *Oriole* lie in fracture-planes in the monzonite between three parallel dykes; outside the dykes the country-rock (monzonite) is mineralized, but it is only in the area between the dykes that sufficient concentration has taken place to give rise to commercial ore-bodies. The largest dyke is about 150 feet wide and is a quartz-porphyry; between this and the centre one is a distance of 300 feet all more or less mineralized. The centre dyke is also a quartz-porphyry and is 25 to 35 feet wide; between this and the western dyke is a distance of 400 feet more or less mineralized. The western dyke is a trachyte-pitchstone and about 20 feet wide. There is some evidence to show that the mineralization, or at least concentration, follows east-and-west fracture-planes. These fracture-planes may be either cooling fractures in the monzonite magma, or fractures induced in a direction normal to the plane of and incidental to the disturbance caused by the cutting through of the dykes. The importance of this distinction is that if the fractures are the result of the intrusion of the dykes, then the ore-bodies would probably go to much greater depth than if the fractures are simply cooling cracks. With the exception of one small isolated occurrence in the large dyke, there is no mineralization of the dykes, but to some extent there is a concentration of values along the walls of the dykes. While the country-rock is practically all monzonite, there are in places remnants of highly altered and silicified sediments.

Chalcopyrite and bornite are the primary copper minerals present, associated more or less with hæmatite, magnetite, and iron-pyrites. Along certain zones, notably in a shaft on the *Helen H. Gardner*, secondary action has taken place, giving rise to chalcocite, native copper, malachite, azurite, and cuprite. The ore-bodies are extremely irregular, and it is very hard to make even a rough estimate of tonnage until the ground has been riddled with diamond-drill holes.

The largest ore-body at present showing is on the *Sunset*, while on the same property another one is being prospected. Smaller bodies on the *Oriole*, *Helen H. Gardner*, *Ada B.*, and *Princess May* have been shown up. On the *Sunset* there is a shaft down 161 feet at an angle of 60 degrees, with considerable drifting, most of which is in ore. This work was done in part by the original Sunset Company, and in part by the British Columbia Copper Company in 1905, but no work has been done in it lately. The *Princess May* has a very fine showing of ore on the surface, but a crosscut tunnel in 350 feet has not encountered any very good ore as yet. On the *Helen H. Gardner* a hand-sunk shaft, down about 50 feet, is in nice ore showing native copper, cuprite, chalcocite, etc.

The officers of the company tentatively estimate a total tonnage on all the claims of about 5,000,000 tons of 1.5 to 2 per cent. copper ore, but future development may of course, considerably increase this figure. Gold and silver values are negligible or very low.

The Copper Mountain showings may be said to have passed the initial stage, and now the company is considering opening up the properties on a fairly large scale. A crosscut tunnel from a point down the hill towards the river will probably be driven in with cross-drifts underneath the various ore-bodies. The ore-bodies are to some extent isolated, so that they will be mined partially by a glory-hole and in part by a large stope system, utilizing the waste strips as natural pillars. The present plans also include a 1000-ton-a-day concentrator situated somewhere near the river, and a tramway from the tunnel-mouth to the mill. A falls on Whipsaw creek which will supply sufficient power will also be hydro-electrically developed.

The question of the concentration of the ore, which was a stumbling-block in 1905, has been to some extent solved. Mr. Collins, the mill expert of the company, considers that the patent oil-flotation process of the Minerals Separation Company of San Francisco, or some other oil process, will successfully concentrate the ore, and the company is at present installing

a small 75-to-100-ton mill at Boundary Falls, (which is described elsewhere) for the treatment of *Lone Star* ore; this mill, which will be equipped with an oil-flotation plant of some type, will be used to test the Copper Mountain ores on an extensive scale before commencing construction on the large mill. The concentrates will eventually be shipped to the company's smelter at Greenwood, British Columbia. Some difficulties still remain in the opening-up of the Copper Mountain properties, but it is confidently expected that these will all be solved and that before long they will be producing steadily.

The work at Voigt camp and afterwards at Copper mountain was in charge of F. R. Weekes until the end of August 1913. At the time of visiting the property in September, Mr. Walz was temporarily in charge, but at the present time Mr. Kitsan is superintendent and Mr. Poe is foreman.

SIMILKAMEEN MINING DIVISION.

REPORT OF HUGH HUNTER, MINING RECORDER.

I have the honour to forward the annual mining report on the Similkameen Mining Division for the year 1913.

On Copper mountain the British Columbia Copper Company has a large force of men at work prospecting the numerous claims they have under bond.

In Summit camp, at the head of the Tulameen river, considerable work has been done during the past year. The Treasure Mountain Mining Company drove a crosscut tunnel 570 feet long and struck the main vein, which is said to be over 4 feet in width, and carries 10 to 12 inches of solid galena, assaying $150 to the ton in silver and lead.

In other sections of the district assessment-work has been performed.

OFFICE STATISTICS—SIMILKAMEEN MINING DIVISION.

Free miners' certificates	309
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Location records	311
Certificates of work	319
Bills of sale, mineral claims	43
Permits (placer)	2
Bills of sale	2

LILLOOET DISTRICT.

LILLOOET MINING DIVISION.

REPORT BY WM. M. BREWER, M.E.

In pursuance with instructions received from the Provincial Mineralogist, W. Fleet Robertson, I left Victoria on the night of July 31st, 1913, taking saddle-horse equipment and supplies by steamer to Vancouver. On August 2nd, I left Vancouver at 9 a.m., and arrived at the town of Squamish, situated at the mouth of the Squamish river, at the head of Howe sound, at 2.45 p.m. This is a new town, the present ocean terminus of the Pacific Great Eastern Railway, which is now under construction, the steel being laid to a point fourteen miles northward, or about two miles above the confluence of the Cheakamus river with the Squamish.

The first part of this trip was necessarily through the Vancouver Mining Division, in which are situated the claims described on the following three pages. The dividing line between the Vancouver and Lillooet Mining Divisions is at Green lake, as is indicated later.

INDIAN RIVER PROSPECTS IN THE VANCOUVER MINING DIVISION.

On August 3rd I left Squamish for the headwaters of the Indian river, which empties into the North arm of Burrard inlet not many miles from the city of Vancouver, and where I was informed prospectors were working on several mineral locations. I was accompanied by S. A. Habrich, one of the prospectors who, in partnership with Peter Herress, own the *Ethel*, *Rose*, *Irish Molly*, *Lucky Jack*, and *Jenny* mineral claims located on the mountain-side above Indian river, and distant about twelve miles from Squamish. The ride along the trail occupied five hours' steady travelling.

The pack-trail follows a south-easterly course from Squamish for a distance of about eight miles up Stamish creek, where, at an elevation of 2,170 feet, the trail forks, the right fork continuing to Seymour creek, near North Vancouver, and the left fork leading up Bear creek to the summit; thence to the prospects to be examined, and from there down Indian river to its mouth. The elevation at the summit is 2,375 feet above sea-level. This trail was in anything but good condition; Mr. Habrich had, at his own expense, opened it up earlier in the season, so that he could pack his supplies over it with horses, but it would require about $2,000 to be expended on it to put it into good condition for a pack-trail, and, in view of the work the prospectors are doing in this section, I would respectfully suggest that such an appropriation might be made by the Provincial Government to be expended on this trail next season.

After crossing the summit on which Indian river rises we followed down on the east side of that river a short distance, descended about 600 feet to the bed of the river, and crossed it by jumping from one rock to another; then climbed about 300 feet up to Habrich's cabin, situated on the west bank.

Belle Group. The *Belle* group of mineral claims is located nearly parallel to the course of Indian river, and lies about five or six miles distant in an easterly direction from the *Britannia* mines. These mineral claims have been surveyed and grouped as the *Belle* group; a good cabin has been erected on the *Irish Molly* claim, about 300 feet from the west line of the claim, and all the work I examined has

been done on that claim. This work, which has been thoroughly well done, consists of two adits, an upper and a lower, driven, crosscutting the formation to intersect an ore-body carrying chalcopyrite that outcrops, 10 feet wide, on the surface about 60 feet above the upper adit. The cabin and lower adit are at the same elevation, 2,160 feet above sea-level by aneroid. This lower adit had been driven about 20 feet. The upper adit, which is about 500 feet easterly from the lower, is at about 150 feet higher elevation and had been driven 35 feet. Both adits are very well timbered; each is 6 feet high by 5 feet wide in the clear, with the timbers 4 feet between centres. Neither of these adits had at the time been driven far enough to crosscut the ore-bodies which the outcroppings indicated.

In addition to the two adits, several open-cuts had been made on outcroppings of ore showing chalcopyrite and iron-pyrite in a quartz gangue. One of these outcrops occurs about 60 feet above the upper adit; this shows a width of 10 feet of partially oxidized material. Another outcrop, showing the same character on the surface, is 25 feet wide, but with an intrusive dyke from 12 inches to 3 feet wide occurring in the ore. This outcrop is about 500 feet west from the upper adit, and nearly over the lower at about 300 feet higher elevation. Still another outcrop is 20 feet wide; this is near the east line of the *Irish Molly* claim on Copper creek. Mr. Habrich stated he could find other outcroppings at various places for a distance of several hundred feet farther to the east. The country-rock is apparently an altered greenstone. The strike of the ore-bodies is nearly true east and west, but the dip cannot be determined until the showings are opened deeper.

Several other mineral claims have recently been staked in the same vicinity, but, as none of the owners were camped on their claims, I did not see any of them.

Prospecting in this locality is attended with much difficulty, owing to the dense growth of underbrush and thick timber and the precipitous mountain-sides.

A sample I took, typical of the outcrop 25 feet wide, but not to be considered an average, yielded by assay: Gold, trace; silver, 2.0 oz. to the ton; copper, 5.3 per cent.

On August 4th I returned to Newport.

PACIFIC GREAT EASTERN RAILWAY.

On August 5th I left Squamish on horseback, following the wagon-road which parallels the line of the Pacific Great Eastern Railway up the east side of the Squamish river to its confluence with the Cheakamus river; thence up this latter stream to its source, and across the divide to the head of Green river, and down it to Pemberton Meadows, where I arrived on August 8th. The distance by wagon-road is about 66 miles. This wagon-road has been constructed by the contractors along the railway for the purpose of hauling in supplies from Headquarters, situated fourteen miles from the mouth of the Squamish river, and to which point steel had been laid and trains were being operated.

The Squamish valley, which the railway follows for about ten miles, has considerable width, and I passed several ranches having every appearance of prosperity, especially the large hop-ranch situated about six miles north from Newport. After passing the confluence of the Squamish and Cheakamus rivers, the wagon-road leaves the Squamish and follows up the east bank of the Cheakamus; in this portion there is no valley on the east side of that river, but on the west side the valley is apparently quite wide, and the fact that substantial bridges have been built across both these rivers would indicate that the settlement along the valleys was considerable.

For a distance of about four miles beyond Headquarters, along the east bank of the Cheakamus river, there is a wide valley; beyond this the bluffs come close to the river, necessitating the construction of the wagon-road by blasting-out of the solid rock of Bear

mountain. This wagon-road is about 100 feet above the railway-grade, which latter follows along the east bank of the river to a point seven miles from Headquarters, where it will cross to the west bank. The wagon-road, however, continues along the east bank. This portion of the river is a succession of falls and cataracts, the stream flowing through a box canyon for some miles. The water-power that could be developed from the Cheakamus river would be great, and the scenery is very grand.

At Mile 9 from Headquarters, George Cunningham, sub-contractor, has established his No. 1 construction camp, and was engaged in grading very heavy rock-work; in fact, about the heaviest along the entire line. Although all his work is on the west bank of the river, his camp is on the opposite side along the wagon-road, and his men and horses cross to and from work by means of substantial cable suspension bridges, the design and construction of which well merit mention.

The rock formation across Bear mountain is granite of greenish tint, showing in places gneissic structure.

After leaving Cunningham's camp I travelled along the wagon-road blasted along the mountain-side for about one mile; then I dropped down to the river-bottom, which I followed for about half a mile, and, turning easterly over a low ridge, crossed Stony creek; and, after passing Daisy lake, traversed a wide valley to a point between twenty-seven and twenty-eight miles from Squamish, where the wagon-road crosses to the west side of the Cheakamus river, and here again has had to be constructed by blasting along the mountain-side.

The rocks observed along this portion were basalt and other volcanic rocks, except between Miles 16 and 17, where a narrow belt of black slate occurs. At Mile 17 from Headquarters, or 31 from Squamish, the Brandywine river is crossed by a good bridge, and about two miles beyond, the North fork of the Cheakamus river is crossed, also on a good bridge. The same character of rocks prevails, but in this portion much of the rock formation is hidden by swamps.

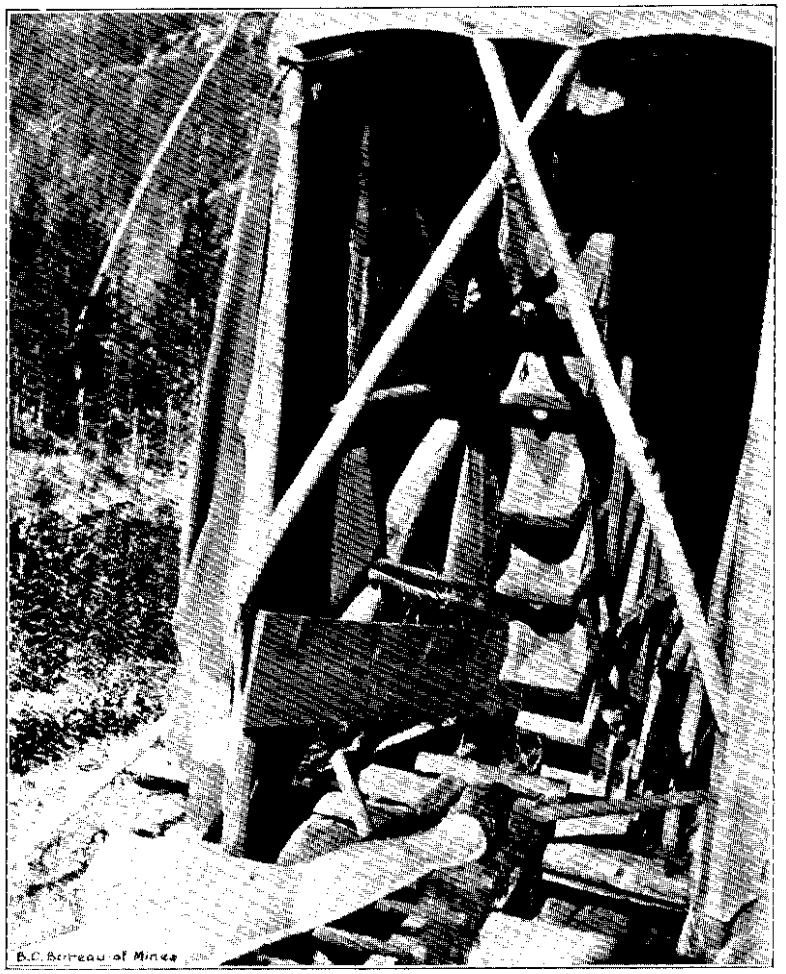
Between Miles 19 and 21 from Headquarters the excellent quality of the timber, fir, balsam, hemlock, and spruce, is very noticeable.

On August 7th I left McGillivray's No. 2 construction camp, thirty-six miles from Squamish, and, after passing Summit lake, arrived at the southerly end of Green lake. The rocks observed were of greenish-coloured granites, some having gneissic structure, but near Mile 43 from Newport a narrow belt of black slate occurs. Near the road at this point there are extensive gossan outcroppings, also indications that iron ore occurs in the vicinity. Near here a trail branches off to the east, leading to the Green Lake Mining and Milling Company's property, but, as no work has been done since the Provincial Mineralogist made an examination in 1910, and as I was also informed there was no one at the camp, I did not visit it. At Mile 40 from railroad Headquarters, or 54 from Squamish, at an elevation of 2,597 feet above sea-level, the dividing line between Vancouver and Lillooet Mining Divisions is indicated by a sign-post. For some distance in this vicinity the wagon-road crosses immense rock-slides, and it is noticeable that to the north the timber is not of as large growth as south from Green lake. The railroad from the south is being constructed along the east side of Green lake, while the wagon-road follows the west side. Green river flows out of Green lake from the north end, and the wagon-road crosses it by a substantial bridge.

LILLOOET MINING DIVISION.

At this point on my journey I entered the Lillooet Mining Division.

The night of August 7th was spent at Jones's No. 2 construction camp near the confluence of Six-mile creek and Green river. A three-mile ride on the morning of August 8th brought



Home-made Pelton Wheel—Cadwallader Creek.

Green River Falls—Lillooet M.D.

me to the Green River falls, where the waters of that stream rush through a narrow box canyon and, within a short distance, fall about 200 feet in three nearly vertical falls, consequently offering one of the best opportunities for the development of an extensive power system in this section of the Province.

An old log bridge spans the box canyon, which was built by the Indians, years ago, to enable them to gain access into the mountains to the south, where bear and other game used to be very plentiful.

Another opportunity to develop great water-power is found on One-mile creek, a tributary of Green river, which is crossed near its mouth about two miles from the Green River falls; this is so called One-mile because of it distance from Pemberton Meadows. The falls on that creek are located about three miles up from the road-crossing, and a splendid view of them can be had from near the Pemberton rancherie, at a distance of nearly ten miles, while the noise of the water falling can be plainly heard at the old Currie ranch at about five miles distance.

On August 8th I arrived at Pemberton Meadows about noon and decided to lay over to ascertain if any prospecting-work was being carried on in that district, because, in 1898, I had my attention drawn to several quite extensive bodies of a decomposed quartz carrying large quantities of iron-pyrites. These occurr on One-mile creek and also some thirty miles from Pemberton Meadows, on the divide between the upper Lillooet river, which flows through Pemberton Meadows into Lillooet lake, and Cadwallader creek. In the fall of that year I had some fifty samples of this material assayed, and although every sample showed traces of gold, all were too low grade to merit any further attention at that time. The extent of the bodies on one-mile creek was great, being from 100 to 800 feet in width, so that it is quite possible prospecting might expose a pay-streak of commercial importance. Through inquiries I ascertained that practically no prospecting had been done in this section since my visit in 1898, except a little at the head of Lillooet lake near the old Cariboo road, and on Owl creek, a tributary of Poole creek, which empties into the Birkenhead river, a tributary of the Upper Lillooet river, along the portage between Pemberton Meadows and Anderson lake. The head of the Birkenhead river is about thirty-six miles north from the new bridge across the Lillooet river near the old John Currie ranch, and its mouth is opposite the Upper Pemberton Indian rancherie.

Messrs. Bowers, Strickland, and Lindsay, who had been prospecting near the head of Lillooet lake, reported finding a ledge of rock which they thought to carry platinum, but, as all of these men were out of the country at the time of my visit and the exact location of the claims was not known by any one I met, it was useless to attempt to find the claims without taking more time than I considered was warranted.

The prospecting on Owl creek had resulted in several claims being staked, but no work had been done, nor were the prospectors convenient to find, so I did not visit that creek.

The Pemberton Meadows, if some system of drainage was installed on the lower portion, would develop into one of the most important and thickly settled agricultural sections in British Columbia. The soil, a black loam, is both very rich and deep; in fact, a well on the old Currie ranch, 14 feet in depth, showed the soil to be at least that depth. Crops of every description—even maize or Indian corn—mature and produce phenomenal crops. The extent of the bottom lands along the upper Lillooet river is great; flats are always found either on one side or other of the river, and in places on both sides, for a distance of about fifty or sixty miles up from the head of Lillooet lake. At present a good wagon-road has been built along the south-west bank of the river for a distance of twenty-six miles, and several ranchers are farming tracts preparatory to furnishing farm produce to the Coast markets when the rails

are laid on the Pacific Great Eastern Railway. The upper portion of the valley needs no drainage; in fact, if the log-jams were removed from the channel of the river, only that portion near the mouth of Green river would require any extensive drainage system.

I ascertained that no prospecting has been done in the Blackwater country since 1898; therefore I did not visit that section, which is reached by an old trail that branches off to the north-west from the Portage wagon-road near the Ronald Currie ranch, on the headwaters of Poole creek, about half-way across the Portage.

After leaving Pemberton Meadows and crossing the upper Lillooet river on the bridge near the old John Currie ranch, the wagon-road follows along the north bank of that river to a point nearly opposite the church on the rancherie, then up the west bank of the Birkenhead river, where, at a point about eight miles up, is located the Dominion Government fish-hatchery. Here T. W. Graham, the superintendent, drew my attention to some specimens of clay he had found on the hatchery reservation, which, from crude experiments he had made, would appear to be of commercial value. I arranged for him to send samples to the Provincial Mineralogist for analysis.

On the morning of August 10th I left Nixon's construction camp, near the head of Tchalnicht creek, where I had stayed during the night previous, and travelled to the head of Anderson lake, a distance of fifteen miles. This portion of the portage offers good opportunities for farming, as there are several large areas of alder bottom land that could be cleared with little difficulty. At present there are about half a dozen partially cleared ranches under cultivation, in addition to several smaller patches on the Indian rancherie near the head of the lake.

From Squamish I had for the most part found accommodation at several of the construction camps along the line of the Pacific Great Eastern Railway through a letter kindly given me by Mr. Sperry, the traffic manager at Squamish, and I desire here to record my thanks to the various time-keepers and foremen at the camps where I stayed for their uniform courtesy and kindness.

McGillivray Creek.

On the morning of August 11th I left the south-west end or head of Anderson lake and followed an old Indian trail in a northerly direction across a high rocky point that projects out into the lake on the west shore, to the mouth of McGillivray creek, distant nearly ten miles by this trail. The prevailing country-rock is apparently diorite, or a rock very closely resembling it, in which occur some extensive intrusive dykes of hornblendic eruptives usually of a dark-greenish colour, but I could observe no indication of mineralization. The trail after crossing the rocky point passes through some fair-sized alder bottoms, where the conditions appear favourable for farming, then ascends to the summit or divide near the south bank of McGillivray creek, where the elevation reached is about 1,000 feet, or 1,200 feet above Anderson lake or from 1,850 to 2,050 feet above sea-level, and the creek flows over a series of falls between precipitous banks. The trail from the summit down to the bed of the creek is well graded, but steep. At the mouth of McGillivray creek I left the railroad-grade on the lake-shore and travelled in a westerly course along a steep switchback trail up the north side of the creek for about five miles to the property of the Anderson Lake Mining and Milling Company, known as the old "Brett mine," that was discovered by the Brett Brothers, of Lillooet, in 1898. This is at an elevation of about 3,300 feet above sea-level. As the property was fully described by the Provincial Mineralogist in his report for 1910, and, as no work had been done since, and apparently the entire milling plant, tramway, and cabins have been abandoned and are fast becoming ruins beyond repair, I did not devote any time to examination, but on the morning of August 12th started along the trail up McGillivray creek to the forks, about five miles distant from the mine.

About three miles up, a new trail branches off to the right, up the precipitous mountain-side to an elevation of about 4,000 feet above sea-level, while the old trail descends into the valley to the forks of the creek, the south fork of which flows into the main creek from the south-west, while the main, or north, fork flows from the north. The new trail had been built about two weeks previous to my visit and was constructed on an excellent pack-trail grade.

The rain was falling heavily, and where the rock formation was not hidden by rock-slides it was overlaid by soil, thus preventing any observation as to the geological formation passed over.

As elevation was gained the timber became less plentiful; in fact, the trail was just below timber-line until a small creek, a tributary of McGillivray creek flowing from the west, was crossed at an elevation of 5,000 feet. This for the most part flowed through parks, where the clumps of balsam and spruce and good grass for horse-feed made most picturesque scenery. On the north bank of this creek I found some tents, used as the packers' or trail camp, of the McGillivray Mountain Mining Company, which afforded shelter from the heavy rain.

On the morning of August 13th, although the rain was still falling, I broke camp and again took the trail toward the summit of McGillivray mountain, where is located the property of the McGillivray Mountain Mines, Limited, of which S. A. Cawley M.P.P., of Chilliwack, is president, and J. M. Williams is managing director, who also personally superintends the work.

The trail from the packers' camp started at timber-line and gradually ascended until, at the mining camp, a distance of four miles, an elevation of 6,800 feet is reached and every vestige of timber was left behind. The mountain-side has a slope of about 35 degrees and is covered with a most luxuriant growth of grass and wild flowers. The rain soon turned to snow, and, when the cabin on the mining property was reached, a regular snow-storm, approaching a blizzard, was raging.

McGillivray Mountain Mines.

With Mr. Williams as guide, I started to examine this property, which consists of three mineral claims, staked in September, 1911, and located as the *Empire*, *Empire No. 1*, and *Empire No. 2*. The *Empire* claim takes in the apex of the mountain, and on the north-west side is overlaid by a glacier for about 500 feet. The *Empire No. 1* claim is located to the east (mag.) of and adjoining the *Empire*, while the *Empire No. 2* is still farther to the east and adjoining the *Eagle No. 1*. All the work has been done on the *Empire* claim, and this consisted, at the time of my visit, of two adits; the upper, at an elevation of 7,400 feet, but 100 feet below the apex and outcrop, is a drift 15 feet long on the foot-wall side of the vein, with a crosscut 18 feet long to the hanging-wall of the vein material and beyond into the country-rock. The lower adit had been driven in at an altitude of 7,100 feet, or 400 feet below the apex of the mountain, and was a crosscut 65 feet long, having been driven to intersect the ore-body, which, according to survey, should have been reached about 16 feet farther in, where, if found, it would give 60 feet of backs; from there drifting was to be commenced, and the height of backs would increase very rapidly. This crosscut was commenced at this point instead of on the outcrop because of the exposed position of the latter to snowslides. Some idea of the danger from these may be had from the fact that at the time of my visit there was the remains of a slide several feet deep lying between the cabin and the mine-workings.

The fissure, filled with vein-matter, forms a most conspicuous landmark on the mountain-side; the dip of the ore-body is at an angle of 60 degrees towards the south, the strike being N. 75° W. (mag.). The vein-matter is quartz carrying malachite, azurite, and grey copper. The foot-wall is an argillite, the hanging-wall on the surface being serpentine. Slide-rock almost fills a deep gulch to the east of the apex of the mountain and below the mine-workings

but, at a point about 700 feet lower elevation and some 1,500 feet horizontally along the strike of the ore from the outcrop of the mountain, I found what was apparently a continuation of the ore-body in place on the *Empire No. 1* claim, and took a sample across 4 feet which assayed: Gold, 40 cents; silver, 35.2 oz. a ton. Another sample from the *Empire* claim from the upper adit assayed: Gold, trace: silver, 35.4 oz.; copper 0.5 per cent. a ton. These samples were not taken to represent a "cold-blooded average," but as being typical of the class of ore.

In the gulch beyond the rock-slide I had a good opportunity to study the series of country-rocks, which includes a narrow belt of crystalline limestone next to argillites on the northern or foot-wall side, with intrusive dykes of igneous rocks resembling gabbro and pegmatite granite, as well as masses of diorite, on the southern or hanging-wall side, but no serpentine showed on this low level. Some fine large green crystals, apparently hornblende with very distinct striation marks, were noticeable in the rock in place in this gulch, which extends towards the east quite a considerable distance.

Mr. Williams had a force of four miners working on the lower adit and expected to continue working until as late a date as possible, and, if he could arrange accommodations and get in supplies, he hoped to work all winter.

To the westward from the *Empire* group and on the opposite side of the glacier on the summit of McGillivray mountain, several mineral claims have been located and assessment-work done; the most prominent of these are three claims held by the estate of W. T. Smith, Jack Johnson, and Dr. H. Christie, of Lillooet.

On the morning of August 14th the blizzard was still raging, about 8 inches of snow having fallen, and in some places drifts 3 or 4 feet deep had piled up, so that all trails were filled, and even with Ab. Brett, an old-timer and thoroughly conversant with the country, as a guide, it was with some difficulty we were able to travel through the pass at 6,300 feet elevation to the head of a small creek below the mountain known as the "Smith" summit, which had to be crossed at an elevation about 6,800 feet in order to descend into the Cadwallader creek valley on the opposite side and nearly 2,000 feet lower. At the head of this creek I found Jack Johnson and John Olson, two prospectors just preparing to break camp; they had been engaged in doing assessment-work on some of the mineral claims I have referred to as located west from the *Empire* group; they had some ore quite similar to that found on the *Empire* claim, of which I had taken a sample, and would have been glad to show me over their ground, but the depth of snow absolutely prevented any examination, and the weather conditions did not promise any improvement, at least for some days; consequently I took Mr. Olson as guide over the "Smith" summit, where all the trails were obliterated. I continued my journey and in the afternoon reached the bottom of the mountain and Cadwallader Creek valley, where a gang of roadmen was camped, engaged in slashing out a new trail around the base of this mountain to the divide at the heads of Cadwallader and McGillivray creeks, and so connect with the trail built down the latter creek.

When this connection is made, it will be quite an easy trip from the mouth of McGillivray creek over the divide, at 5,800 feet elevation, and down Cadwallader creek. The distance from the Pacific Great Eastern Railway, at the mouth of McGillivray creek, to the *Coronation* mine on Cadwallader creek by this new route will not exceed twenty-two miles.

As we descended the "Smith" mountain on the Cadwallader Creek side from an elevation of 6,800 feet there was no snow on the ground at about 300 feet below the summit, although rain had fallen heavily, which appeared strange, as on the McGillivray Creek side the snow had extended down to the creek-level, or at least about 1,000 feet lower than the summit.

CADWALLADER CREEK.

On the morning of August 15th the rain was still falling, but I proceeded to travel down Cadwallader creek until I reached Hathorn creek, a tributary flowing in from the north and distant about four miles from the road camp. Here I found E. E. Freeland, of the Dominion Geological Survey, in camp, with a party of assistants, awaiting clear weather to enable him to take photographs from the summit of a high mountain on the south side of Cadwallader creek for a topographical survey he was making of the district.

After crossing Hathorn creek the geological formation, which had been hidden to the east of the creek, was exposed in places, and I could see argillites in place with lenses of apparently barren quartz embedded within the folds. The *Coronation* mine camp was reached about 4.30 p.m., rain having fallen almost continuously all day.

The morning of August 16th broke clear and promised fair weather. I travelled to the Pioneer group, about half a mile east from the *Coronation* camp.

Pioneer Group. This property originally consisted of the *Pioneer* claims, located by F. H. Kinder, but the group now consists of seven claims and three fractions, the *Pioneer* claim being the most westerly. Adjoining this to the south and across Cadwallader creek is situated the *Sunset*. To the east, in a solid block, are the *Union Jack Fraction*, *Coral Sand*, *Emondale*, *Olympia Fraction*, *Great Fox*, *East Pacific*, *Titanic Fraction*, and *Clifton*. The property was acquired from Mr. Kinder about two years ago, and is now held by the "Pioneer Syndicate," of which Andrew Ferguson, of Vancouver, is the manager. He was in camp making preparations to resume work after a suspension of operations, and I examined the property in his company.

The elevation at the cabin is about 3,900 feet above sea-level. The outcroppings occur on the north side of and 60 feet above the creek, where two distinct veins had been located. The strike of these veins is nearly east and west; the dip of each vein is nearly vertical, with a very slight inclination towards the north or into the high ground back from the creek. To the south a belt or zone of serpentine rock occurs, but the walls of the veins are an igneous rock, classified by Dominion Geologist Camsell as "diorite," showing schistose structure near the fissures containing the vein-matter, and, where it forms the foot-wall of the No. 1 vein, underground, this rock is very much altered; in some places the feldspar appears to have become segregated and is found in solid blocks.

The work has been all done on the *Pioneer* claim, except 100 feet of crosscut tunnel on the *Great Fox* claim, which was driven about 3,000 feet to the east from the main workings on the *Pioneer* in the hope of crosscutting these ore-bodies, but so far this hope has not been realized. This crosscut was driven at a very much higher elevation than the *Pioneer* workings, and in the argillites which flank the diorites on the north side.

At the time of the Provincial Mineralogist's examination of the *Pioneer* claim, in 1910, in addition to small prospect-pits, he found a total of 215 feet of underground work, but since then that total has been increased to a total of 671 feet on the *Pioneer* claim and 100 feet on the *Great Fox* claim.

The new work on the *Pioneer* claim is made up of a crosscut 300 feet in length, the portal being located at a point about 400 feet to the east of the west line of the *Pioneer* claim. This crosscut is expected to cut the No. 1 vein at about 100 feet farther in, where there would be about 100 feet of backs. Additional drifting has also been done on both the veins crosscut in the original adit; on No. 1 vein the drift to the west has been extended from 30 to 35 feet, and the drift to east from 10 to 21 feet. On the No. 2 vein the drift to the west has been extended from 20 to 160 feet; this work has resulted so satisfactorily that, at a point 70 feet

in, or 50 feet beyond the face of that drift at the time of Mr. Robertson's visit, the width of quartz-vein matter had increased from 2 feet to about 12 feet, which width continued for about 30 feet, when it gradually decreased to 3 feet in the face, some 60 feet farther to the west. At the point where the increased width began, it appeared as though another vein had formed a junction with that which the drift had been run on from the crosscut, and the manager thought that the two known veins encountered in the crosscut had united; but, if such had happened, it would have been necessary for the No. 1 vein exposed in the crosscut to have changed its line of strike from nearly east and west to north-west, thus making a turn of almost 45 degrees between the present face of that vein in the west drift and the point on No. 2 vein in the drift where the increased width was first noticed. This may have occurred, but is hardly probable, when the conditions as to regularity and continuity of lines of strike throughout the camp are considered, so I should rather favour the theory that a third vein had crossed the No. 2 vein, and I think that drifting will demonstrate such to be the case. The backs above the two veins crosscut in the adit are about 60 feet, and, after this ore is stoped, sinking must be done to develop more ore as at this point the portal of the adit is on the bank of the creek and only about 4 feet above high-water mark.

A sample taken across 3 feet at the face of the west drift on No. 2 vein, representing about an average of the ore, assayed: Gold, $16; silver, 1 oz. a ton.

The old arrastra and water-wheel described by Mr. Robertson are still on the ground, but have been allowed to go to ruin.

Coronation Group.

On the same day I examined the underground workings on the *Little Joe* claim, one of the claims originally incorporated in the *Bend' Or* group, which is now the property of the Coronation Mining Company, of which H. B. Thomson, M.L.A., of Victoria, is president; Fred H. Forbes, secretary; while C. L. Copp was superintendent at the time of my visit and for a couple of years previous, but was shortly afterwards succeeded by Chas. C. Galloway, who is still superintendent. This property comprises the following mineral claims: *Little Joe*, *Countless*, *White Crow*, *Exchange Fraction*, *Delighted*, *Happy Thought*, and *Jim Crow Fraction*, which are so located as to include 2,700 feet along the line of strike of the known mineralized zone.

Since the Provincial Mineralogist's visit in 1910, this group of claims has been acquired by the Coronation Mining Company, and the work of developing the ore reserves has been carried on continuously since the season of 1911 on both the *Little Joe* and *Countless* claims. During the present season stoping ore, and milling I found had been going on since June.

The development-work on the *Little Joe* claim, done by the present owners, consisted of driving a crosscut from the No. 4 tunnel a distance of about 300 feet to the vein, about 400 feet below its outcrop; drifting along the vein a distance of 300 feet, and upraising to the No. 3 level about 90 feet. The old workings above the No. 2 level had been all stoped out and caved, so that no entry could be made into them.

Only one vein, filling a well-defined fissure with good walls and a gouge parting the vein-matter from the walls, has been developed on this claim; this occurs in the same character of country-rock as the veins on the *Pioneer* claim, and its line of strike, nearly east and west, is similar to those veins, but its dip is at an angle of 70 degrees towards the north.

The vein-matter is white quartz, showing, in places, visible free gold; much of this quartz has a ribbon structure, and such portion invariably carries the highest values; this structure usually has a width of from 6 to 8 inches, although the vein-matter between the gouge on each wall usually averages about 18 inches in width.

Stoping from the No. 4 level had been carried up 35 feet along the length of the ore-shoot as exposed in the drift, about 300 feet in length. The east face of the drift showed a pinch in the vein, but this fact should not deter further development in that direction, for, although the same conditions are found in the upper levels, it has been proved, by trenching on the surface, that the vein maintains its continuity in that direction.

An examination of the No. 3 level, to which I ascended by the upraise, showed that quite a quantity—though not all—of the ore had been stoped from between No. 3 and No. 2 levels, but it was not possible to measure the tonnage remaining.

The ore-shoot on the No. 3 level was about the same length as on the No. 4, and in the floor of the No. 4 drift the width of ore appeared to be about the same as in the upper levels.

It would now appear that the No. 4 adit did crosscut the course of the vein, at a point 30 feet to the south or nearer the portal, from where the crosscut was started in the country-rock, although the fact was not realized at the time, presumably because the vein was badly broken up, due, possibly, to the fact that at this point a gulch cuts through from the hill in which the vein occurs to the creek near there, and the west wall of the adit is not far from this break in the country. Consequently, when the present company started a crosscut to find the vein, it was started at a point in the adit some 30 feet inside of the vein intersection, and the course of the crosscut was so nearly parallel with the vein that the crosscut had to be driven 300 feet before it cut the vein, known as the "Ribbon vein"; after which drifting was done on this vein both to the east and west, the drift to the west being now nearly back to the adit, thus rendering it probable that the vein had been cut by the adit in driving.

This west drift, at its present face, some 30 feet from the No. 4 crosscut, meets a cross-course vein, known as the "Bull lead," from 18 to 36 inches wide, of low-grade quartz, running nearly parallel with the main No. 4 adit and to the east of it; this Bull lead was also encountered in the crosscut, but did not there carry important values. This Bull lead appears to somewhat break up the Ribbon lead in its westward extension, and to a certain extent absorb it, but to what extent is not known as yet. It is quite possible that this may be the explanation as to why the old management did not recognize the quartz, encountered in driving the No. 4 adit, as being the probable extension of the Ribbon lead.

A second vein is known to occur in the *Little Joe* claim, apparently paralleling the vein just described as now being worked. This second vein had been exposed at one point only, and that was in the working done about 1900 on the No. 2 level, where it showed quartz carrying a large percentage of iron-pyrites, but the values found were too low to permit of profitable milling at that time, especially without arrangements for treating concentrates.

It would be difficult to estimate the tonnage of ore in sight, since the width of the ore in the vein varies, and the ground between the third and second levels was not in good condition to examine.

The 10-stamp mill, which had been erected on the property in 1899 and operated during the summer months until 1901, has been repaired as has also the flume which carries water from Cadwallader creek to furnish the power. The mill was being operated during my visit, and, I was informed by the management, with satisfactory results, saving 76 per cent. of the values by amalgamation, while the tailings were being impounded for future treatment by cyanidation.

With regard to the milling operations for the year 1913, Fred. H. Forbes, the secretary of the Coronation Mining Company, informs me that up to November 19th there had been a total of 880 tons of ore milled, which yielded, by amalgamation, bullion of the value of $27,000, and also about 25 tons of concentrates, assaying in gold $105 to the ton. The tailings from this ore were saved, and these assay from $5.60 to $7.22, averaging about $6 to the ton.

The comparatively high value of the tailings is accounted for by the fact that the only concentrator used was a sluice lined with blanket.

A small sawmill run by the same power has been installed to cut lumber and mining timbers, and, as there is no timber on the north side of Cadwallader creek, where the mill and mine workings are situated, a cable carrier has been devised to transport logs from the south side of the creek to the mill, or to deliver them on the tramway between the mill and the mine. A surface tramway connects the portal of No. 4 adit with the ore-bin at the stamp-mill, one car at a time being easily handled by one man.

Countless.

On August 17th I examined the *Countless* mineral claim. This adjoins the *Little Joe* claim on the east, and was acquired by the Coronation Mining Company about the end of 1910. The old workings, described by the Provincial Mineralogist in his report for 1910, have caved in, but about a year ago the Coronation Mining Company drove a crosscut adit about 500 feet in length and having 210 feet depth of "backs" at the face; for the first 100 feet this adit was driven through surface sand and gravel, requiring close timbering, which was very well done, but beyond that no timbering was necessary. After passing through the surface work, about 360 feet of the diorite country-rock was crosscut, when a quartz vein 3 feet in width was cut, with a strike nearly east and west and dipping 60 degrees to the north. Beyond this, after driving through 35 feet of country-rock, to within a foot of the face, a second vein of white quartz, 10 inches wide, with ribbon structure, was exposed; its strike is nearly east and west and dip 65 degrees to the north. This second vein looks very similar to the *Little Joe* vein.

The first vein, where it was crosscut, was somewhat broken up and mixed with country-rock. No drifting had been done on either of these veins, but I am informed by the president of the company that they will be thoroughly prospected and developed during the coming winter, so that ore may be milled from this claim next season.

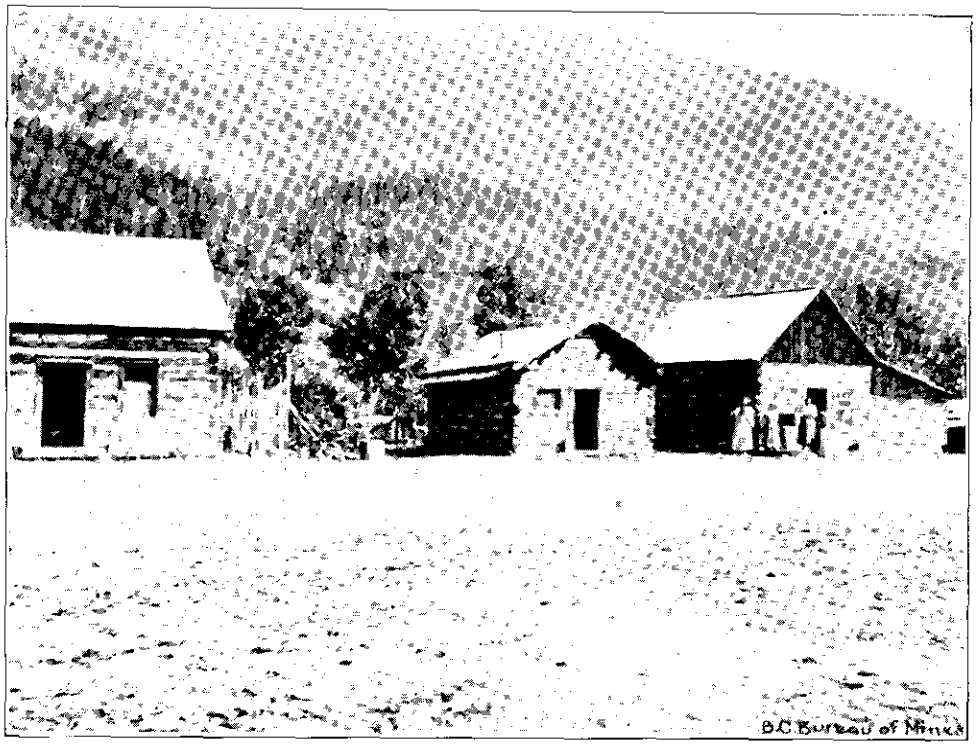
Ida May.

This property has not been worked for some years; it is situated to the west of and adjoining the property of the Coronation Mining Company. The work was done prior to 1901, under its original ownership, by the Alpha Bell Gold Quartz Mining Company. The property is now reported to have been recently acquired by a Vancouver syndicate. The location of the old workings is at a point about a mile north from Cadwallader creek, and at a somewhat higher elevation than the workings on the *Little Joe* claim of the *Coronation* group. As no work had been done since I examined and reported on this property, in April, 1901, I did not visit it, but extract from my report made at that time, as follows:—

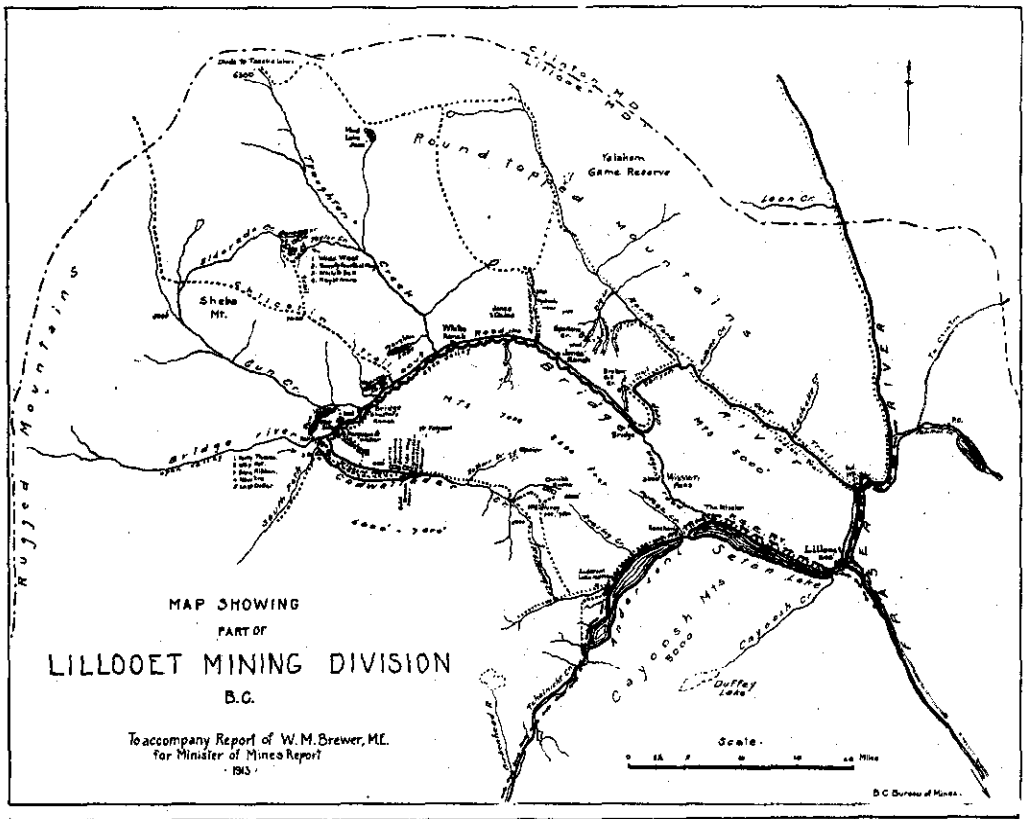
On the *Ida May* claim there is a total of 278 feet of development done on two distinct veins; on the upper vein, which has much the same characteristics as the *Little Joe* vein, a crosscut adit 30 feet in length has been driven to the vein, which was drifted on for 65 feet; this vein averaged about 2 feet in width.

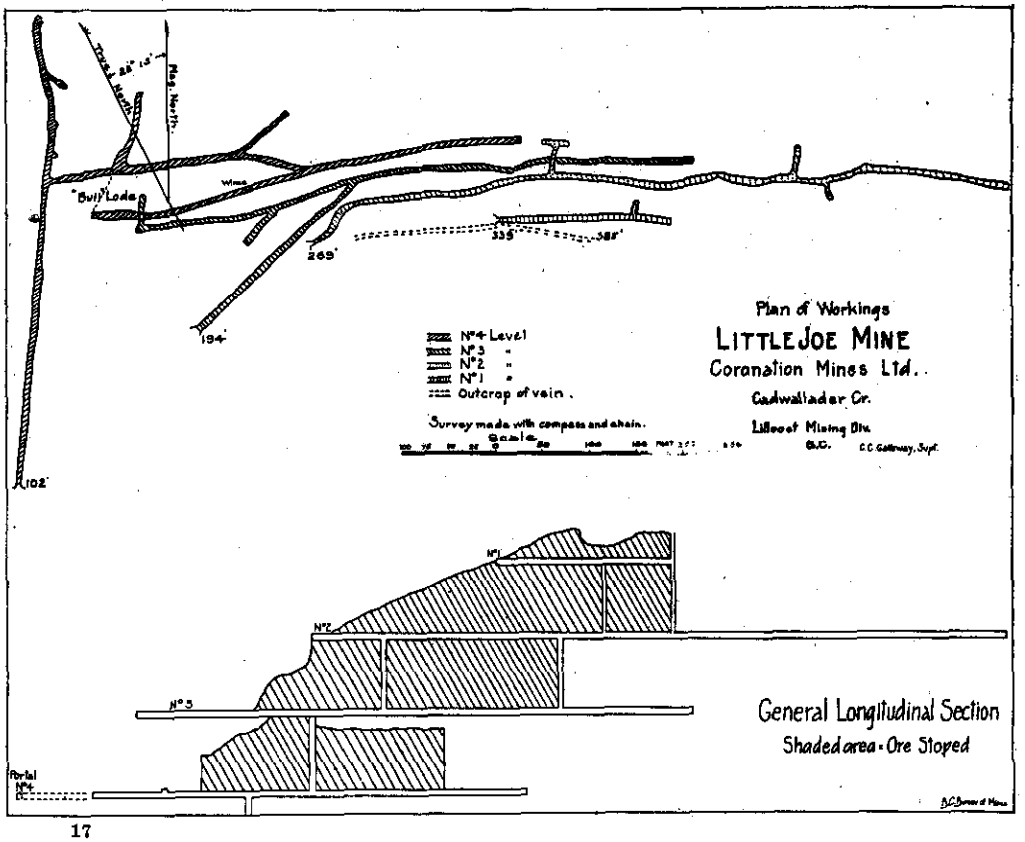
On the lower vein a crosscut adit, about 90 feet under cover, cut the vein where it was 3 feet 6 inches in width. About 90 feet of drifting was done in the country-rock parallel to the vein, leaving the vein exposed only on the hanging-wall side. The strike of the upper vein is N. 85° E. and dip 35° towards the north; the strike of the lower vein is north-west and the dip is vertical. The walls of both veins are well defined, with gouge on each wall. The work on the upper vein is peculiar, for the reason that a second adit has been driven immediately under the first, presumably with the intention of sinking on the vein on an incline from the point where it was found to dip at so low an angle as 35°. I judge, though, that this portion of the vein must have broken over, because at no other point in the mineralized zone did I find any other vein with such a flat dip.

Seton Lake—from Mission.



Rancherie at Mission—Seton Lake.


MAP SHOWING
PART OF
LILLOOET MINING DIVISION
B.C.
To accompany Report of W. M. Brewer, M.E.
for Minister of Mines Report
1915
Rugged Mountains
Round Top Mountains
Yalakom Game Reserve
Shehe Mt.
Bridge River
Cayoosh Mts
Cayoosh Creek
Duffey Lake
Lillooet
Scale.


Bull Lode
Mag. North
269'
335'
388'
194'
102'
No 4 Level
No 3 "
No 2 "
No 1 "
Outcrop of vein.
Survey made with compass and chain.
Scale
Plan of Workings
LITTLE JOE MINE
Coronation Mines Ltd.
Cadwallader Cr.
Lillooet Mining Div.
B.C.
No 1
No 2
No 3
General Longitudinal Section
Shaded area - Ore Stoped

Samples from the *Ida May* taken from the upper vein, across 2 feet, assayed $23.20 in gold to the ton. A grab sample from the dump assayed $6 a ton in gold; a sample from the lower vein, across 3 feet 6 inches, assayed $3.20 a ton in gold.

Blackbird. This claim has been acquired within the past few months by the Blackbird Syndicate, composed of Victoria business-men, who furnished the capital for the work which was under progress at the time of my examination on August 18th. The eastern boundary of the claim joins the western boundary of the *Ida May* claim. The work is being done under a wide outcrop of quartz near the western boundary; this consists of a crosscut tunnel 7 feet high by 5 feet wide. Since my return from this trip I am informed by Fred. H. Forbes, secretary of the syndicate, that the adit had been driven 106 feet in length, when it crosscut a quartz vein 28 inches wide, and that this vein is being drifted on; also that the values are from $12 to $14 in gold to the ton.

In order to determine the continuity of this vein towards the east, six cuts have been made by ground-sluicing off the overburden, the water for this being brought in ditches from small lakes in the mountains to the north. These cuts show a quartz vein of from 1 to 8 feet in width, with a general line of strike nearly east and west and dipping towards the north.

A sample, typical of the ore on the outcrop above the crosscut adit, taken by myself, but not to be considered as an average sample, assayed: Gold, $2; silver, trace, to the ton.

Lorne Group. On August 18th I also examined the *Lorne* group of claims, which comprises the *Lorne*, *King*, *Marcus*, *Woodchuck*, *Woodduck* and *Telephone*, owned by the Lorne Amalgamated Mining Company; William Sloan, of Nanaimo, president. There are three arrastras and one 5-stamp mill on this property; these are designated as the *Wedge*, *King*, and *Woodchuck* arrastras, and the *Woodchuck* mill, a fact I mention for the reason that the several mine-workings have been similarly designated by the operators, which designation I have adhered to in the following description.

The old arrastras were driven by overshot water-wheels, the water being brought through a ditch from a small lake at an elevation of about 5,000 feet. The stamp-mill is also operated by water-power, the plant consisting of two Pelton wheels, one 18-inch for driving the rock-crusher, the other 48-inch for driving the stamp-mill, both under a head of 270 feet.

On this property the mine-workings are all situated between 3,700 and 3,900 feet elevation, and the stamp-mill slightly below 3,600 feet elevation, about half a mile in a direct line north from Cadwallader creek, the location being about 600 feet higher elevation and about a mile and a half west from the *Coronation* mine.

I found on this property that a greater number of veins have been discovered and developed than on any other in Cadwallader Creek camp, and the mineralized or vein-bearing zone here appears to have reached its maximum width, so far as at present known, although the diorite formation, in which all the veins on Cadwallader creek occur so far as known, extends considerably wider, and therefore further prospecting may result in the discovery of other quartz veins.

So far, as many as nine apparently distinct ore-bodies have been exposed and opened on the *Lorne*, *King*, and *Woodchuck* mineral claims, but most of the work has been done on four of these, designated as the *Arrastra*, *Wedge*, *King*, and *Woodchuck* lodes.

At least five veins have been demonstrated to exist on the property; these occur in two series, one having the line of strike nearly true east and west, and the other from about true N. 30° E. to N. 70° E.

With the exception of the *Arrastra* lode, which belongs to the series with east-and-west strike, the veins on which old development-work has been done belong to the other series, but new work has been started calculated to explore all of these at depth. This new work consists of a main adit with its portal on the *Woodchuck* claim near the level of the ore-bin floor in the mill, at 300 feet lower elevation than the work on the *Arrastra* lode. This adit has been driven 230 feet, and, I understand, the intention of the management is to continue to drive this and crosscut the formation, to run off drifts from it to make connections with the old workings and thoroughly explore the zone in which the veins occur at that depth; this adit would also be used as a main thoroughfare through which to transport the ore to the mill.

The old workings were described in the Provincial Mineralogist's report for 1910, but this property is of such importance to the district that I deem a brief repetition, especially as some additional work has been done, is not out of place in this report.

The work on the *Arrastra* lode, which is the most northerly ore-body opened, consisting of an open-cut 50 feet in length and a shaft 80 feet deep, was about the first done on the property, and the ore mined, which was treated in the *Wedge* arrastra, is reported as yielding $5,000 in gold. This work is at an elevation of 3,900 feet, the highest point where any work has been done.

On the *Wedge* lode, about 450 feet south-westerly from the *Arrastra* and at an elevation of 3,750 feet, a crosscut adit was driven 100 feet in country-rock to a fault, beyond which ore was exposed in a vein with its strike true N. 25° E. and dip 67 degrees towards true N. 65° W. This was drifted on for a distance of 120 feet, and at a point 100 feet from the fault an upraise was made, about 80 feet, to a short drift. The ore averaged about 2 feet in width throughout the drifts and upraise, and most of it was treated in the double-arrastra plant designated as the *King* arrastra. A sample of typical ore, but not taken as an average, assayed: Gold, $4; silver, trace, to the ton.

On the *King* lode, about 200 feet east from the *Wedge* and at the same elevation, the greatest quantity of work has been done, and the ore mined is reported to have yielded $54,000 in gold from treatment in the *King* double arrastras. The work comprises a deep open-cut 220 feet in length, about 10 feet in width, along a vein having very well-defined walls, which was underhand-stoped from the surface, but, later, a drift was driven 80 feet below the open-cut and upward stoping instead of downward was done. This drift opens up about 320 feet along the vein, and at the face is connected with the surface by an upraise 80 feet high. This vein has its strike true N. 70° E. and dips near the surface in the open workings, at an angle of 50 degrees towards the north-west, but in the drift the ore-body has straightened up, so that the dip is nearly vertical, the slight inclination being towards the north-west.

A typical sample across 2 feet of ore at the face assayed: Gold, $13.40; Silver, 1 oz. a ton. At a point about 150 feet south-west from the drift and open-cut and at 50 feet lower elevation, an adit has been driven about 300 feet in length. The first 25 feet in from the portal is close-timbered, and 25 feet beyond that point a cross-vein of quartz, 6 to 10 inches wide, was exposed, with its strike true N. 45° E. and dip at an angle of 70 degrees towards the north-west. This was followed for about 50 feet, when it formed a junction with the main vein, which had been drifted on 50 feet above, and the drift from that point followed the main vein, with its strike true N. 70° E. The ore-body at the junction measured 4 feet in width, later increasing to 5 feet; then decreasing to about a foot, but widening again to nearly 3 feet; next pinching to 12 inches, and widening to 4 feet at a point 225 feet in from the portal, which width it held for about 20 feet; then narrowed down to 18 inches, which is the width of ore at present showing in the face.

An upraise connecting this drift with the drift above was made at the point where the ore-body showed 4 feet in width; this connection was made 50 feet in from the portal of the upper drift, where some ore had been underhand-stoped. No stoping has been done above the lower adit drift, the portal of which is connected with the ore-bin at the 5-stamp mill, at 120 feet lower elevation, by means of a three-rail gravity-tramway about 300 feet in length.

Woodchuck. On nearly the same level as the top of the ore-bins, or about 100 feet lower than the adit just mentioned, work has been started on the main adit referred to earlier in this report. This has been driven in diorite country-rock 230 feet, but has not yet progressed far enough to expose any of the veins, although, apparently, such should be done within a comparatively short distance.

The mill was not being operated during my visit; in fact, all work on the property had been suspended for some months. I presumed the reason for this being that there had been no plant installed for collecting the concentrates, or even saving them or the tailings for future treatment, and the loss thereby would undoubtedly have been great. Direct cyanidation of this ore might prove the most profitable method for treatment.

On the *Woodchuck* ground, in addition to the main adit referred to, there is an open-cut about 50 feet in length, 10 feet in width, and 20 feet in depth, from which the ore was mined and treated in the 5-stamp mill, yielding, it is reported, $1,500. In addition to this work and the work described by the Provincial Mineralogist in his report for 1910, a crosscut adit has been driven to prospect the ground, at an elevation of 3,625 feet, and with its portal about 400 feet easterly from the stamp-mill. This adit is about 200 feet in length, the first 90 feet close-timbered, the balance driven through diorite, except where four narrow quartz veins have been cut, and at the face an ore-body 10 inches wide is exposed, with its strike at right angles to the course of the adit and dip nearly vertical. The course of this adit from the portal for 100 feet is true N. 50° E., at which point it has been diverted to a more northerly course.

Alhambra. This claim is situated east of and adjoining the *Woodchuck* claim. It was acquired by a New York syndicate in 1901, when development-work was carried on for some months, several thousands of dollars expended, and the claim Crown-granted. Since then I am informed the head of the syndicate has died and the property has remained idle.

The ore outcrops in a bold precipitous bluff, and the main working consists of an adit drift, about 250 feet in length, with its portal about 100 feet lower than the outcrop. This height of backs increased as work progressed along the adit and at the face, because the bluff or ridge under which it is driven increases in elevation quite rapidly in the north-easterly direction in which the adit is being driven. The quartz vein followed by the drift is a very strong one, from 12 inches to 5 feet in width, with well-defined walls and several inches of gouge between the ore and each wall; the strike is true N. 75° E. and dip vertical. At the face the vein has pinched to 6 inches in width. A sample across 6 inches of ore in the face of the adit assays: Gold, $4; silver, trace, to the ton.

Several other openings of minor importance have been made on this claim, evidently during a search for other veins, and, while ore is exposed in some of these, the work has not been carried far enough to demonstrate any material facts.

Argyle Fraction. This claim owned by Mark Eagleston, is located easterly from and adjoining the *Lorne* group. During my visit the annual assessment-work was being done on this claim, and an effort was being made to remove by ground-sluicing the heavy overburden and cross-channel the ground with a deep trench. This work exposed the contact between the argillites and diorite about 1,500 feet east from the

workings on the *King* lode of the *Lorne* property. As there is but little natural exposure of "rock in place" on the claim, long crosscut trenches are absolutely necessary to prospect the ground.

Gold Dream Mining Co.

On August 19th I visited the camp of the Gold Dream Mining Company, of which C. P. Dam, of Seattle, is manager. This company owns five 500-yard bench leases on Cadwallader creek to the west from the Coronation Mining Company's group, also twelve bench and two creek leases at the mouth of the South fork of the Bridge River.

On the north bench of Cadwallader creek, about 750 yards west from the *Coronation* mine, a crosscut 150 feet in length, and averaging about 20 feet in depth and 10 feet wide at the bottom, had been ground-sluiced in order to expose bed-rock. This had been successful, for 100 feet in length, the bed rock being soft and schistose. Some placer gold in heavy particles had been found, but no pay-streak showing really commercial value had been exposed up to the time of my visit.

Last Dollar.

This claim is on the north side of Cadwallader creek, about 4,000 feet above its mouth. The claim is owned by two prospectors, Carl Wihksne and John Boyd. An adit drift has been driven 35 feet in length on a vein that outcropped on the top of the precipitous creek bank, the portal of the adit being 50 feet below the top of the bank, and about 50 feet above the creek. The strike of the vein is N. 35° E. and the dip 45 degrees towards the north-west, but the vein appears, with depth, to be straightening up to a higher angle. This vein fills a fissure with well-defined walls in the solid, and the ore is from a few inches to 2 feet in with. This ore-body is quartz, of a bluish cast, and some of it has ribbon structure. The country-rock is diorite and appears to be an extension of that occurring on the *Lorne* and other claims to the east.

New Era.

This claim is situated on the south side of Cadwallader creek, 3,500 feet above its mouth, and is owned by the same prospectors as the *Last Dollar* claim. An adit was started as a crosscut in a N. 65° W. course, which cut a vein 10 feet in from the portal. From the point where the vein was exposed the course of the adit was changed, and 40 feet farther was driven to drift along the vein, the strike of which is N. 35° E. and dip 60 degrees towards the north-west.

This vein had increased in width from a few inches, where first exposed, to 22 inches in the face; the walls are quite well defined, with gouge on both, between the ore and country-rock. A sample taken across 22 inches of ore at the face assays: Gold, 40 cents to the ton, and silver a trace.

London No. 1.

This claim is situated west of and adjoining the *New Era* claim on the south side of Cadwallader creek, and is owned by the same prospectors. In an open-cut on the surface, 12 feet long, 6 feet wide, and 8 feet high at the face, a fissure-vein filled with quartz, with well-defined walls, has been exposed. This is between 3 and 4 feet in width, and apparently the same vein can be traced to the south-west across the South fork of Bridge river, about 1,000 feet distant. Its strike is N. 70° E. and dips at an angle of 65 degrees towards the north-west.

As this bank of the creek is very precipitous, the owners have started a crosscut adit just above high-water mark in the expectation of intersecting the vein at a depth of 300 feet. They have already driven 40 feet, and, figuring on the dip anticipated, have about 250 feet yet to drive before reaching the vein. These prospectors have done excellent work on all their openings, especially when timbering was necessary. They have also, at their own expense, built a substantial bridge across Cadwallader creek, so strong that eight pack-horses loaded with heavy packs have crossed at the same time.

Blue Ribbon. This claim was staked and ore discovered by Carl Wihksne a few days before my visit, on August 19th. It is situated on the west side of the South fork of Bridge river in the diorite which has a somewhat schistose structure, evidently from shearing movement. The strike is north-west and south-east, with a dip about 65 degrees towards the north-east. At the point where the discovery was made the vein is 2 feet in width, and the quartz filling has ribbon structure similar to that in the *Little Joe* ore-body. A sample from this outcrop, not taken as an average, assays: Gold, $2.20 to the ton, and silver a trace.

Conclusions as to Cadwallader Creek.

From the recent discoveries made by Carl Wihksne, it would appear as though the ground westward from the *Lorne* property to the mouth of Cadwallader creek, a length of about five miles, and for probably half a mile in width, would be worthy more thorough prospecting than it has had, and the same remark applies to the country east from the *Pioneer* mine and between that and the McGillivray summit. During the seasons of 1897 and 1898 a large number of claims were staked that were not prospected or even scratched over, but to-day most of this ground is vacant, and the following facts should be considered by prospectors: The improved metallurgical processes and cancellation of the patents on the method of cyanidation result in profitable operations to-day which would have been very unprofitable at that time. Improved transportation, by the construction of an excellent wagon-road in place of a pack-trail, has reduced the cost of freighting supplies from Lillooet to about $3 a hundredweight. There is no question but that the gold-bearing quartz of this district is well adapted for treatment by cyanidation, either of the concentrates after amalgamation and concentration, or of the ore itself as stoped from the mines. It is a clearly established fact, as stated by the Provincial Mineralogist in his report to the Minister of Mines for 1910, that there are two distinct series of veins with a possibility of more, but these have not been studied in detail or even surveyed, which should be done, and is necessary before the occurrence of the gold-bearing veins can be even thoroughly discussed.

South Fork of Bridge River.

Why Not Group. On the morning of August 20th I visited Haylemore's camp on the *Why Not* group of mineral claims, recently acquired by the Burnside Syndicate, composed chiefly of some Victoria business-men. This group of claims comprises six claims and one fraction, named the *Why Not*, *Why Not No. 2*, *Burnside*, *Guadaloupe Nos. 1, 2, 3*, and *Why Not Fraction*, situated along the east bank of the South Fork of Bridge river, below its confluence with Cadwallader creek.

This bank of the river is extremely precipitous, so much so that for more than 600 feet I could follow, without a break, the dip of a quartz vein down the face of a bluff from the summit, on which the vein outcropped. Its strike is N. 24° W. and dip 55 degrees towards the south-east.

This vein, which in several places along the outcrop is over 6 feet wide and at one point about 10 feet, occupies a fissure between good walls in a country-rock that is so much altered it could not be classified. It is so quartzose, especially on the hanging-wall side, as to be almost a flint, and is so full of iron-pyrites near the vein as to suggest that it might carry some value, notwithstanding the talcose gouge between the walls and the quartz ore-body.

A drift adit had been recently started at a point about 200 feet below and directly under the edge of the river-bank and about 550 feet above the river, where the ore-body is 3 feet in width. The adit starts with backs of about 75 feet above it, but this height increases very rapidly, and at a point 110 feet from the portal is 114 feet. On the incline of the dip the ore-

body can be examined for every foot of that length, as you descend the trail blasted out along the side of the precipitous bluff; consequently, with the ore-body exposed as it is, the tonnage of ore in sight can be calculated with two sides uncovered; while trenching on the surface would uncover the third side. Below the point where the work has been started the outcrop is not so distinct, as slide-rock hides the face of the bluff, but there would appear to be no reason why a break should occur, unless there is a fault also hidden by slide-rock.

On November 4th the superintendent reported the adit had been advanced to a length of 110 feet, also that the quartz vein maintained its continuity that entire length, with the face all in ore; that the width of the vein was from 6 to 7 feet; also that the ore assayed from $10 to $12 in gold a ton.

Two other veins occur on this property. One outcrops at a point about 150 feet above the bed of the South fork of Bridge river, and about 300 feet below the one on which work is progressing. The strike of this second vein is about parallel to the one already described, and the dip, so far as can be judged before any work is done, is about the same. The main outcrop, which is about 200 feet in length and from 8 inches to 2 feet in width, seems to indicate a well-defined fissure-vein.

The third vein on the property outcrops along the summit of the bluff that forms the river-bank, about 700 feet above the bed of the river. This vein is shown by outcrops as comparatively narrow, but it is extremely persistent along the line of strike east and west, and, it is claimed, can be picked up at various points for two miles east from the *Why Not* camp.

The opportunities for cheap mining and milling here are better than at almost any other camp I have visited in years, as a good location for a mill-site is to be had on the river, almost in a direct line down from the portal of the drift, the slope being at an angle of about 50 degrees. The river will not only furnish ample water for milling, etc., but also power, more than sufficient to drive all machinery at mine and mill, while a plentiful supply of timber occurs in the vicinity of the summit of the river-bank, from where it can be lowered to the mine-workings instead of having to be transported uphill, as is usually the case at the Cadwallader Creek mines.

Forty Thieves.

On the north and adjoining the *Why Not* group is situated the *Forty Thieves* claim, owned by the Estate of the late John Marshall, a pioneer of Lillooet, who died about two years ago. This was located in 1897, one of the earliest locations made in the district. A prominent outcrop of rusty-looking quartz, near a huge rock-slide on the face of the high precipitous bluff that forms the east bank of the South fork of Bridge river, was responsible for the discovery of the vein by a prospector who was engaged in tracing up quartz float found at the placer-diggings at the mouth of this river. No work has been done on the claim since it was Crown-granted, about 1898, when it was bonded to a syndicate represented by Barclay Bonthrone, M.E., of Vancouver.

A short crosscut adit had previously been driven near the summit of the river-bank, which had exposed a quartz vein about 3 feet in width, extremely well defined, so far as could be judged, where it outcropped and was exposed underground. Mr. Bonthrone started driving a crosscut adit under the rock-slides from a point near high-water mark in the river. The ore-body where opened showed it to be dipping at an angle of about 50 degrees towards the north-east, or in the same direction in which the adit was being driven; this adit was about 200 feet vertically below and 100 feet south-west of the outcrop. This crosscut would require to be driven about 300 feet to strike the vein, but was abandoned after driving about 100 feet; and the property, after being Crown-granted, has remained idle although it is a very promising prospect.

MOUTH OF SOUTH FORK OF BRIDGE RIVER.

For more than twenty years, placer-mining, both by sluicing and hydraulicking, has been carried on intermittently with varying results. An old Indian named "Hunter Jack" years ago took out quite considerable gold, and since then D. C. Hamilton has been working placer-ground by sluicing, with such success as must be deemed satisfactory to himself at least, because he works energetically every year and "pays his way" with gold-dust, much of which is in heavy particles and small nuggets.

The Gold Dream Mining Company, already referred to in this report, has acquired twelve bench leases and two creek leases near the mouth of the river. The past summer this company has been doing preliminary work in an attempt to expose bed-rock. Two holes were sunk to bed-rock, which was exposed at a depth of 16 feet, but the non-arrival of a pump and gasolene engine retarded the work, and the operators, being driven out by water, left this part of the property to work on their Cadwallader Creek holdings. This machinery was expected to arrive soon after my visit, and Mr. Dam, the manager, told me he had arranged to resume work as early as possible.

Marconi Group.

Near the mouth of Sucker creek, which flows into the main Bridge river from the east at a point about two miles down that river from the mouth of the South fork, and one mile below the Government bridge across Bridge river, is situated this camp, which I reached about noon on August 20th. It is occupied by Messrs. Ferguson and Walker, the two pioneer prospectors and operators who have acquired the *Marconi* group of seven mineral claims.

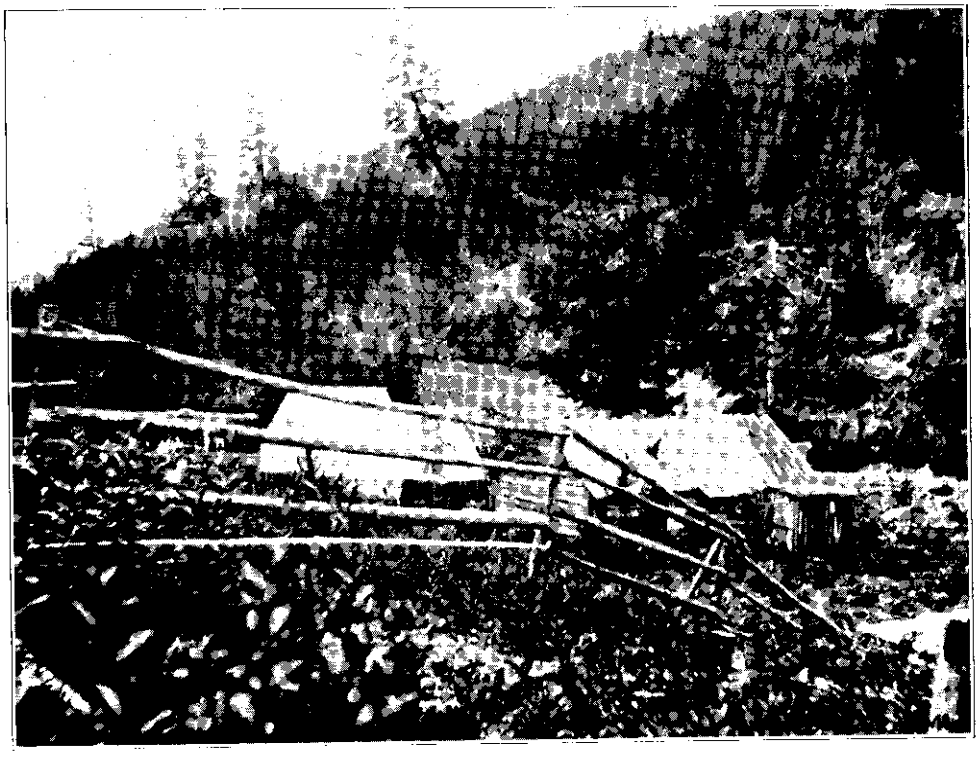
These are situated nearly west from the Cadwallader Creek camp, on an extension of the line of strike of the east and west series of quartz veins that are now being worked, but, as the claims are located in the valley and there are no natural rock-exposures, the surface being covered from 25 to nearly 50 feet deep by an overburden of material designated by Chas. Camsell, of the Dominion Geological Survey, as "volcanic ash," deep cuts by ground-sluicing had to be made to expose bed-rock.

At the time of my visit a crosscut trench 250 feet in length, from 25 to 45 feet in depth, with an average width of between 40 and 50 feet, had been made by hydraulicking, for which purpose the water from Sucker creek was being used. The idea of these operators is to expose bed-rock and locate the line of contact between the sedimentary rocks prevailing along the Bridge River valley and the igneous rock in which the gold-bearing quartz veins occur, but up to the time of my visit they had not succeeded in this, but had exposed three narrow, parallel quartz veins in the igneous rocks, with their lines of strike north-west and south-east.

The bed-rock is overlain by about 3 feet of cemented gravel and sand, so hard that it has to be blasted. *This cement, Mr. Ferguson informed me, carries some gold in quite coarse,* heavy particles, but not sufficient for profitable operations in hydraulic mining.

One portion of the plant in use here deserves special mention because of the ingenuity exhibited in its construction; this is a home-made self-dumping boulder-slide derrick operated by a wooden Pelton water-wheel encased in canvas; the slide-derrick is built on a long trestle, over which a flat-bottomed wooden car, on which the boulders are loaded, is hauled by a rope connected with the shaft of the water-wheel. This trestle can be extended at will, and the success of the machinery is attested to by the immense masses of boulders piled up at the various points that have been used for dumping terminals.

Bridge River—at South Fork.



Pioneer Mine Cabins—Cadwallader Creek.

Wayside and Commodore Groups.

I visited this property on August 21st, and found that since the Provincial Mineralogist's visit in 1910 a change in ownership and management had taken place, D. C. Paxton and associates, of Cincinnati, Ohio, being the present owners, with that gentleman acting as manager. These groups of mineral claims comprise the *Wayside*, *Radium*, *Hellium*, *Argon*, *Queen City*, *Covington*, *Newport*, *Camp Denison*, *Commodore*, *Howard*, *Cincinnati*, and *Ohio*. Six of these are located parallel to the north bank of Bridge river, the remainder, adjoining to the north-west, extend back into the mountains.

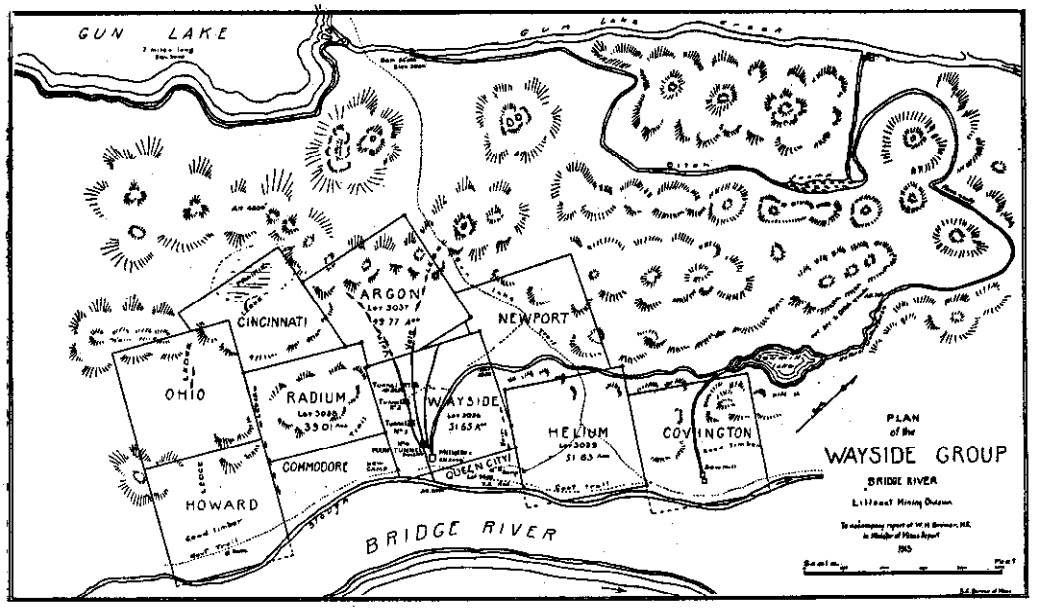
The mine camp is located nearly opposite the *Marconi* group camp, and it is a model as regards construction of cabins and excellent trails connecting them with the various mine-workings.

The mountains at this point rise abruptly from the river-bank, so that within the boundaries of one claim, the *Wayside*, and not more than 1,000 feet from the wagon-road along the river-bank, the difference in altitude is 540 feet, and within a distance of 4,000 feet, by survey, the difference is 2,100 feet.

All of the work, consisting of seven adits, has been done on the *Wayside* claim. Adits Nos. 1, 2, and 3 were described by Mr. Robertson in his report for 1910, and as no further work has since been done on those, a repetition here is unnecessary.

Adit No. 4 is 105 feet in length and has been driven at an elevation of 2,550 feet, drifting on a fissure filled with talcose material and occasional lenses of quartz. This fissure has a strike N. 35° W. and dips 66° towards N. 35° E. and averages about 18 inches in width. From the face of the drift a crosscut 19 feet in length has been made into the barren, igneous country-rock. Where the quartz lenses occur the values carried show fairly well by panning, but I took no sample because these lenses occur so rarely that it would only be misleading.

This adit, I was informed by the manager, was being driven as a main working-adit, to be eventually connected with adits Nos. 1, 2, and 3 for transporting the ore to the grizzly floor of a mill to be erected on a site chosen at 110 feet lower elevation and almost directly under the portal of the adit.



Adit No. 7 is on the same level as No. 4, about 100 feet west from it; this has been driven 51 feet as a drift on a fissure-vein that varies in width from a few inches to 18 inches. Some of this quartz shows free gold, visible to the naked eye, especially in that portion of the vein having ribbon structure. The strike of this vein is N. 45° W. and dips 45 degrees towards the north-east. The first 15 feet of this adit is timbered, as it was driven through overburden of soil, slide-rock, etc., so that the vein is first exposed between solid rock walls at that point.

Adit No. 6 is situated some short distance westerly from and about 25 feet higher than adits Nos. 4 and 7; this has been driven in 35 feet at the contact between a narrow belt of quartzite and the igneous country-rock. A quite narrow vein of quartz occurs at the contact, but its line of strike swings around from a north-westerly trend towards the west, and the adit has been driven following that, so that it has been driven in almost a semicircular direction for most of its length, and at the face the quartz is mixed up with black slaty material. A sample of this quartz, not taken to represent an average, to my surprise, showed a good "prospect" when crushed and panned, and the pulp assayed: Gold, $28; silver, 0.2 oz. a ton.

I noticed one unusual feature with regard to the ore on this property, which is that the talcose material, often occurring between stringers and narrow veins of quartz, is gold-bearing, with particles visible to the naked eye, and invariably carries sulphides; in fact, oftener than in the quartz itself; consequently, in carrying on milling operations, this talcy crushed material should be considered as vein-matter, notwithstanding that much of it will probably be lean.

On the afternoon of August 21st I travelled to Gun creek by an old trail, following the course of Bridge river on the south side instead of by the wagon-road along the north side, in order to better observe the geological formations, and possibly locate a contact to the east of the igneous rock in which the quartz veins of Cadwallader creek, and as far to the north-west from there as the *Wayside* group, occur; but in this I was disappointed, as I found but few exposures, and the first rocks seen were made up of argillite very much stained, red, blue, and yellow colours. The strata were much broken and folded, denoting considerable movement and the probable close proximity of the igneous rocks. At the mouth of Gun creek I crossed Bridge river on a good bridge at Shuster's ranch.

For some distance west from the mouth of Gun creek along the south side of Bridge river, as well as east from that creek along the north side of the river, the valley bottom is quite wide; much of it is covered with alder timber and is suitable for agriculture, as was attested at Shuster's ranch, and also at Grant White's ranch, a short distance east from the mouth of Tyaughton creek, ten miles east from Gun creek, where not only is hay—especially alfalfa—a sure and heavy crop, but wheat, oats, and all varieties of vegetables produce large yields, although needing irrigation usually, though not every year. The water-supply for irrigation as well as power purposes is very plentiful throughout the entire Bridge River district.

Eldorado Creek and Taylor Basin.

On the morning of August 22nd, in company with J. Lindsay, I set out for these comparatively new districts, situated about midway between Gun and Tyaughton creeks, and about fifteen miles northerly from Bridge river.

The trail leading to these camps branches off from the main wagon-road about five miles south-west from Tyaughton creek on the old Chilcotin trail, and is none too good; in fact it is a typical Indian trail used for many years by the Indians in travelling between their homes in the vicinity of Taseko lakes and Lillooet. After following that trail on the upper benches and

around the east side of Pearson lakes, then, by a very steep climb, to the summit at an elevation of 7,600 feet, a new trail made by prospectors is reached, which branches off to the north, while the old trail continues to the west. A series of summits and deep gulches are crossed for about five miles before the trail leads down a steep hill to the headwaters of Taylor creek, in Taylor basin, at an elevation of 5,000 feet; the distance from the wagon-road by the present trail is about twelve miles.

This route is not the best by which to reach the camps, according to E. J. Taylor, the prospector who discovered the district and who has "cruised out" a route, following the present trail to the top of the first bench from Bridge river, then branching off to the north-east and following the benches around the west end of Tyaughton lake, to near the mouth of Taylor creek, which empties into Tyaughton creek, then up the valley of that creek to the headwaters. This route would enable prospectors to travel in at least one month earlier than by the present route, because during the months of May and June the depth of soft snow prevents crossing the several summits; it would also give a good grade for a wagon-road.

Taylor basin is a deep depression at an elevation of about 5,000 feet, and just above timber-line; on every side are mountain-peaks reaching an elevation of from 1,500 to 3,000 feet higher, with their southerly sides covered almost to the summits with a most luxuriant growth of grass and wild flowers, but their northerly sides are usually very precipitous and covered with deep rock-slides, especially at the higher altitudes.

A wide belt of crystalline limestone was observed, crossing the creek at about 1,000 feet lower elevation than the basin itself. Aside from the wide dykes of serpentine, which on the southerly side of the basin, reach from summit to summit as far as the eye can see in a south-east and north-west direction, among the more noticeable peculiarities of this section are the very wide belts of deep red and brown iron gossan that can be traced for considerable distances, their trend or line of strike being north-west and south-east, and the further fact that by panning-tests this material almost always shows a fair prospect in gold and large quantities of iron-pyrites.

Messrs. Taylor and Shuster own two groups of claims—the *Twenty-fourth of May* group, comprising five claims, the *Twenty-fourth of May*, *Golden King*, *Comet*, *Dolly*, and *Jumbo*; and the *Wild West* group of three claims, the *Wild West*, *Eclipse*, and *Snowstorm*. The first of these groups is located from south-east to north-west from the basin to the summit of the mountain which separates Taylor basin from Eldorado creek, and the second group is located from the creek in a westerly direction towards the basin.

24th May Group. The first claim I examined was the *Golden King*, the western boundary of which is along the summit of the mountain just mentioned. At an elevation of about 1,000 feet above the basin I found a narrow vein of solid sulphide ore exposed by an open-cut near the south line of the claim. The width of the solid ore was from 9 to 15 inches, but the fissure itself was wider because of gouge on each wall; these walls were composed of igneous rock, resembling diorite. The strike of the fissure was N. 15° E. and the dip almost vertical.

The open-cut in which the vein is exposed is 25 feet in length; at the southerly end a wide intrusive dyke appears to have cut the vein off beyond that end of the open-cut while at the northerly end an enormous mass of slide-rock covered it up. A sample across 9 inches of the solid sulphide mineral assayed: Gold, $1; silver, trace, to the ton.

Several small streams flow down the mountain-side, the gravel from which invariably showed colours of gold from panning, but nowhere could I find sufficient to indicate "pay" from placer-mining.

Near the northerly line of the *Golden King* claim on the summit, about 1,000 feet higher elevation than the work already described, is situated an outcrop of sulphide ore, on which 9 feet wide has been exposed by an open-cut. A typical sample, but not to be considered as an average, from this showing assayed: Gold, $6.40; silver, 1.4 oz. to the ton.

Dolly. On this claim, which is located at an elevation about 5,000 feet above sea-level, in the basin at the foot of the mountain on which the *Golden King* is located, I found a series of open-cuts made in gossan outcrops. The line of strike of these outcroppings is N. 35° W. and can be traced for about 1,000 feet in length, but, as no walls were exposed, I could not determine the dip. Much of the surface material yielded a few fine colours to the pan. The most serious work was an open-cut that crosscut the gossan for a width of 45 feet, and averaging about 4 feet in depth and 5 feet wide. This cut was deep enough to expose the rock formation below the gossan, and into which the gossan gradually merged, showing that it had derived its origin from the oxidation of the material below. This material looks like spar, but is apparently quartzose, has a bluish tint, and carries large quantities of "white iron," but whether marcasite or arsenical pyrites was difficult to determine.

I sampled the open-cut in four sections, three taking in 10 feet each, and one 5 feet, each of which assays show: Gold, trace; silver, trace, to the ton.

Although these assays of the underlying sulphides and unoxidized material do not show appreciable values, it would appear from the panning-tests that there is a certain amount of surface enrichment covering quite an extensive area, and it would be only reasonable to suppose that the pyrites in the unaltered quartzose rock found below the gossan should carry values, although my samples would appear to contradict this supposition. Results from one set of samples should hardly be considered conclusive negative evidence, and I would recommend further systematic prospecting. These outcroppings of gossan undoubtedly derive their origin from the oxidation of the pyritous quartzose rock, and, when their extent is considered, it does seem as though a pay-shoot, probably of low-grade ore, occurs somewhere in the lead, and, as the work of prospecting can be carried on at a low cost, further and thorough search should be made.

Wild West. This claim is located on Taylor creek, about 3,000 feet distant in an easterly direction from the open-cut on the *Dolly* claim, and at about 800 feet lower elevation. Here I found that a wide open-cut, 8 feet deep at the face, had been made in the creek-bank, just above high water, under a gossan outcrop exposing a body of sulphide ore, in quartzose-spar gangue, fully 20 feet wide. This body has its line of strike north-east, and occurs between diorite on the north-west side and crystalline limestone on the south-east side.

Of several assays that had been made from this material, Mr. Taylor told me an average of $4 was the best. If the extent along the line of strike and at depth is persistent, neither of which have been yet proven, this property should be an attractive proposition, especially when it is considered that it is admirably adapted for concentration, with its location on a stream that will furnish a practically unlimited water-power and an ample supply for concentrating, also that the supply of balsam and spruce timber on the creek-bottom is very plentiful.

No other claims have been staked on Taylor creek, nor in the basin, nor were there any prospectors other than Mr. Taylor in the vicinity at the time of my visit.

ELDORADO CREEK.

This creek is west from Taylor basin and separated from it by a mountain-range, with the ridge about 7,000 feet elevation, although several of its peaks are higher. The trail has not

been made over this ridge, as it is always covered with more or less snow, but runs south-westerly for about a mile, then turns northerly and crosses a pass at nearly 6,000 feet elevation, descending by a well-graded trail to the head of Eldorado creek.

The creek flows towards the north for a couple of miles, then turns to the west and empties into a tributary of Gun creek. The valley at the head of the creek is about the same elevation as Taylor basin, but the fall is much less than that in Taylor creek, so that the growth of timber is very considerably less than on the creek-bottom of Taylor creek, which is about 800 feet lower elevation than the headwaters of Eldorado creek.

Grant White and George Bell are the pioneer prospectors of Eldorado creek, having staked claims there in 1909, since which time a few other claims have been located this season by William Haylmore and others, but the only work that has been done is on White & Bell's property. At the time of my visit there was not a prospector on the creek except J. Lindsay, who accompanied me, and who represents the Eldorado Placer Mining Company of Vancouver, B.C., of which R. E. Gosnell is president, which company owns two miles of hydraulic leases on Eldorado creek.

As yet this company has only done prospecting-work on this ground, but Mr. Lindsay claims this resulted in a yield of 25 cents to the yard. It was not possible to verify this statement during the limited time at my disposal, but, outside of this feature, a cursory examination leads me to the opinion that the dumpage facilities will be found inadequate to take care of the tailings, unless an elevator is installed, which would tend to increase the costs to a point where the question would be a very vital factor; in addition to this, it is questionable if the quantity of water that could be secured is sufficient to ensure good work, but these are questions the officers of the company should investigate for themselves.

Such placer gold as is found in Eldorado creek had its source from the erosion that has taken place in the surrounding mountains, which undoubtedly has been enormous, but apparently the formation that carried gold has been only a small proportion of the whole, and, so far as I could judge, only from the mountain that separates Eldorado creek from Taylor basin.

White & Bell's Claims.

On the east side of the basin, formed by the headwaters of Eldorado creek, at a point about 400 feet up the slope of the mountain, in an igneous rock, resembling diorite, there occurs a deposit of greatly decomposed and oxidized material, very much stained with iron-rust, that appears to overlay the diorite, and probably has broken down from higher levels; this latter pitches at an angle of about 20 degrees towards the south-east and has its strike apparently north-west. As the hanging-wall does not show, it is impossible to determine the average thickness. An adit has been driven about 40 feet in length immediately under where this material covers the slope of the mountain. For several feet this crosscuts diagonally the decomposed material or so-called vein-matter, in which occurs a few inches of heavy sulphides, under which the solid igneous rock is exposed, dipping at the angle stated. Some of the decomposed oxidized material, after it had been coarsely crushed, showed fine colours of gold in the pan. I took a sample, typical of the so-called ore-body, which assayed: Gold, $3.60 to the ton; silver, trace.

Adit No. 2 is located some distance westerly from the one already mentioned, but at about the same elevation. The portal is in an outcrop of the same decomposed oxidized material, about 4 feet wide at this point, filling a well-defined fissure between walls of igneous rock, with several inches of talcose gouge between the walls and vein-matter. The strike is N. 25° W. and dip 69 degrees towards S. 25° E.

This adit, 30 feet in length, is driven along the strike of the vein, with the same material in the face, showing every indication of persistency along the strike with increasing depth. A

sample taken by myself, typical of this so-called vein, but not to be considered an average of the entire ore-body, assayed: Gold, $18.40; silver, 0.1 oz., to the ton.

About 150 feet lower down the slope and almost directly under adit No. 2, two open-cuts, crosscutting the formation, have been made, in which is exposed similar decomposed vein-matter, with a dip very nearly vertical. Apparently these exposures are the extension at depth of the fissure on which adit No. 2 has been driven. I say "apparently" because there was some doubt in my mind whether the vein was "in-place" in these open-cuts, but to prove this a good deal more work is needed. A typical sample was taken which assayed: Gold, $7.20; silver, 0.2 oz., to the ton.

High mountains practically surround Eldorado Creek basin, and in this respect the conditions are similar with those around Taylor basin, but some of the geology appears dissimilar; for instance, judging from the weathering of the rocks, there are no occurrences of serpentine around the immediate vicinity of the former, as there are at Taylor basin. Near the head of Eldorado creek a wide belt of metamorphosed argillites occurs in which, farther down the creek, there is a well-defined intrusive dyke. Still farther down the creek, some of the mountains are apparently made up of an igneous rock, resembling diorite, while several of the peaks have the appearance of being formed of vast masses of quartzite weathered to the colour of yellow ochre.

On the night of August 24th I returned to Grant White's ranch near the mouth of Tyaughton creek.

Bridge River from Tyaughton Creek to Mission Mountain.

On August 25th I left Grant White's ranch and followed the wagon-road down the Bridge River valley, which is quite wide, to the crossing of Alexander creek near its mouth, where a trail branched off up that creek to the deserted Babb Hydraulic plant. This property was described by Mr. Robertson in his report for 1910; it has been idle since 1911, the watchman withdrawn, and, I was later informed, Mr. Babb had left this section.

From there I travelled to the ranch of W. W. Jones, whose coal and other mineral claims were examined and reported on by the Provincial Mineralogist. On inquiry, I ascertained from Mr. Jones that no work had been done since Mr. Robertson's visit, so on the morning of the 26th I proceeded down Bridge river to "Jack's Landing," about ten miles distant, so called after "Hunter Jack," who several years ago operated a ferry across Bridge river, using a canoe for crossing passengers and supplies, but when horses came along they had to swim.

I had heard that John Hunt had acquired some mineral claims near here, up a small creek, which I had expected to examine, but, as I could find no one who could show me the locations or give me any definite information about them, I had to omit visiting them.

Broken Hill Group.

Later, however, at Lillooet, I met John Hunt, who with associates, has acquired the mineral claims to which I have referred as being located near "Jack's Landing," and he informed me that the property designated as the *Broken Hill* group consisted of six claims, the *McLeod*, *Mineral Wonder*, *Broken Hill*, *Silver Standard*, and *Standard Nos. 1* and *2*. These are situated about two miles up Sebring creek, which flows into Bridge river about a mile above the bridge near "Jack's Landing"; they are at an elevation of about 4,000 feet and were staked during 1912.

Mr. Hunt described the trail as being "merely a deer-trail," and the work so far done as being confined to stripping the surface, which work, he said, had exposed a large mineralized ledge, which could be traced on the surface for quite a long distance, but, he also said, the work done was not sufficient to enable any one to form much of an idea as to the values or material facts. He showed me some fifteen assay certificates, most of which, he said, showed

the results from assaying samples of ore that had been taken by W. C. Thomas, late of the Boundary Falls smelter. The best values were shown as $9.60 in gold, 24.12 oz. silver, 5.20 per cent. copper, and decreased by a sliding scale to 30 cents in gold, silver between 5 and 6 oz., and copper down to 1 per cent.

Mr. Thomas, in his report, says that the strike of the vein is east and west, dip north, into the mountains, and that the general geological structure is a quartz capping, the hanging-wall being granite and lime-shale, and the foot-wall of quartzite.

I proceeded across the bridge to the south side of Bridge river and to the foot of Mission mountain, which is now traversed by an excellently graded wagon-road, about eight miles in length, replacing the old steep switchback trail used, but often "cussed," in past years. This road brought me to the Mission Landing, on the north shore of Seton lake, about four miles from its head, where a few Indians live at the rancherie, which is very picturesquely situated on a small flat at the foot of the mountain.

The grade of the Pacific Great Eastern along the shore has obliterated the old trail to the foot of the lake, blasted out along the precipitous side of the mountain which rises abruptly from the water, so that all horses have to be transported by steamers down the lake. As the boat did not stop on that day, I passed the night at a railway-construction camp and next morning rode to the head of the lake, travelling along an old Indian trail across the hills a short distance back from the lake, and took passage from there on the steamer to the foot of the lake, distant about four miles from the town of Lillooet.

From the Mission Landing towards the east the mountains on both sides of the lake are apparently made up of greenish and blackish quartzose schists, with dykes of grey granite, and masses of quartz-porphyry, so classified by the late Dr. Geo. M. Dawson.

The grade of the railroad, now under construction, for practically the entire distance from the head of Anderson lake to the foot of Seton lake, except across the short portage between the two, has been blasted out along the base of the mountains near the water-line, following the sinuosities of the shore-line, except at one point on Seton lake near its head, where a tunnel has been driven. This is one of the most picturesque pieces of scenery in British Columbia.

From the foot of Seton lake the grade of the railroad follows down Cayoosh creek, which flows out of the lake eastward to the Fraser river, which the railroad will cross on a bridge some little distance below the mouth of Cayoosh creek, the grade gaining elevation on a bench on the east bank of the river opposite the town of Lillooet; thence along the east bank to Pavilion creek, about eighteen miles from Lillooet, to which point construction was in progress at the time of my visit.

LILLOOET.

I found the town of Lillooet enjoying great prosperity because of the construction-work going on along the line of the new railroad, and there were about a dozen auto stages running between the town and Lytton, on the Canadian Pacific Railway, about forty-eight miles distant, but the mail and express were still carried by horse stages twice a week from Lytton and once a week from Ashcroft.

No mining of any description was being carried on in the neighbourhood of the old town of Lillooet, which, until within the past few years, had always shown a considerable production of placer gold.

August 28th and 29th were occupied in interviewing some of the old-time prospectors and miners, as well as the Government Agent, to ascertain facts relative to the condition of the mining industry in the neighbourhood. From them I learned that some important develop-

ments had been recently made at the *Spokane* group, up the North fork of Bridge river. So on the morning of August 30th, accompanied by Jack Johnson, of Cayoosh creek, I started for that property, which had also been visited and reported on by Mr. Robertson in 1910. Since that time the old trail from Lillooet along the west bank of the Fraser river to the mouth of Bridge river, a distance of about five miles, has been widened and graded into a first-class wagon-road, but after crossing Bridge river on a good wagon-bridge to the north side, travel up the river is over the same trail as was travelled by Mr. Robertson.

The rocks at the mouth of Cayoosh creek are black and grey quartzites and sandstones, with bands of rocks rusty from the weathering of iron-pyrites, which are disseminated through those rocks. The bedding-planes are vertical and the line of strike generally towards N. 25° W.

Both sides of Bridge river from the mouth to the North fork are in an Indian reserve the main rancherie being located on a high bench at the mouth of the river, from which an excellent lookout could be maintained by the Indians in the past when the Chilcotins used to raid the rancheries of the other tribes in this portion of the Province. Although all water for domestic purposes has to be packed from the river up to the high bench by a very steep trail, a number of Indian families still reside at this old rancherie.

At several places along the river the benches on both sides of the river have been cultivated by Indians; Mochell's ranch, about eight miles above the mouth, is an illustration of Indian thrift and systematic mixed farming rarely seen. The fields of alfalfa, oats, and nearly every variety of vegetables, even including celery, as well as the orchard with fruit-trees, even at a tolerably high altitude, demonstrate the prolific character of the soil. His horses, cattle, and hogs all showed evidence of good breeding as compared with such animals found in the same district years ago.

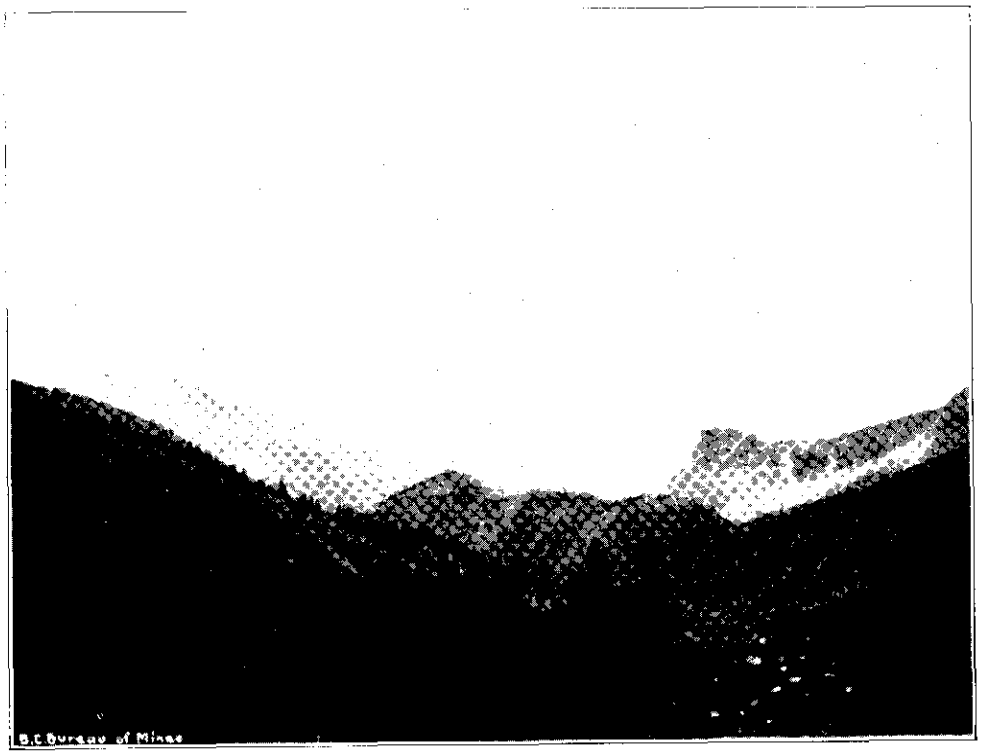
Arriving at the forks or confluence of the North fork and main river, I found that last year a trail had been constructed through the canyon of the main river to connect with the wagon-road at "Jack's Landing," but considerable work is necessary before this will be generally used, as the width is too narrow for heavily loaded pack-horses. It was made chiefly for the convenience of hunting parties after big game, who, being desirous of extending their hunt, used to be compelled either to travel up the North fork and cross the Tyaughton summit by the trail travelled by Mr. Robertson in 1910, or else go to Lillooet, then up Seton lake and cross Mission mountain, in either case travelling nearly fifty miles instead of fourteen, the length of the canyon.

Brown Hydraulic Mine.

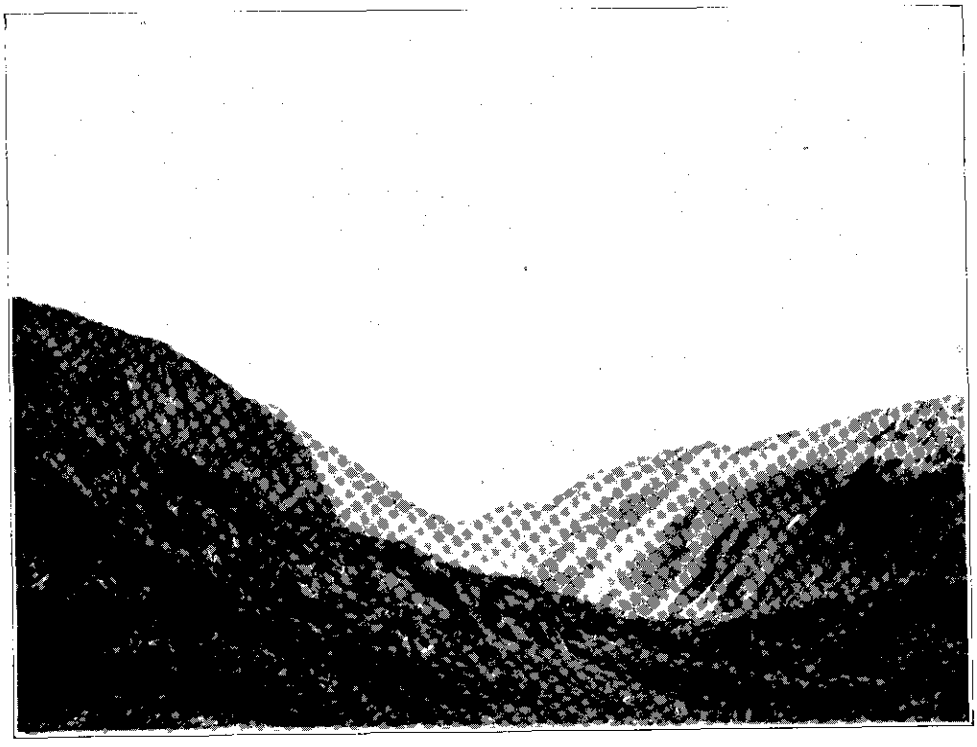
This property, located at Horse Shoe bend on the main Bridge river just below the junction with the North fork, I found was idle, and, I presume, abandoned by the Brown Company, because there were new stakes dated August, 1913, and some of the ditch and pipe line were in ruins.

From this point I travelled the same trail as Mr. Robertson had in 1910, and found that his suggestion relative to changing the route to the head of Holbrook gulch from the present one used via Rochelle creek to one via Big creek had not been followed, neither had any work, apparently, been done on the old trail, which follows up Rochelle creek, a tributary of the North fork, to the summit, 7,000 feet elevation, between it and Porcupine creek; crosses this summit at about the same elevation; then drops down to Porcupine creek, and climbs again to the summit between it and Lewis creek, crossing that summit at about the same elevation as the first summit; then dropping down to the creek, crosses it and climbs again to about the same altitude, and after descending to Holbrook gulch climbs again to 7,000 feet.

If the Big Creek route was adopted, all of these summits would be avoided, because Holbrook gulch is a branch of Big creek, which empties into the North fork about ten miles above its mouth.



Eldorado Creek—Bridge River.



Gun Creek—Bridge River.

Spokane Group.

This group of claims, owned by Dr. Christie, of Lillooet, and associates, is situated at the head of Holbrook gulch, where I found the most recent work consisted of two open-cuts, one being about 400 feet south-easterly and 100 feet lower elevation from the work described in Mr. Robertson's report, and the second one about 150 feet farther in the same direction, but on about the same level.

In the first open-cut the stripping is about 35 feet in length across the formation, in which a quartz vein 5 feet in width, carrying iron-pyrites, has been exposed, but, as the work was merely a surface trench cut to solid rock, the exposure was not sufficient to determine the strike and dip, although the strike apparently conformed with that shown in the old workings, N. 45° W., and the country-rock is apparently the same diabase.

The second open-cut, 8 feet deep, exposed an ore-body almost 25 feet square, and the quartz showed apparently the same iron-pyrites and mineralization as the ore in the vein exposed in the other open-cut and in the old workings. This open-cut is also in line with the other workings, but whether the ore-bodies exposed in these cuts are extensions of the original discovery it is impossible to say, because a deep rock-slide covers the base of the ridge in which the old workings are located, and extends nearly the whole width of the gulch towards the creek. The exposures are apparently in place, and although the second one is partially under the slide-rock referred to, this was cleared off before blasting was done in the solid ore.

A sample, not intended to represent an average, but typical of the ore-body in the second open-cut, assayed: Gold, trace; silver, trace; copper, *nil*, to the ton.

From Mr. Robertson's report for 1910 I extract the following from his description of this group: "The quartz is quite heavily mineralized with white and yellow iron-pyrites carrying values in gold and silver. A sample taken of one of the well-mineralized portions of the vein gave, upon assay: Gold, $7.20; silver, 0.7 oz. to the ton; and copper, 2.3 per cent."

When returning from the *Spokane* group my attention was attracted to the rock formation on the summit between Porcupine and Rochelle creeks, and to the fact that there was apparently a contact in the vicinity, between crystalline limestone and igneous rocks, also to the occurrence of a belt of serpentine. These geological conditions should prove attractive to prospectors, as in other sections of the Province prospecting along such contacts has led to the discovery of valuable copper-mines.

The land along the North fork is rapidly settling up, and the settlers who have already come in are apparently prosperous. Irrigation is necessary, but the supply of water for that purpose is amply sufficient, while the growth of timber is such as to provide a good supply for years to come; at the same time, not so dense but that clearing land can be done with little cost.

I returned to Lillooet the evening of September 1st, and on the next day left for the Thompson river via Ashcroft.

LILLOOET MINING DIVISION.

REPORT OF C. PHAIR, GOLD COMMISSIONER.

I have the honour to submit the annual report on the progress of mining in Lillooet Mining Division during the year 1913.

PLACER-MINING.

There was very little placer-mining done, except by the Golden Dream Mining Company, Limited, of Washington, D.C., which has had a few men prospecting its leases on the South fork of Bridge river, under the management of C. P. Dam, who is now putting in a dam, on the South fork, which is nearly completed. The South fork splits into two channels about a mile from its junction with Bridge river, forming an east and west channel, both carrying nearly an equal volume of water. On completion of the dam all the water will be run through the west channel; the east channel will then be dry and open for hydraulic mining, which, I am informed, will be commenced next season as soon as the weather permits. The foundation of the dam is laid on bed-rock, and the superstructure is built in the most substantial manner possible. The two ends are laid into high cement gravel banks for 32 feet and rest against the solid high rim-rock. The dam is 401 feet in length, 12 feet wide, and from 8 to 14 feet high from foundation, according to the depth of bed-rock. The bulk-head is composed of heavy logs and 12-inch cross-ties, each joint being fastened with a 16-inch drift-bolt. The dam will be filled in with heavy sacks and boulders and will be as near watertight as possible. All seams will be caulked with oakum and burlap. A 16-inch water-gate runs through the dam to furnish water for hydraulicking and sluicing the river-bed and adjoining benches at any stage of the water. If this dam will stand—of which I have no doubt—the company will have over half a mile of channel to mine, which is supposed to be rich in gold. Some years ago an attempt was made to dam this east channel, but the dam was carried off by a freshet before completion.

The Indians who usually mine the bars of the Fraser and Bridge rivers, did not do any mining, as they found profitable employment in hauling freight for the Pacific Great Eastern Railway Company and others, so the output of placer gold has been small. I have no returns from the individual miners holding claims, who probably forwarded what gold they obtained direct to the Assay Office, as very little was sold at Lillooet.

MINERAL CLAIMS.

More men than usual were employed at Bridge river and Cadwallader creek, and consequently more development-work was done proving the value of some of the recent claims.

Marconi. Three men did a good deal of work ground-sluicing on this claim with the object of striking a ledge which the owners believe exists; they uncovered two ledges in the open-cut they are driving.

Why Not. This claim is on the South fork of Bridge river and adjoins the *Forty Thieves* group, and was worked by three men under contract to drive a tunnel for 200 feet; this they have driven 160 feet, and I am informed that the ledge is 4 feet in width and carries good values in free-milling gold.

Pioneer Group. A. F. Ferguson, one of the owners, states: "There has been an average of three men employed on *Pioneer* group of mineral claims; 200 feet of tunnel has been driven on the ledge, which has developed a large body of free-milling gold ore. For a considerable distance, at the junction of No. 1 and No. 2 veins with the main ledge, the ore-body is from 10 to 12 feet wide, averaging $10 to $12 a ton; and in the west drift, on the old main ledge, very rich ore was struck, assaying from $100 upwards a ton in free-milling gold."

Wayside. D. C. Paxton, the manager, writes: "The *Wayside* was worked during the summer with four or five men; 136 feet of tunnel was driven and considerable improvement of the camp was done preparatory to arranging for a milling outfit. The development of the lowest tunnel, at an altitude of 2,550 feet, being much the lowest of any present workings in the diorite belt, has proved the free-milling quality of the ore and values that characterize the higher altitudes."

Coronation Mines. The Coronation mines were worked during the whole year with a force of about thirty men. The 10-stamp mill was operated during the season, but I have had no returns, as yet, from the company as to the result.

McGillivray Creek Mountain Mines—These properties were worked during the season, driving a tunnel which is now in over 200 feet. The ledge is about 8 feet in width and its chief value is in silver.

OFFICE STATISTICS—LILLOOET MINING DIVISION.

Free miners' certificates issued	200
Mineral claims recorded	123
Certificates of work recorded	146
Certificates of improvement recorded	12
Placer claims recorded	15
Placer and dredging leases in force	36
Conveyances, etc., recorded	48

Revenue.

Free miners' certificates	$1,234 30
Mining receipts, general	3,047 65
Tax, Crown-granted mineral claims	429 25
	$4,711 20

CLINTON MINING DIVISION

REPORT OF E. C. DUNN, GOLD COMMISSIONER.

I have the honour to submit the annual report of the Clinton Mining Division of Lillooet District for the year ending December 31st, 1913.

I regret to say, as shown by the office statistics given below, that conditions are not so good as those of last year. There is practically no activity in the mining industry in this Division, but it is generally expected that, with the opening-up of transport facilities by the Pacific Great Eastern Railway at an early date, prospecting will be carried out on a much larger scale.

There has been some slight activity shown in the soda-deposits lying to the north of Clinton, and it is expected by local men that this will eventually become an industry.

During the past year several gypsum claims have been taken up in the vicinity of Kelly lake, and from general reports this should prove a good industry with the advent of proper transport facilities.

OFFICE STATISTICS—CLINTON MINING DIVISION.

Free miners' certificates individual)	33
Mineral claims recorded	37
Certificates of work issued	16
Conveyances, etc., recorded	13

VANCOUVER ISLAND AND COAST.

ALBERNI DISTRICT.

REPORTS BY D. G. FORBES, M.E., M.A.I.M.E., M.I.M.M., ETC.

Early in June of 1913 a visit was paid by the writer to the west coast of Vancouver Island with a view to obtaining any information that might be available respecting the Alberni and Clayoquot Districts, which have, of later years, been somewhat neglected by prospectors and mining operators.

A start was made from Port Alberni, A. H. Davie, a miner, who had resided for many years in the district, being employed as a guide.

ALBERNI CANAL.

Arriving on Tuesday, June 10th, at the *Edith* landing at 11 a.m., camp was made. The *Edith* and *Gladys* groups were examined during the afternoon.

Edith. The *Edith* group of mineral claims, owned by A. E. Waterhouse, of Alberni, is situated on the south side of the Alberni canal, at an elevation of 400 feet above sea-level. The country-rock, where exposed, is a crystalline limestone; at several points on the property small lenses of ore have been located, striking due north-west.

A short tunnel has been driven at an elevation of 425 feet on one of these ore-bodies, which proved to be of small extent and low value. Some 300 feet south-east from the tunnel, a fissure has been traced on the surface for 150 feet, exposing a little pyrite and chalcopyrite, the greatest width being 2 feet of ore. A sample taken across 2 feet of this ore assayed; Gold, 0.1 oz.; silver, 4 oz.; copper, 5 per cent.

Near the cabin, a parallel fissure has been traced for 200 feet, exposing some pyrite, with traces of chalcopyrite, in a garnetite gangue.

Gladys. The *Gladys* group of mineral claims is situated about a quarter of a mile west of the *Edith* group. The country-rock is limestone; the occurrence of the ore is similar to that in the *Edith* claim, except that the strike of the lenses is north or south (magnetic). The property was equipped with a small two-bucket tram from the mine to salt-water, but which is now in a bad state of repair.

A small opening has been made on the line of the tramway, 200 feet above sea-level, which shows a little garnetite containing pyrite and a little chalcopyrite, the vein striking north and dipping to the east at an angle of 75 degrees. At an elevation of 350 feet and 1,200 feet from salt-water, a little above the upper terminal of the tramway, there is a large open-cut from which an incline shaft has been sunk and some ore stoped; these workings were full of water and could not be inspected, but the shaft was sounded and appeared to be about 30 feet deep.

About 150 feet farther up the hill, at an elevation of 400 feet, another shaft has been sunk, which also was full of water. On the south side of this shaft the streak of ore, about 6 inches in width, has been cut off by a diabase dyke, striking north-west. Some further prospecting has been done to the south of this dyke, but nothing of promise was found. Recently an attempt was made to trace the ore down the mountain below the upper terminal of the tramway, but without success.

On Wednesday, June 11th, camp was moved to the *Monitor* cabins on the north side of the canal.

Monitor. The *Monitor* mine had been equipped with an aerial tramway, which, however, is now completely wrecked. The mine-workings are three-quarters of a mile from the sea at an elevation of 425 feet, and were full of water, so they could not be inspected. A small hoist, vertical boiler, and a horizontal-plunger pump are still at the mine, but are quite ruined from exposure. About half-way up the trail from the cabins a little prospecting has been done recently on some copper-stained felsite, but nothing of any commercial value was discovered.

Southern Cross. On June 12th camp was moved to the *Southern Cross* mine, situated on the east side of Uchucklesit harbour about one mile from the cannery wharf. An outcrop of crystalline hornblende situated 300 feet from the sea at an elevation of 125 feet, containing small quantities of chalcopyrite, had been prospected by an open-cut, and nearly all the hornblende that contained any copper taken out, the best ore having been picked out and shipped. The hanging-wall consists of diabase rock and the foot-wall of blue limestone. A small shaft has been sunk for a few feet in hornblende, but disclosed nothing of value, and a drift, run 35 feet N. 40° E. (mag.) on the contact without finding anything of value. Seventy-five feet farther down the mountain a tunnel has been driven into the mountain and several drifts and crosscuts run off from it, following seams in the country-rock, but finding nothing of value.

Sunshine. The *Sunshine* was visited on June 13th. This claim is situated about half a mile up the creek from the end of Uchucklesit harbour, six miles from the *Southern Cross*, at an elevation of 250 feet above the sea. Two hundred and ninety feet of tunnel has been driven south-west into the mountain, but I was unable to discover, either on the surface or underground, any indication of any mineral of value.

On June 14th I returned to Alberni in the morning, and left on the S.S. "Tees" for Clayoquot on the same evening at 11 p.m. On June 15th I arrived at Clayoquot and arranged to visit the *Kallapa* mine the next day.

Kallapa. The *Kallapa* group of mineral claims, including the *Kallapa*, *Golden Gate*, *Sninik Fraction*, *Jack of Clubs*, *Homatsa*, and *Syontl*, is situated on Mears island, Disappointment inlet, and about three miles and a half from Clayoquot post-office. This property, owned by J. Chesterman and others, of Tofino, is under bond to C. E. Cartwright, of 601 Rogers Building, Vancouver.

A good corduroy road, suitable for a narrow-gauge wagon, has been constructed from the beach to the mines, a distance of about two-thirds of a mile, through dense timber and underbrush.

The ledge strikes east and west (mag.) and dips at from 70° to 80° to the north. The hanging-wall is well defined, but the foot-wall is rather irregular; both walls are of diabase rock.

The ore consists of chalcopyrite, pyrite, arsenopyrite, and some zinc-blende in a quartz gangue, and is said to carry gold, silver, and copper in payable quantities.

The principal development-work consists of two tunnels; the upper, driven at an elevation of 475 feet above sea, follows the ledge for 300 feet. At this point the ledge has been faulted 12 feet in a south-easterly direction, but has again been picked up, and shows about 6 inches width of pyritic matter in the drift, but has not been followed beyond the fault. The ledge shows considerable mineralization in places, from 1 to 3 feet of solid pyritic matter being

found, but it is probable that the values are rather irregular; no stoping has been done on this level. The lower tunnel, at an elevation of 375 feet, has been driven 210 feet on the ledge and is still being continued although at the time of my visit there was no ore in the face. However as the 475-foot tunnel showed ore for a much greater distance into the mountain, it is hoped that it will again be found in the 375-foot tunnel. At 125 feet in on this level a stope has been started, and ore is being broken, hand-sorted, and sent to the smelter.

In this tunnel, at about 130 feet from the portal, a cross-course with a clay gouge has been followed a considerable distance into the foot-wall, but so far, without results. A sample of ore, sorted ready for shipment, assayed: Gold, 0.40 oz.; silver, 6.4 oz.; copper, 7.1 per cent.

Leora.

The *Leora* group of mineral claims, owned by Hanbury & Bowes, of Victoria, is situated on the east bank of Elk river, about two miles from Kennedy lake. This lake is situated two miles south of Tofino inlet, Clayoquot sound. The principal development-work consists of a tunnel 340 feet long, situated about 1,000 feet from the river; this tunnel has been driven on a small ledge, from 6 to 12 inches wide, with diabase walls, striking N. 72° E. and dipping at an angle of 55 degrees to the north-west, exposed in the creek near the portal of the tunnel. At 117 feet in the tunnel a winze has been sunk on the ledge, in which it is said that better values and a wider ledge were found. This winze was full of water, and I was unable to inspect it. A small shipment has been made from this winze which yielded a return of over $100 per ton.

Very little ore was visible after passing the winze in this tunnel, although the wall is well defined, dipping from 45 to 55 degrees to the north-west. It appeared to the writer that it is possible that the ledge had been left in the hanging-wall at some point near the winze, and that it might be found by excavating in the hanging-wall at the face of the drift.

The country-rock appeared to be much shattered, very heavy movement having taken place along the strike of the ledge. Mineralization consisted of pyrite, arsenopyrite, and the gangue of quartz and calcite. A sample taken near the winze assayed 1.4 oz. gold to the ton.

Bessie B.

The *Bessie B.* mineral claim is situated a quarter of a mile west of Elk river and two miles and a half from Kennedy lake, and at an elevation of 175 feet above the lake. No defined ledge has been found on this property, but some work has been done on a diabase dyke, in porphyry, bearing S. 45° W. (mag.), which contains some small quartz stringers from which good assay values in gold have been obtained.

The principal exposure is in a bluff some 50 feet high, in which the quartz stringers can be seen in the dyke, dipping from 75 to 80 degrees to the north-west. It appeared to the writer that these occurrences were due to cooling cracks in the dyke, which had since been filled with quartz.

An open-cut has been put in some 50 feet in length on one of these stringers, a tunnel driven 15 feet, and at the time of my visit, June, 1913, a winze had been sunk 16 feet, and was still being continued in the hope that the stringers exposed above would come together and form a body of quartz of workable size.

Rose Marie.

The *Rose Marie* group of mineral claims, including the *Rose*, *Maggie*, *Marie*, and *Sadie*, is owned by Messrs. Watson and others. The lower camp on Elk river is situated three miles from Kennedy lake, at an elevation of 50 feet above sea-level.

The claims are located on a small quartz vein, from 15 to 18 inches in width, on the east side of Elk river. The vein strikes N. 34° E. (mag.) and dips from 64 to 68 degrees to the north-west. The vein is located in porphyritic diabase and contains pyrite, with traces of arsenopyrite.

On the top of the first bench, 1,000 feet above the river, some prospecting-work has been done by open-cuts; the ledge in places showing a width of 2 feet.

The principal development-work consists of a tunnel driven on the ledge at an elevation of 695 feet above Kennedy lake. This tunnel has been driven for 438 feet N. 34° E. (mag.), the ledge varying in width from 15 to 18 inches of kindly-looking mineralized ribbon quartz. A sample taken from the face of this tunnel assayed 1.50 oz. gold to the ton. I was able to pan some free gold from the oxidized ore on the dump.

The sample mentioned above was a fair average sample taken in the face of the tunnel at the time of my visit. It showed no visible free gold, consisting apparently of quartz carrying pyrite, the latter not exceeding 1 per cent. of the ore. The return obtained is, however, above the average value of the ore in the mine.

The ore is amenable to ordinary "free-milling" and cyanide treatment, and could be worked on the spot, more than sufficient water-power being available for all purposes. The mine is not large enough to stand expensive company management, but there is no reason why it should not have a successful future if worked economically as a small enterprise.

Bear Group.

The *Bear* group of mineral claims is situated at an elevation of 500 feet above Kennedy lake, and half a mile west from Elk river and three miles and a half from its mouth. The group, which consists of three claims, *Black Bear*, *Cinnamon Bear*, and *Grizzly Bear*, is owned by W. Wilson, Jno. Irving, and Spidal.

The principal development-work has been done on the *Cinnamon Bear* claim, a tunnel being driven 246 feet on a strong quartz ledge 3 to 4 feet wide; strike S. 60° W. (mag.) dipping 45 to 50 degrees to the north-west. The gangue is quartz, feldspar, and calcite, and the mineralization pyrite and arsenopyrite. The best ore is said to be 1 foot wide on the foot-wall. The diorite foot-wall and porphyry hanging-wall can be traced on the surface for 400 feet. The hanging-wall is soft, decomposed vein-matter, in which the tunnel has been driven. The tunnel is in an unsafe condition, the soft material in the hanging-wall having "winded" and several falls taken place. An average sample of the ore assayed 0.10 oz. gold.

Ruth.

The *Ruth* mineral claim is situated about 1,800 feet south-east from the *Bear* group at an elevation above Kennedy lake of 600 feet, and shows a quartz vein 18 inches to 2 feet in width, exposed for about 100 feet on the surface; a small diabase dyke accompanies the ledge on the foot-wall; the hanging-wall is porphyry. Limestone occurs from 6 to 10 feet to the eastward of the ledge; no development-work has been done. Strike N. 30° E. (mag.); dip 75 degrees to the south-east. The gangue is quartz and the mineralization pyrite and chalcopyrite. An average sample assayed: Gold, trace; silver, 2.8 oz.; copper, 1.9 per cent.

Olympic.

The *Olympic* and *Titanic* mineral claims are situated half a mile west from Elk river and four miles from Kennedy lake, at an elevation of from 350 to 450 feet. A quartz ledge shows up in these claims, having a strike N. 73° E. and dipping to the north-west. No development-work has been done; the outcrop shows a little pyrite and chalcopyrite. The claims are intersected by a creek running in a deep canyon, and, owing to high water, it was not possible to visit the other outcroppings of this ledge. From an exposure farther up the creek a sample over a width of 20 feet is said to have yielded $20 in gold. A sample taken on the *Olympic* claim assayed 0.03 oz. a ton in gold.

All the claims visited were situated at comparatively low elevations within easy reach of Elk river, and, as far as could be ascertained, very little prospecting has been done, and no claims located higher up the mountains, which rise on both sides of Elk river to a height of 3,000 to 4,000 feet.

The ledges have all been located on or near diabase dykes which cut through a diabase-porphyry, their strike being approximately, in most cases, about N. 45° E. (mag.).

This belt appeared to be about two miles in width, bounded by limestone, and striking in about the same direction, and it appeared to the writer to be a section of country that is well worth further attention from the prospector.

After leaving Kennedy lake district a visit was paid to Deer river, at the head of Tofino inlet, and half a day was spent looking for trails to the *Jumbo* mine and other claims. As nothing could be found, we left for Tranquil creek in the afternoon. On June 24th a start was made early in the morning up the trail to visit General Ashton's claims. Included in the group are *General James M.*, *Faith*, *Leviathan No. 1* and *No. 2*, and the *Leviathan Fraction*.

At an elevation of 2,025 feet above sea-level, and about four miles from it, a small blow-out of pyrrhotite and chalcopyrite was located; about 7 tons of ore had been broken, but there appeared to be no more in place. A short tunnel had been driven across the diabase country-rock, but no more ore was located. The remainder of the day was spent searching for other workings, but, as nothing was found, a return was made at dark to the sea.

ALBERNI MINING DIVISION.

JOHN KIRKUP, GOLD COMMISSIONER.

I have the honour to submit the annual report on mining in the Alberni Mining Division during the year ending December 31st, 1913.

Although practically no mining was done in the district the past year, the Ptarmigan Mines, an English company, which has taken over the property known as the *Big Interior* group, has expended quite a large sum of money on road-making to permit of machinery being taken to the property, and it is quite probable that during the coming season a large amount of development-work will be done on this property, and possibly some shipments of ore may be made.

With the exception of the work mentioned, little or nothing has been done, but the annual assessment-work on a number of claims as shown in the accompanying statistics.

OFFICE STATISTICS—ALBERNI MINING DIVISION.

Placer claims recorded	4
Mineral claims recorded	23
Certificates of work	47
Bills of sale, etc., recorded	4
Free miners' certificates (individual)	72
" " (special)	2

Marble Bay Mine—Vananda, Texada Island.

Salt Evaporating Plant at Kwinitza—Skeena River.

CLAYOQUOT MINING DIVISION.

REPORT OF WM. SIMPSON, DEPUTY MINING RECORDER.

I have the honour to submit the annual report on mining operations in the Clayoquot Mining Division for the year ending December 31st, 1913.

Assessment-work recorded was as follows:—

Jessie B. (H. G. Gibson)—Twelve feet of open-cut and 12 feet of tunnel.

Rose, Mamie, Maggie, and *Sadie* (Anthony Watson)—Continuation of main tunnel to the extent of 25 feet; size 6 feet 6 inches by 5 feet 5 inches; removing of slide from entrance to mouth of tunnel, 15 x 5 x 5 feet, and other prospecting-work.

You group (T. D. A. Purves, R. W. Purves, and A. Wooler)—The surface of the vein being in a slope of about 45 degrees, the work done consists of a drift on the vein, for a distance of 54 feet to the breast, 7 feet in height by 4½ feet in width; about 20 tons of ore was taken out, and other prospecting-work done.

Leora group (D. W. Hanbury)—Drove tunnel 94 feet, erected new cabin, and fitted up air-ventilating system.

New Crow group (J. Drinkwater)—Opening 30 feet long by 5 feet high and 5 feet wide; cleared out 30 tons of ore and earth, and other prospecting-work.

Kallapa Group.

The Kallapa Mining Company, Limited (capital, 250,000 shares of $1.00 par value), has taken over the interests of C. E. Cartwright and associates in this group of mining claims, situated on Disappointment inlet, on Meares island. Mining-work on this group was commenced in May, 1912, by Mr. Cartwright and associates, and has continued steadily to date. The work has been chiefly development and building of roads and ore-bunkers; about 600 feet of drifting and 200 feet of upraising has been done during the year. A road about 2,000 feet long from the workings to the inlet, has been constructed; ore-bunkers with a capacity of 500 tons, which will load direct into steamers have been completed. Two shipments of ore were made to Tacoma smelter, aggregating 217 tons, and the property in February will be in a position to begin regular shipments of 500 tons each month. From sixteen to twenty men are employed.

The ore carries gold, silver, copper, varying in value, at the workings, from $10 to $22 a ton. Surface indications encourage expectations of higher-grade ore, and also of wider ore-bodies. As shown in the workings, the vein is narrow, the average of ore in the slopes being generally under 30 inches. The ore is persistent, however, and very little displacement occurs at faults.

All development-work has been by drifting on the vein, no crosscutting being necessary. There are at least five veins on the property, but practically all work has been done on one of these. The other veins, however, have good surface showings, and the company hopes during the coming year to do considerable development on these as well.

It is also proposed at an early date to install air compressors and drills, and a tramway from the lower workings to the wharf. It is expected to steadily increase development and shipment until an output of 1,000 tons a month is reached.

Ptarmigan Mines.

The interests in these claims are owned by the Ptarmigan Mines, Limited, the head office of the company being at Finsbury Pavement House, London, England. The address of the consulting engineer, H. H. Johnson, is 109 Belmont Building, Victoria, B.C.

The ore has gold and silver values. There is a tunnel-entry of 10 feet, seven and a half miles of road built, and twenty-five bridges built at a cost of $38,000. The average number of men employed from June 1st to November 30th was forty, and the total sum expended $47,000. To complete the road, three and a half miles has yet to be constructed and several large bridges built.

OFFICE STATISTICS—CLAYOQUOT MINING DIVISION.

Free miners' certificates	29
Mineral claims recorded	37
Certificates of work recorded	36
Payments in lieu of assessment-work	10
Surveys	4
Powers of attorney, transfers, etc	9
Other receipts	7

Revenue.

Free miners' certificates	$ 110 50
Mining receipts, general	1,330 00
	$1,440 50

QUATSINO MINING DIVISION.

REPORT OF O. A. SHERBERG, MINING RECORDER.

I have the honour to submit the annual report on the mining operations in the Quatsino Mining Division for the year ending December 31st, 1913.

The property known as the *A. T. Monteith* and *Sockeye* mineral claims, situated on Kyuquot sound, are the only claims from which any ore has been extracted and shipped from this district during the year; 1,800 tons was shipped from the *A. T. Monteith* and 100 tons from the *Sockeye*. This property is owned by the British Columbia Pottery Company, of Victoria.

Twenty mineral claims situated near Elk lake, and known as the *Old Sport*, a group of eight claims; the *Shamrock*, a group of three claims; the *Idaho*, a group of two claims; the *Merry Widow*, a group of six claims; and the *Black Jack Fraction*, was taken up on a bond last July for $100,000 by C. Wolfle and F. R. Wolfle, of Spokane, Wash. The greater part of the work so far, since the property was taken over, has been building trails, establishing camps, and getting in supplies. Only a few men have been employed in mining.

A diamond-drill is now on the ground, and I understand that it is the intention of the owners chiefly to work the diamond-drill during the winter.

Notes by Provincial Mineralogist.—The *Merry Widow* and *Old Sport* groups, situated in the vicinity of Elk lake, have been attracting some attention of late; their location and means of access to them is shown in the accompanying sketch-map.

Mr. Halliday, who was connected with the operations this past season, supplied the writer with the following information, in September last:—

The properties are under bond to a syndicate, of which F. R. Wolfle, of *Florence* mine, Ainsworth, B.C., and C. R. Wolfle, of Spokane, are important shareholders.

Some fifteen men were employed this past summer.

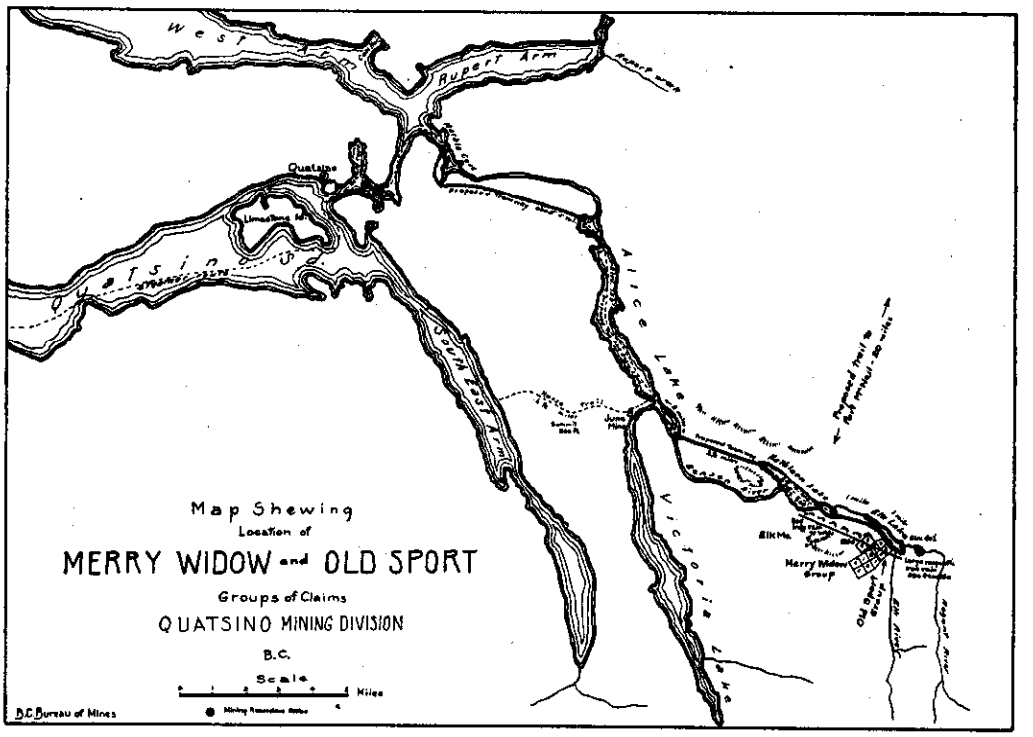
The bond is for $100,000, and is good for four years under conditions of work and development, and with the first cash payment of 25 per cent. at end of second year.

The deposits are contact deposits between limestone and diorite, occurring in the vicinity of a large batholith of granite, of which the diorite is probably an offshoot.

Along this contact there is a crushed zone or vein, which has been subsequently silicified, having a width of from 20 to 60 feet, and traceable for 3,000 feet at least in a southerly direction.

On the other side of the lime-deposit, here about 1,000 feet thick, there is a second and smaller vein, not as well prospected as yet. In this vein there are a number of shoots of ore, consisting of chalcopyrite associated with magnetite, assaying in picked samples from 10 to 20 per cent. copper, with from 0.5 to 1 oz. silver, and about $1 in gold to the ton.

On the *Mother Lode* there is a body of pyrrhotite, a sample from which assayed 5 per cent. zinc, 2 per cent. copper, and $4.50 in gold to the ton.



With the exception of the above-mentioned properties, no extra development-work has been done during the season, further than the necessary assessment.

The Teta River Company has applied for certificate of improvements respecting the *Quatsino King*, *Paramount*, *Hill Side*, *Alexander*, and *Eros* mineral claims, situated on the South-east arm of Quatsino sound.

Messrs. Moerman, Falconer, Jackson, Nordstrom, H. Malmberg, and A. Malmberg have been prospecting for the greater part of the season in the vicinity of Cape Cook for placer-mining ground, and they have just lately, staked six placer-mining leases on Amos and Gold creeks. They are now making preparations to start work, in about two weeks or so, I expect, to develop the ground.

OFFICE STATISTICS—QUATSINO MINING DIVISION.

Mining claims recorded	47
Certificates of work recorded	78
Bills of sale, powers of attorney, etc	15
Free miners' certificates	53

NANAIMO DISTRICT.

NANAIMO MINING DIVISION.

NOTES BY DONALD G. FORBES, M.E., M.AM.INST.M.E., M.I.M.M., ETC.

VALDES ISLAND.

On Tuesday September 10th, a visit was paid to Valdes island, in the Nanaimo Mining Division. This island is situated at the north end of the Gulf of Georgia, and is one of the largest islands of the intricate archipelago situated between Vancouver Island and the mainland coast, and extending from the Gulf of Georgia to Queen Charlotte sound.

A contact between the Coast granites and the Vancouver Island greenstones crosses the island from Open bay, Hoskins inlet, on the south-east, to Granite bay, Johnson straits, on the north-west side of the island, a distance of approximately nine miles.

In the neighbourhood of this contact, on the western side of the island, irregular bodies of limestone occur in the diabase country-rock, sometimes in the form of small masses enclosed in the diabase and at others in bodies covering several acres of the surface; this limestone is cut by intrusive dykes striking, generally, north-west (mag.), and is underlaid by diabase. These deposits of limestone are probably the remnants of large deposits which formerly overlaid the present surface. Several natural cavities in the limestone were observed containing water, in one place forming a sink for a small stream, and varying in size from small pot-holes to cavities of considerable dimensions.

The mineral deposits, consists of small bodies of pyrrhotite and quartz carrying chalcopyrite and pyrite, containing some gold, and are probably replacements of the limestone. They are generally located in the limestone, in close proximity to the diabase or granite. Small quartz veins also occur in the diabase, containing tellurides, probably sylvanite, and visible free gold. The principal mineral deposits are all located within a short distance of and on the south-west side of the main limestone-granite contact.

Stampede. The *Stampede* mineral claim, owned by W. Hall, is situated on a greenstone dyke which strikes north-west, some six miles from Granite bay and three miles from Open bay. A quartz ledge which cuts the dyke in a north-to-south direction (mag.), dipping to the east, can be traced on the surface for 150 feet. The quartz carries some chalcopyrite, pyrite, and a little pyrrhotite. The open-cuts have been made on the vein about 2,000 feet from the granite-contact, and show the quartz to be in places from 2 to 5 feet in thickness, but pinching, at times, to nothing. A sample of the best ore assayed: Gold, 0.3 oz.; silver, 0.8 oz.; copper, 1.6 per cent. Another opening, a few feet to the north-west of the vein and the first-mentioned open-cuts, exposes a stockwork of quartz stringers in diabase, apparently of small value.

Gold Exchange. The *Gold Exchange* mineral claim, owned by T. Bachus, lies to the north-west of the *Stampede*. Several open-cuts have been made on a siliceous schist lying between diabase and limestone, and showing in some places a little chalcopyrite. This deposit is situated 300 yards to the west of the granite-contact.

Bird. The *Bird* group of mineral claims, owned by A. McNear, C. E. Lyman, R. Sharp, and T. Holman, lies to the north-west of the *Gold Exchange*. Included in the group are the *Anaconda* mineral claim, situated on the shores of a small lake, 200 yards from the granite-contact and half a mile north-west from the *Gold*

Exchange. On this claim there are five open-cuts exposing the contact between limestone and diabase, the strike of the latter being, as usual, north-west and the dip to the south-west. The dyke-matter on the contact shows some chalcopyrite and pyrite, and the quartz and calcite stringers in the dyke are said to carry free gold. A sample assayed: Gold, 0.2 oz.; silver, 0.2 oz., to the ton.

Condor. The *Condor* mineral claim, situated on the north-west of the *Anaconda*, exhibits the same conditions as on the latter. A body of pyrrhotite 3 feet wide has been exposed on the contact at the mouth of a tunnel which has been driven 110 feet south-west through the limestone hanging-wall, and has exposed another diabase dyke in the face, but in which there is no ore. A sample assayed: Gold, 0.2 oz.; silver, 0.2 oz.; copper, 0.9 per cent.

Cormorant. The *Cormorant* mineral claim is situated half a mile to the west of the *Condor*. A shaft has been sunk 40 feet on pyrrhotite occurring in limestone, the latter having an apparent strike of north and south and a dip of 75 degrees to the east. This shaft was full of water and could not be inspected. The ore is said to be 4 feet wide in the bottom of the shaft, and was 2 feet 6 inches wide on the surface. The ore occurs in a north-and-south fissure, crossing the diabase dyke, which has been filled with crystalline calcite and quartz containing pyrite, pyrrhotite, and a little chalcopyrite. The lime in the fissure is partly covered on surface by a flow of diabase. A sample from the surface assayed: Gold, 0.06 oz.; silver, 0.2 oz.; copper, 2.7 per cent.

Pelican. The *Pelican* mineral claim lies to the north-east of the *Cormorant*, three miles and a half from Granite bay. An intermittent outcrop of pyrrhotite exposed by a series of open-cuts can be traced on the surface for 600 feet, following the lime and diabase contact, having a strike to north-west, dipping nearly vertical to the north-east. The main granite-contact is situated a few hundred feet to the north-east of the outcrop. The ore, in places, attains a width of 10 feet, but is usually from 1 to 3 feet in thickness. A sample taken over a width of 4 feet assayed: Gold, trace; silver, trace; copper, 0.7 per cent.

Hook. The *Hook* mineral claim, owned by Edward Hamilton, is situated a mile south-west from the *Pelican* claim. An outcrop of quartz striking north-east and dipping 75 degrees north-west occurs in diabase, some limestone being present on the foot-wall side. The quartz contains some pyrite, pyrrhotite, and traces of chalcopyrite. The vein has not yet been traced for more than a few feet, one open-cut being put in on quartz. A sample contained no values.

White Swan. The *White Swan* mineral claim, owned by W. L. Cameron and W. Stramberg, is situated about four miles from Granite bay. Several bodies of pyrrhotite from 1 to 4 feet in thickness occur in limestone, striking north-east, at right angles to the general strike of the diabase, and dipping north-west. A series of open-cuts has been made extending over 600 feet along the contact of the limestone and diabase, and so exposing these deposits. A shaft has been sunk 50 feet on the property, which cuts into one of these deposits of pyrrhotite at 15 feet; it dips north-west 30 degrees and is 4 feet in width. The shaft was full of water to within 20 feet from the surface, and the lower workings could not be inspected. At the north-west end of the claim a cut has exposed a body of quartz containing pyrite and chalcopyrite, 20 feet in width, in diabase. This deposit has not been traced on the surface beyond the limits of the cut. A sample of pyrrhotite from the surface assayed: Gold, trace; silver, 0.2 oz.; copper, 1.0 per cent.

Geiler. The *Geiler* mineral claim, owned by W. L. Cameron and W. Stramberg, adjoins the *White Swan* to the north-west. A shaft has been sunk 30 feet on this claim on a limestone and diabase contact, following a small stringer of quartz and calcite which shows free gold. Sample No. 8 assayed 0.03 oz. gold A little fine free gold can be panned on the surface for 600 feet following this contact, and has probably been shed from the small quartz stringers in the diabase, which vary in width from 1 to 12 inches. Sample No. 9 was taken from a streak of quartz 1 foot wide in porphyritic diabase at the north end of the claim, and assayed 4.14 oz. gold.

On the eastern side of the claim a body of schist strikes north-west and dips north-east; in this small quantities of pyritic matter occur and can be traced on the surface for 200 feet. Sample No. 10, taken across 4 feet on the north-east of the deposit, assayed 0.08 oz. gold.

Gold Thread. The *Gold Thread* mineral claim, owned by Andrew Law, is situated about three miles from Granite bay. A small stringer of quartz 4 inches wide, in diorite, striking north-west and dipping south-west, showing free gold and tellurides, probably sylvanite, has been located.

Lucky Jim. The *Lucky Jim* group of mineral claims, situated two miles and a half from Granite bay, was reported on by the Provincial Assayer in 1910, and since that date, owing to financial difficulties, but little development-work has been carried on. The property is in charge of a watchman, who has done some stripping on the surface, exposing some further small bodies of ore following the lime and diabase contacts to the north-west. Ore has now been exposed on the surface in irregular bodies, usually not over 2 feet in thickness, for a distance of 1,000 feet, there being several barren zones along the contact from 50 to 100 feet in length. Some 300 tons of pyrrhotite and chalcopyrite of fair grade are now piled up on the surface, some from the open-cuts, and some from the 110-foot shaft.

The following list of assays were taken from the various claims, the samples being representative of the class of ore found on the island. It will be noted that neither the larger deposits of quartz nor the pyrrhotite contain any appreciable quantity of gold, this metal being confined to the small stringers included in the diabase dykes. As a rule, these veinlets so far as exposed, are too small to be of commercial value, but it is possible that further prospecting on the *Geiler* claim may develop a sufficient width of these stringers, mixed with diabase, to be worked at a profit. The presence of tellurides, probably sylvanite, was noted on both *Geiler* and *Gold Thread* claims.

Description of Sample.	Gold. Oz. per Ton.	Silver. Oz. per Ton.	Copper. % Wet Assay.
No. 1. *Stampede*, 4 feet quartz and pyritic matter	0.03	0.3	1.6
No. 2. *Anaconda*, 2 feet pyritic matter on contact	0.2	0.2	.....
No. 3. *Condor*, 3 feet pyrrhotite and quartz, on contact mouth of tunnel	0.02	0.2	0.9
No. 4. *Cormorant*, quartz and pyrrhotite	0.06	0.4	2.7
No. 5. *Pelican*, 4 feet pyrrhotite diabase	Trace.	Trace.	0.7
No. 6. *Hook*, 5 feet quartz and pyrrhotite	Trace.	Trace.	.....
No. 7. *White Swan*, pyrrhotite	Trace.	0.2	1.0
No. 8. Shaft on *Geiler*, 1 foot on contact	0.03	.....	.....
No. 9. *Geiler*, 12-inch quartz stringer	4.14	.....	.....
No. 10. *Geiler*, 4 feet mineralized schist	0.08	.....	*Nil.*
No. 11. *Gold*, traced 4-inch stringer containing telluride	33.40	0.6	.....

TEXADA ISLAND.

The *Marble Bay* mine, owned by the Tacoma Steel Company, is situated on the east side of and five miles from the north end of Texada island, and is in the town of Vananda.

The mine is located in limestone which has been cut by numerous dykes of diabase, along some of which considerable movement has taken place. Since the intrusions of the dykes fresh movements have occurred and new fracture-planes have been formed; it is along these later lines of fracture that the ore-bodies are located and that alterations and replacements have been made in the limestones.

The mineralization, consisting of chalcopyrite and bornite containing some gold and silver, occurs in a gangue of felsite, garnetite, and some tremolite. Native silver is also found in the mine, though not often present in quantity.

The main shaft has been sunk to a depth of 1,000 feet, and from this level, at a point 180 feet north of the main shaft, another vertical shaft or winze has been sunk for 300 feet, making the bottom level 1,300 feet vertically below the surface and 1,250 feet below sea-level.

The 1,200-foot and 1,300-foot levels are being worked at present, and exploration-work is being carried on along the fracture-planes and following small stringers of ore. One fair-sized pocket of ore has been located between the 1,300-foot and 1,200-foot levels and is now being stoped out. The ore consists of chalcopyrite and bornite in a gangue of lime, felsite, and garnetite. Bornite is present in considerable quantities in this ore, and is here found at a depth of over 1,200 feet below sea-level, an occurrence quite unusual at such a depth.

The stope also contains some banded siliceous ore which has not been found in other parts of the mine. A winze has been sunk for 40 feet on the incline below this stope, but disclosed nothing of value and has been discontinued.

The principal exploration-work in the mine has been carried out in a north-and-south direction, as the irregular and disconnected bodies in which the ore occurs pitch to the north.

The ore-bodies are distributed over some 300 feet from east to west, and very little exploration-work has been carried out beyond these limits. The total area covered by the main workings from the main shaft probably does not exceed 600 feet north and south and 400 feet east and west. The ore-bodies are irregular in form and extent and are disconnected from each other; they vary in size from small kidneys to large and rich deposits containing many tons. There is very little to guide the management in the location of fresh ore-bodies from level to level, except that fresh ore-bodies in a level are usually found to the north of those in the level above. Exploration in a southerly direction, where it has been attempted, has proved unprofitable. Exploration has been usually confined to following the dykes and lines of subsequent fracture mentioned above, both vertically and horizontally, preference being given to those in which felsite is present, and, when the exploratory drift and winzes run into pure limestone, they are usually discontinued.

The mine is fully equipped with the necessary hoisting, pumping, and air-compressor plants, which are all in good order. An average of about fifty men is employed at the property.

Little Billie.

The *Little Billie* mine is situated half a mile to the south-east of the *Marble Bay* property, near the shore of Malaspina strait, on a granite and limestone contact striking south-south-west and dipping to the north-west. The ore, which is similar to that in the *Marble Bay* mine, occurs near the granite-limestone contact in a felsite gangue. Some small bodies of ore have been located in the limestone, consisting of chalcopyrite and bornite occurring in tremolite.

The principal development-work consists in a shaft that has been sunk 270 feet vertically, from which two levels have been opened up. The payable ore found in the upper level has been taken out, but a fair body of ore still remains at the 270-foot level. The mine was shut down when visited in September, but had shipped during the previous portion of the year some 1,700 tons of ore to the Tacoma smelter.

Cornell.

The *Cornell* mine is situated about a mile south and west of the town of Vananda, at an altitude of 250 feet, by barometric observation, above sea-level. The mine is at present under lease to Hamilton & McLeod, who are working a force of eleven men. The geological conditions and ore occurrences are similar to those in the *Marble Bay* mine. The principal ore-deposits are located near the western or foot-wall side of a diabase dyke of some considerable size, which has been proved, at one point, to be 100 feet in width. The mineralization consists chiefly of bornite and chalcopyrite in a felsite and tremolite gangue. The ore-bodies pitch to the north-east, following the general direction of the dyke.

The main shaft has been sunk to a depth of 560 feet and six levels have been opened up. Extensive developments have been carried out, following the strike of the diabase dyke, and many crosscuts have been driven through the felsite and limestone on the western side of the dyke, locating ore-bodies that have been mostly stoped out. The dyke has been cut through, but, as a considerable quantity of water and very little ore was found, watertight bulk-heads were erected and this portion of the mine is closed.

Work at present is principally confined to the fifth level, where a kidney of high-grade ore 20 x 40 feet in diameter, measured horizontally, has been located near the dyke, and 500 feet from the main shaft. At several points in the fourth and fifth levels likely-looking points are being prospected in the hope of locating payable ore-bodies. The lessees are at present engaged in unwatering the mine to the sixth level, in the hope of locating the body of ore found on the fifth level.

Lime-quarry.

On the north end of Texada island, at Blubber bay, a large deposit of limestone of exceptional purity has been located. The Pacific Lime Company, Limited, has erected there three stone lime-kilns on the water-front, having a capacity of 400 barrels a day, and has also erected extensive storehouses and wharves. The quarry is located a little to the east of the kilns, and at present has a working-face 50 feet in height. A steam-drill is employed in breaking down the limestone, one round of holes producing sufficient to charge the kilns for several weeks.

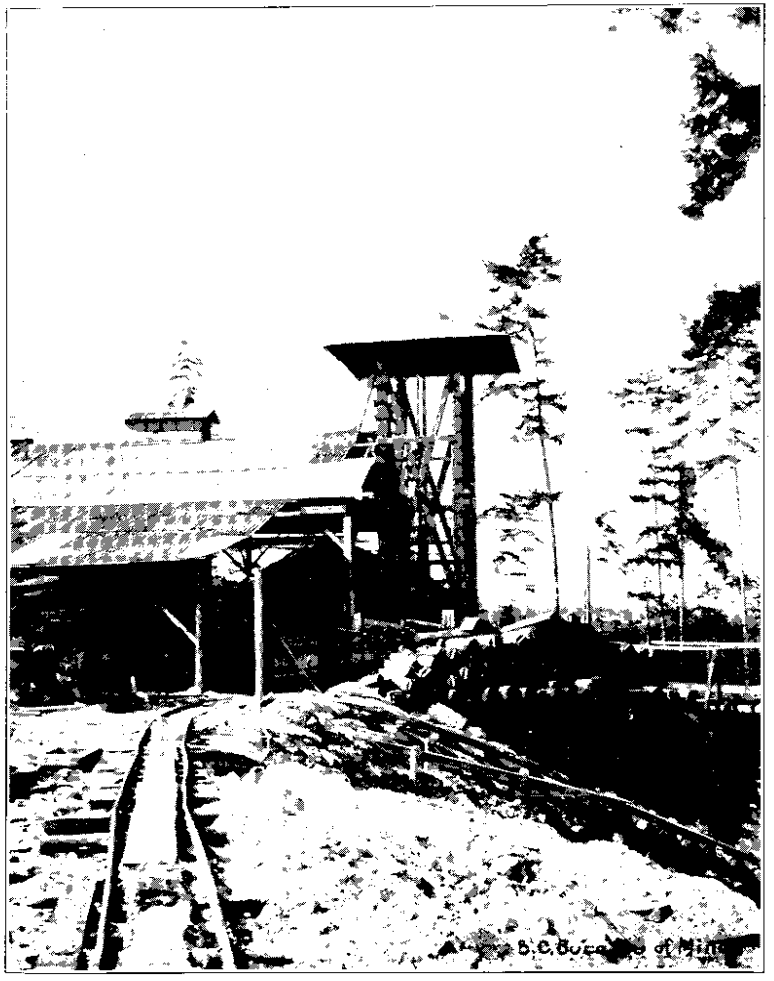
The stone is conveyed from the quarry to the kilns by a system of aerial rope-haulage, such as is often used in large excavations, consisting of one standing cable supporting a carriage fitted with falling block and kibble and with separate hauling and lifting cables, which allows loads to be picked up at any point underneath the standing cable.

The company also owns and operates a barrel-factory, using local fir timber for heads and staves, but importing material for hoops from Oregon and from the East.

The Tacoma Steel Company has also erected four small lime-kilns on the same body of limestone on the west side of the island, but this plant is not at present in operation.

A visit was also paid to a mineral claim on Agamemnon channel, Jervis inlet. It is operated by R. Durnsford, Jr. Mr. Durnsford was advised by letter of this visit, but unfortunately, owing to a breakdown of a launch-engine, the writer was a day behind time, and on arrival found that Mr. Durnsford had left the property the day before, having closed the tunnel with a wooden bulk-head before leaving.

From what could be seen outside the tunnel, the claim appeared to be of small value, a little pyrite occurring on a contact between quartzite and diabase.



Little Billie Mine—Vananda, Texada Island.

Cornell Mine—Vananda, Texada Island.

NANAIMO MINING DIVISION.

REPORT OF GEORGE THOMSON, GOLD COMMISSIONER.

I have the honour to submit herewith the annual report on the mining operations in the Nanaimo Mining Division for the year ending December 31st, 1913.

The mining operations in this Mining Division during the past year were confined to annual assessment-work.

Reports from Texada island and Valdes island are very encouraging; a few of the old claims which have been allowed to remain idle for some time are now being vigorously prospected and are showing up well.

The *Marble Bay* mine still continues to ship ore and is opening up new ground.

OFFICE STATISTICS—NANAIMO MINING DIVISION.

Free miners' certificates (individual)	142
" " (company)	1
Mineral claims recorded	168
Certificates of work recorded	298
Certificates of improvements	1
Transfers and agreements	44

VICTORIA DISTRICT.

VICTORIA MINING DIVISION.

REPORT OF HERBERT STANTON, GOLD COMMISSIONER.

I have the honour to submit the annual report on the mining operations in the Victoria Mining Division for the year ending December 31st, 1913.

Although there is very little actual lode or placer mining being done at present in this Division, there seems to be a fair amount of prospecting going on, as indicated by the recording of some seventy mineral claims during the year, of which, undoubtedly, some were relocations of ground formerly staked, but many were new locations; further evidence of prospecting activity is given by the recording of assessment-work on fifty-two mineral claims, which does not include development done on a large number of Crown-granted claims.

The actual output from placer or lode mining in this Division has been practically *nil* this past year, but, nevertheless, the Division has contributed to an important extent to the general mineral output, through the production of other mineral products such as cement and other building materials.

PLACER-MINING.

A certain amount of work was done on the hydraulic placer leases held on the Sombrio river in the southern end of the Island, where the gravels undoubtedly carry a fair amount of placer gold, but the operations have not, so far, been carried on to make a profit or any considerable output; it is understood another attempt will be made this coming season under new management.

Some desultory placer prospecting has been done, and a small amount of gold recovered, from Leach, Gordon, and Sooke rivers and other creeks, from which the prospectors have been around with samples of the gold found, but, as far as can be learned, in no instance has the amount of gold found been sufficient to be profitably worked, but prospecting is being continued under the encouragement of the more or less authentic traditions of gold recovered in the early days from these streams.

LODE-MINING.

In the Mount Sicker camp no work has been done on any of the claims of the Tyee Company, the Leonora or any of the companies which a few years ago were important producers—the impression of the owners seeming to be that the ore-bodies have been exhausted, so that these properties are practically abandoned.

On the claims of the King Solomon Copper Mining Company, on the Koksilah river, near Cowichan Station, the company has again begun operations under the superintendency of H. G. Humes.

The work at present under way is the driving of a crosscut adit tunnel to tap the ore-body seen in the old workings, at a greater depth.

Mr. Humes writes: "This tunnel will give us a depth of 450 feet on the dip; the cross-cut is now in a distance of 550 feet, and, from the dip of the veins, we should strike the ore vein in another 100 feet, provided the assumption is correct that the vein (seen in upper workings) will retain its present dip. We have cut three distinct veins, in the tunnel, which

give values in copper from a trace up to 2.5 per cent., with a trace in gold. We have not attempted to prospect these veins, preferring first to reach the main ore-body. The Canadian Northern Railway cuts through the middle of the property and is 60 feet vertically and 250 feet horizontally from the portal of the crosscut we are driving.

"The company has installed an 80-horse-power boiler, a 3-drill Ingersoll-Rand air-compressor, with two 2¼-inch Ingersoll machine-drills. There has also been installed an American sawmill of 20,000 feet capacity, consisting of a No. 4 American mill, Am. Junior gang-edger, which will cut up to 33 inches in width, a No. 7 Cowan planer and matcher, and a cut-off saw."

In the vicinity of Port Renfrew, on the south-west coast of the Island, a large number of claims have been staked on deposits of magnetic iron ore; a number of these properties have been reported upon by the Provincial Assayer in the 1902 Report of this Department, since when others have been staked.

From these reports it appears that there is a large tonnage of iron ore of very good quality, but, as there is at present no market for iron ore on the Coast, there has of late been little active development going on, the owners contenting themselves with doing the necessary assessment-work preparatory to Crown-granting the properties. Most of the claims staked have been kept in good standing.

The copper properties on Sooke peninsula, which contain considerable bodies of copper ore associated with magnetite, have not been developed to any extent this past year.

In addition to the well-known and Crown-granted claims, which already have considerable development, several other properties have been staked, some of them on lands held under old Hudson's Bay Company's grants, and on several of these there are quite extensive showings of copper ore.

The following is an extract from Memoir No. 13, Geological Survey of Canada, by Charles H. Clapp:—

"*Sooke Type of Mineral Deposit.*

"*General Character and Distribution.*—On the East Sooke peninsula, developed usually in shear zones of the Sooke gabbro and distributed throughout the gabbro stock, are deposits of low-grade copper ores. The ore mineral is chalcopyrite; associated with it are pyrite, pyrrhotite, and magnetite. Pyrite, pyrrhotite, and magnetite occur chiefly in large masses which are composed almost entirely of metallic minerals. Chalcopyrite occurs chiefly in wide shear zones, through which it is disseminated as small patches, lenses, or veinlets. The only important gangue mineral is hornblende. Since the chalcopyrite is usually disseminated through wide zones of sheared rock, the deposits are low grade. The ore mineral could, however, be easily concentrated, hence the deposits are of great prospective value. At present but little development-work has been done."

CEMENT.

There have been two Portland-cement plants in actual operation during the past year in this Mining Division. The larger and older plant, owned and operated by the Vancouver Portland Cement Company (R. P. Butchart, President; office, Board of Trade Building, Victoria), is situated at Tod inlet, on the Saanich arm, about twelve miles from Victoria.

The raw materials for making the cement—clay and limestone—are mined on the company's property adjacent to the plant. The capacity of the plant is from 2,000 to 2,500 barrels of cement a day; the output made during the past year was about 500,000 barrels of cement, having a value of approximately $1,000,000.

The plant is thoroughly equipped, and is operated largely by electric power transmitted from the British Columbia Electric Company's power plant at Goldstream, but has auxiliary steam plant.

The other cement plant has been constructed at the upper end of Saanich inlet by the Associated Cement Company (Canada) Limited, of London, England. The plant was in operation for seven months of the year, and is credited with having manufactured somewhere about 135,000 barrels of cement of a gross value of approximately $250,000, and employing 140 men while in operation.

The Rosebank Lime Company (W. F. McTavish, manager, Esquimalt), manufactures lime at the west side of Esquimalt harbour, employing about twelve men and producing this year about 50,000 barrels of lime, valued at about $50,000.

The British Columbia Pottery Company, Limited, manufactured clay products, chiefly sewer-pipe, having a value of approximately $90,000. This represents only a part of a year's output, as the company's plant was destroyed by fire in September, 1913, but it is now being rebuilt and certain improvements made.

In this Division there was made this last year, at the yards near Victoria and on Sidney island, approximately 15,000 M. red brick, having a total value of nearly $140,000.

OFFICE STATISTICS—VICTORIA MINING DIVISION.

Free miners' certificates issued	408
" " (special)	14
Mineral claims recorded	70
Certificates of work recorded	52
Conveyances recorded	4

Revenue.

Free miners' certificates	$4,067 25
Mining receipts, general	1,118 70
	$5,185 95

COAL FORMATION ON GALIANO, MAYNE, AND SATURNA ISLANDS.

The following is a private report made in the fall of 1910 by Dr. C. H. Clapp for the Tyee Copper Company, which was at that time prospecting these areas for coal, but has since ceased to do so.

The company has loaned the report and the accompanying maps to the Provincial Mineralogist, and has consented to their publication for the benefit of the public.

Messrs. The Tyee Copper Company, Limited,
Victoria, B.C.

GENTLEMEN,—I herewith submit a report, accompanied by a geological map and fourteen structure sections, on the coal properties held by your company on Galiano, Mayne, and Saturna islands, British Columbia. The report is based on my examination of twenty-two days, October 4th to October 25th, 1910, inclusive.

GENERAL GEOLOGY.

The coal produced in the vicinity of Nanaimo, B.C., occurs in the so-called Nanaimo series or Nanaimo formation. The Nanaimo series consists largely of sandstones, with conglomerates and sandy shales. Coal occurs near the base of the series. The series is Upper Cretaceous in age and rests unconformably upon the older crystalline rocks of the region, and, with the

exception of the unindurated surface deposits, are the youngest rocks of that particular district. The larger number of the producing coal-seams occur in the Nanaimo basin, a large down-fold, or geosyncline, extending on Vancouver island from Nanaimo south to Crofton, and then across the islands south of the Gulf of Georgia to Washington territory.

Two sections of the Nanaimo series were measured during my examination—one at Nanaimo, and the other on Saturna, Mayne, and Galiano islands. The former is a complete section, and the latter nearly so. Based on the Nanaimo section, the entire series may be subdivided into four groups or formations, as follows :—

Upper sandstones.
Shales.
Lower sandstones.
Productive measures.

The lithology of each formation does not correspond entirely with its name, but does in general. The upper two formations are fairly well defined throughout the Nanaimo basin. The lower two are well defined at Nanaimo, but are not so in the Saturna-Mayne-Galiano section ; nor is the boundary between the "shales" and the "lower sandstones" very definite in this section.

DETAILED SECTIONS.

The two sections are in detail as follows (the thickness of the various beds is the stratigraphic thickness—that is, is measured perpendicular to the bedding or dip ; the actual vertical depth would, of course, be greater, depending on the angle of dip) :—

Nanaimo Section.

Upper Sandstones—

	Feet.
Thick bedded sandstone	638
Medium to thin bedded sandstone	340
Unexposed, probably thin bedded sandstone	53
Medium to thick bedded sandstone	92
Thick bedded sandstone	172
Unexposed, probably thin bedded and shaly sandstone	88
Thin bedded sandstone	198
Medium to thick bedded sandstone, with a few thin horizons of thin bedded and shaly sandstones	154
Unexposed, probably sandstone	51
Sandstone and conglomerate	88
Total	1,774

Shales—

Unexposed and shales	319
Medium to thin bedded sandstone	101
Sandy shale and few thin beds of sandstone	297
Unexposed, probably sandy shale	88
Thin bedded to shaly sandstone	57
Shaly sandstone and sandy shale	42
Total	904

Lower Sandstones—

Thick to medium bedded sandstone	155
Thick bedded sandstone, with thin horizons (1 foot ±) of thin bedded and shaly sandstone	175
Thick bedded and concretionary sandstone	230
Total	560

Productive Measures—

Unexposed under Nanaimo River flat, probably some shales, but chiefly sandstone; dip probably irregular, but from mine data averages at least 10 degrees, and there is also a fault with a down-throw to the east of about 150 feet	695
Medium to thin bedded sandstone	16
Thin bedded sandstone, some shaly and medium bedded	90
Unexposed and shale, 4 feet exposed at top	24
Medium to thin bedded and some shaly sandstone	25
Thick bed of sandstone	12
Thin bedded to shaly sandstone	43
Medium bedded sandstone	15
Thin bedded to shaly sandstone	32
Fault down-throw probably to east	..
Thick bed of sandstone	22
Sandy shale	20
Thin bedded and shaly sandstone, with lenses of coal and sandy shale	17
Medium bedded sandstone	20
Unexposed, contains shale and Douglas or Nanaimo coal-seam	35
Sandy shale	5
Thin bedded sandstone	10
Thick bedded sandstone	40
Dark sandy shale	3
Thick to thin bedded sandstone	70
Medium to thick bedded and concretionary sandstone	80
Thin bedded and shaly sandstone	60
Medium bedded sandstone	45
Shaly sandstone	30
Unexposed; this horizon contains the Newcastle or Wellington coal-seam and sandstone	60
Sandy shale	16
Sandstone and conglomerate	260
Unexposed (under water)	..
Coarse conglomerate	200
Fine conglomerate and sandstone	155
Unexposed (under water)	105
Calcareous and shaly sandstone, with some conglomerate and impure limestone	105
Basal conglomerate	45
Total	2,355

Position of Coal-seams—

Newcastle or Wellington seam—

Above base	946
Below top of "productive measures"	1,409
Below top of "shales"	2,873
Below Douglas or Nanaimo seam	378

Douglas or Nanaimo seam—

Above base	1,324
Below top of "productive measures"	1,031
Below top of "shales"	2,495

Saturna-Mayne-Galiano Section.

Upper Sandstones (on Galiano Island)—	
9. Sandstone, chiefly medium bedded	1,160
8. Thick and thin bedded sandstone, with thin horizons of shaly sandstone and sandy shale	940
7. Unexposed, probably thin bedded to shaly sandstone	84
6. Medium bedded sandstone	255
5. Unexposed, probably thin bedded sandstone	88
4. Medium bedded sandstone	177
3. Unexposed, probably thin bedded sandstone	155
2. Thick bedded sandstone	165
1. Sandstone, chiefly thick but some thin bedded	330
Total	3,354
Shales, Upper Part (on Galiano Island)—	
(7.) Conglomerate, with thin beds of sandstone	224
(7.) Unexposed, probably conglomerate	135
(7.) Fine to coarse conglomerate and sandstone beds and lenses up to 10 feet thick	627
(6.) Medium to thick bedded sandstone (drill located here)	451
Shales, Upper Part (on Mayne Island)—	
7. Sandy shales and thin beds of sandstone	682
6. Medium to thin bedded sandstone	216
Shales, Lower Part (on Mayne Island)—	
5. Conglomerate and thin lenses of sandstone	583
4. Coarse, thick bedded sandstone	231
3. Shaly sandstone and sandy shales	176
2. Thick bed of sandstone	15
2. Thin bedded sandstone	10
1. Sandy shales and thin beds of sandstone (partly unexposed)	407
Total (Mayne-Galiano)	2,659
(Mayne alone)	2,120
Lower Sandstones (on Mayne Island)—	
Thick bedded sandstone with some conglomerates and also thin bedded and shaly horizons	750
Productive Measures (on Saturna Island)—	
4. Shaly sandstone and sandy shale (with 8-foot bed of conglomerate at west end of Mayne island)	500
3. Sandstone, thick, medium, and thin bedded, with thin layers and lenses of conglomerate, on Mayne island	540
2. Shales, with thin beds of sandstone	430
(Drill recommended to be placed here)	
1. Sandstone and conglomerate exposed	15
Total	1,485

(The numbers of the various strata of the above section are shown on the accompanying map and structure sections.) The two sections in general are:—

	Nanaimo.	Saturna-Mayne-Galiano.	
			(Galiano) (Mayne)
Upper sandstones	1,774	3,354	
Shales	904	2,659	2,120
Lower sandstones	560	750	
Productive measures	2,355	1,485+	
Total	5,593	9,377+	8,766+

Comparison of the Two Sections.

It is seen from the above column the Saturna-Mayne-Galiano section is roughly twice as thick as the Nanaimo section. The presence of more and thicker conglomerate horizons, especially in the "shale" formation on Galiano and Mayne islands, is another very striking difference. Conglomerates also occur in the other formations on Saltspring, Prevost, and Pender islands. To the east on Saturna island conglomerate beds are, however, rare. In the former section the marine beds, which occur at the base of the Nanaimo section, are absent, even on Saltspring island, where the conglomerates rest directly upon the underlying crystalline rocks. These conglomerates also appear to be high in the section, probably belonging to the "shale" formation.

Distribution and Structure of Rocks and Formations.

The distribution of the various formations, as well as the occurrence of the different rock types, notably sandstone, conglomerate, and shale, is best shown on the accompanying geological map of Galiano, Mayne, Saturna, Prevost, and Pender islands. The structure of the region, as worked out from the strikes and dips, is best shown by the structure sections.

Use of Maps and Structure Sections.

These need little explanation other than the explanatory legend, but a word of caution should be given as to their use. As they are made solely from surface observations they cannot be made absolutely correct. The sections on account of the scale are necessarily generalized, and the thickness of the different strata vary in an unknown manner below the surface. This is especially true of the beds of the Nanaimo series. As has been shown above by a comparison of the two sections, there is a great variation in thicknesses of the different formations in the two sections. This variation is much greater when an individual stratum is considered. The strata are of relatively small lateral extent, the conditions of deposition having varied greatly within short distances. Thus, for example, the shales exposed on the shore of Montague harbour, Galiano island, grade to the south-east into coarse conglomerates, which in turn give way to shales and sandstones again on Mayne and Samuel islands. The correlation of beds is therefore very difficult, and is made doubly so by the comparative absence of fossils and of good "horizon-markers"; that is, beds whose position in the section can be readily recognized. The correlations should therefore not be taken as at all definite, except where the various horizons are well marked and virtually continuous, as they are from Gabriola island across Valdes, Galiano, and Mayne islands to Saturna island. On the other hand, the mapping of the various kinds of rocks is correct. The boundaries inland were not, however, traced, and are not, therefore, exact, although they are approximately, and even practically, correct on the properties held by your company. The existence of all the folds shown is also assured.

Division into Two Basins.

One of the chief features of the structure of the Nanaimo basin is its division into two subsidiary basins, a north-western and a south-eastern, by an axis of crystalline rocks on Saltspring island. This axis was apparently a land-mass during the formation of the "productive measures," as the conglomerates which directly overlie the crystalline rocks appear to belong either to the "shale" or "upper sandstone" formations. The presence of this land-area would account for the prevalence of conglomerates on Prevost and Galiano islands.

Folds.

It is seen from the structure sections that the rocks of the district are crumpled into two complete folds—that is, two synclines with two corresponding anticlines. The pitch of these folds is neither so great nor so constant as was thought on immediately completing the field-work.

COPY OF

GEOLOGICAL MAP

OF

GALIANO, MAYNE and SATURNA ISLANDS

Accompaning a

Report made by C. H. Clapp

for the

TYEE COPPER COMPANY

Scale of Miles

0 1 2 3

TRINCOMALI CHANNEL

GALIANO ISLAND

Salamanca Pt.

Galiano

Gossip Island

Active Pass

Georgina Pt.

Parker Island

Wise Id

Walker Hook

St. Mary Lake

Vesuvius Bay

Phillimore Pt.

Helen Pt.

Mary Ann Pt.

Miners Bay

Edith Pt.

Mayne

Campbell Pt.

Village Bay

MAYNE ISLAND

Ganges

Chain Islands

GANGES HAR.

Welbury Pt.

Scott Pt.

Nose Pt.

Peile Pt.

Selby Pt.

Annette Pt.

Horda Id

PREVOST ISLAND

Portlock Pt.

Dinner Pt.

Curlew Id.

Belle Chain

Samuel Id

Boat Pass

Winter Pt.

Lizard Id.

St. John Pt.

Stanley Pt.

Navy Chan.

Port Washington

James Pt.

Pender

Otter Bay

NORTH PENDER ISLAND

Lyall Harbour

Payne Pt

Saturna

SATURNA ISLAND

TUMBO ID.

Race Pt

East Pt

Deep Cove

Java Hd

Croker Pt

Murder Pt.

Taylor Pt

Mouatt Pt

Razor Pt.

Port Browning

Beaumont

Beswell

SOUTH PENDER ISLAND

South Pender Harbor

Blundun Id

Camp Bay

Wallace Pt.

Tilly Pt

Gowlland Pt

SWANSON CHANNEL

Cushoon Lake

Acland Islands

Liddell Pt.

Ellen Bay

PASSAGE I.

Channel Id.

Yeo Pt

SALT SPRING ISLAND

Beaver Pt.

FULFORD HAR.

Eleanor Pt.

RUSSELL ID.

Isabella Pt.

PORTLAND ID

MORESBY ISLAND

Cape Keppel

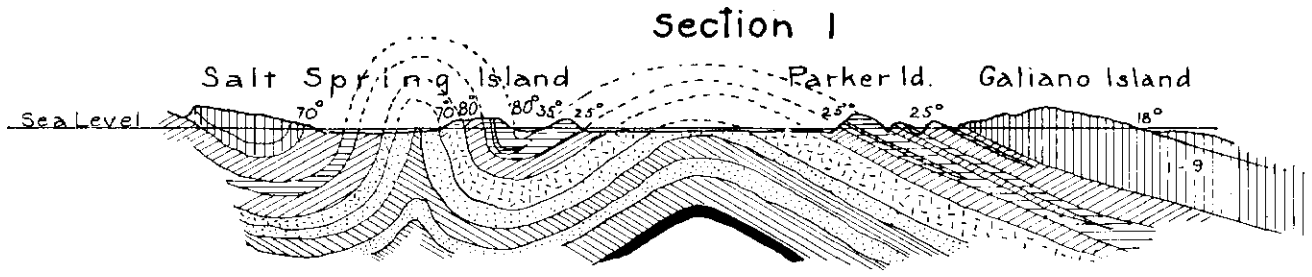
SATELLITE CHAN.

PIER ID.

SAANICH PEN.

B.C. Bureau of Mines

Section 1



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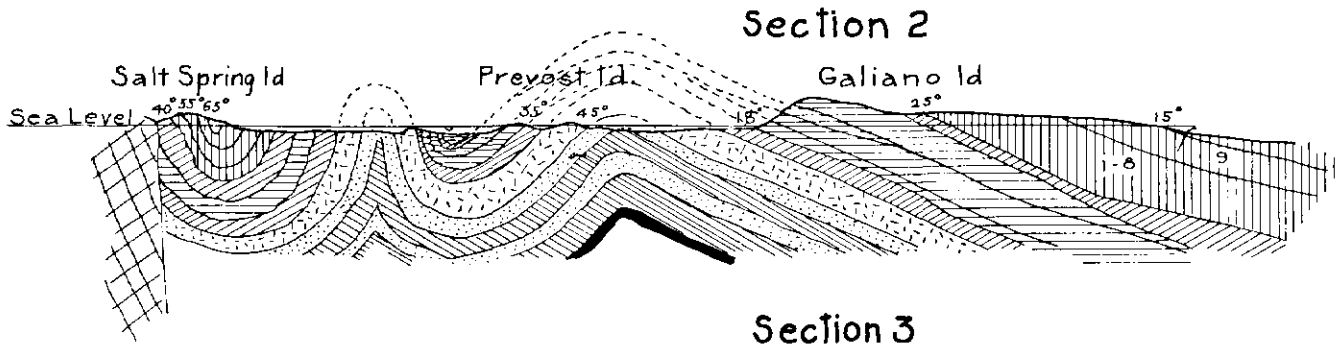

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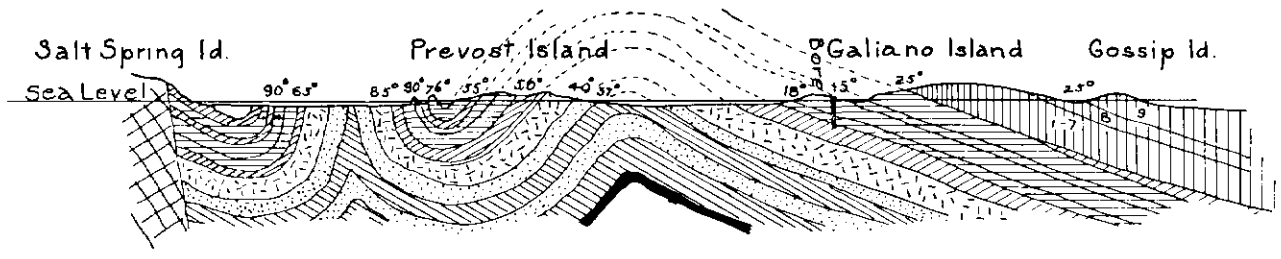

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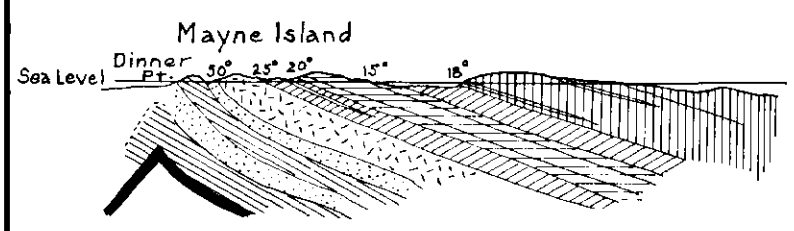

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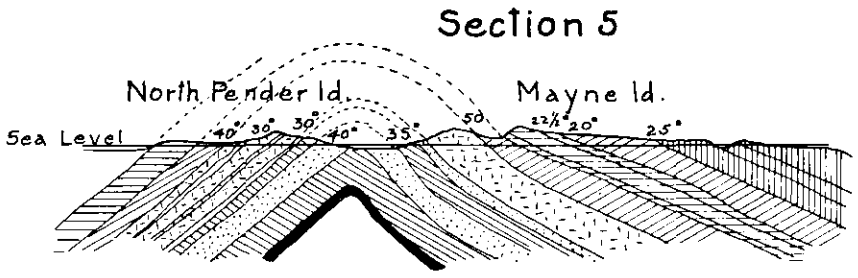

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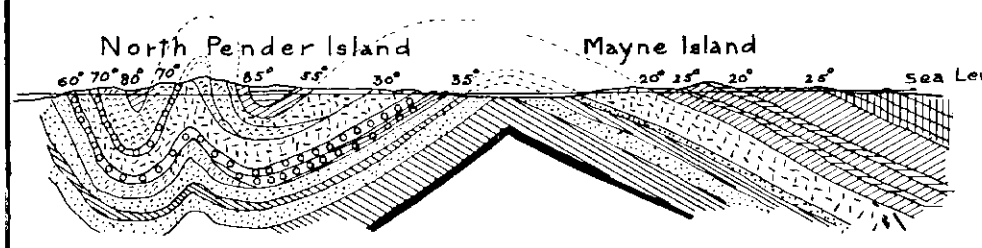

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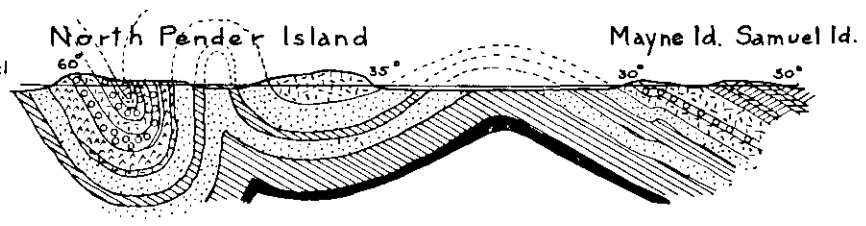

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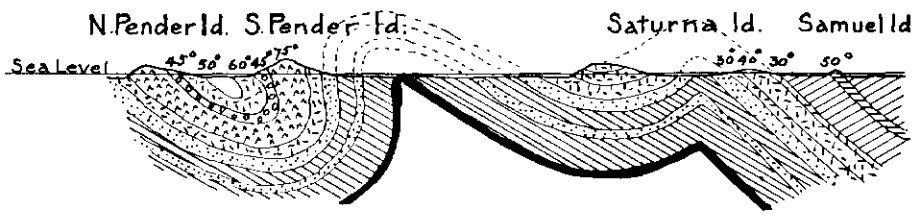

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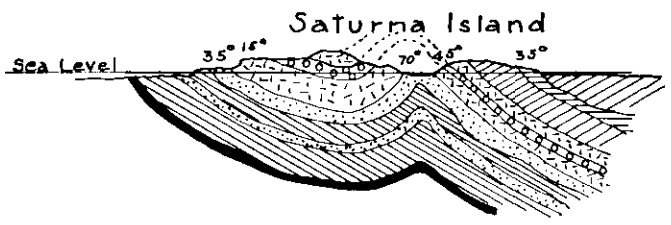

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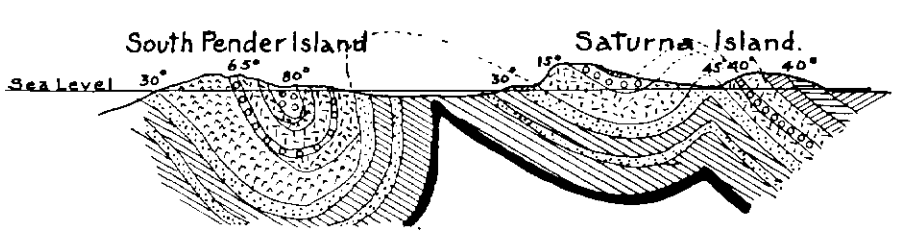

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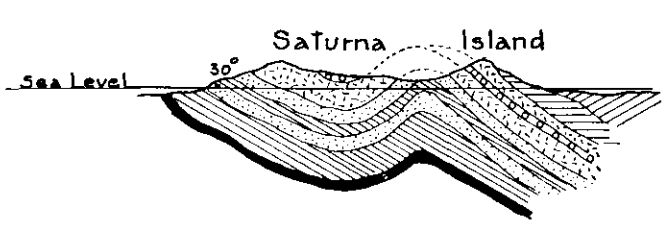

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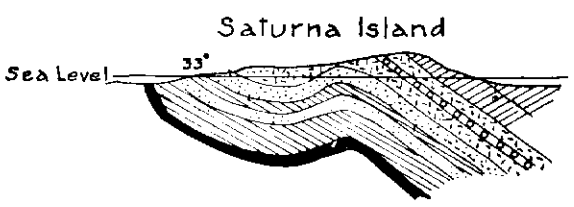

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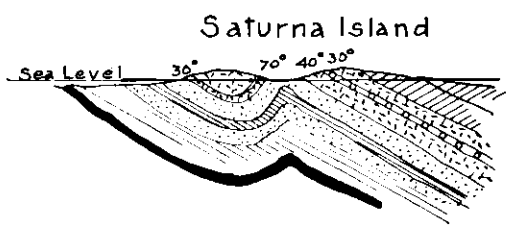

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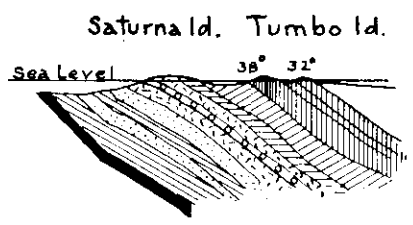


STRUCTURAL SECTIONS

THROUGH

GALIANO, MAYNE and SATURNA ISLANDS.

to accompany a report by C. H. Clapp

to the Tyee Copper Company

B.C. Bureau of Mines

Galiano, Mayne, and Samuel islands occur entirely to the north of the northernmost anticline, which extends through Trincomali and Navy channels to Lyall harbour and across Saturna island to Deep cove. Therefore the rocks of the above islands form a simple monocline dipping to the north, with the exception of a small fold in the south-eastern part of Mayne island, north of St. John point. There is a crest in the anticline between Lyall harbour and Navy channel, as it pitches to the east on Saturna island, and to the west in Navy and Trincomali channels. The anticline is fairly close on Saturna island, but opens to the westward.

The syncline to the south is an open one on Saturna island, but closes to the westward. On North Pender island it is open on the east shore, where the exposed shale is bent into four or five minor folds, and on the west shore is quite close, with a pitch to the north-west. On Prevost island it is an almost typical close, isoclinal fold.

The two southernmost folds exposed on Pender, Prevost, and Saltspring islands are both closed folds, and slightly overturned, so that the majority of the beds dip steeply to the north.

FAULTS.

The faults of the district are relatively unimportant. There are no large dip or transverse faults (those which have the plane of faulting at a considerable angle to the strike), although a small one occurs on Saltspring island north of Cusheon lake. It is probable that large strike faults are also absent, with the exception of one which apparently occurs along the southern boundary of the basin extending from Saltspring island to the south-east, and actually separating the crystalline rocks and sedimentaries to the west of Yeo point, on Saltspring island.

DEPTH OF "COAL HORIZON."

The actual coal horizon at Nanaimo is situated from 900 to 1,300 feet above the base, and may be supposed to occur at about that same distance above the base in the Saturna-Mayne-Galiano section, say from 1,000 to 1,300 feet. From a comparison of the relative thicknesses of the upper three formations of the Nanaimo and the Saturna-Mayne-Galiano sections, the thickness of the "productive measures" in the latter section may be estimated at 4,000 feet, of which 1,400 feet is exposed. The depth of the coal horizon from the lowest exposed beds may be therefore estimated at 1,300 to 1,600 feet. This depth is estimated from a point on the south shore of Saturna island known locally as "Murder" point, where the lowest horizon on the Tyee Copper Company, Limited, properties is exposed. The "coal horizon" is shown on the structure sections and its approximate depth from any desired point may be scaled off from them.

The following data derived from the sections gives the essential data regarding the supposed depth of the "coal horizon":—

Sections 1, 2, and 3: "Coal horizon" comes nearest to the surface at crest of anticline, where it is from 3,000 to 2,700 feet below sea-level, and below 5,000 feet on Saltspring, Prevost, Parker, and Galiano islands.

Section 4: 2,500 feet below sea-level at crest of anticline, but under Dinner point, Mayne island, the depth is 3,500 feet and increases very rapidly to the north.

Section 5: 1,500 feet below sea-level at crest of anticline, but dip of both levels so steep that under Mayne island the depth is 3,500 feet and under North Pender island 2,000 feet, but increasing in half a mile to over 4,000 feet.

Section 6: 1,200 feet below sea-level, 3,000 feet south of Mayne island, and 2,000 feet north of North Pender island. Under Mayne island the depth is 2,500 feet, increasing to 4,000 feet in half a mile; while under North Pender island it is 2,000 feet, increasing to 4,500 feet in half a mile.

Section 7: 1,100 feet below sea-level, 4,500 feet south of Mayne island, and 5,000 feet north of North Pender island. Under Mayne island 3,500 feet, increasing to 4,500 feet in half a mile, and under North Pender island 3,500 feet below surface, increasing to 4,000 feet in half a mile, then slightly decreasing for 2,000 feet, when it increases in depth very quickly.

Section 8: Crest of anticline in "coal horizon" reaches the surface 7,000 feet south of Saturna island, and half a mile north of South Pender island. Under Saturna island it is 3,500 feet, increasing to 4,000 feet in 1,500 feet to the northward, then decreasing to 2,500 feet under Lyall harbour. Under South Pender island over 5,000 feet below sea-level.

Sections 9 and 10: Half a mile south of Saturna island "coal horizon" reaches the surface; under Saturna island depth is 2,000 feet and increases to 5,000 feet below the surface (4,000 feet below sea-level), then decreases to 3,000 feet below Lyall harbour and valley to the east. Under South Pender island depth is 3,500 feet and increases rapidly to over 5,000 feet.

Section 11: Probably comes to the surface about 2,500 feet south of Saturna island, and under the island is 1,300 feet, increasing inland to 2,000 feet below sea-level (2,400 feet below the surface) in 1,000 feet; increases to 3,500 feet below sea-level in one mile, and then decreases to 2,300 feet under valley (2,600 feet below the surface).

Section 12: 2,000 feet below the south shore of Saturna island, decreasing rapidly to the south under the water, and increasing to the north to 3,200 feet below sea-level in 3,800 feet, then decreasing to 2,500 feet.

Section 13: 3,000 feet below Saturna island, decreasing rapidly to the south and increasing to the north to 3,800 feet in 2,000 feet, and then decreasing to 2,000 feet under Deep cove.

Section 14: Averages 4,000 feet below Saturna island and over 5,000 feet below Tumbo island.

Probability of Coal in South-eastern Basin.

The above data gives the depth to the supposed coal horizon, although it is impossible to state whether productive coal-seams occur in it. It is probable that in the neighbourhood of the land-area separating the north-western basin from the south-eastern, which was above water during the formation of the coal-seams of the north-western basin, the conditions would not be favourable for the formation of coal. Farther to the east, however, in the south-eastern basin, it is very probable that conditions similar to those existing in the north-west basin prevailed, and that coal was formed. This conclusion is substantiated by the fact that coal is known to occur in this basin in the United States territory on Sucia islands, Waldron island, and on the mainland near Bellingham. Indications of coal formation are also found in the exposed rocks of Saturna and North Pender islands.

Value of Property.

Of the properties held by your company, it is readily seen from the above descriptions that the easternmost, those on Saturna island, are the most valuable. The prospects of finding workable beds of coal underlying Galiano and the western part of Mayne island are very poor, as the conditions do not appear to have been favourable for the formation of coal, and as the "coal horizon" occurs at such great depths. The prospects of finding coal in the neighbourhood of Saturna island seem to be good, but whether or not in workable beds can only be discovered by prospecting. The depth at which the coal would probably occur has been given above. The most valuable properties, based on the probable depth of the "coal horizon," are the southern claims on Saturna island between Croker point and Java head, and the southern foreshore claims.

The claims in the proximity of the northern anticline from deep cove westward to Navy channel would only be valuable in the event of finding a thick, continuous seam of coal of a very good grade, on account of the depth of the "coal horizon." The depths given above, as well as those in the trough of the syncline on Saturna island, are overestimated rather than underestimated. In the event of striking a good seam of coal, the foreshore rights of south-eastern Mayne island from Conconi reef east to St. John point would be the most valuable.

It is readily seen that the prospect for finding workable coal on Pender, Prevost, or eastern Saltspring island is very poor, because of the depth of the "coal horizon," the complexity of the structure, and the unfavourable conditions of coal formation.

PROSPECTING.

As to the prospecting of the measures, my present advice is virtually the same as I gave in my preliminary report. The first bore should be located at Murder point and carried to a depth of at least 1,600 feet and 2,000 feet if necessary to prove the measures at this place. In the event of striking coal, its lateral extent should be proved by bores placed at no very great distance apart, since the coal-seams of the Nanaimo series are apt to be lens-like in form. At least four bores should be made along the south shore of Saturna island, two to the west and two to the east of Murder point at approximately a mile apart, the easternmost being located on one of the Seagull islets. The depth of the coal would be 600 to 700 feet greater than at Murder point. If an extensive coal-seam is thus located, and its depth determined, I would be in a far better position to advise about further prospecting. Apparently it would be well to determine its northward and westward extent by very deep bores, one located on the southern shore of Lyall harbour, north of Boot cove, which would need to be approximately 3,000 feet, and one on the point projecting into Navy channel, from the central part of the south shore of Mayne island, which would need to be approximately 2,000 feet.

Respectfully submitted,

CHARLES H. CLAPP.

December 17th, 1910.

VANCOUVER MINING DIVISION.*

REPORT OF J. MAHONY, MINING RECORDER.

I have the honour to submit the following report of mining operations in the Vancouver Mining Division, from August 1st to December 31st, 1913:—

Claims recorded in this Division during the past year are located in the following vicinities:—

Britannia mountain and valley	52
South valley	50
East side of Howe sound	15
Seymour creek and valley	40
Lynn creek and valley	14
Cheakamus River valley	11
Indian river	17
North arm of Burrard inlet	1
Mill creek	13
McNab creek	5
Potlatch creek	8
Grouse mountain	4

* *See also* notes on Indian River claims included in Report by W. M. Brewer, M.E., on Lillooet Mining Division.

Staamish River valley	10
Cypress creek	4
Gambier island	3
Bowen island	2
Jervis inlet	10
Sechelt peninsula	1
Porpoise bay	4

There has been a marked improvement in the mining industry, much more development-work having been done this year than in previous years.

The Bowena Copper Mines, Limited, has been developing the properties on Bowen island, which it has acquired this year, and is now establishing a plant to determine the most economical process for the concentration of the ore. Newton Emmens, mining engineer, Vancouver, has kindly furnished me with the following information regarding this company's holdings:—

"The property is situated on the east side of Bowen island, about two miles south of Snug cove, and extends from the water's edge inland across the first range of hills, whose summits reach an altitude of 1,100 feet above sea-level.

"The formation in which the ore occurs belongs to the Texada Division of the Devono-Carboniferous group of the Palæozoic era, and consists mainly of chert, porphyrite, quartzite, and agglomerate, which represent the original volcanic and sedimentary Palæozoic rocks in a highly altered condition, caused by the metamorphic action of the Coast Range intrusive; this not only changed the physical aspect of the overlying rocks, but crushed and shattered them, especially along their bedding-planes, affording channels for the circulation of magmatic waters and other mineral-bearing solutions accompanying and following this geological disturbance.

"The ore-bodies occur along these zones of crushing, not only near their contact with the granitic intrusive, but also at some distance therefrom, and along some of the major lines of faulting.

"There are three ore zones, or veins, known to exist on the property, all of which are of the same general type, with strikes ranging from N. 10° E. to N. 40° W., with almost vertical dips. With the exception of a couple of shallow pits sunk on the No. 1 vein, and a few shots put in the outcrop of the No. 3 (which work disclosed the presence of copper-bearing minerals)' development-work had been confined to the No. 2 vein, which lies between the other two and intersects the No. 1 on its strike. The No. 2 vein occupies a zone of crushing between two fault-planes and is a combination of the replacement and fissure-filling types, cutting the strike of the formation obliquely, having a width of from 2 to 10 feet between walls, which is occupied by ore, consisting partly of crushed rock cemented together, and, in places, replaced by copper-iron sulphides and partly of well-mineralized quartz, which has been deposited in a pre-existing open fissure. This vein has been traced by means of surface cuts from the water's edge inland for a horizontal distance of over 800 feet. Average samples taken from the several cuts assay from 0.01 oz. gold, 0.2 oz. silver, and 1.7 per cent. copper to 0.025 oz. gold, 0.4 oz. silver, and 2.4 per cent. copper.

"The place of intersection of the Nos. 1 and 2 veins has been uncovered at surface by an open-cut and the ore shown to have a width of 25 feet, with only one wall exposed. Samples from this place assayed 0.02 oz. gold, 0.5 oz. silver, and 3.2 per cent. copper.

"An adit is being driven on the No. 2 vein from near the water's edge, and has now reached a distance of 95 feet from the portal. Here the vein is well mineralized, and, where crosscut, shows a width of 8½ feet, with the face of the crosscut still in ore. Average samples taken during the driving of the adit and crosscut assayed from 0.01 oz. gold, 0.6 oz. silver, and 1.43 per cent. copper to 0.02 oz. gold, 0.8 oz. silver, and 2.51 per cent. copper.

"During the progress of development-work, tests will be carried out to determine the most economical process for the concentration of the ore. For this purpose an experimental plant is now being erected in Vancouver, under the direction of A. J. C. Nettell, from which important results are expected."

The *Bulliondale* group, consisting of six claims held by Robert Mungall and associates, of Vancouver, is situated on the south-west side of Indian river, about equidistant from Squamish and the North arm of Burrard inlet. There are several large dykes containing copper ore which can be traced throughout the whole length and breadth of the property. These occur in a chloritic formation, which has been crossed by snowslides, exposing the ore in large bodies. Samples taken from across these dykes assayed $15.90 in gold, silver, and copper, made up as follows:—

Gold, 0.015 oz. a ton	$ 0.30
Silver, 2.5 oz. "	1.50
Copper, 4.7 per cent.	14.10
Total	$15.90

The holders of these claims have been doing a lot of preliminary work during the past year, and intend to send men in in the spring to drive tunnels and further develop the property.

The holders of the *Bank of Vancouver* group, situate near the headwaters of Seymour creek, have made arrangements to continue the development-work on their holdings all winter. Over 180 feet of tunnel has been run in this property, and good commercial ore has been found in all the different cuts.

Arrangements have also been made to continue the work all winter on the *Red Mountain* group, situate at the north end of Loch Lomond. The ore is high-grade chalcopyrite. No. 2 ledge, where cut, is over 7 feet wide. Assays of this ore run from $5 to $75 a ton.

Several claims have been located on Potlatch creek, assays of which give $50 to the ton in silver and a small amount of lead.

Assays of ore from claims located on Cypress creek are said to give high returns in molybdenum.

The *Canadian Consolidated* group on Seymour creek has about 220 feet of tunnel-work, and shows a large body of iron ore with a small percentage of copper.

The *Harbrick-Harris* group at Indian River has a promising-looking prospect on a copper lode, situated between lime and schist; the copper occurring in the form of chalcopyrite, with a quartz gangue. The lode also carries about $2 in silver and 50 cents in gold to the ton, and is from 12 to 20 feet wide, and can be traced on the surface for some distance. The principal ore-shoot on the lode is said to be about 2,000 feet in length, and to carry values up to $14 a ton.

A gold-and-silver lode has been struck on the *MacDonald* claims on Brandywine creek. This lode carries galena, iron, copper-pyrites, with a quartz gangue; but its values are in gold and silver, and run from $5 to $40 a ton.

The Britannia Mining and Smelting Company, Limited, advises me that tonnages for the year 1913 from its mines on Howe sound are as follows: Mined, 215,589; milled, 215,121 The product is shipped to the Tacoma Smelting Company, at Tacoma, Washington, and during the year the company received settlements for approximately 45,000 tons crude ore and concentrates, with gross contents of approximately: Gold, 89 oz.; silver, 72,300 oz.; copper, 13,167,000 lb.

During the year the following new dwellings were erected for occupancy by employees' families, all of which are equipped with electric lights, sanitary plumbing, bath-rooms, etc.: At the Beach, six dwellings with four rooms and thirteen dwellings with three rooms; and at the new tunnel-site, five dwellings with three rooms. Also at the Beach, a new general store, complete in all details, with refrigerating plant, barber-shop, dentist's office, etc.

Work was also commenced on the building of a railway-line to extend from the new tunnel to a point about a mile above the Beach, from which point it is the intention to install a hoisting and lowering incline in order to permit of the handling of ore direct from tunnel to mill, eliminating in time the aerial tramway, which is now the only means of transportation between the mine and the Beach.

This railway-line has not been completed further than grading, but it is the company's intention to have the same in operation during the present year, and it also plans to erect a new concentrating plant at the Beach, with a capacity of approximately 2,000 tons a day. The machinery for this is practically all on the ground, and work will be commenced on the erection of the plant within the next few months.

The company maintained an average during the year of approximately 210 men underground and 400 men on the outside work.

OFFICE STATISTICS—VANCOUVER MINING DIVISION.

Free miners' certificates issued	1,522
Special free miners' certificates issued	19
Quartz claims recorded	264
Placer claims recorded	1
Certificates of work issued	362
Receipts issued for money in lieu of work	12
Mineral conveyances recorded	116
Placer conveyances recorded	7
Abandonments recorded	12
Notices filed	23
Certificates of improvement issued	9
Crown grants applied for	7
Placer leases renewed	2
Placer lay-over recorded	1

Revenue.

Free miners' certificates issued	$10,940 50
Mining receipts	3,503 05
Total	$14,443 55

VANCOUVER MINING DIVISION.

BRITANNIA MINE.

The following description of the *Britannia* mine was written by R. G. McConnell, and was issued as an appendix to the International Geological Congress Guide Book No. 8, published by the Geological Survey of Canada, 1913:—

The group of mineral claims owned by the Britannia Mining and Smelting Company, and known as the *Britannia* mine, is situated in the Coast range east of Howe sound, about twenty miles directly north of the City of Vancouver and twenty-eight miles following the steamer route along the coast. Howe sound is an irregular fiord, cutting well back into the Coast range, and is bordered along its whole length by rugged mountains and high ridges. The claims now being worked are situated on a steep ridge, about 4,300 feet in height, separating Britannia creek from Furry creek. The principal workings are in the north slope of the ridge at a distance of three and a quarter miles from the coast and at an elevation of 3,275 to 3,775 feet above sea-level.

Rocks.—The Coast range is built predominantly of granitoid rocks, mostly coarse quartz diorites or granodiorites, but contains at various points a number of inclusions of the older rocks invaded by the granitic magna. These vary in size from small angular fragments, a few feet across, to wide bands extending along the range for miles. The mineralized zone at the *Britannia* mine occurs in an inclusion or undestroyed area of the intruded rocks from one to two miles in width and running south-easterly from Howe sound for a distance of more than seven miles.

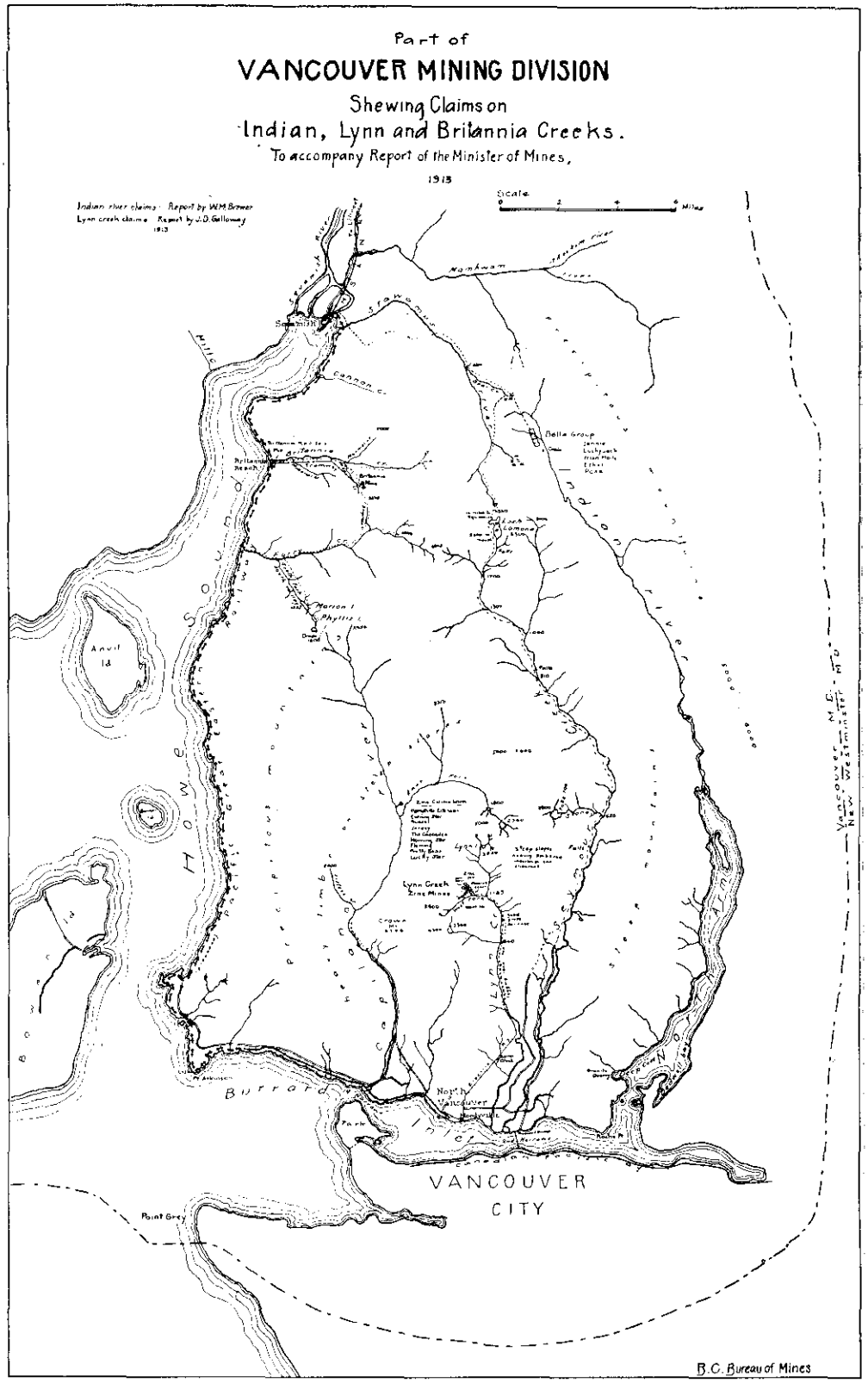
The rocks in the inclusion consist largely of slate, alternating with a dark intrusive, probably a diorite-porphyry, usually crushed and altered into a greenish chloritic schist. Volcanic rocks, mostly porphyrites and hardened fine and coarse fragmentals, occur near the northern border of the inclusion.

The slaty rocks, when unaltered, are dark in colour and contain considerable carbonaceous matter. They are seldom regularly cleaved except for short distances, and in places pass into fine-grained quartz biotite schists. A hard quartzitic variety due to silicification is common, and alterations into greyish and silvery-white quartz sericite schists occur over large areas.

The crushed dioritic intrusive is economically the most important rock in the group. It forms the country-rock at the *Britannia* mine and is also heavily mineralized at other points. It alternates with the slates and their altered equivalents, the sericite-schists, in bands and lenticular areas ranging from a few feet to more than 1,000 feet in width. Like the slates, it exhibits varying degrees of alteration, often passing in a short distance from a hard, irregularly joined, gneissic rock to a soft, greenish, well-foliated, micaceous schist. A light-green variety, spotted conspicuously and fairly regularly with dark-green chlorite films often half an inch or more in length, forms the principal country-rock along the mineralized zone at the *Britannia* mine. The origin of the green films has not been definitely determined. They may represent crushed ferro-magnesian phenocrysts, but possibly are derived in part at least from small fragments of slate included in the intrusive and subsequently crushed and altered.

Dykes genetically connected with the surrounding Coast Range batholithic rocks, usually abundant in inclusions, are rare in the Britannia area, except near the contact.

An excellent section of the alternating slates and crushed intrusives is afforded by a tunnel driven from Britannia creek at an elevation of 2,100 feet above sea-level southward diagonally across the strike of the rocks for a distance of 4,200 feet.


Part of
VANCOUVER MINING DIVISION
Shewing Claims on
Indian, Lynn and Britannia Creeks.
To accompany Report of the Minister of Mines,
1913
Scale
Miles
Indian river claims - Report by W.M. Brewer
Lyon creek claims - Report by J.D. Galloway
1913
Howe Sound
Indian River
Lynn Creek
Burrard Inlet
North Vancouver
VANCOUVER
CITY
Point Grey
Annex 14
Vancouver M.D.
New Westminster M.D.
B.C. Bureau of Mines

Mineralization.—Mineralization at the *Britannia* mine is on an extensive scale. The deposits are of the replacement type and are formed along wide, irregularly fissured zones, enclosed in and striking with the greenstone-schists. The most conspicuous croppings occur in the *Jane* and adjoining claims to the east and consist of two high iron-stained bluffs, about 1,000 feet apart, facing each other across the drift-covered bottom of Jane Creek valley. The mineralized zone exposed in the two bluffs consists of silicified schists impregnated with iron, copper, and zinc sulphides, and has a width in the eastern or *Mammoth* bluff of fully 200 feet. It undoubtedly extends across the concealed interval separating the two bluffs and may be considered to have proved minimum length of 2,000 feet.

East of the *Bluff* mineral zone a number of disconnected croppings occur in the steep mountain-slope covered by the *Fairview* claim. A tunnel driven under these from the *Mammoth* bluff at a depth of about 1,000 feet below the crest of the ridge resulted in the opening of a second important mineral zone, practically a continuation of the *Bluff* zone, but separated from it by a short lean stretch. The strike is also 30 degrees more to the south. Development-work on the second, or *Fairview*, zone is still in progress, and its full dimensions have not been ascertained. The work done up to the present has shown it to have a minimum width of fully 500 feet made up of bands of commercial ore, separated by barren, or nearly barren, schists. Drifts have been carried along the zone for a distance of 1,200 feet.

Minerals.—The metallic minerals in the *Britannia* ore-bodies consist of pyrite, chalcopyrite, considerable zinc-blende in certain areas, and rarely some galena. Small quantities of black oxide of copper and bornite occur as alteration products, but are nowhere abundant. The gangue is principally the greenstone-schists forming the country-rock, more or less silicified. Small quartz veins, generally following closely the direction of the schistosity, but frequently cutting directly across it, are numerous.

Calcite in very small quantities is occasionally present and some fluorspar has been found.

Ores and Ore-bodies.—The wide *Bluff* mineral zone originally worked is practically a low-grade copper-deposit throughout its whole extent. Pyrite, in masses, disseminated grains, and in veinlets through the silicified country gangue, is the most abundant mineral present. Chalcopyrite, in small lenses, veinlets, and scattered grains, occurs with the pyrite, but in much smaller quantites, and in places a notable percentage of blende is present. No mining is at present being done on this zone. A considerable quantity of ore was mined and concentrated before the discovery of the *Fairview* zone, but the venture was not commercially successful. Since then transportation to the coast has been improved and better methods of treatment largely increasing the recovery of metal have been adopted, so that the ores could probably now be mined and treated at a fair profit. The average tenor in copper is about 1.5 per cent.; in addition the ores contains 0.5 to 1 oz. in silver, and in the western portion of the zone, 40 cents in gold.

The character and distribution of the ores in the *Fairview* zone differ markedly from those in the *Bluff* zone. The chalcopyrite, the principal valuable mineral present, in place of being disseminated more or less irregularly through the whole width of the zone, is concentrated along certain lines in fairly definite ore-bodies, ranging in width from a few feet or more, which have proved very persistent. The ore-bodies are not confined between walls and are marked mainly by a more or less complete cessation of both metallic and non-metallic mineralization. They are approximately parallel, but occasionally diverge or unite at low angles. The dip is to the south, at an angle of about 70 degrees, and is comformable or nearly so to that of the enclosing schists. In the present workings, six ore-shoots have been encountered and followed for varying distances up to 1,000 feet. The vertical range has been proved for 500 feet.

The chalcopyrite in the ore-bodies occurs characteristically in fairly large, nearly pure, aggregates, usually as short lenses, occasionally a foot or more across, in stringers interleaved with or cutting the schists at a low angle and in reticulating veinlets penetrating the silicified schists in all directions. Only a small percentage occurs in disseminated grains. The quantity present varies in the different ore-bodies and along the dip and strike of the same ore-body. The general average tenor in copper of the whole system of leads is given at 2.5 per cent. The silver-content is small, amounting only to about 0.5 oz. per ton, and gold occurs only in traces.

The proportion of pyrite present is much smaller than in the *Bluff* zone, and zinc-blende, prominent in the latter, is absent.

The production in 1912, according to published statements, amounted to 193,000 tons, yielding 14,300,000 lb. of copper and 76,500 oz. of silver. The present production is approximately 600 tons a day, the full capacity of the present transportation facilities from the mine to the mill.

Development.—The *Fairview* mineral zone has been opened by five levels at elevations of 1,050, 850, 700, 600, and 500 feet below the summit of the ridge into which they are driven. The levels, with numerous crosscuts and raises following the ore-bodies, serve to explore the zone for a distance of 1,000 feet along the strike and 500 feet along the dip. A long tunnel at a depth of 1,200 feet below the present lowest level, starting from Britannia creek and running toward the ore zone, in now completed to a point beneath and a short distance west of the ore-bodies worked. This will be connected in the near future with the upper workings by a large three compartment shaft and an ore-chute. The extension downward of the ore-bodies below the 1,050 level can be reached from the shaft by short crosscuts.

Treatment of Ore.—The chalcopyrite in the *Fairview* ore-bodies occurs as a rule in fairly large aggregates, often separated by considerable waste, and the material mined is concentrated before shipment. The ore is crushed at the mine and transported to the concentrating-mill at Britannia Beach by an aerial tramway built in two sections, with a daily capacity of about 600 tons. At the mill it is first washed in a 4- x 6-foot trommel with 1½-inch perforations. The oversize discharges on to a sorting-belt, and about 50 tons of 12-per-cent. ore and 150 tons of waste are picked out daily from the 600 tons received. The milling-ore, except the undersize from the washing-trommel, passes from the conveyor to a Blake crusher, and then through a series of spring rolls, which reduce it gradually to the size required, about 2 mm., for treatment in Hancock jigs. The greater part of the sulphides is separated out in these machines.

Flotation Process used.—The tailings and the undersize from 1½-mm. trommels are ground in Hardinge pebble-mills to a 40-mesh or smaller size, and subjected to the Minerals Separation Company's flotation process, the details of which are still kept secret. The Hancock jigs used are of the Anaconda type and the separation of the sulphides by them, followed by the use of the Minerals Separation process on the finer material, has given excellent results, only a very small percentage of the sulphides escaping. The concentration is in the ratio of 4 to 1.

Equipment.—The present equipment is inadequate to the needs of the mine, and extensive improvements and enlargements are being made. A new concentrating-mill with a daily capacity of 200 tons is contemplated, and work is in progress on a system of transportation of the ores from the mine to the Beach, which involves the construction of a double-track gravity-tramway a mile in length with an average grade of 15 per cent.; a switchback track five miles in length with a 3-per-cent. grade on which gasolene-locomotives will be used; a 9- x 12-foot tunnel, 3,600 feet in length: and a 1,200-foot vertical chute connecting the tunnel with the present workings.

Water-power developing 1,800 horse-power from Britannia creek is largely used to operate the mill, compressors, and other portions of the extensive plant, and this, with 650 horse-power obtained from steam, is ample for present requirements.

LYNN CREEK ZINC MINES, LTD.

NOTES BY J. D. GALLOWAY, ASSISTANT MINERALOGIST.

In accordance with instructions from the Provincial Mineralogist, the writer made an examination of the property of the Lynn Creek Zinc Mines, Limited, leaving Victoria on August 30th.

This property consists of the following claims: *Kemptville Extension*, *Evening Star*, *Russel*, *Jersey*, *The Cascades*, *Fleming*, *Pretty Bess*, and *Lucky Star*, containing 400 acres, more or less; the first two being Crown-granted and the others held by assessment. They are situated on the West fork of Lynn creek, about fifteen miles from North Vancouver, and are reached by a very indifferent pack-trail. Most of these claims have been staked for many years, but it was not until the last three years under the present control that any serious development-work has been carried out. The property is owned by the Lynn Creek Zinc Mines, Limited, with head offices in Vancouver; Mr. Prentice is president, and Newton W. Emmons is manager.

Topography.—The country for the most part is very precipitous and rough, being situated on the fringe of the Coast range. The mountains are steep and rugged, with narrow canyons and rapid streams. The northern and eastern slopes and valleys are heavily wooded with fir, cedar, poplar, spruce, etc., and the underbrush is generally dense, while the southern slopes are steep and often impossible to climb. It is a difficult country to travel in, and in some places difficult to prospect on account of the thickness of wash. These claims are situated on a long spur running out from Crown mountain, and are fortunately free from any danger of snow-slides or rockslides. Sufficient water-power is available on the branches of Lynn creek to run a compressor, concentrator, and for any other requirements. Mining timber is plentiful.

Geology.—The rocks in which the ore-bodies occur are a series of sedimentaries (probably Palæozoic) which have been completely metamorphosed by the intrusion of the Coast Range granitic batholith, into quartzites, lime-silicates, and altered limestone. On the *Kemptville Extension* the contact between the granite and altered sediments can be seen. Black lamprophyre dykes, probably of recent age, cut across the other formations. During or after the granitic intrusion the sediments were fractured along north and south lines, and in these fractures mineralization has taken place, probably representing the last phase of batholithic activity.

Ore bodies.—Two main ore-bodies, the east and west, occur on either side of Zinc canyon, roughly parallel and about 150 feet apart. Between these ore-bodies lies a body of limestone forming the hanging-wall of both. The foot-wall of the east ore-body is quartzite, and of the west one is granite. The ore consists of zinc-blende, galena, iron-pyrites, chalcopyrite, and pyrrhotite, in a siliceous gangue. Developments of garnet, epidote, actinolite, and other lime-silicate minerals are common. The gangue rock shows all variations of silica and lime from quartzite to unaltered lime. Zinc-blende and galena are the only minerals of economic importance, and the latter only occurs to an appreciable extent in one working (Pearson drive). Silver values in the zinc and galena are very low, running from 0.5 to 2 oz. to the ton.

The east ore-body has been opened up by an open-cut showing 8 feet of ore. One hundred and fifty feet north of this a crosscut tunnel has been run which crosscuts the ore 12 feet from the entrance; the crosscut then passes through 15 feet of ore, and continues for 20 feet farther into the quartzite foot-wall. From the eastern boundary of the ore the A drive has been driven along the ore-body, with quartzite on the east and ore on the west side. The face of this drive shows about 3 feet of ore, with probably more continuing into the hanging-wall. Five hundred feet north of this and 275 feet higher, the Pearson tunnel has been driven 130 feet on what is supposed to be an extension of the east ore-body. The face of this tunnel is

not in ore, but Mr. Emmons, engineer in charge, thinks that the ore-body can be picked up by crosscutting to the east. The ore from this working is a mixture of galena and zinc-blende, and the manager estimates that one-third of the rock extracted in driving the tunnel was ore. About 20 tons of first-class ore and about 25 tons of second-class ore has been saved and is piled up on the dump.

A possible extension of the eastern ore-body crops out on the *Evening Star* claim at an elevation of 3,448 feet. This showing has been developed by several open-cuts, which show from 2 to 14 feet of ore. Sample No. 8 was taken from a cut at this showing across 4 feet. Sample No. 9 was taken from the largest outcrop showing across 14 feet.

The western ore-body is developed by an open-cut right at the contact between the granite and the limestone. Against the granite there is a small development of chalcopyrite, and about 4 feet from the granite there is 3 feet of solid zinc-blende. A short distance north of this another open-cut shows low-grade zinc-blende. Immediately below this and to the east a crosscut tunnel has been started to strike the ore-body. Twenty feet from the mouth a small body of pyrrhotite was encountered, which, however, has no commercial value. The tunnel continues 10 feet farther, but has not yet reached the contact nor any ore. The western ore-body has been traced on the surface about 400 feet, and has a width varying from 2 to 6 feet. Sample No. 4 was taken across 4 feet from a surface cropping north of the crosscut tunnel.

A cross-fissure with a strike of S. 83° E. cuts the two ore-bodies a short distance north of the main workings in Zinc canyon. This fissure is mineralized across from 2 to 4 feet. Sample No. 5 was taken at this point. Another small mineralized cross-seam occurs farther north, but is of slight importance.

Diamond-drill Holes.—A small diamond-drill outfit was packed in over the seven-mile trail at considerable expense. Three holes were put down, all in the same vertical plane—No. 1, horizontal; No. 2, 187 feet deep at an angle of 32°; No. 3, 205 feet deep at an angle of 53° 25′. The holes were started at a point a little west of the strike of the western ore-body, and were intended to cut the junction of the cross-fissure with the western ore-body. The course of all the holes is the same—namely, N. 46° E. No ore was struck in holes Nos. 1 and 2. In No. 3 hole zinc-bearing material was encountered from 125 feet to 160 feet. Mr. Emmons says that this 35 feet of ore averaged 10 per cent. zinc and 0.5 oz. silver.

A small showing of galena-zinc ore has been uncovered in Fleming canyon on the *Morning Star* claim, but with the present development is as yet of only slight importance.

Values.

Sample No.	Description.	Zinc.	Lead.	Silver.
		Per Cent.	Per Cent.	Ounces.
1	No. 1 E. working (15 feet)	8.3	....	Trace.
2	W. side A drive (20 feet)	10.8	....	"
3	Face of A drive (3 feet)	5.3	....	"
4	Open-cut W. ore-body (4 feet)	3.2	....	"
5	Cross-fissure (3 feet)	8.1	....	"
6	First-class ore, Pearson drive	18.4	35.0	1.4
7	Second-class " "	10.3	14.4	2.8
8	Open-cut, *Evening Star* (4 feet)	13.7	....	Trace.
9	" " (14 feet)	8.4	....	"
	Average	9.4	....	....

With the present development it cannot be said that any very large tonnage of ore has been proven. On the eastern ore-body in Zinc canyon the manager estimates a block of ore 20 x 50 x 100 feet, which, while quite possibly correct, cannot be said as yet to be "in sight,"

while the "possible ore" may be very much greater. Samples Nos. 1, 2, and 3 give an idea of the value of this block of ore, the average of these being 8.1 per cent. of zinc and a trace of silver. It is very hard to estimate a tonnage at any of the other showings from the open-cuts, especially with a deposit of this nature, wherein the ore comes in and goes out quite abruptly. On the *Evening Star* claim there is probably a good big ore-body, as on the surface it is from 2 to 14 feet wide and ore can be traced on the surface for several hundred feet; but more development-work is needed.

It will be noted that the average values are approximately 10 per cent. zinc, with silver values negligible. The showing of galena in the Pearson drive is limited in extent and is not to be considered as being as important as the zinc showings. With such values in zinc it would be necessary to have, first, large ore-bodies; second, cheap mining facilities; third, an efficient concentrating plant making a high extraction and a concentrate running about 50 per cent. zinc, before the property could be operated at a profit. One very favourable feature at this place is the occurrence, in the main showings, of practically straight zinc-blende and gangue with no other interfering minerals, such as galena, iron-pyrites, pyrrhotite, etc. For this reason it should be easy to concentrate the ore by straight water-concentration.

At the present time it costs 5 cents a pound to pack in supplies to the mine, which is much too high. The construction of a wagon-road would materially assist the company in opening up and developing the property. The property is not at present being worked, but if a good road was put in to the mine the company intends to resume development and later erect a concentrating-mill.

NEW WESTMINSTER MINING DIVISION.

REPORT OF IRVING WINTEMUTE, MINING RECORDER.

I have the honour to submit the following report of mining operations in the New Westminster Mining Division for the year ending 1913:—

The mining situation in this district remains practically unchanged since my report of last year.

The mineral claims recorded during the year were distributed as follows:—

Pitt lake	41
Stave lake and vicinity	9
Kanaka creek	1
Hatzic lake	2
Chilliwack and vicinity	30
Harrison lake and vicinity	14
Total	97

OFFICE STATISTICS—NEW WESTMINSTER MINING DIVISION.

Free miners' certificates issued (individual)	289
" " " (company)	3
" " " (special)	5
Mineral claims recorded	97
Certificates of work issued	134
Certificates of improvement issued	1
Conveyances, etc., recorded	42
Notices filed	9

Revenue.

Free miners' certificates	$1,380 00
Mining receipts	3,115 10
	$4,495 10

INSPECTION OF MINES.

REPORT OF THOMAS GRAHAM, CHIEF INSPECTOR.

I have the honour to submit my second annual report as Chief Inspector of Coal and Metalliferous Mines.

The reports of the District Inspectors, covering the production of coal and coke, the number of persons employed, and list of accidents and prosecutions, also a brief description of the mines in their several inspectorates, are hereto appended.

PERSONNEL AND ORGANIZATION OF INSPECTION STAFF

Thomas Graham, Chief Inspector, Victoria;
Thomas Morgan, Nanaimo;
James McGregor, Nelson;
Evan Evans, Fernie;
Robert Strachan, Merritt;
John Newton, Nanaimo;
Thomas H. Williams, Fernie;
Henry Devlin, Nanaimo.

Early in the year Inspector James McGregor made application for three months' leave of absence, so in order to keep the staff efficient and to maintain the standard of inspection in force, and in view of the contemplated early retirement of Inspector Thomas Morgan, it was deemed advisable to make a permanent appointment to the staff.

This policy was followed, and early in February Henry Devlin, of South Wellington, was, by Order in Council, appointed an Inspector of Coal and Metalliferous Mines.

Inspector Evan Evans, of Fernie, was transferred from Fernie to Nelson to take up Inspector McGregor's duties, Inspector Devlin being sent to the Fernie District to take up Inspector Evans's duties.

On the return of Inspector McGregor to duty early in May, Inspector Evans returned to Fernie and Inspector Devlin to the Coast and took up the duties of Inspector Thomas Morgan, who was superannuated on June 1st.

On August 7th, while returning from a visit of inspection of the *Silver King* mine near Nelson, Inspector James McGregor met with an accident, the team running away, and in getting out of the rig Mr. McGregor received a bad sprain of the right ankle; later investigations showed that some of the bones of the ankle and heel were broken. This accident prevented Mr. McGregor from resuming duties during the remainder of the year. Inspector Evan Evans was again moved to Nelson to take up the duties in the West Kootenay and Boundary Districts, and Inspector John Newton, of Nanaimo, was moved to Fernie to take up Mr. Evans's duties, leaving Inspector Devlin in charge of the Vancouver Island mines.

Inspector Newton remained in Fernie for three months, when resumption of operations in the Vancouver Island mines made his return to the Coast imperative. Inspector T. H. Williams covered both districts in the Crowsnest field until the end of the year. Thus for a period of four months and a half the staff was short of one Inspector, but owing to some of the Vancouver Island mines being temporarily closed, the work of inspection was carried through without making any temporary appointments.

In addition to the regular monthly inspections of the District Inspectors, I have personally during the year visited and inspected every operating coal-mine in the Province, excepting the South Wellington and Suquash mines of the Pacific Coast Coal Mines, Limited, and the Northfield mine of the Western Fuel Company at Brechin.

FATAL ACCIDENTS IN COAL-MINES.

There were during the year twenty-four separate fatal accidents, which caused twenty-seven deaths; this is an increase in the number of fatal accidents of two over the previous year, and a decrease of one in the number of persons killed.

There were 6,671 persons employed in and around the coal-mines, making the ratio of fatal accidents to the 1,000 persons employed 4.05, the rate for the previous year being 3.93. The average for the ten-year period is 4.43.

The tonnage produced during the year was 2,570,760, being 454,950 tons less than produced in 1912. The reduction in tons produced and in the number of persons employed in and around the mines, was due to labour troubles on Vancouver Island.

The following table shows the collieries at which the fatal accidents occurred:—

Canadian Collieries (Dunsmuir) Limited, Cumberland	6
Canadian Collieries (Dunsmuir) Extension	4
Western Fuel Company, Nanaimo	1
Nicola Valley Coal and Coke Company, Middlesboro	3
C.P.R. Natural Resources Coal Department, Hosmer	3
Crow's Nest Pass Coal and Coke Company, Michel	1
Crow's Nest Pass Coal and Coke Company, Coal Creek	9
Total	27

The following table shows the various causes of the fatal accidents and their percentage of the whole:—

Cause.	No.	Per Cent.
Falls of roof and rock	11	40.740
Falls of coal	7	25.930
Mine-cars and haulage	5	18.520
Shaft-sinking	2	7.405
Surface, miscellaneous	2	7.405
Total	27	100.000

Falls of roof and coal again account for the largest number of accidents, being 66.66 per cent. of the whole, as against 32.14 per cent. in 1912.

Fatalities from mine-cars or haulage show a decrease, being 18.52 per cent., as against 32.14 per cent. in 1912.

The very marked increase in the fatalities from falls of roof and coal requires some comment. Of the eighteen fatalities from this cause, six lives were lost by suffocation in fine coal; all three of the fatalities at Hosmer were from this cause—in one accident two lives were lost. The pitch of the seam is 65 degrees and the coal friable; two men were engaged in work preparatory to pillar-extraction; while engaged in this work a large corner of the pillar fell from an unseen slip, burying both men in the fine coal against the battery. The third man was buried in a mass of fine coal through the swinging of a set of timber.

Three of the fatalities from falls of coal at Coal creek were due to sudden pressure of gas, or "bumps," breaking down timber without warning and burying the unfortunate men in fine coal; here the seams are very thick and the coal very soft; much of the coal is timbered up and contains much gas, from which excessive pressure is developed, and a number of sets of timber will suddenly give way without any warning of any kind.

These accidents occurred at the intersection of roadways or lines of crosscuts, and the use of selected timbers of certain sizes to form the bridge-sticks was adopted.

The breaking-off of crosscuts directly opposite each other, necessitating two bridge-sticks, has also been stopped, except where the same was unavoidable.

Early in the year it was recognized that the fatalities from falls of roof and coal were going to be very high, and on June, 9th, 1913, the following circular letter was sent from this office to all mine managers in the Province:—

"Sir,—For a number of years past the percentage of fatal accidents from falls of roof and coal at the working-faces has ranged from 35 to 60 per cent. of the total accidents due to the industry.

"I regret to say that during the first five months of the present year there have been twelve (12) fatal accidents from these causes, or three (3) more than during the whole of last year.

"Owing to the large increase in this class of accident, the Honourable the Minister of Mines deems it necessary to avail himself of the powers given him in section 101 of the 'Coal-mines Regulation Act,' and proposes, in writing to the managers of the various collieries, a special rule covering the question of 'systematic timbering and spragging' at the working-face.

"Recognizing that owing to the widely varying conditions in the different collieries in the Province—even in the same field and often in the same mine—that a hard-and-fast rule on systematic timbering would render such rule often impracticable; making the same invalid and even tending to bring about the very conditions that we are aiming to prevent. Therefore, before formulating any such rule, the Minister, in keeping with his former policy, would like to avail himself of your assistance and co-operation in this very important matter, and we beg to submit the following for your consideration:—

"(1.) The manager shall submit to the Minister of Mines a systematic method of timbering for the mine, division, or subdivision of the mine. This shall indicate the average height of the seam, the kind of timber used, the minimum diameter of such timber, the maximum distance that shall exist between the props, timbers, or other roof supports and between such props, timbers, and other roof supports and the sides and face of the working place or face.

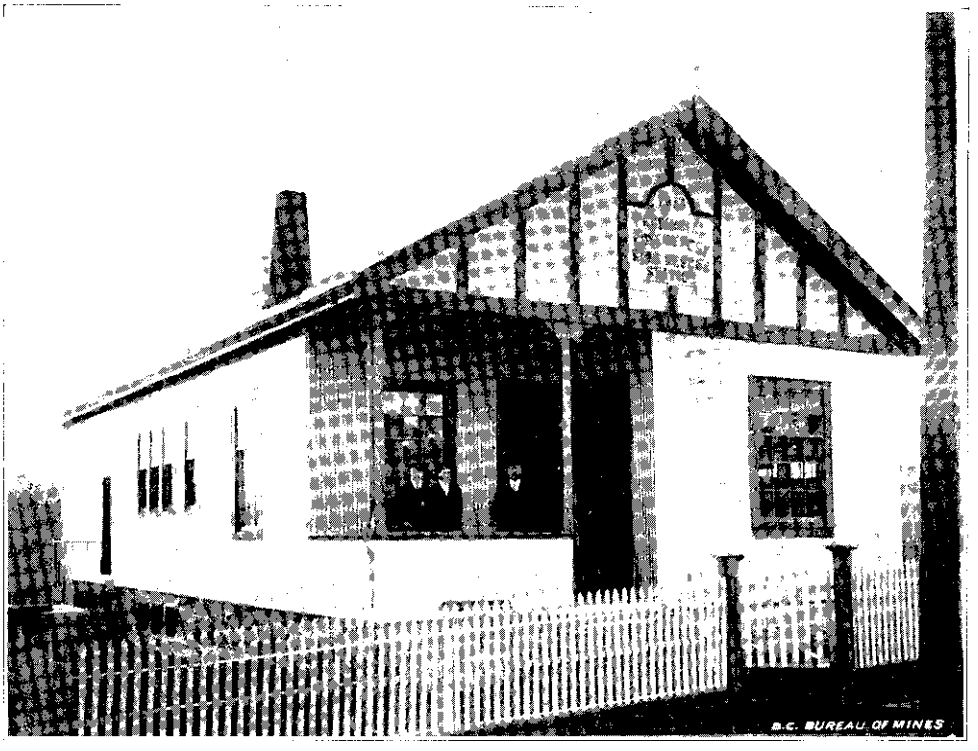
"Should the Minister approve of such 'systematic method of timbering,' a notice or notices of such method shall be kept posted in a legible manner at the entrance to such mine, division, or subdivision of the same.

"(2.) It shall be the duty of the workman in charge of the working-place—which shall include such working-place and for a distance of fifteen (15) feet back from the face—to keep the props, timbers, or other roof supports as designated in the 'notice of systematic timbering' governing the mine, division, or subdivision of such mine in which he is employed.

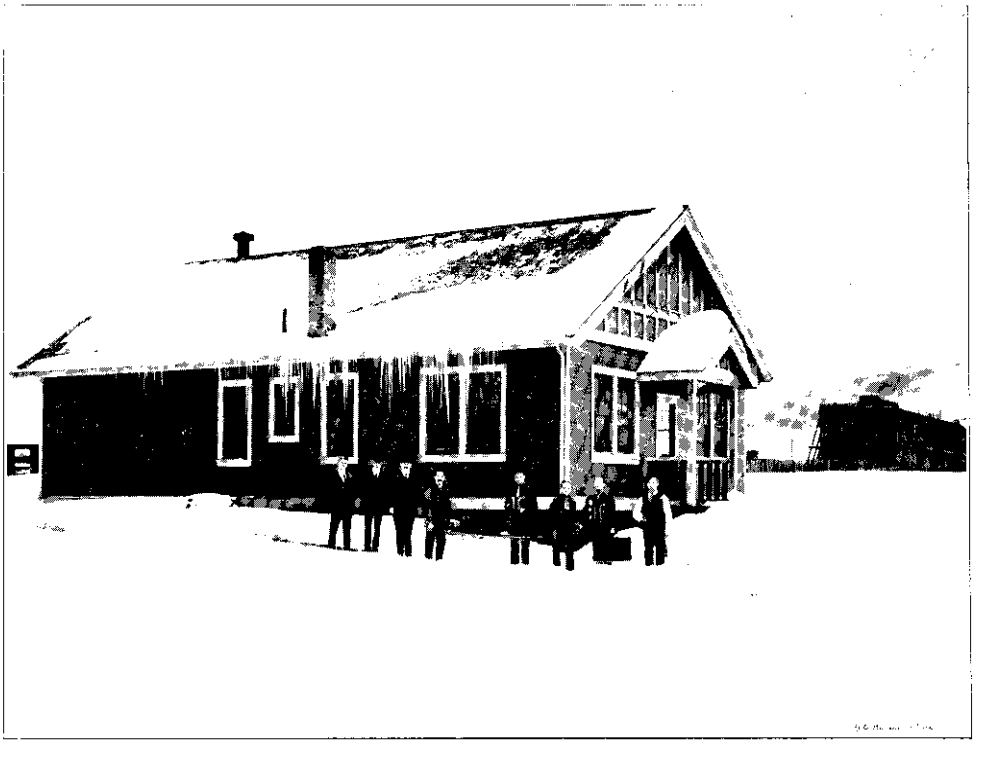
"Nothing in such notice shall preclude or prevent the use of more props, timbers, or other roof supports, or the erection of the same, should the workman or any of the officials deem such necessary for safety.

"(3.) In addition to the requirements of Rule 2 as to timbering, every workman in charge of a place shall set sufficient sprags or other supports for the undermined coal; provided that before commencing to mine he shall set one sprag or other support, and not less than one additional, for every six (6) feet of such undermining.

"(4.) Temporary props shall only be withdrawn by use of a dog and chain or other type of timber-drawing machine, unless permanent timber has been set before such withdrawal, and no permanent prop, timber, or other roof supports shall be finally withdrawn without the use of such timber-drawing device.



Government Mine-rescue Station—Nanaimo.



Government Mine-rescue Station—Fernie.

"Trusting to have your hearty co-operation in this, we await your suggestions."

I am pleased to say that this proposal had the hearty support of a large majority of the managers in the Province, and all, with the exception of two or three who have since complied, were in a position to start the year 1914 under a method of systematic timbering.

The Special Rule as finally adopted is uniform throughout the Province, each colliery having its own method of timbering adopted under the rule to suit the local conditions in their mines.

The following is the Special Rule as finally adopted:—

"SPECIAL RULE.—SYSTEMATIC TIMBERING.

"(*a.*) The manager of the mine shall cause to be posted at a conspicuous place near the mouth of the mine a notice stating the minimum size of the different types of timber to be used in such mine, and the maximum distance between the timbers and between the timbers and the face and sides of the working-place.

"(*b.*) In the event of two or more methods of timbering being used in one mine, then, in addition to the notice posted at the mouth of the mine, a notice shall be posted at the entrance to each section or district, stating the method of timbering to be used in each section or district of such mine.

"(*c.*) It shall be the duty of the miner in charge of a working-place—which shall include such working-place and for a distance of fifteen (15) feet back from the face—to keep the props, timbers, or other roof supports erected as designated in the 'notice of systematic timbering' governing the mine, division, or subdivision of such mine in which he is employed.

"(*d.*) Nothing in this section shall prevent a miner from setting supports, or an official from requiring the miner to set supports, in his working-place at more frequent intervals than those specified in the notice aforesaid, where necessary for safety.

"(*e.*) Every miner in charge of a working-place shall set sufficient sprags or other supports for the undermined coal; provided that before commencing to mine he shall set one (1) sprag or other support, and not less than one (1), for every six (6) feet of such undermining.

"(*f.*) Temporary props shall only be withdrawn by use of a dog and chain or other type of timber-drawing machine, unless permanent timber has been set before such withdrawal, and no permanent prop, timber, or other roof support shall be finally withdrawn without the use of such timber-drawing device."

I believe that the adoption of this rule will be found beneficial, and look forward to a reduction in the loss of life at the working-face from falls of roof and coal.

There is still room for much improvement in the maintenance of discipline in the underground work; in some collieries the officials are negligent in the enforcement of their own special rules and flagrant violations are overlooked, the Inspectors often being forced to prosecute for infractions of the rules where it was clearly the duty of the management to institute these proceedings, and in a few instances, I am sorry to say, after such proceedings were instituted by the District Inspectors, officials have not hesitated to make good fellows of themselves at the expense of the Inspectors' so-called busy interference.

I most sincerely regret to say—inconceivable as it may seem—we have, in a few cases, been led to suspect concerted action between employees and company officials to defeat the enforcement of the provisions of the Act and of the companies' own special rules.

As a whole, the efforts of the Inspectors to reduce accidents and safeguard life has met with much co-operation and assistance from officials generally.

THE UNDER-OFFICIALS AND MINE ACCIDENTS.

Eighty to eighty-five per cent. of mine accidents occur within the area which lies between the end of mechanical haulage and the working-faces; the supervision of operations within this area usually falls upon the under-officials.

Through the method of examinations as conducted under the provisions of the "Coal-mines Regulation Act," I believe that the under-officials of the mines of this Province are as intelligent and efficient as any similar body of officials anywhere; notwithstanding this statement, I sometimes fear that some of them fail to realize the great responsibilities of their positions.

It has long been recognized that "familiarity with danger breeds comtempt" for it, and that the average mine-worker needs nothing so much as he needs protection against his own acts. Recognizing this, legislation has been provided to protect him; the fireboss and the shotlighter are the product of such legislation, and are specially appointed because of their superior technical knowledge of the dangers to be apprehended and created through acts committed in ignorance, foolhardiness, or indifference. These specially appointed officials, with a proper conception of the responsibilites of their duties, can do much to reduce accidents in coal-mines, and I especially appeal to the mine manager to see that these under-officials are impressed with the importance of their duties, and to solicit their co-operation in the work.

MINE-RESCUE WORK.

The Government now has two fully equipped mine-rescue stations in the Province; these stations are equipped with Draeger mouth-breathing type of apparatus.

The Government equipment consists of sixteen 2-hour apparatus, eight ½-hour apparatus, and four pulmotors. During the year, twelve C.E.A.G. electric safety-lamps were added to the equipment.

Training was actively conducted most of the year at the Fernie station (George O'Brien, Instructor), and Government certificates of competency were issued to seventy-three persons from this station.

The Nanaimo station was not taken over until late in the year and little work was done at this station, but pending the completion of the same, the Instructor, J. D. Stewart, was sent to Merritt, and, through the courtesy of the Nicola Valley Coal and Coke Company, which granted the use of its station, Mr. Stewart, assisted by Frank Bond and Inspector of Mines Robert Strachan, instructed a class of twenty-nine men, who were each granted certificates of competency.

There were, therefore, 102 Government certificates of competency in mine-rescue work issued during the year.

THE EQUIPMENT OF OPERATING COMPANIES.

The equipment maintained by the operating companies was supplemented during the year by three 2-hour Draeger apparatus.

For the use of 5,500 underground employees there are sixty-six sets of 2-hour and twenty-six sets of ½-hour apparatus in the Province, or one for every sixty persons.

First-aid work around the coal-mining centres has not made much progress during the year 1913. On Vancouver Island, where the work was most active, its operations were much hampered by the labour troubles.

In the fall, technical classes in mining and first-aid work were started by the employees of the Vancouver-Nanaimo Coal Company, Limited, Nanaimo; and the Western Fuel Company, of the same place, have erected an addition to their mine-rescue station, in which first-aid will be taught to the employees.

LIST OF HOLDERS OF CERTIFICATES OF COMPETENCY IN MINE-RESCUE WORK ISSUED DURING 1913.

Date.	Name.	Station.	No.
June 10th	Evan Evans	Fernie	1
" 10th	Robert Strachan	"	2
" 10th	Thomas H. Williams	"	3
" 10th	George O'Brien	"	4
" 10th	John Shanks	"	5
" 10th	David Martin	"	6
" 10th	William Lancaster	"	7
" 10th	William Wilson	"	8
" 10th	James Stewart	"	9
" 10th	Adam G. Watson	"	10
" 10th	Henry E. Miard	"	11
" 10th	William McFegan	"	12
" 10th	Dudley Michell	"	13
" 10th	Peter P. Millar	"	14
" 10th	John Baggaley	"	15
" 10th	Carmichael McNay	"	16
" 10th	William Stockwell	"	17
" 10th	John Biggs	"	18
" 10th	Thomas Ratcliffe	"	19
" 10tn	Joseph Lane	"	20
" 10th	James White	"	21
" 30th	William Commons	"	22
" 30th	Robert J. Brown	"	23
" 30th	William Shaw	"	24
" 30th	John Musgrove	"	25
" 30th	James McKelvie	"	26
" 30th	Robert Anderson	"	27
" 30th	Stewart Lynch	"	28
" 30th	Walter Price	"	29
" 30th	James Wardrop	"	30
" 30th	George Rankin	"	31
" 30th	Alex McD. Allan	"	32
" 30th	William Rankin	"	33
" 30th	James Maltman	"	34
" 30th	Robert Fowler	"	35
" 30th	James P. Bushnell	"	36
" 30th	Edward Rutledge	"	37
" 30th	John McAlpine	"	38
Sept. 2nd	Chas. O'Brien	"	39
" 2nd	Joseph Worthington	"	40
" 2nd	Walter Joyce	"	41
" 2nd	Frank Lauder	"	42
" 2nd	John Caufield	"	43
" 2nd	John Chester	"	44
" 2nd	Robert Adamson	"	45
" 2nd	John T. Mawson	"	46
" 2nd	James Steele	"	47
" 2nd	David Shanks	"	48
" 2nd	Alex McFegan	"	49
" 2nd	William Wesnedge	"	50
" 2nd	John Moore	"	51
" 2nd	Herbert Lanfear	"	52
" 2nd	W. R. Puckey	"	53
" 12th	Thomas Brace	Nanaimo	54
" 12th	J. T. Taylor	"	55
" 12th	A. Phalen	"	56
" 12th	James Hendry	"	57
" 12th	J. Wilcocks	"	58
" 12th	H. John	"	59
" 12th	James Gemmell	"	60
" 12th	Robert Vardy	"	61
" 12th	George Thacker	"	62
" 12th	R. S. Brown	"	63
" 12th	John Kirkwood	"	64
" 12th	S. Poole	"	65

LIST OF HOLDERS OF CERTIFICATES OF COMPETENCY IN MINE-RESCUE WORK ISSUED DURING 1913.—*Concluded.*

Date.	Name.	Station.	No.
Sept. 12th	J. Blair	Nanaimo	66
" 12th	James Sharp	"	67
" 12th	R. McMillan	"	68
" 12th	J. T. Brown	"	69
" 12th	Thomas Rowbottom	"	70
" 12th	Alex Ewart	"	71
" 12th	James Fairfoull	"	72
" 12th	William Strang	"	73
" 12th	L. Warburton	"	74
" 12th	Thos. Bullin	"	75
" 12th	B. Barnes	"	76
" 12th	George Hudson	"	77
" 12th	J. McDonald	"	78
" 12th	J. C. Hughes	"	79
" 12th	D. Crawford	"	80
" 12th	Frank Bond	"	81
" 12th	A. E. Smith	"	82
Nov. 1st	James E. McPherson	Fernie	83
" 1st	Thomas Wilson	"	84
" 1st	George Loxton	"	85
" 1st	Joseph Hamer	"	86
" 1st	David James	"	87
" 1st	Thomas France	"	88
" 1st	Thomas J. Shaw	"	89
" 1st	James Bain	"	90
" 1st	Evan Jones	"	91
" 1st	Robt. T. Stewart	"	92
Dec. 1st	Archibald B. Howden	"	93
" 1st	Thomas McGuire	"	94
" 1st	Albert W. Frearson	"	95
" 1st	Fred Hutson	"	96
" 1st	James Taylor	"	97
" 1st	Edward Taylor	"	98
" 15th	Wm. A. Brown	"	99
" 15th	Arthur Hancock	"	100
" 15th	David Morris	"	101
" 15th	Angus Soloski	"	102

METALLIFEROUS-MINE ACCIDENTS.

There were twelve separate fatal accidents in the metalliferous mines of the Province in the year 1913, causing the death of thirteen persons; this is an increase of five deaths over the number in 1912. The ratio of fatal accidents to the 1,000 persons employed was 3.02, as against 2.10 for 1912. This, while a large increase over 1912, is, with the exception of that year, the smallest in the last ten years. The average for the ten-year period was 4.35.

The mines at which these accidents occurred were:—

Granby, Phoenix	3
Gold Drop, Phoenix	2
Highland, Ainsworth	1
Le Roi, Rossland	1
War Eagle, Rossland	1
Centre Star, Rossland	1
Mother Lode, Sheep creek	1
Surprise, Sandon	1
Second Relief, Erie	1
Britannia, Britannia mountain	1
Total	13

The following table shows the various causes of these fatal accidents and the percentage to the whole:—

	No.	Per Cent.
Picking or drilling into unexploded powder	3	23.08
Falls of ground	3	23.09
Mine-motors and haulage	2	15.38
Blasting	1	7.69
Suffocated or gassed with powder-fumes	1	7.69
Falling into chutes	1	7.69
Falling off ladder	1	7.69
Falling off trestle on surface	1	7.69

This table shows that a large proportion of the fatalities in metalliferous mines occur from picking or drilling into unexploded powder, in miss-fire and cut-off holes, or in the muck.

I believe that the use of non-freezing explosives would have the effect of reducing this class of accidents, in which three lives were lost in 1913.

Several of the large producing companies in the Province are using exclusively non-freezing powders, and I have received information from the superintendent of the Britannia Mining Company that since adopting the non-freezing powder, on two occasions miss-holes had been drilled into without the powder exploding, and on another occasion some of this powder went through the mill-rolls without exploding.

In view of the fact that the majority of fatal and serious accidents in metalliferous mines is due to drilling or picking into explosives, the above statements are, of the utmost importance to every person in the industry.

The benefits to be derived from using this powder are many:—

(1.) Less accidents from actual contact with the powder by drill or pick:

(2.) No thawing required, reducing risks from thawing and extra handling in thawer.

(3.) Powder always in condition, reducing the chances of powder being unexploded.

The price of the powder is the same as ordinary dynamites, and the results in the production of ore a pound of powder used are not affected.

I would therefore urge that the managers of metalliferous mines give this their earnest consideration.

In my report for 1912 I was pleased to note that no fatal accidents occurred from falls of ground, notwithstanding the large tonnage obtained from the mines using the open-stope system of mining.

During 1913 there were three fatal accidents from falls of ground; however, it is worthy of note that only one of these accidents occurred in the open-stope system, and again shows the great care exercised in scaling ground in the mines using this system of mining.

There is also an increase in the number of accidents from haulage, two deaths being due to this cause, both lives being lost in the same accident, which occurred on the last day of the year at the *Granby* mine, Phœnix.

Owing to severe weather conditions, the compressed-air line in No. 3 tunnel froze, and the men detailed to thaw this line were killed. Wood fires were built at various points along the tunnel on the air-line, and the smoke from these fires became so dense that lights were indiscernible. To complicate matters, at the place where the men were working a small valve from the main air-line had been opened by one of the deceased men, presumably to note the progress made in the thawing. The noise from this escaping air was such that the approach of the motor with train of cars could not be heard, and the men were run over by the motor.

The use of wood fires, with the resultant smoke, for the purpose of thawing an air-line underground cannot be looked upon as good mining practice, and should never be resorted to without first suspending traffic on the roadway involved, and if smoke is being carried by the ventilating-current into the mine-workings, then the men should be withdrawn from the mine before the fires are built.

There is a reduction in the fatalities from falling into chutes, the deaths from this cause being one, as compared with three in the year 1912.

We have again to record a fatal accident due to gassing from powder-fumes. I would respectfully call the attention of metalliferous-mine managers to the results obtained in this class of accident, or in cases of electrical shock from the use of the pulmotor.

I am pleased to say that the Consolidated Mining and Smelting Company of Canada has purchased six of these machines for its mining and smelting operations in this Province.

The fatalities from all classes of mining in the Province for the year numbered forty; and as the total number of persons employed in and around the mines was 11,023, the ratio of fatal accidents to the 1,000 persons employed was 3.63.

I regret to say that at least 60 per cent. of these fatal accidents were avoidable and were due to negligence on the part of the persons killed or some other employee, or to lack of proper discipline by officials who are responsible for the enforcement of such discipline.

INSPECTION OF METALLIFEROUS MINES.

WEST KOOTENAY AND BOUNDARY DISTRICTS.

REPORT OF EVAN EVANS, INSPECTOR.

I have the honour to submit my annual report as Inspector of Metalliferous Mines for West Kootenay and the Boundary Districts during the year 1913.

I wish to state that the industry has been very active during the year, a number of new mines being placed on the shipping-list.

I regret to have to report that in my inspectorate the number of fatal accidents was larger than in the previous year. There were nine fatal accidents and two serious accidents which resulted in two more deaths, making a total of eleven fatalities. The causes were as follows: Explosion of powder, 3; falls of rock, 3; asphyxiation by powder-fumes, 1; falling down chute, 1; falling off trestle on surface, 1; motor-haulage, 2.

NELSON DISTRICT.

Mining in the Nelson District has made substantial progress during the year, the number of shipping mines having been increased; considerable prospecting and development-work has also been carried on during the year and the future looks very promising.

When inspecting the mines of this district I have found them well ventilated and the timbering good, and also that the requirements of the "Metalliferous Mines Inspection Act" are carried out as reasonably as possible.

ROSSLAND DISTRICT.

This year has been the most successful, as regards the production of the mines, for several years in Rossland. The number of shipping mines has increased and a considerable amount of development-work has been carried on in the several mines.

When inspecting the different mines I have found them well ventilated and well timbered; I have also found an evident desire on the part of the management to comply with the requirements of the "Metalliferous Mines Inspection Act."

I may state that early in the year a new company (Richmond Consolidated) took over a new property situated in what is known as the "South Belt"; I expect that early in the year this mine will be shipping.

YMIR AND SHEEP CREEK DISTRICT.

The number of shipping mines in this district has remained about the same as in previous years, although considerable prospecting and development-work has been carried on during the year. I expect that more mines will be in operation next year.

During my inspection of the operating mines in this district I have found general conditions good, the mines being well timbered and ventilated; also the "Metalliferous Mines Inspection Act" is reasonably complied with.

AINSWORTH DISTRICT.

The operation of the mines in this district has been very active during the year, and the number of shipping mines has increased; also a large amount of development-work and many improvements have been made in and outside about the mines, and the future looks very promising.

The requirements of the "Metalliferous Mines Inspection Act" are reasonably complied with, and during my inspection of the mines I have noticed that much care is taken in the handling of explosives, and that the mines are well timbered and ventilated.

LARDEAU DISTRICT.

In this district the number of shipping mines has not increased, although a considerable amount of prospecting and development-work has been carried on, and I expect that more mines will be operating in the near future.

SLOCAN DISTRICT.

During the year mining has been very active, several new mines having been placed on the shipping-list. A number of long tunnels have and are being driven to intersect the ledges or veins at considerable depths, while a good deal of prospecting has been done, and generally the future looks extremely promising for this district.

During my inspection of the mines in this district I have found them well ventilated and timbered; also great care is used in handling explosives, and the provisions of the "Metalliferous Mines Inspection Act" are very well complied with.

BOUNDARY DISTRICT.

Mining operations have been quite successfnl in this district during the past year, the mines having been operated at nearly full capacity. A good deal of prospecting and development-work has been done during the year, and I expect to see the same activity prevailing in the coming year as in the past year.

In this district the *Mother Lode* mine of the British Columbia Copper Company is being worked by a combination open-stope-glory-hole system. The largest blast in the history of this mine was fired during the year; 4,843 holes averaging 15 feet deep were drilled in the roof, pillars, and road-sills and loaded with 49,550 lb. of 40-per-cent. dynamite, all the holes being fired similtaneously by means of an electric battery. This blast successfully removed a section of ground 235 feet deep, 205 feet long, and 180 feet wide, approximately 400,000 tons.

During my inspection of the mines I have found them generally in good condition, and that every precaution is taken to make the large stopes safe by barring down loose rock from the sides and roof of the stopes; also the requirements of the "Metalliferous Mines Inspection Act" are reasonably complied with.

SIMILKAMEEN INSPECTION DISTRICT.

REPORT OF ROBERT STRACHAN, INSPECTOR.

I have the honour to submit my annual report as Inspector of Metalliferous Mines for the Similkameen District for the year ending 1913.

The principal metalliferous mine in this district during the year was the *Nickel Plate*, belonging to the Hedley Gold Mining Company, Limited, Hedley, B.C.; G. P. Jones, general manager; Wm. Sampson, mine superintendent. The mine, which is situated at the top of the mountain of same name, is almost 4,000 feet above the town of Hedley.

The *Nickel Plate* ore-bodies are in an altered limestone, tongues of andesite having penetrated the bedding-planes of the limestone and brought in the ore-carrying solutions. The values are partly free gold and partly in arsenical iron-pyrites carrying gold. The ore-bodies are very large and are worked by a pillar-and-chamber system; commencing on the foot-wall and working upwards, using the broken ore as a floor for the miners to work on, then slices are

taken across the top, and as the ore is taken away the pillar is worked downwards. In this method very little timber, if any, is used, great care being taken, in leaving the top or roof, to bar down all loose rock, and it indicates with what thoroughness this is done that we have very seldom occasion to report accidents from falls of roof or sides.

This mine has been developed by tunnels driven through the country-rock until they reach the ore-bodies; No. 4 tunnel is the lowest of these, and now all the ore is handled through it. A new incline, called the Dixon incline, has been sunk on the ore-body for over 700 feet; a large hoist has been installed, which will hoist all the ore to pockets, so arranged for conveniently transferring to the cars.

The ore from the mine is loaded into cars carrying 2 tons, and is conveyed by electric-locomotive haulage to the top of the incline, a distance of about 7,000 feet, where it is unloaded into large ore-bins. From these ore-bins the ore is drawn to supply the gravity-tramway. The gravity-tramway is operated in two stages; in the first stage the ore, which is loaded into skips carrying 5 tons, is lowered down 4,000 feet; during part of this distance an auxiliary compressed-air engine assists the loaded skip. At the central station the skip is transferred by means of a fast rope to the lower tramway, and continues its journey for another 6,000 feet. An automatic dumping arrangement allows of the skip to unload into ore-bins situated above the mill, from which the ore is drawn as required. The gravity-tramway is a three-railed track, with a passing in the centre, and is equipped with both electric bells and telephones. In running the incline, by an ingenious arrangement of weights, instead of putting the brake on to stop the trip, it is necessary to take it off to allow the trip to run, thereby ensuring greater safety, as should the person in charge neglect his duties the trip immediately stops.

All the ore goes to the mill; there is practically no waste, and no sorting is done either at the mine or the mill. The average daily output has been increased during the present year to almost 250 tons, and by a judicious mixing of different grades the average value is kept fairly constant, which allows of the treatment of much low-grade ore which it would be unprofitable to treat alone.

The power-plant, which is operated by water for the greater part of the year, is also fitted so that steam can be used when required, and consists of one 360-kw. Westinghouse generator, so arranged that it can be driven either by a 400-horse-power Pelton type water-wheel or a 500-horse-power Goldie-McCulloch Corliss condensing-engine; one two-stage, cross-compound, steam-condensing Corliss Rand compressor, with a capacity of 3,000 cubic feet of free air a minute, compressed to 125 lb. to the square inch. This compressor also is fitted with a 26-foot Pelton water-wheel for driving with water, and only uses the steam when water fails. In addition to the above, there is a 100-kw. generator driven by a water-wheel for lighting purposes and an 18- x 24-inch straight line air-compressor, which are kept as an auxiliary plant. The boiler plant consists of three 100-horse-power boilers, which are only used in the event of the water failing, or in the wintertime when the water is scarce.

Work is now in progress to build a dam at the mouth of Twenty-mile creek; this dam will be 350 feet long, and a cement headgate will carry the water to a 7- by 8-foot timber flume, which will be nearly four miles long. A new power plant will be built at the end of the flume and it is expected to supply about 1,500 horse-power.

During my inspections of this mine I have always found the "Inspection of Metalliferous Mines Act" being strictly complied with, and every endeavour is made to select and take care of the workmen. Special rules are provided, which the workmen must read and sign before being engaged.

During the past year a new warehouse has been erected at the mine, and a new cook-house and bunk-house are in course of erection. Every accommodation is provided for the workmen; baths and reading-rooms, and lots of good healthy food.

A list of the accidents at this mine is attached, and I am pleased to state that it is short, neither of the two accidents being fatal.

I also inspected the *Dividend* mine, belonging to the Dividend-Lake View Cansolidated Gold Mining Company, situated about a mile and a half north of the International Boundary-line between the United States and Canada, on the road from Oroville to Penticton. The mine is situated on Kruger mountain, and was originally operated as a glory-hole proposition, but now levels have been driven in on the hillside to strike the ore-body at 90 feet and 350 feet from the top. The vein, which is about 15 to 30 feet wide, carries values in copper and gold.

The total men at work number eight; of these, five are employed underground, the other three being employed outside.

The ore is dumped into a chute and then drawn out underneath by a small dump-car, then run to the ore-pocket outside, where the waste is picked out. The ore is hauled from the mine in a 5-ton auto-truck to Oroville, and shipped from there by rail to the smelter at Grand Forks.

The plant consists of a Fairbanks air-compressor with a capacity of 217 cubic feet of free air a minute, driven by a 40-horse-power gasolene-engine by the same maker.

The method of mining is pillar-and-chamber, but so far the work is simply development.

The work in progress seems to me to be very well done and the Act complied with; there have been no accidents reported from this mine. John Trainer is the foreman in charge of the mining operations and John Fisher is superintendent.

COAST INSPECTION DISTRICT.

THOMAS MORGAN AND JOHN NEWTON, INSPECTORS.

I have the honour to enclose my annual report for the metalliferous mines in my inspectorate for the year ending December, 1913.

J. W. D. Moodie, general manager; W. A. Wylie, mine superintendent.

Britannia. This company's mine is situated on Howe sound, about twenty-eight miles from the city of Vancouver, and is reached by a daily boat service operated by the Union Steamship Company, with headquarters in Vancouver. The extent in which this company has enlarged its mining and concentrating operations is not known to the general public, or even to those residing in the city of Vancouver.

During the year a large general store has been built which would be a credit to any of our large cities on the Coast. A full line of goods in every department is in stock.

In addition to this, thirty workmen's cottages have been built, with all the modern improvements attached. A large concert or ball-room is under construction, which when completed will be another step this company will have made to improve the social conditions of its workmen.

A large hospital is maintained for the benefit of the employees, free of charge, with a trained nurse in attendance. Another auxiliary hospital is maintained up at the mine with a doctor in charge, where first aid can be administered.

The mine is situated about four miles from the Beach, at an altitude of about 4,000 feet, and employs from 300 to 350 men.

The ore is conveyed by an aerial tram-line, operating in two sections, with a capacity of from 600 to 700 tons a day, to the Beach, where it is put through a concentrator and made ready for shipment to the smelter.

A new electric surface tram-line has been graded from the Beach to what is called the Half-way or Tunnel section, which, when completed, will greatly reduce the cost of transportation.

The mines are operated by six adits ranging from 100 to 200 feet between levels, and which are called the 250, 500, 600, 700, 850, and 1,050 levels. The mines are worked in raises from the 1,050 level to the 250 level.

All the ore from the upper levels is run down these raises until it reaches the 1,050 level, where it is conveyed by a small 3-ton electric motor to the rock-crusher, and from there by the aerial tram-line to the mill at Britannia Beach. All the above levels are in good ore. When I visited this mine on December 17th I found it well timbered and ventilated.

The compressed air to operate the drills in this mine is furnished through an 8-inch air-line, the compressor being situated at the Beach, four miles away.

Tunnel Section.—E. Malarkey in charge. This tunnel is situated at what is called the Half-way, at an altitude of 2,300 feet, and 1,200 feet below the mine above.

This tunnel has an area of 104 square feet, and is in a distance of 4,300 feet, all laid with 45-lb. steel rails. The haulage is effected by means of a 6-ton electric motor.

A shaft 10 x 20 feet, with three compartments—two 6 x 7.5 feet and one 3 x 7.5 feet—and a raise 8 x 12 feet are under construction to the 1,050 level at the mine above. The shaft is down a distance of 200 feet, and the raise up 250 feet.

The tunnel is well ventilated by an exhaust-fan driven by a 20-horse-power motor. A 24-inch diameter wood pipe-line acts as a return air-line, while a 16-inch diameter branches off to ventilate the shaft and raises.

When the raises and shaft are completed, all the ore from the mine above will be dumped into this raise and conveyed on the surface tram by a 10-ton motor to the Beach.

Machinery installed at the Mine.—Two Champion rock-crushers; two Canadian Rand compressors, one 1,200 cubic feet capacity and one 1,000 cubic feet capacity; two generators, one 200 kw. and one 100 kw.

Machinery at the Beach.—Seven return-tubular boilers, 680 horse-power; four generators, 600 kw.; one 2,500 cubic feet Rand compressor.

All the machinery is operated by water-power; Pelton wheel.

TEXADA ISLAND.

The mines that are operating on the island are *Marble Bay*, *Cornell*, *Copper Queen*, *Maud Adams*, *Crackerjack* (formerly called *Nut-Cracker*).

Marble Bay. This mine is the property of the Tacoma Steel Company. The shaft is down to a depth of 1,200 feet, with an auxiliary shaft in operation, to what is called the 1,300-foot level, at a distance of about 200 feet from the main shaft.

A level is turned away from the foot of this shaft, and is in a distance of 200 feet in good ore. A raise has been started to tap the ore on the 1,200-foot level. A winze has also been started to follow the body of ore down. As the ore goes down it seems to maintain its quality.

When I visited this mine on my December examination I found it well ventilated and timbered up.

Machinery installed.—Two return-tubular boilers, one 84 and one 96 horse-power; two Canadian Rand compressors, one 10- and the other 5-drill; one hoist, 15 x 18 inches; three Lidgerwood hoists, two below and one above; one dynamo, 7 kw. Chas. Mead, foreman.

Copper Queen. The *Copper Queen* has been bonded by the Granby Company. This company has just started operations at this mine, and is only working a few men. The shaft is down a distance of 600 feet, with a level in a distance of about 200 feet, in fairly good ore. The 200-foot level is also working, and a raise has been started with fairly good prospects.

Machinery installed.—One return-tubular boiler, 73 horse-power; one 5-drill compressor; one hoist. J. Tuttle, foreman.

When I made my examination I found the mine well ventilated and well timbered.

Cornell. This property has been leased by a number of prospectors belonging to the island, who have faith in the prospects of the mine to invest their capital into it, and it seems that their expectations have been fulfilled.

When I visited the mine in December the 600- and 500-foot levels were in good ore. From the 600-foot level a raise has been started to tap the ore on the 500-foot level.

When I visited this mine in December I found it well ventilated and timbered up.

Machinery installed.—One hoist, 10 x 14 inches; one 5-drill compressor (Rand); two boilers, one 92 and one 33 horse-power. Jas. Roper, foreman.

Crackerjack. This mine was formally called the *Nut-Cracker*, and is a gold-bearing quartz property. A shaft is down 50 feet, with levels turned east and west to try and tap the lead that has been uncovered on the surface.

Machinery installed.—One Sorall hoist. Jno. McConville, foreman.

Maud Adams. When I visited this mine they were installing machinery to start operations.

Machinery.—One return-tubular boiler, 70 horse-power; one 3-drill compressor; one 10 x 12 hoist.

The *Little Billie* mine has been shut down since September. Two men are engaged to keep the mine dry and in good repair.

The *Rose and Bell* mine was not operating when I visited the island.

REPORT OF THOMAS MORGAN, INSPECTOR.

Britannia.—J. W. D. Moodie, manager. May 8th. On the above date I made a visit to this mine and found all in good condition and well ventilated.

Little Billy Mine, Texada Island.—April 17th. On the above date I visited this mine and found the condition good all through and the ventilation good.

Cornell Mine.—April 17th. On the above date I visited this mine and found all in good condition, well timbered, and the ventilation good.

Marble Bay Mine, Texada.—April 17th. Tacoma Steel Company. On the above date I visited this mine and found all in good condition and the ventilation good.

LIST OF ACCIDENTS IN METALLIFEROUS MINES, 1913.

REPORT BY EVAN EVANS, INSPECTOR, WEST KOOTENAY.

No.	Mine.	Date.	Name.	Occupation.	Details.
1	Molly Gibson	Jan. 1	Owen Jones...	Miner	Picked into a small piece of powder in hole; face slightly cut and both eyes slightly injured.
2	Mother Lode, Sheep ck.	Jan. 8	J. H. Warner .	"	Drilled into powder in an old hole; skull fractured, and died March 27, under the name of J. J. Gunderson.
3	Granby, Phœnix.....	Jan. 9	R. Petersen...	Blaster	Deceased had loaded six holes and was evidently loading the seventh when it exploded, injuring him so that he died without recovering consciousness.
4	Silver Dollar, Salmo ...	Jan. 12	J. Harrison ...	Miner	A false skid at the bottom of the shaft was caught up by the hoisting-bucket; dropping back 4 feet, it broke Harrison's leg.
5	Gold Drop, Phœnix....	Jan. 16	Geo. Bolen....	Mucker.....	While mucking in a stope some loose rock rolled down the pile and fractured his right leg.
6	Gold Drop, Phœnix....	Mar. 12	Paul Nelson...	Miner	While setting up machine-drill a thin scale of rock fell from hanging-wall and struck him on the legs. Compound fracture of left leg; fracture of right thigh; injury to spinal cord; scalp-wound and torn peritoneum. Died four days later.
7	Granby, Phœnix.....	Mar. 19	Red. Rodak...	"	Picked into unexploded powder in a round left by himself. Left eye gone completely; right eye punctured, with hæmorrhage, with possibility of saving it. Right thumb and first finger broken and puncture wounds on face.
8	Centre Star, Rossland..	Apr. 25	Rudolph Smith	Labourer....	While grasping belt to place it on pulley his right forearm got caught and broken.
9	War Eagle, Rossland..	Apr. 30	Oscar Kolli ...	Miner	While trimming off loose ground a small piece over his head fell on him, knocking him off the box on which he was standing. Scalp-wound and right leg broken above the knee.
10	Gold Drop, Phœnix....	May 22	Jacob Tahia...	"	Picked into missed hole contrary to instructions of shiftboss. Explosion killed him instantly.
11	Second Relief, Erie....	June 9	E. Shallenburg	"	Fall of rock from roof of stope fractured his skull, resulting in death.
12	Granby, Phœnix.....	June 25	Geo. Mattocks.	Blaster	Injured man was loading a hole with dynamite when same exploded. Three fingers and both bones of left forearm fractured; thigh injured and numerous powder-burns.

LIST OF ACCIDENTS IN METALLIFEROUS MINES, WEST KOOTENAY.—*Continued.*

No.	Mine.	Date.	Name.	Occupation.	Details.
13	Highland, Ainsworth ..	June 26	William Willis	Miner	Went back too soon to round of holes he had fired, was overcome by fumes from powder-explosion. Picked up unconscious and died later.
14	Le Roi, Rossland.....	June 28	Henry Burt...	Shoveller ...	Picked into loose powder in muck; killed by the resulting explosion.
15	Mother Lode, Sheep ck.	June 30	O. Poulin.....	Labourer ...	He was tightening up the precipitate-press in the cyanide-mill when the bar fell and broke his arm and injured his knee and back.
16	Gold Drop, Phœnix....	July 10	J. D. Campbell	Mucker.....	Falling rock knocked him off a bench and he fell 40 feet, thereby receiving concussion of the brain, partial rupture of the stomach and fracture of bone in left foot.
17	War Eagle, Rossland..	Aug. 5	W. Groutage..	Shoveller ...	Two tons of rock fell unexpectedly from the hanging-wall, killing him instantaneously. The place was considered quite safe.
18	Centre Star, Rossland..	Aug. 9	E. G. Therian.	Labourer ...	In removing old ore-bins deceased fell off a stringer, dying shortly after being taken to the hospital.
19	Jewel-Denero, Greenw'd	Aug. 16	Frank Ganzini.	Carman.....	While cleaning track in front of skip, the skip was raised, crushing him against the side of the shaft. Left leg, thigh, and back bruised and flesh-wound on thigh.
20	Mother Lode, Sheep ck.	Aug. 20	Pete Kyllone..	Miner	Staging gave way and injured fell 4 feet with machine-drill, which struck him on the left leg, causing a flesh-wound.
21	War Eagle, Rossland..	Sep. 5	James Laity...	Labourer ...	Right ankle and leg broken by rock falling from a chute.
22	Mother Lode, Greenw'd	Oct. 7	Matt Zellinich.	Miner	Falling rock in chute caused a bruised face, arm, and shoulder.
23	Granby, Phœnix.....	Oct. 16	Richard Owens	Brakeman...	He was riding on rear end of ore-train, which collided with a nipper's truck; both legs broken near the ankle.
24	Molly Gibson, Nelson..	Oct. 18	Dan MacLean.	Miner	A piece of steel fell out of a sling and dropped on him at the bottom of a manway; skull fractured.
25	Surprise No. 2, Sandon.	Nov. 1	Max Calgara..	"	Fell off ladder into timber-chute, and was instantly killed.
26	War Eagle, Rossland..	Nov. 1	C. Serraphine .	Timberman..	He was standing beside a short ladder which was struck by the electric locomotive; left leg broken by the impact of the ladder.
27	Granby, Phœnix.....	Dec. 1	J. C. Kempston	Cage-tender.	Fractured rib and bruises, resulting from being squeezed between car and side of a station.
28	Granby, Phœnix.....	Dec. 2	Matt Oja	Miner	Leg broken by a rock falling down a chute.

LIST OF ACCIDENTS IN METALLIFEROUS MINES, WEST KOOTENAY.—*Concluded.*

No.	Mine.	Date.	Name.	Occupation.	Details.
29	Granby, Phœnix.....	Dec. 6	B. Spelac	Mucker.....	While standing by a chute he was struck by a motor, injuring him about the shoulders.
30	Granby, Phœnix.....	Dec. 11	Leonard Adams	Crusher-[feeder	When barring down rock in bin, he suddenly slipped from the rope that was supporting him and was ruptured.
31	Highland, Ainsworth ..	Dec. 16	T. C. Wintle..	Mucker.....	Spine and legs injured by rock falling from the hanging-wall.
32	Granby, Phœnix.....	Dec. 21	Red Covich ..	Miner	Stepped on old nail in blacksmith-shop and drove it into his foot.
33	Silver King, Nelson...	Dec. 24	Fred Tatham..	Mucker.....	Picked into loose powder in muck beside the track; eyes and face injured.
34	Granby, Phœnix.....	Dec. 31	John R. Nelson	Shiftboss ...	Run over by electric motor and instantly killed.
35	Granby, Phœnix.....	Dec. 31	A. Catterini...	Miner	Run over by electric motor and instantly killed.

REPORT BY ROBERT STRACHAN, INSPECTOR, SIMILKAMEEN DISTRICT.

36	Nickel Plate, Hedley ..	July 19	Fred Anderson	Miner	Was riding on the skip and did not jump in time; Both bones of left forearm fractured.
37	Nickel Plate, Hedley...	Dec. 4	D. B. Lawley..	Mucker.....	Picked into unexploded powder in muck, receiving injury to eyes and face.

REPORT BY JOHN NEWTON AND HENRY DEVLIN, INSPECTORS, COAST DISTRICT.

38	Britannia Mine.....	Aug. 8	C. McRae....	Timberman's [helper	Fell down ore-chute and instantly killed.
39	Marble Bay, Texada Is.	Nov. 5	Chow Hing ...	Ore sorter ..	Finger crushed by a large rock rolling on it.
40	Marble Bay, Texada Is.	Nov. 6	John Bentely..	Miner	Rock falling down a chute bruised his back and ankle.

TABULATED LIST OF ACCIDENTS IN METALLIFEROUS MINES, 1913.

	Cause of Accident.	Extent of Injury.			Total.
		Fatal.	Serious.	Slight.	
A	Blasting	2	1	..	3
B	Defective powder	..	..	..	..
C	Drilling into old holes containing powder	2	1	1	4
D	Powder in muck	1	1	1	3
E	Shafts and cages, accidents connected with	..	1	2	3
F	Falling down shafts or winzes	1	..	..	1
G	Falling down chutes	1	..	..	1
H	Mine-cars	2	3	1	6
I	Rock falling in stopes, levels, etc	3	3	..	6
J	Rock falling down chutes or openings	..	3	2	5
K	Timbering	..	..	..	..
L	Miscellaneous, underground	..	1	1	2
M	Miscellaneous, surface	1	2	3	6
	Totals	13	16	11	40
Accidents for each 100,000 tons ore mined		0.488	0.600	0.412	1.50
Accidents for each 1,000 men employed		3.04	3.74	2.57	9.35

COAL-MINING IN BRITISH COLUMBIA.

BY WM. FLEET ROBERTSON, PROVINCIAL MINERALOGIST.

During the year 1913 there was mined in the various collieries of the Province 2,570,760 tons (2,240 lb.) of coal, a decrease from the preceding year of 454,949 tons, equivalent to 15 per cent.

In spite of this great decrease, it nevertheless remains a fact that this year's production is the third greatest ever produced by the Province, being only exceeded by those of 1910 and 1912.

Such a falling-off in the output calls for an explanation, and it can be definitely stated that the shortage is in no way attributable to the mines themselves, nor to, at that time, any diminished market, but has been caused entirely by labour troubles, which, starting at the Canadian Collieries' Comox mines, spread to all the Vancouver Island collieries, and which during the whole year greatly retarded the production of all the collieries.

As the direct result of these troubles there was a decreased output from Vancouver Island collieries of 584,747 tons (2,240 lb.)

While it is true that, at the time the strike began, there was an ample market for the output of all the Island collieries, such was not the case at the close of the year, for the shutting-off of the coal-supply by the strike, and the uncertainty regarding it in the future, drove the consumer to seek other sources for fuel, resulting, in many important cases, in the substitution of California crude oil, so that, at the end of the year, while the strike is still theoretically on, the mines are operating with more than sufficient men to supply the remaining market and these collieries are not working full time.

The market having thus been alienated, it will be some time before it can be recovered, and the loss to employer and employee will continue long after the original cause of grievance may have been settled.

While the Province as a whole shows a decrease, as already stated, it must be noted that this decrease is confined to the Vancouver Island collieries and for the reasons given, whereas the other districts each show a material increase; the Nicola-Princeton District of 59,285 tons and the Crowsnest District of 70,513 tons, together equal to an increase of 129,798 tons.

The total sales of coal made in 1913 was 1,797,120 tons (2,240 lb.), of which 1,169,605 tons was sold in Canada, practically British Columbia; and the balance amounting to 627,515 tons, was exported to the United States, including Alaska.

The coke sales of the Province for the year was 287,157 tons (2,240 lb), of which 236,531 tons was sold in British Columbia and 50,626 tons exported to the United States.

The following table shows, for the past seven years, the output and the *per capita* production of the 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.
1907	East Kootenay District	876,731	2,290	383	1,527	574
	Coast District	1,342,877	3,769	356	2,862	469
	Whole Province	2,219,608	6,059	366	4,389	506
1908	East Kootenay District	883,205	2,524	350	1,746	506
	Coast District	1,226,182	3,549	345	2,686	456
	Whole Province	2,109,387	6,073	347	4,432	476
1909	East Kootenay District	923,865	2,427	380	1,737	532
	Coast District	1,476,735	3,991	370	2,976	496
	Whole Province	2,400,600	6,418	374	4,713	509
1910	East Kootenay District	1,365,119	3,111	439	2,374	575
	Coast District	1,774,116	4,647	382	3,529	502
	Whole Province	3,139,235	7,758	404	5,903	532
1911	East Kootenay District	442,057	2,197	201	1,585	272
	Coast District	1,855,661	4,676	397	3,627	511
	Whole Province	2,297,718	6,873	334	5,212	440
1912	East Kootenay District	1,261,212	2,410	523	1,780	708
	Coast District	1,764,497	4,720	374	3,495	504
	Whole Province	3,025,709	7,130	424	5,275	574
1913	East Kootenay District	1,331,725	2,666	500	1,965	678
	Coast District	1,239,035	3,777	328	2,865	433
	Whole Province	2,570,760	6,443	399	4,830	532

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.

It will be seen from the foregoing table that the production *per capita* increased more or less regularly up to the year 1912, but that the year 1913 shows a decrease, especially in the Coast District. This increased effectiveness, during the last few years, of the labour employed is largely due to better methods, better equipment, and greater volume of output.

The effect of the prolonged strike on Vancouver Island is clearly shown in the material decrease in the *per capita* production of that district. A similar condition of affairs existed in the East Kootenay District during the strike of 1911.

The East Kootenay field also showed a decrease in *per capita* production, for which no satisfactory reason can be given.

In the Coast District the effectiveness of the employee, disregarding the past year, both total and underground, has not altered very materially in the last few years, and is considerably lower than in the East Kootenay District.

The coalfields of the Province which are at present producing may be divided into two main divisions—those of the East Kootenay District and those of the Coast District.

These fields from their geographic positions—the one at the extreme eastern boundary of the Province, and the other at the extreme western edge—are in no way competitors in the market, their markets being quite separate and ruled by completely different conditions.

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 two-thirds of the coal sold as such being exported to those States, while the other third 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 smelters of Trail and the Boundary District—takes over 80 per cent. of the product, while 20 per cent. is exported to the States mentioned.

As regards the 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 coal-field, with practically the same grade of coal and working under similar conditions.

This competition has kept the price obtainable for coal at from $2.25 to $2.50 a ton, with little probability of any material increase in price, owing to the facility with which new collieries can be opened up and the very large reserve areas of coal limits in that district; a description of these reserves was given in the Report of this Bureau for the year 1909.

The Coast District may be subdivided into two fields—the Nicola-Princeton field and the Vancouver Island field—in which the markets differ considerably.

In the former 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 demand for coal from the larger coasting steamers and from the railways has in past years diminished, as the Canadian Pacific Railway main line engines are nearly all burning California crude oil, and a large coasting steamer burning coal is now an exception.

Owing to the strike conditions having curtailed the output of the Island collieries, prices have been maintained as high or higher than for preceding years; in fact, the high price of coal on the Coast is one of the chief reasons for the marked increase in the use of California oil fuel. It does not seem at all likely, either, that the present price of coal on the seaboard, of from $4 to $4.50 a ton f.o.b., will decrease for some time.

As in former years, the greater proportion of the coal production was made by three larger companies—the Crows Nest Pass Coal Company, with two collieries in East Kootenay; and by the Western Fuel Company, of Nanaimo, and the Canadian Collieries, Limited, formerly the Wellington Colliery Company, these last two operating on Vancouver Island.

In addition to these large shippers, very appreciable shipments have been made by the Hosmer Mines, Limited, and the Corbin Coal and Coke Company, in East Kootenay; by the Nicola Valley Coal and Coke Company and the Inland Coal and Coke Company, both of the Nicola Valley; by the Princeton Coal and Land Company, of Princeton; and by the Pacific Coast Coal Mines, Limited, and Vancouver & Nanaimo Coal Mining Company, both operating on Vancouver Island, near Nanaimo.

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 1913 about 65.1 per cent. of the coal, sold as such, by the collieries of the Province was consumed in British Columbia; and the remaining 34.9 per cent. was exported to the United States, including Alaska. Of the coke sold, about 82.4 per cent. was consumed in British Columbia, and the remaining 17.6 per cent. was exported to the United States.

The distribution of this output of coal and coke is shown in the following table:—

COAL AND COKE PRODUCED, EXPORTED, ETC., BY PROVINCE DURING YEAR 1913.

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	1,169,605		236,531	
" export to United States	627,515		50,626	
" " other countries				
Total sales		1,797,120		287,157
Lost in washing	179,612			
Used in making coke	433,277			
" under colliery boilers, etc	192,402		416	
Total for colliery use		805,291		416
		2,602,411		287,573
Stocks on hand first of year	48,712		4,189	
" last of year	17,061		2,661	
Difference taken from stock during year		31,651		1,528
Output of collieries for year		2,570,760		286,045

Coal (used as such) 2,137,483 tons = $7,481,190. Coke, 286,045 tons = $1,716,270.

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	201		111		312	
Whites—Miners	2,107				2,107	
Miners' helpers	363				363	
Labourers	1,096		632		1,728	
Mechanics and skilled labour	650		455		1,105	
Boys	124		89		213	
Japanese—Miners	71				71	
Helpers	46				46	
Labourers	8		10		18	
Chinese — Miners	118				118	
Helpers	93				93	
Labourers	73		418		491	
Indians — Labourers			6		6	
Totals	4,950		1,721		6,671	

COLLIERIES OF THE COAST DISTRICT.

The gross output of the Coast collieries, including the Nicola valley, for the year 1913 was 1,239,035 tons (of 2,240 lb.) of coal actually mined, while some 31,139 tons was taken from "stock," making the actual consumption of coal 1,270,174 tons.

Of this gross consumption, 982,090 tons was sold as coal, 108,472 tons was consumed by the producing companies as fuel, and 179,612 tons was lost in washing; no coal was used in making coke. Although no coke was produced, 66 tons was taken from stock and sold.

Formerly, in 1902, the Coast collieries exported to the United States 75 per cent. of their coal; in 1910 they exported there only 24.5 per cent. of their product, 71.3 per cent. of the output being consumed in Canada. In 1911, 76.1 per cent. of the coal sold was for consumption in Canada, 21.6 per cent. was exported to the United States, and 2.3 per cent. to other countries.

In 1912, 71.25 per cent. was sold for consumption in Canada, 21.25 per cent. exported to the United States, and 7.47 per cent. to other countries.

In 1913, 89.8 per cent. was sold for consumption in Canada, and the balance, or 10.2 per cent., was exported to the United States.

The following table gives an aggregate summary of the output of the Coast collieries for the year 1912, and shows the dispositions made of such product:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	882,195		66	
" export to United States	99,895			
" " other countries				
Total sales		982,090		66
Lost in washing	179,612			
Used in making coke				
" under colliery boilers, etc.	108,472			
Total for colliery use		288,084		
		1,270,174		
Stocks on hand first of year	47,811		2,370	
" last of year	16,672		2,304	
Difference taken from stock during year		31,139		66
Output of collieries for year		1,239,035		*Nil.*

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	130		77		207	
Whites—Miners	1,154				1,154	
Miners' helpers	225				225	
Labourers	793		226		1,019	
Mechanics and skilled labour	176		233		409	
Boys	98		50		148	
Japanese—Miners	71				71	
Helpers	46				46	
Labourers	8		10		18	
Chinese — Miners	118				118	
Helpers	93				93	
Labourers	73		418		491	
Indians — Labourers			6		6	
Totals	2,985		1,020		4,005	

The following tables show the output of coal, and the disposition made of it, in the subdivisions of the Coast District:—

COAL-OUTPUT, ETC., 1913, VANCOUVER ISLAND SUB-DISTRICT.

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	638,624		66	
" export to United States	96,327			
" " other countries				
Total sales		734,951		66
Lost in washing	176,617			
Used in making coke				
" under colliery boilers, etc	92,993			
Total for colliery use		269,610		
		1,004,561		
Stocks on hand first of year	47,140		2,370	
" last of year	16,072		2,304	
Difference taken from stock during year		31,068		66
Output of collieries for year		973,493		*Nil.*

COAL-OUTPUT, ETC., 1913, NICOLA-PRINCETON SUB-DISTRICT.

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	243,571			
" export to United States	3,568			
" " other countries				
Total sales		247,139		
Lost in washing	2,995			
Used in making coke				
" under colliery boilers, etc.	15,479			
Total for colliery use		18,474		
		265,613		
Stock on hand first of year	671			
" last of year	600			
Difference taken from stock during year		71		
Output of collieries for year		265,542		

COLLIERIES OF THE EAST KOOTENAY DISTRICT.

The gross output of the collieries of the East Kootenay District for the year 1913 was 1,331,725 tons (2,240 lb.) of coal actually mined, which, with 512 tons taken from stock, made the actual consumption of coal 1,332,237 tons. Of this gross consumption of coal, 815,030 tons was sold as coal, 83,930 tons was consumed as fuel by the producing companies, while 433,277 tons was converted into coke, producing 286,045 tons, of which 416 tons was used under the companies' boilers, while 1,462 tons was taken from stock, making the coke sales for the year 287,091 tons.

The East Kootenay collieries exported to the United States about 64.8 per cent. of the coal sold and about 17.6 per cent. of the coke.

The following table gives an aggregate summary of the output of the East Kootenay collieries for the year 1913 and shows the dispositions made of such product:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	287,410		238,465	
" export to United States	527,620		50,626	
" " to other countries				
Total sales		815,030		287,157
Used in making coke	433,277			
" under colliery boilers, etc.	83,930		416	
Total for colliery use		517,207		416
		1,332,237		287,573
Stocks on hand first of year	901		1,819	
" last of year	389		357	
Difference taken from stock during year		512		1,462
Output of colliery for year		1,331,725		286,045

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	71		34		105	
Whites—Miners	953				953	
Miners' helpers	138				138	
Labourers	303		406		709	
Mechanics and skilled labour	474		222		696	
Boys	26		39		65	
Japanese						
Chinese						
Indians						
Totals	1,965		701		2,666	

COAL POTENTIALITIES OF BRITISH COLUMBIA.

In addition to the coal-mines actually producing and whose outputs are included in the foregoing tables, there are a number of important fields which have not as yet reached the producing stage—some of these partly developed and equipped, and others only prospected.

The great unworked and only partly developed coal-seams in the Rocky Mountains coalfield lying to the north of the field now being exploited were fully described by the writer in the 1909 Report, since when no great amount of development-work has been done. Very successful development has been going on in the Flathead valley.

Near Princeton, in addition to the colliery of the Princeton Coal and Land Company, which shipped some 29,206 tons of very good lignitic coal, a new colliery—the United Empire—made a start last year by shipping 500 tons, and 1,752 tons this year.

In the same section the Columbia Coal and Coke Company has continued development all year with a force of seventy men, but has not as yet begun shipping. The plan of development adopted by the old company did not prove very successful, and the property has been taken over by a Vancouver syndicate, which will conduct the work along different lines.

In the Nicola valley the Pacific Coast Collieries Company has continued development with a small force, and, although only shipping 600 tons, reports indicate that the development has been successful in proving seams of good coal.

The coalfield of the Peace River valley was described in the 1912 Report by C. F. J. Galloway, which indicates that, although the seams are thin, the coal is of exceptionally good quality.

The Groundhog coalfield was visited by the writer during the summer of 1912, an account of which will be found in the Report of that year. The extent of the coalfield proved to be all that was claimed, but the quality of the seams as exposed in the openings seen in the southern end of the field was very disappointing. The field has only been tested in one part, and it seems quite probable that further prospecting will develop cleaner seams of coal; the number and thickness of the seams is all that could be desired.

Some development has been carried out on the Nass watershed, at the southern end of the field, with very encouraging results, samples certainly showing a lower percentage of ash.

The coalfields on the Bulkley, Telkwa, and Zymoetz rivers, near the line of Grand Trunk Pacific Railway east of Hazelton, have all been undergoing development, but it is as yet premature to say how important they may prove to be. An encouraging report on the last-mentioned field will be found on page 110 of the Report.

On the Queen Charlotte islands, at the southern end of Graham island, on Skidegate inlet, a colliery had been partly equipped, but the output was unimportant. No work was done on the property this past year, the coal not proving satisfactory fuel.

In the interior of Graham island to the east of the coal-outcrops at Camps Robertson and Wilson, systematic boring has been in progress all year, but without demonstrating workable coal.

Drilling has been going on in the northern part of the island near Masset, but no word has been received of commercial coal-seams having been proved.

But slight development has been done on the coal-area near Bowron lake (formerly Bear lake), in the Cariboo District.

On Vancouver Island the coalfield on Quatsino sound has been undergoing development in a small way, with as yet no definite results.

The large producing companies have all been quietly doing extensive development-work—the Canadian Collieries, near Campbell river and south of Cumberland, and it is understood much of this has been satisfactory, but details are not available for publication.

The Western Fuel Company has been engaged in opening a new shaft—the Reserve shaft—which will develop a new and very extensive seam of coal. Two shafts, each 10 x 26 feet inside of timbers and 350 feet apart, are being sunk; no expense or trouble, which would tend to increase the safety or economy of future work, is being spared in opening up this new colliery—a policy for which the present management has already acquired an enviable reputation.

The Pacific Coast Coal Mines, Limited, has continued the development of its Suquash Colliery, and has this year mined 2,215 tons of coal.

Development by the producing companies on Vancouver Island, as well as production, has been greatly hindered this year by the continued labour troubles and no great advance has been made during the year.

That these fields contain a large reserve of coal there is absolutely no doubt, and many of them will be developed and producing as soon as the market demands it and the transportation facilities can be provided.

The following table showing these reserves is taken from the "Coal Resources of the World," as presented to the International Geological Congress in 1913, in a paper by D. B. Dowling, B.A.Sc., of the Canadian Geological Survey:—

COAL RESOURCES OF BRITISH COLUMBIA, GROUP I.

(Including seams of 1 foot and over to a depth of 4,000 feet.)

DISTRICT.	ACTUAL RESERVES.			PROBABLE RESERVES.		
	Area, Square Miles.	Class of Coal.	Metric Tons.	Area, Square Miles.	Class of Coal.	Metric Tons.
Southern Interior	230	B_2	22,586,342,000	216	B_2	32,491,000,000
					B_3	296,000,000
					C	1,800,000,000
					D	286,000,000
Central Interior	.....	.....	.....	25¾	B	34,700,000
					B_2	432,000,000
					B_3	20,000,000
Northern Interior	.....	.....	.....	5,114	A_2	1,200,000,000
					B_2	1,550,000,000
					B_3	1,600,000,000
					D	3,850,000,000
Vancouver Island	185	B_2	1,060,000,000	645	B_2	4,807,000,000
		B_3	118,000,000		B_3	384,000,000
Queen Charlotte Islands	22	A_2	6,900,000	59	A_2	293,000,000
		B_2	.....	.....	B_2	.....
	2	D_2	60,000,000	136	D_2	1,000,000,000
Totals	439	.....	23,831,242,000	6,195¾	.....	50,043,700,000
						23,831,242,000
Total coal, Group I., in B.C.	.....	.....	.....	.....	.....	73,874,942,000

INSPECTION OF COAL-MINES, 1913.

VANCOUVER ISLAND AND COAST DISTRICT.

This district, comprising, as it does, the coalfields of Vancouver Island and the Coast, as well as those of the Nicola and Similkameen valleys, has been subdivided, for inspection purposes, into three Inspection Districts, each under the charge of a District Inspector, as follows:—

NANAIMO INSPECTION DISTRICT.

HENRY DEVLIN, INSPECTOR (OFFICE, NANAIMO).

The collieries operating and producing coal during the year in this Inspection District, including the new mines that have been started, were:—

NANAIMO: The Western Fuel Company—No. 1 shaft, Protection shaft, and No. 4 shaft, Northfield mine, and sinking shafts at Reserve Colliery.

EXTENSION: The Canadian Collieries (Dunsmuir), Limited (formerly the Wellington Colliery Company)—Nos. 1, 2, and 3 mines, all worked from what is known as the No. 1 tunnel, and No. 4 mine, worked by a shaft.

Pacific Coast Coal Mines, Limited—Fiddick Colliery, South Wellington, Cranberry District, Nos. 1 and 2 slopes, and the new shafts at the Morden mine.

Vancouver-Nanaimo Coal Mining Company, Limited—New East Wellington Colliery, Mountain District, Nanaimo, No. 1 slope.

COMOX INSPECTION DISTRICT.

JOHN NEWTON, INSPECTOR (OFFICE, NANAIMO).

The collieries operating and producing coal during the year in this Inspection District, including the new mines that have been started, were:—

CUMBERLAND: The Canadian Collieries (Dunsmuir), Limited—Nos. 4 and 7 slopes, and Nos. 5 and 6 shafts, and two new shafts at No. 8.

Pacific Coast Coal Mines, Limited, Suquash Colliery, Nos. 1 and 2 slopes, and shaft.

NICOLA-PRINCETON INSPECTION DISTRICT.

ROBERT STRACHAN, INSPECTOR (OFFICE, MERRITT).

The collieries operating during the year in this Inspection District, including the new mines, that have been started, were:—

NICOLA VALLEY: The Middlesboro Colliery of the Nicola Valley Coal and Coke Company, Merritt—Nos. 2, 3, 4, 5, 6, and 7 mines.

Inland Coal and Coke Syndicate, Merritt—One shaft and 3 slopes.

Diamond Vale Colliery Company, Merritt—No. 3 mine.

Pacific Coast Colliery Company, Merritt—No. 1 slope and No. 2 shaft, adjoining the Middlesboro Colliery.

PRINCETON: Princeton Coal and Land Company's Princeton Colliery—No. 1 slope.

United Empire Mining Company—One adit tunnel.

COALMONT: Columbia Coal and Coke Company, Limited—developing only.

MIDWAY: Boundary Mining and Exploration Company—developing only.

The headquarters of the Inspectors of both the Nanaimo and Comox Inspection Districts is at Nanaimo, which permits of one of the Inspectors being constantly at headquarters while the other is making inspections; it also permits of the shifting of inspection duties, so that each Inspector knows both districts.

During the year Inspector Thomas Morgan was superannuated, his place being taken by Inspector Henry Devlin, who had been appointed in February.

NANAIMO INSPECTION DISTRICT.

REPORT OF THOMAS MORGAN AND JOHN NEWTON, INSPECTORS.

The report of Inspector John Newton includes full returns for the year 1913; it is therefore placed first and is followed by the partial report of Inspector Thomas Morgan for the five-month period ending June 1st.

REPORT OF JOHN NEWTON, INSPECTOR.

I have the honour to submit my annual report for the coal-mines in my inspectorate for the year ending December 31st, 1913, together with a list of all accidents and convictions.

During the present year labour troubles have greatly reduced the coal production of the Island.

A strike was declared on September 16th, 1912, at the mines in Cumberland, and on September 18th, 1912, at Extension; these mines are the property of the Canadian Collieries (Dunsmuir), Limited.

On May 1st, 1913, a strike was called by the United Mine Workers of America in my inspectorate, which includes the mines of the Western Fuel Company, the Pacific Coast Coal Company, and the Vancouver-Nanaimo Coal Company. The strike has not been declared off by the Union, with the exception of the Vancouver-Nanaimo Coal Company, which on September 1st, 1913, signed up with the United Mine Workers of America, and is now working under the agreement.

All the mines mentioned above had an unexpired working agreement between the operators and their employees which to all appearances was giving good satisfaction, and which did not expire at the Western Fuel Company's and the Vancouver-Nanaimo Coal Company's mines until September, 1913, the Pacific Coast Coal mines or South Wellington Company's agreement expiring in September, 1915.

The output of the various mines for the year has thus been greatly reduced by these existing conditions.

The South Wellington Company began to open its mines again in June, with what men it could get, but the Western Fuel Company made no effort to fill the workmen's places until September, after the agreement had expired.

Both companies at the present time are increasing their outputs, and it will not be long before normal conditions are reached.

During the year the Provincial Government has erected a fine rescue-station adjacent to the No. 1 shaft of the Western Fuel Company, with J. D. Stewart as Instructor in charge of the building; this building is 60 x 30 feet, the main work-room 14 x 26 feet, smoke-room 18 x 30 feet, with all modern appliances. After the completion of the station the Inspectors' office was removed from the Provincial Building to the new rescue-station, where an office was fitted up.

Supplies on hand in the Government station at the end of 1912: Eight 2-hour Draeger apparatus; four ½-hour Draeger apparatus; twelve storage-cylinders; twelve 2-hour cylinders;

twelve ½-hour cylinders; 116 2-hour cartridges; 300 1-hour cartridges; 112 ½-hour cartridges; one pulmotor; two oxygen refilling-pumps; eleven full tanks of oxygen, 130 atmospheres each; one oxygen stretcher; five Sprae reducing-valves, with duplicate parts for all machines.

During the year all the apparatus has been remodelled, being changed from the 1909 type, substituting thereby the 1910 and 1911 model, being able by this change to do away with the helmet, which was an added weight to the machine, also very uncomfortable on the head of those using the same. By thus substituting the 1910 and 1911 model with the mouth-breathing attachments, it has been pronounced by those wearing this machine that it is much more comfortable than that of the 1909 type. Since the new rescue-station has been opened, 679 cubic feet of oxygen has been used in training candidates in the use of this life-saving apparatus.

The Western Fuel Company.

Head Office—San Francisco, Cal.

Capital, $1,500,000.

Officers.	*Address.*
John L. Howard, President or Chairman,	San Francisco, Cal.
Jas. B. Smith, Vice-President or Vice-Chairman,	San Francisco, Cal.
D. C. Norcross, Secretary,	San Francisco, Cal.
Joseph L. Schmidt, Treasurer,	San Francisco, Cal.
Thomas R. Stockett, General Manager.	Nanaimo, B.C.
Thomas McGuckie, Mine Manager (10 months),	Nanaimo, B.C.
T. R. Jackson, Mine Manager,	Nanaimo, B.C.

The above company has operated the following collieries at Nanaimo during the past year, namely: No. 1 or Esplanade shaft, Nanaimo; Protection Island mine, No. 4 Northfield mine, and the Douglas slope.

The following returns show the combined output of all the company's mines for the past year:—

RETURNS FROM WESTERN FUEL COMPANY'S MINES FOR YEAR 1913.

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	135,367			
" export to United States	50,846			
" " other countries				
Total sales		186,213		
Used in making coke				
Used under colliery boilers, etc	34,972			
Total for colliery use		34,972		
		221,185		
Stocks on hand first of year	1,412			
" last of year	522			
Difference taken from stock during year		890		
Output of colliery for year		220,295		

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		22		53	
Whites—Miners	357				357	
Miners' helpers	19				19	
Labourers	396		31		427	
Mechanics and skilled labour	99		75		174	
Boys	40		20		60	
Japanese						
Chinese			135		135	
Indians			6		6	
Totals	942		289		1,231	

NO. 1 SHAFT, ESPLANADE, NANAIMO.

T. R. Jackson, Manager; Wm. Roper, Overman; R. Adam, Jno. Weeks, W. Johnson, R. W. Morton, G. Yarrow, W. Neave, J. Perry, D. John, J. Dudley, and A. Combs, Firemen.

No. 1 mine of the Western Fuel Company is located at the south end of the Esplanade, in the city of Nanaimo. It has been in operation for the last thirty years past, and has many years of productive capacity ahead.

The present operations are at a depth of 600 to 1,200 feet below the surface; a large area being under the sea. The hoisting-shaft is circular, 18 feet in diameter, and 600 feet deep, with an air-shaft 13 feet in diameter and the same depth as the hoisting-shaft. There is also a hoisting and ventilating shaft located on Protection island, at a depth of 650 feet, also an hoisting and ventilation shaft on Newcastle island, 347 feet in depth; both of these shafts are connected with and are a part of No. 1 mine. Mining is being carried on in both the New castle and Douglas seams.

Rescue-station.—This company has one of the most modern rescue-stations on the Pacific slope, fully equipped with apparatus and trained ambulance and fire-fighting corps. For two years in succession this company's first-aid team took first prize in Victoria for work in first aid.

Rescue Apparatus on Hand.—Four 2-hour Draeger apparatus, three 1-hour apparatus, four 2-hour Proto apparatus, twelve large tanks of oxygen, stretcher, and pulmotor.

Newcastle Seam.

This seam is operated from No. 1 North level and is penetrated at three different points—namely, Nos. 1, 2, and 3 slopes. These slopes, which are sunk with distances of about 4,000 feet between each, cover a very extensive coal-area; they are connected with the other, making one continuous working-face.

The seam varies from 3 to 3½ feet in thickness, and is of a very hard nature, worked on the long-wall system, which is well adapted for this method of working. Mining-machines of the "pick quick" (or bar machine) and punching type are used to undermine the coal, the depth of mining varying from 5 to 6 feet.

At the present time only No. 1 slope and part of No. 2 are producing coal, owing to labour troubles. The haulage is done by electric motors of the trolly type.

The ventilation is produced by an exhaust-fan of the Guibal type, 9 x 18, and 100 horse-power, rope-driven, running seventy revolutions a minute, producing 100,000 cubic feet of air a minute, with a water-gauge of 2 inches.

There is also an emergency exhaust-fan at Newcastle Island shaft in case of accident, which is always ready for use.

On my last inspection there was 75,000 cubic feet of air a minute passing into No. 1 level, divided into two splits.

No. 1 Slope.—There was 14,000 cubic feet of air a minute passing into this slope for the use of sixty-eight men and four horses, or an average of 175 cubic feet of air for each unit employed. No explosive gas was found; the timbering and roadways were in good condition.

No. 2 Slope.—There was 16,000 cubic feet of air a minute passing into this slope for the use of thirty-six men and 4 horses, or an average of 333 cubic feet of air for each unit employed. No explosive gas was found; timbering and roadways were in good condition.

Upper Seam.—There was 12,000 cubic feet of air a minute passing into this section of the mine for the use of twenty men and three horses, or an average of 413 cubic feet of air for each unit employed. No explosive gas found; timbering and roadways good.

Protection Island Shaft.

This shaft is used for lowering and raising of the workmen on the north side of No. 1 level. Coal is being extracted from pillars in this mine for the purpose of generating power for the machinery installed. When I made my inspection in December I found the mine free from gas and well ventilated and well timbered up.

Machinery installed.—Two Canadian Rand compressors, one delivering 2,500 and the other 1,800 cubic feet of air a minute, for the purpose of supplying power for the cutting-machines, pumps, and winches. The air is conveyed through a 7-inch air-line to No. 1 level, there connecting with one of the same size from No. 1 shaft, making one complete circuit. Two new return-tube boilers of 280 horse-power have been installed during the year, also a new powder-magazine, oil and lamp room has been built, with reinforced concrete, to guard against fire.

Douglas Seam, South Side.

This part of the mine forms the deepest workings of No. 1 mine, but has not been in operation since May 1st owing to existing labour conditions. During this period of idleness a fire broke out between Nos. 2 and 3 South headings on August 11th, 1913. After fighting this fire from its inception until August 22nd, without any perceptible signs of getting the best of it, through not being able to secure sufficient help to extinguish it, a consultation was held by the officials of the company and Chief Inspector Graham, who personally examined the fire-area with a 2-hour Draeger apparatus.

After this examination it was decided that the only safe way to protect life and property was to flood this section. The company, acting on the advice of the Chief Inspector, began pumping water into the mine on August 23rd, at 11.30 a.m., and kept it up continuously for seven weeks, when it was decided that the water had reached the fire-zone. A start was made to pump this water out again on December 17th.

During this period a new Prescott pump had been installed for this purpose, with a capacity of 750 gallons a minute. In addition to this, there is another Prescott pump with a capacity of 500 gallons a minute.

A new 6-inch pipe-line had to be laid from the sump of these pumps to No. 3 station, where another pump is installed with a capacity of 200 gallons a minute. In addition to this one, a duplex motor-driven pump is installed down the Diagonal slope to handle the water that was pumped into that section.

A new fireproof pump-room has been built, with reinforced concrete, 51 feet long, 16 feet wide, 12 feet high, with 12-inch steel girders overhead with 2-foot centres. This is one of the finest pump-rooms in any of the coal-mines on the Pacific slope.

The following are the official returns from the No. 1 shaft and Protection Island collieries for the year 1913:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	119,377			
" export to United States	30,855			
" " to other countries				
Total sales		150,232		
Used in making coke				
" under colliery boilers, etc.	23,022			
Total for colliery use		23,022		
		173,254		
Stocks on hand first of year	1,362			
" last of year	259			
Difference taken from stock during year		1,103		
Output of colliery for year		172,151		

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	20		10		30	
Whites—Miners	201	3.30 - 7.00			201	
Miners' helpers	15	2.86			15	
Labourers	227	2.86 - 3.30	10	2.75	237	
Mechanics and skilled labour	52	2.86 - 3.85	41	3.00 - 4.50	93	
Boys	28	1.10 - 2.45	12	.50 - 1.65	40	
Japanese						
Chinese—Labourers			64	1.50 - 1.88	64	
Indians						
Totals	543		137		680	

Mine was operated 151 days during the year; balance of the year closed on account of labour troubles.

Brechin Mine.

This mine has been idle since May 1st, 1913. A few workmen are engaged cleaning up the airways and keeping the mine in repair. The surface pump started operations on November 6th and has been kept going continuously.

RESERVE MINE.

This is a new shaft being opened by the Western Fuel Company in the Cranberry District near the centre of a 2,500-acre virgin coalfield in Nanaimo and Cranberry Districts, the Main shaft being located about 1,700 feet east of the Nanaimo river.

The "first sod" was turned in July, 1910, and a 10-foot seam of coal was struck in April, 1913. The Auxiliary shaft has not reached the coal, being down 828 feet. Owing to the existing labour conditions, these shafts suspended operations on May 1st, the shafts being allowed to fill up with water.

During this enforced idleness a new pit-head has been erected, with all the latest improvements attached. The railway connecting this mine with the shipping wharves of the company on Nanaimo harbour has been completed by a two-span Howe-truss bridge across Nanaimo river.

Both shafts are equipped on the most modern and improved system. The hoisting-engines are equipped with Corliss valves, and all the latest improvements for controlling the hoisting and preventing overwinding. The Main shaft engine has cylinders 30 x 60 inches, two drums 14 feet in diameter. The Auxiliary shaft engine has cylinders 24 x 54 inches, with two drums 12 feet in diameter. Both engines are set in heavy concrete foundations and are enclosed in substantial and well-lighted iron-clad houses.

Both surface and underground plans call for equipping and developing the mine on the most modern lines, and with an ultimate capacity of 1,500 to 2,000 tons a day.

The following are the official returns of the Reserve Colliery for the year ending the 31st December, 1913:—

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	.....	4	.....	6	.....
Whites—Miners	.....	.....	.....	.....	.....	.....
Miners' helpers	.....	.....	.....	.....	.....	.....
Labourers	17	4.00 - 4.40	15	.....	32	.....
Mechanics and skilled labour	33	4.50 - 5.50	16	.....	49	.....
Boys	.....	.....	1	.....	1	.....
Japanese	.....	.....	.....	.....	.....	.....
Chinese—Labourers	.....	.....	30	.....	30	.....
Indians—Labourers	.....	.....	6	.....	6	.....
Totals	52	.....	72	.....	124	.....

Development-work, January 1st to April 30th, or 114 days, balance of year labour troubles. Main shaft down 1,050 feet. Douglas coal-seam cut at 1,043 feet, thickness 10 to 12 feet; dip about N. 19° E., angle 22 degrees. Counter-shaft down 828 feet in sandstone.

The following are the official returns of the Northfield Colliery for the year ending the 31st December, 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	15,990			
" export to United States	19,991			
" " to other countries				
Total sales		35,981		
Used in making coke				
" under colliery boilers, etc.	11,950			
Total for colliery use		11,950		
		47,931		
Stocks on hand first of year	50			
" last of year	263			
Difference added to stock during year		213		
Output of colliery for year		48,144		

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	9		8		17	
Whites—Miners	156	3.30 - 5.50			156	
Miners' helpers	4	2.86			4	
Labourers	152	2.86 - 3.30	6	2.75	158	
Mechanics and skilled labour	14	2.86 - 3.57	18	3.00 - 4.00	32	
Boys	12	1.10 - 2.20	7	1.00 - 2.25	19	
Japanese						
Chinese—Labourers			41	1.50 - 1.88	41	
Indians						
Totals	347		80		427	

Mine was operated ninety-nine days during the year.

REPORT OF THOMAS MORGAN, INSPECTOR.

I beg to submit my report on the inspection of the various mines in my district that I have visited during the five months up to May 31st, 1913.

No. 1 shaft of the Western Fuel Company; Northfield mine; Pacific Coast Coal Mines; Vancouver-Nanaimo Coal Mining Company; Extension mines of the Canadian Collieries (Dunsmuir), Limited.

PACIFIC COAST COAL MINES, LIMITED.

South Wellington Mines, Nos. 1 and 2 Slopes.—March 1913. On my visit to this mine I examined all the workings in both slopes and found the condition good all through, well timbered and cogged, and the ventilation good. For the use of forty men and four mules in No. 1 slope there was 17,500 cubic feet of air a minute; for the use of sixty men and five mules in No. 2 slope there was 22,200 cubic feet of air a minute.

VANCOUVER-NANAIMO COAL MINING COMPANY.

East Wellington.—April 9th. On the above date I made a visit to this mine and found the condition good all through. For the use of twenty-two men and two horses in No. 0 dip there was 10,000 cubic feet of air a minute; for the use of sixty-two men and four horses in Nos. 2, 3, and 4 levels there was 12,000 cubic feet a minute. Harry N. Freeman, manager.

WESTERN FUEL COMPANY.

No. 1 Shaft, Nanaimo; No. 4 South Heading.—On my visit to this district I found some timbers broken in McNevin's stall, and also in Wilson's stall, which needed renewing at once. All the other workings were in good order, and the ventilation good. For the use of thirty men and four horses there was 10,000 cubic feet of air a minute.

No. 6 South Heading and South-east District.—For the use of forty-five men and eight mules there was 12,100 cubic feet a minute in No. 6 South heading; for the use of thirty-six men and six horses in South-east district there was 12,800 cubic feet a minute.

Northfield Mine.—On my last visit to this mine I found the condition good, well timbered and cogged, and the ventilation good. For the use of fifty men and three mules in No. 3 Right there was 11,000 cubic feet a minute; for the use of sixty-two men and five horses in No. 3 Left there was 12,500 cubic feet a minute; for the use of nineteen men and two mules in the Top seam there was 6,000 cubic feet a minute; For the use of sixty men and eight mules in Nos. 4 and 5 Left of the slope there was 12,500 cubic feet a minute. J. W. Montgomery, manager.

CANADIAN COLLIERIES (DUNSMUIR), LIMITED.

No. 1 Mine, Extension.—On my last visit to this mine I found all in good order, well timbered, and the ventilation good. For the use of fifty men and four mules there was 25,000 cubic feet a minute J. H. Cunningham, manager; Robert Bonar, overman.

No. 2 Mine, Extension.—On my last visit to this mine there was no one working. The ventilation was going around as usual.

No. 3 Mine, Extension.—On my last visit to this district I found all clear, but a little gas on top of a cave in No. 3 stall off Bowater's level. For the use of twenty-eight men and four mules there was 8,000 cubic feet a minute. I also examined the pillar-work in No. 4 motor-road, and found all in good order and the ventilation good.

REPORT BY INSPECTOR DEVLIN.

Canadian Collieries (Dunsmuir), Ltd.

Head Office—Victoria, B.C.

Capital, $15,000,000.

Officers.	*Address.*
Sir William Mackenzie, President,	Toronto, Ont.
A. D. McRae, Vice-President,	Vancouver, B.C.
R. P. Ormsby, Secretary,	Toronto, Ont.
A. J. Mitchell, Treasurer,	Toronto, Ont.
C. F. Compton, Asst. Secretary,	Victoria, B.C.
W. L. Coulson, General Manager,	Victoria, B.C.

The Canadian Collieries (Dunsmuir), Limited, during the year 1911 acquired all the holdings of the Wellington Collieries Company, Limited, and has been operating the following mines during the past three years under the general management of W. L. Coulson :—

The Extension Colliery, in the Cranberry District (Extension); J. H. Cunningham, manager.

The Union Colliery, in Comox District; R. Henderson, J. H. McMillan, T. A. Spruston, managers at the several mines.

NOTE.—This latter colliery is in the Comox Inspection District, in which report will be found a description of the property and the details of production.

The following table shows the combined output of all this company's collieries during the past year :—

RETURNS FROM CANADIAN COLLIERIES MINES FOR YEAR 1913.

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	353,709		66	
" export to United States	25,359			
" " other countries				
Total sales		379,068		66
Lost in washing	137,615			
Used under colliery boilers, etc.	40,991			
Total for colliery use		178,606		
Stocks on hand first of year	2,872		2,370	
" last of year	11,148		2,304	
Difference { *added to / †taken from } stock during year		* 8,276		† 66
Output of colliery for year		565,950		*Nil.*

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	46		15		61	
Whites—Miners	205				205	
Miners' helpers	80				80	
Labourers	73		56		129	
Mechanics and skilled labour	68		74		142	
Boys	40		16		56	
Japanese—Miners	71				71	
Helpers	46				46	
Labourers	8		3		11	
Chinese — Miners	118				118	
Helpers	93				93	
Labourers	73		123		196	
Total	921		287		1,208	

EXTENSION COLLIERY.

J. H. Cunningham, Manager.

The general supervision of all the mines of this colliery are entrusted to J. H. Cunningham, who has an overman in charge of each separate mine.

No. 1 OR TUNNEL MINE.

Robert Bonar, Overman; W. Bradley, J. Davidson, D. Gordon, and Evan John, Firebosses.

This mine was closed down in the early part of the year on account of the strike. Work was resumed in March of this year, and was again interrupted during the latter part of August and the early part of September.

The greater part of the work in this mine is carried on by the long-wall system of mining, and territory is being worked which was previously abandoned.

During the year the mine has been developed so that it is now producing as much coal in one shift as was previously done in two shifts. A new electric hoist has been installed at the head of No. 2 slope, with a view to increasing the production from this section of the mine.

When I made my inspection in December I measured 16,800 cubic feet of air a minute passing into this mine for the use sixty-five men and seven mules, or an average of 188 cubic feet of air a minute for each unit employed. No explosive gas found, and the faces were well cogged and timbered, and the roadways in good condition.

No. 2 MINE, EXTENSION.

Thomas Strang, Overman; W. Cosier and J. Nimmo, Sr., Firebosses.

The work in this mine has been confined principally to the West side of No. 2 slope, cleaning up and repairing air-courses. When I made my inspection in December I found 12,600 cubic feet of air a minute passing into this mine for the use of eighteen men and one mule. No explosive gas found; timbering and roadways were in good order.

No. 3 MINE, EXTENSION.

James Strang, Overman; J. Barkley, D. Campbell, J. Ross, and G. Smith, Firebosses.

The work in this mine has been confined principally to Nos. 4 and 5 West levels; splitting and extracting pillars. Frequent interruptions during the year have interfered with the regular working of both Nos. 2 and 3 mines. No. 2 fan (Guibal type) was destroyed by fire early in the year, and has since been replaced with a "Murphy" fan.

During the latter part of the year, owing to the destruction of the electric haulage locomotives, mule haulage has been employed temporarily. The locomotives formerly in use are being repaired; but in the meantime the tunnel haulage is being handled by a new Morgan-Gardner locomotive, which started operating early in November.

In No. 3 mine a heading is being driven over the "Jump" fault near the face of No. 5 West level, which is expected to make a marked improvement in both the haulage and ventilation conditions of the Old Slope district.

When I made my inspection in December I found 4,680 cubic feet of air a minute for the use of twenty-five men and four mules. No explosive gas was found; timbering and roadways were good.

The ventilation in No. 3 mine is not very good at the present time, owing to the "Murphy" fan, recently installed in place of the "Guibal" fan, which was destroyed by fire early in the year, not giving satisfactory results.

No. 4 MINE, EXTENSION.

This mine has not worked since August, 1912, when it was closed down for some reason.

The following are the official returns of the Extension Colliery for the year ending the 31st December, 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	42,388			
" export to United States, Alaska	464			
" " other countries				
Total sales		42,852		
Lost in washing	8,689			
Used under colliery boilers, and employees	5,664			
Total for colliery use		14,353		
		57,205		
Stocks on hand first of year	91			
" last of year	741			
Difference added to stock during year		650		
Output of colliery for year		57,855		

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	4.00 - 6.00	8	6.00 - 3.50	11	
Whites—Miners	55	3.30 - 5.00			55	
Miners' helpers	15	2.75 - 3.30			15	
Labourers	9	2.47 - 3.00	5	2.75 - 3.02	14	
Mechanics and skilled labour	30	2.75 - 3.02	34	2.75 - 4.40	64	
Boys	16	1.10 - 2.20	4	1.10 - 2.20	20	
Japanese						
Chinese—Labourers	7	1.50 - 1.65	13	1 50 - 1.75	20	
Indians						
Totals	135		64		199	

Name of seams or pits—Wellington Nos. 1, 2, 3, and 4.

Description of seams, tunnels, levels, shafts, etc., and number of same—One tunnel connecting Nos. 1, 2, and 3. No. 4 shaft situated one mile south of tunnel.

REPORT BY INSPECTOR NEWTON.

Pacific Coast Coal Mines, Limited.

Head Office—Victoria, B.C.

Capital, $2,000,000.

Officers.	*Address.*
John H. Tonkin, President,	Victoria, B.C.
C. P. Hill, Vice-President,	Montreal.
Talbot Schmuck, Secretary-Treasurer,	Victoria, B.C.
J. R. Roaf, Superintendent,	South Wellington, B.C.

Value of plant, $390,994.

This is a recently organized company and includes in its holdings the Fiddick Colliery of the former South Wellington Mines, Limited, and certain property at Suquash, on the east coast of Vancouver Island, near Malcolm island, where the company has, within the past two years, opened up a new colliery, which is now producing coal. The output of coal made by

the company from these two collieries combined during the year 1913 is shown in the following table :—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	69,490			
" export to United States	603			
" " other countries				
Total sales		70,093		
Lost in washing	39,002			
Used under colliery boilers, etc.	11,985			
Total for colliery use		50,987		
		121,080		
Stocks on hand first of year	42,015			
" last of year	581			
Difference taken from stock during year		41,434		
Output of colliery for year		79,646		

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	4		8		12	
Whites—Miners	180				180	
Miners' helpers	50				50	
Labourers	139		17		156	
Mechanics and skilled labour			28		28	
Boys	15		2		17	
Japanese						
Chinese			129		129	
Indians						
Totals	388		184		572	

FIDDICK COLLIERY, SOUTH WELLINGTON.

J. R. Roaf, General Manager; J. Foy, Manager; A. Wilson, Overman; T. Keith and F. Hilly, Firemen.

The South Wellington mines are operated by two slopes, No.1 on the Fiddick Estate and No. 2 on the Richardson Estate. No. 1 is down about 1,400 feet to where the diagonal slope branches off. This slope is down 2,000 feet, with levels turned off north and south. No. 2 slope is down a distance of 1,400 feet, with levels turned off north and south.

The method of working is pillar and stall, and in some places where the coal is thin the long-wall system is adopted: the coal averages from 3 to 20 feet in thickness. The ventilation is produced by a Sheldon single-entry reversible fan 9½ feet in diameter, driven by a 9½-x 14-inch steam-engine, direct-connected, producing 85,000 cubic feet of air a minute, with 1½-inch water-gauge.

The coal production of these mines has been greatly decreased by the existing labour troubles. A strike at these mines took place on May 1st, 1913, and is still in progress.

The Company has built a small rescue-station equipped with two 2-hour and one ½-hour Draeger apparatus, four large oxygen-tanks, and one pulmotor.

In the firing of all shots Monobel powder is used, exclusively fired by electric batteries.

Machinery installed.—One Canadian Rand straight-line air-compressor, capacity 480 cubic feet of air a minute; one Norwalk single air-compressor, capacity 707 cubic feet of air a minute; one cross-compound compressor, capacity 2,100 cubic feet of air a minute. These compressors furnish power for winches and pumps underground. The power-house also contains an electric unit, a 50-kw. generator, with 25 horse-power D.C. exciter attached; these are driven by a steam-engine 9 x 16 inches; also four return-tubular boilers, 286 horse-power.

Boat Harbour.—Two return-tubular 18 x 12 boilers, 106 horse-power each; one Houston Stanwood washer-engine, 14 x 20; One Houston Stanwood loading-engine, 10 x 14; one elevator-engine, 15 horse-power; one double-drum hoist.

When I visited these mines in December I found 11,000 cubic feet of air a minute passing into this No. 1 mine for the use of fifteen men and two horses, or an average of 524 cubic feet of air a minute for each unit employed. No explosive gas was found; timbering and roadways were good.

No. 2 Mine.—There was 16,500 cubic feet of air a minute passing into this mine for the use of 60 men and 5 horses, or an average of 220 cubic feet of air for each unit employed. No explosive gas was found; timbering and roadways were good.

MORDEN COLLIERY, SOUTH WELLINGTON.

MORDEN MINE, NOS. 3 AND 4 SHAFTS.

This is a new mine, operated by the same company, on Section 11, Range 8, Cranberry District, two miles east of South Wellington. Two shafts are sunk; the main shaft is 9 x 16 and the air-shaft 9 x 12 feet in the clear.

The "first sod" was turned in March, 1912, and an 8-foot seam of coal was struck on April 19th, 1913, at a depth of 600 feet. Connection between these two shafts was nearly completed when the United Mine Workers of America called a strike on May 1st, 1913. Operations have been suspended from that date; both shafts being allowed to fill up with water.

During this enforced idleness this company is building an up-to-date pit-head and installing all the necessary machinery to make this a modern plant.

The following are the official returns of the Fiddick and Morden Collieries for the year ending the 31st December, 1913 :—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	67,140			
" export to United States	603			
" " other countries				
Total sales		67,743		
Lost in washing, not previously reported	33,772			
Lost in washing	5,230			
Used under colliery boilers, etc.	11,339			
Total for colliery use		50,341		
		118,084		
Stocks on hand first of year	41,234			
" last of year	581			
Difference taken from stock during year		40,653		
Output of colliery for year		77,431		

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.
	At Mines.	At Morden Shafts.		At Mines.	At Morden Shafts.		
			$			$	
Supervision and clerical assistance	2	1	3.50 - 7.00	7		2.00 - 10.00	10
Whites—Miners	113	57	4.00 - 5.00				57
Miners' helpers	50		3.30 - 5.30				163
Labourers	137		2.86 - 3.30	6	8	2.86 - 3.30	151
Mechanics and skilled labour				22	4	3.00 - 3.85	26
Boys	15		2.00 - 2.25	2		2.00 - 2.25	17
Japanese							
Chinese				105	24	1.50 - 1.75	129
Indians							
Total	317	58		142	36		553

N.B.—The figures under "Number of hands employed, etc.," do not include any details of the months May, 1913, to October, 1913, inclusive.

Name of seam or pits—No. 1 slope, South Wellington, developing Fiddick mine, working upper Douglas seam; No. 2 slope, South Wellington, developing Richardson mine, working upper Douglas seam; Morden shafts, Nos. 3 and 4, both reaching upper Douglas seam on Section 11, Range 8, Cranberry District.

Description of seams, tunnels, levels, shafts, etc., and a number of same—Seam reached in both shafts at about 650 feet from surface.

Description and length of tramway, plant, etc.—At South Wellington mine the plant consists of four return-tubular boilers, 100 horse-power each; one Canadian Rand air-compressor, capacity 500 cubic feet a minute; the Canadian Rand cross-compound air-compressor has

been completed and is now in service; two Fairbanks-Morse pumps for supplying water to boilers, 7 x 5 x 12 duplex; one thoroughly equipped machine-shop; double-drum hoisting-engine for hauling coal from slopes, 200 horse-power; one Sheldon fan capable of producing 85,000 feet of air, with 1½-inch water-gauge; one mine-rescue station containing two 2-hour apparatus and one ½-hour apparatus. The underground plant consists of two winches 6½ x 8, two 5 x 7, and one 9 x 11. Pumps, 300-gallon electric turbine-pump; one 600-gallon Cameron piston-pump; twelve Fairbanks-Morse pumps, duplex, one 5¼ x 3½ x 5 and one 7 x 5 x 7; and three small duplex pumps, one 3 x 2 x 5 and two 4 x 3 x 36; 250 mine-cars, and approximately ten miles of narrow-gauge track in mine.

At Morden mine the plant consists of three 150-horse-power return-tubular Goldie & McCulloch 72- x 18-inch boilers, 160 lb. working-pressure; one pair 24 x 36 hoisting-engines equipped with safety overwinding device, steam-reverse and steam-brake; two 10-foot sheaves with collars and boxes and two self-dumping cages; one Gwynnes 5-inch centrifugal pump direct-connected to 250-volt A. C. motor; two 150-kw. electrical generators connected to two Goldie & McCulloch 13 x 20 x 9 high-speed engines; five electrical motors, 400-volt, 1,200 R.P.M.; one Sheldon ventilating mine-fan direct-connected to a 17- x 20-inch Vulcan Iron Works fan-engine; one Marcus screen 65 feet long; one Marcus screen 63 feet long, both with double decks and doors; concrete tipple and head-frame at present being worked on.

SUQUASH MINES.

This company has started to sink a new shaft 11 x 22 feet, and at the present time is driving two slopes from inside, starting from the old shaft level to drive down to connect with the level from the new shaft; the ultimate object being to take up all the coal out from the new shaft, making the present old shaft an upcast. This work is all in the development state. There are only two firebosses employed in the mine to keep the water out.

Machinery installed.—During the present year two 150-horse-power boilers, also a compressor, and a small engine and generator were installed.

The following are the official returns of the Suquash mines for the year ending the 31st of December, 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	2,350			
" export to United States				
" " to other countries				
Total sales		2,350		
Sold to employees	46			
Used in making coke	600			
Total for colliery use		646		
		2,996		
Stocks on hand first of year	781			
" last of year	*nil.*			
Difference taken from stock during year		781		
Output of colliery for year		2,215		

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	.....	1	.....	2	.....
Whites—Miners	10	3.30	.....	.....	10	3.30
Miners' helpers	.....	.....	.....	.....	.....	.....
Labourers	2	3.30	3	3.30	5	3.30
Mechanics and skilled labour	.....	.....	2	3.50	2	3.50
Boys	.....	.....	.....	.....	.....	.....
Japanese	.....	.....	.....	.....	.....	.....
Chinese	.....	.....	.....	.....	.....	.....
Indians	.....	.....	.....	.....	.....	.....
Totals	13	.....	6	.....	19	.....

Name of seams or pits—Suquash No. 1 mine (Upper seam).

Description of seams, tunnels, levels, shafts, etc., and number of same—One shaft 6 x 10 feet, with midwall one side for hoisting and one side for ventilation. From the shaft-bottom two levels are driven south-east for a distance of about 1,200 feet; two slopes are driven down a distance of about 1,200 feet north-east. Two new slopes have been started from the main shaft level in the direction of the new shaft; these have been driven, approximately, 350 feet at the present writing. Commenced sinking of a new shaft 11 x 22 feet in the clear; shaft 18 feet deep, total depth will be 285 feet. Seam is from 5 to 6 feet in thickness and of good quality, being practically smokeless and giving off great heat.

Description and length of tramway, plant, etc.—Two 150-horse-power return-tubular boilers; sinking-engines now on the ground; permanent engines being one pair 24 x 36 Vulcan Iron Works, equipped with safety overwinding device, steam-reverse and steam-brake, and are now ready for installation; one air-compressor has been installed; also electric generator for surface lighting; one donkey-engine with vertical boiler attached (for hoisting); one small fan for ventilation, producing about 14,000 cubic feet of air a minute; one duplex pump, capacity 50 gallons a minute, for pumping water from mine; a small pit-head and screening arrangement, capable of handling 200 tons daily. A narrow-gauge tramway runs from pit-head to wharf, a distance of about 400 feet. The loading arrangements are suitable for loading scows and small craft. Underground there is about one mile of narrow-gauge track and sixteen mine-cars.

The Vancouver-Nanaimo Coal Mining Co., Ltd.

Head Office—Vancouver, B.C.

Capital, $1,000,000.

Officers.	*Address.*
Alvo V. Alvensleben, President,	744 Hastings Street, Vancouver, B.C.
H. W. Maynard, Vice-President,	98 Powell Street, Vancouver, B.C.
Willibald Imhoff, Secretary-Treasurer,	744 Hastings Street, Vancouver, B.C.
H. N. Freeman, Superintendent,	P.O. Box 283, Nanaimo, B.C.

Value of plant, $500,000.

NEW EAST WELLINGTON COLLIERY.

Harry N. Freeman, Manager; J. Dixon, Overman; W. H. Moore, T. Miles, and W. Calverly, Firebosses; J. Bennie, R. Reid, I. Nash, J. Saunders, A. McNeil, J. E. Knowles, J. Hamilton, and W. Williams, Shotlighters.

This mine is situated about two miles from the city of Nanaimo, the seam being known as the "Old Wellington" seam. It is opened from the surface by two slopes running N. 70° E. and pitching about 35 degrees, and is down a distance of 1,400 feet. At this point two main headings are turned off N. 65° E. and run a distance of 1,400 feet.

Levels are turned off every 200 feet, the coal varying from 4 to 8 feet in thickness. The coal in this section is worked on the pillar-and-stall system, with 20-foot stalls and 6 x 120-foot pillars. On the north side the coal varies from 1 to 4 feet in thickness, and is worked on the long-wall system. During the present year this system has been worked very extensively; No. 0 dip being driven a distance of 900 feet, with two diagonal slopes, right and left, with levels at right angles to the slope. The coal is of a very hard nature and free from impurities. All the coal is hand-mined. Monobel and 30-per-cent. Giant powders are used; fired by batteries.

During the year labour troubles caused a cessation of work at this mine from May 1st to August 31st, when the company signed a two years' agreement with the United Mine Workers of America; the mines starting operations on September 1st.

During the year a new dam has been constructed with a capacity of 30,000 gallons of water, providing ample water for the boilers. The ventilation of this mine is produced by a Sheldon fan 4 x 9 feet, driven by a Sheldon engine producing 35,000 cubic feet of air a minute, with a 2½-inch water-gauge.

Rescue Apparatus.—The following Draeger life-saving apparatus is maintained at the mine, and is constantly ready for use: Two 2-hour Draeger apparatus, helmet type; one ½-hour Draeger apparatus, helmet type; one pulmotor and a full stock of accessories always on hand.

Machinery installed.—One hoist, 12 x 16; three return-tubular boilers, 212 horse-power; Canadian Rand compressor, 700 cubic feet; one small sawmill.

When I made my last inspection there was 35,000 cubic feet of air a minute passing into this mine, divided into three splits.

No. 1 Split.—There was 10,500 cubic feet of air a minute passing into this split for the use of forty-eight men and five horses, or an average of 166 cubic feet of air for each unit employed.

No. 2 Split.—There was 7,500 cubic feet of air a minute passing into this split for the use of 36 men and three horses, or an average of 166 cubic feet of air for each unit employed.

No. 3 Split.—There was 10,000 cubic feet of air a minute passing into this split for the use of fifty men and three horses, or an average of 170 cubic feet of air for each unit employed.

No explosive gas was found in the mine; timbering and roadways were in good condition.

The following are the official returns from the New East Wellington Colliery for the year 1913:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	80,058			
" export to United States	19,519			
" " other countries				
Total sales		99,577		
Used in making coke				
Used under colliery boilers, etc.	5,045			
Total for colliery use		5,045		
		104,622		
Stocks on hand first of year	841			
" last of year	3,821			
Difference added to stock during year		2,980		
Output of collieries for year		107,602		

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	15		6		21	
Whites—Miners	169	5.10			169	5.10
Miners' helpers						
Labourers	87	3.10	9	3.10	96	3.10
Mechanics and skilled labour	1	3.70	18	3.70	19	3.70
Boys	2	1.50			2	1.50
Japanese—Labourers			7	2.00	7	2.00
Chinese—Labourers			29	1.90	29	1.90
Indians						
Totals	274		69		343	4.04

NORTHERN DISTRICT OF VANCOUVER ISLAND.

REPORT OF HENRY DEVLIN, INSPECTOR.

I have the honour to submit my first annual report as Inspector of Mines for the Northern District of Vancouver Island for the year 1913, together with a list of all accidents and colliery returns.

Canadian Collieries (Dunsmuir), Ltd.*

These mines were formerly operated by the Wellington Colliery Company, but were taken over by the Canadian Collieries (Dunsmuir), Limited, in 1910.

The mines are situated in the Comox District, about sixty-five miles from Nanaimo. A railway about twelve miles in length connects the various mines to a shipping point at Union Bay, over which the whole output of coal is conveyed.

This company is operating at Cumberland mines known as Nos. 4 and 7 slopes, and Nos. 5, 6, and 8 shafts.

A new piece of railway has been constructed from a point on the main line near Union Bay along the beach as far as No. 8 mine at the present time, which will be continued to the other mines in the near future. By the construction of this new branch road the company will be able to haul much heavier trains, as the grade will be considerably reduced.

These mines have been operated continually during the year.

The company has a rescue-station at No. 6 mine, 40 x 24 feet, with smoke, dressing, and work rooms, while a room for teaching "first aid" is attached. The equipment of the station at present consists of four 2-hour Draeger rescue apparatus, a recharging-pump, and oxygen-tanks; also a pulmotor owned by the Mines Department. There is at each mine a corps of officials trained in rescue-work.

In August of this year the company turned on the power from their hydro-electric power plant situated on the Puntledge river. The power-house contains two Frances turbines of 6,000 horse-power, each direct-coupled to a 4,000-kw. generator, generating power at 13,200 volts, 3-phase, 25 cycles. The power is delivered to the various mines and the shipping point at Union Bay through transmission-lines, aggregating about thirty miles in length.

At Union Bay the shipping wharves, the machine-shops, car-shops, foundry, and coal-washing plant are driven and lighted by electricity, and electric power has replaced the use of steam on all the company's properties in the Comox field, with the exception of No. 6 mine.

COMOX COLLIERY.

NO. 4 MINE.

R. Henderson, Manager; C. Parnham, Overman; T. Mordy, S. Horwood, H. Hewlett, J. Edwards, J. Furbow, W. Jones, F. Bell, J. Dando, H. Simms, A. Odgers, and M. Brodrick, Firebosses.

This mine is situated about two miles from Cumberland and about fourteen miles from the shipping point at Union Bay.

A Sullivan reversible fan, which provides the ventilation, was in September of last year changed over from a steam drive to electrical drive. For this purpose a 350-horse-power motor running at 245 R.P.M., and provided with an automatic liquid controller, was installed and directly connected to the fan. This fan is capable of delivering 190,000 cubic feet of air a minute, with a 5½-inch water-gauge.

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* *See* also page 348.

The main haulage-engines are being changed over from steam to electric drive, a 500-horse-power motor with liquid controller being installed for this purpose. This motor is being connected to the existing hoisting-drums by means of cut-steel herring-bone gears.

Motor-generator sets have been installed to replace the steam-engine sets in the power-house at this mine, the power being used for pumping and hauling underground. Motors have been installed for driving the screening plant, the machine-shops, wood-turning shops, and pumping equipment on surface, etc.

An electrical sub-station, with transformers, switch-gears, etc., of a capacity of 2,000 kw., has been installed for supplying the electrical power to replace the steam plant.

Owing to existing conditions in this mine, safety-lamps of the Wolf type and permitted explosives, fired by electric battery, have been used exclusively.

The coal-seams are reached by two slopes, Nos. 1 and 2; a direct-haulage system being in use.

No. 1 Slope.

This slope is down a distance of 7,000 feet, running due north. A diagonal slope of 4,000 feet from the entrance of the mine, running N. 45° E. is down a distance of 3,000 feet, where levels are turned off east and west—Nos. 15, 16, 17, 18, and 19 West levels, and Nos. 16, 17, 18, and 19 East levels. Chinese dips, No. 15 West level, and No. 16 East level are extracting pillars; the other levels are advancing, and are worked on the pillar-and-stall system, all in good coal, ranging from 4 to 5½ feet of good coal, with a band of rock running through the centre, ranging from 10 to 12 inches in thickness, and having a fairly good fireclay roof.

During my inspection in December there was 30,000 cubic feet of air a minute passing into this slope for the use of forty-four men and seven mules, or an average of 460 cubic feet of air a minute for each unit employed I found a little explosive gas in No. 14 stall, No. 17 West level, and a small gas-cap in No. 15 West pillars; all other places were free from gas. The timbering and roadways were good, with the exception of several broken stringers on No. 17 West level, which were ordered repaired.

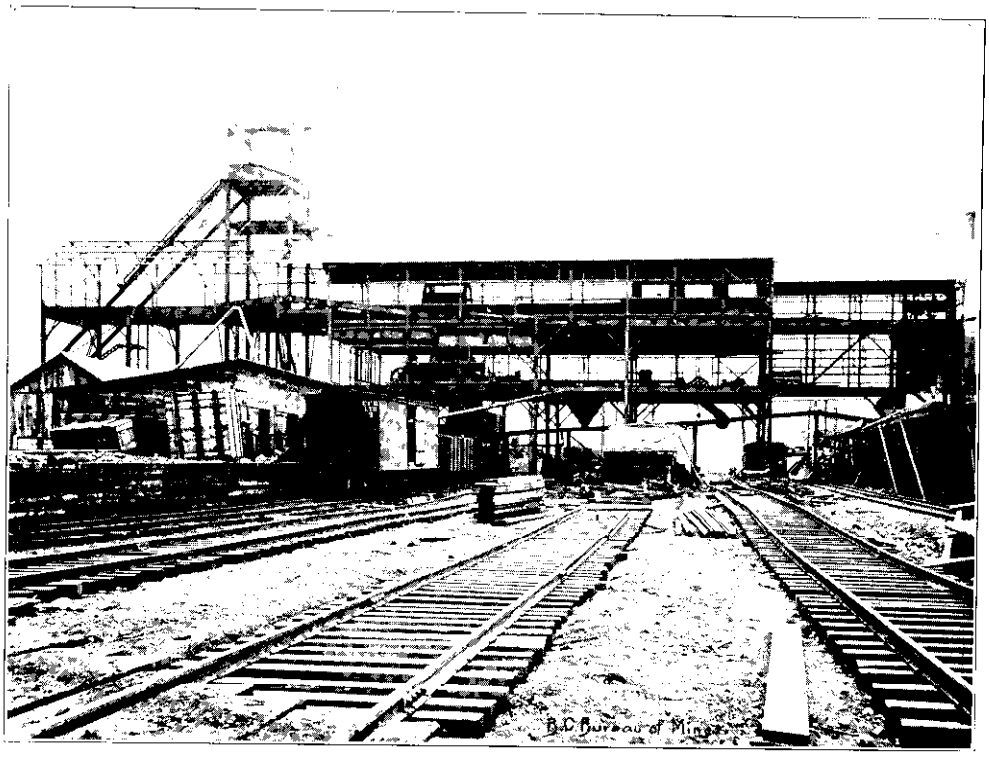
No. 2 Slope.

This slope branches off No. 1 slope a short distance from the mouth of the tunnel, running N. 45° E. and is down a distance of 8,000 feet, forming the deepest workings of the mine. The slope has not advanced any during the year.

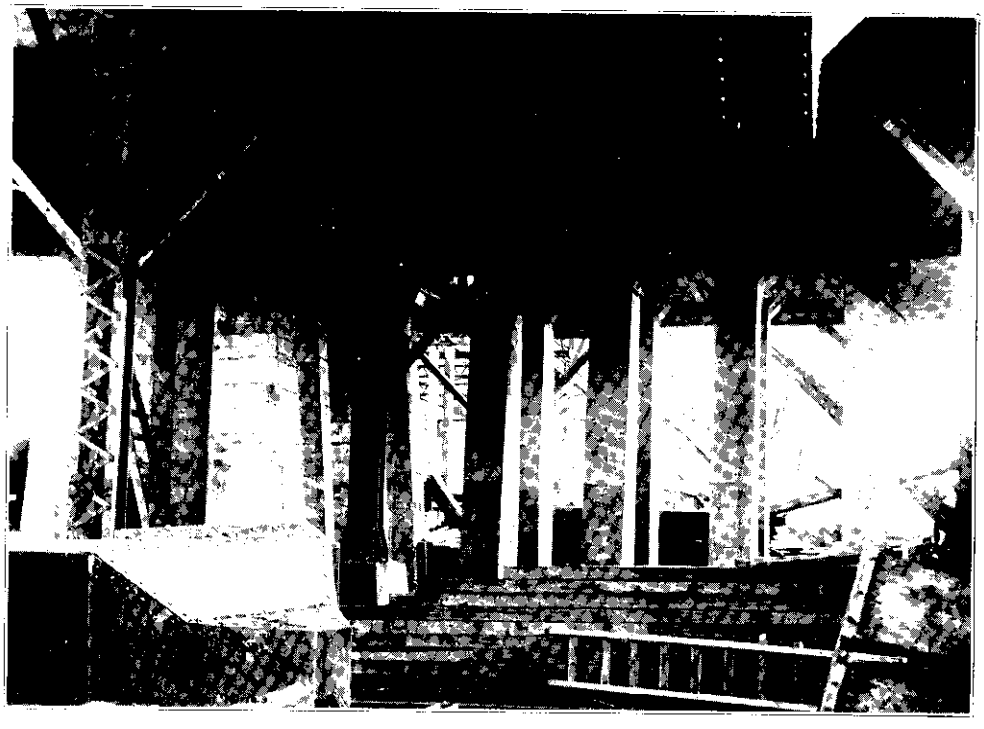
Levels are turned off east and west of the slope, namely: Nos. 15, 16, 17, 18, and 19 on the east side, and Nos. 13, 14, 15, 16, 17, 18, and 19 on the west side. No. 15 on the east side and Nos. 13, 14, 15, and 16 on the west side are extracting pillars. The other levels are advancing in good coal ranging from 4 to 6 feet in thickness, with a band of rock in the centre from 12 to 15 inches in thickness. The roof is of friable fireclay and requires careful timbering. All the levels are worked on the pillar-and-stall system; and all shots are fired by electric battery, and only Monobel powder is used.

During my inspection in December I measured 46,000 cubic feet of air a minute passing into this slope, divided into two splits.

East Side Split.—I found 17,250 cubic feet of air a minute passing into this split for the use of thirty-eight men and seven mules, or an average of 290 cubic feet of air a minute for each unit employed. I found a little explosive gas in a crosscut off No. 18 stall, and Nos. 19 and 20 stalls, No. 18 East; also a ½-inch gas-cap in No. 15 East pillars. Timbering and roadways were in good condition.



New Steel Tipple—Canadian Collieries, Comox.



Reinforced Concrete Substructure of Tipple.

West Side Split.—In this split I found 10,950 cubic feet of air a minute passing for the use of forty-eight men and six mules, or an average of 170 cubic feet of air a minute for each unit employed. I found a little explosive gas in No. 18 stall, and crosscut off No. 19 stall, No. 17 West level; also found a ¼-inch gas-cap in Nos. 13 and 14 West pillars; all other places free from gas. Timbering and roadways were in good order.

There was 46,000 cubic feet of air a minute passing in the main intake in No. 2 slope; the amount passing into the east side was 17,250 cubic feet a minute, and the amount passing into the west side was 10,950 cubic feet a minute, making a loss in leakage through doors, stoppings, etc., of 17,800 cubic feet of air a minute.

No. 5 MINE.

J. H. McMillan, Manager of Nos. 5 and 6 Mines; J. Gillespie, Overman of No. 5 Mine; D. Marsh, H. Leighton, W. C. Jones, J. Jones, R. Dorrance, E. Odgen, R. B. Gascoyne, and J. Brown, Firebosses.

This seam is reached by a shaft at a depth of 600 feet to the Lower seam. Only the Upper seam is being worked at the present time, some 300 feet above the Lower seam, the latter having been abandoned and allowed to fill with water.

This Upper seam is connected by a travelling-road with No. 6 mine, each having a separate intake and return. This shaft acts both as an intake and return, being divided by a strong midwall between the hoisting and upcast shafts.

Nos. 1 and 2 inclines are operating to the rise of the seam, and Nos. 1 and 2 slopes to the dip of the seam.

This mine is worked on the pillar-and-stall system. The coal is of a very hard nature, and owing to impurities between the coal it is very hard to keep clean. Monobel powder is being used in this mine at the present time, and all shots are fired by electric battery.

The coal ranges from 3 to 4 feet in thickness to the rise, and from 6 to 9 feet in the dip sections, with rock bands from 6 to 18 inches in thickness running through it; 60-lb. steel rails have been laid on the East level as far as No. 1 slope, and will be continued inside to No. 2 slope, the intention being to haul the coal from Nos. 1 and 2 slopes to the shaft by electric motor.

The coal to the dip of the East level is being developed by two slopes. No. 1 slope is 1,000 feet from the shaft, and is down 800 feet, with levels turned off right and left; from these levels stalls are being driven to the rise. No. 2 slope is 3,000 feet from the shaft on the main East level, and is down 320 feet; no levels have been turned off yet.

A rock tunnel has been driven on the west side of the shaft during the year, and struck coal at a distance of 280 feet from the shaft. The coal is of good quality, 8 feet in thickness, with two small bands of rock running through it. This means that this mine will be an important producer in the future, as practically all the work has been done on one side of the mine up to the present time.

The ventilating-fan, which is of the Guibal type, 14 feet in diameter, formerly driven by steam-engine, is now driven by belt drive, from a 150-horse-power motor running at 500 R.P.M., with automatic liquid controller, and is capable of producing 52,000 cubic feet of air a minute, with a 1½-inch water-gauge.

A new hoisting-engine has been installed, driven by means of a 300-horse-power motor with liquid controller, and complete with safety devices, replacing the steam-engine formerly in use.

A number of electric hoists and turbine pumps are being installed underground, and the screening plant and air-compressor have been changed over from steam drive to electric drive.

An electrical sub-station, with transformers, switch-gears, etc., of a capacity of 1,500 kw., has been installed to furnish power for replacing the steam plant formerly in use.

In December, when I made my inspection, 36,000 cubic feet of air a minute was passing into this mine, divided into three splits.

No. 1 Split.—I measured 12,600 cubic feet of air a minute passing into this split for the use of thirty-five men and six mules, or an average of 237 cubic feet of air a minute for each unit employed.

No. 2 Split.—I found 8,150 cubic feet of air a minute passing into this split for the use of fifty-five men and four mules, or an average of 121 cubic feet of air a minute for each unit employed.

No. 3 Split.—I found 6,120 cubic feet of air a minute passing into this split for the use of thirty men and four mules, or an average of 145 cubic feet of air a minute for each unit employed.

Found a little explosive gas in a pot-hole in No. 2 slope; all other parts of the mine free from gas. The timbering and roadways were in good order. All my examinations were made with a Wolf safety-lamp.

No. 6 MINE.

H. Sloan, Overman; H. King, L. Saville, J. E. Spicer, G. Oswald, and J. Thompson, Firebosses.

This shaft, like No. 5, is sunk to the Lower seam, about 600 feet deep, but only the Upper seam is being worked. It is worked much the same as No. 5 shaft, operating on both sides of the shaft. There is some solid work on the south side of the shaft to the rise.

The coal in this ground is about 4 feet in thickness, with a soft mining dirt of 3 to 4 inches in the centre, which would be ideal for machine mining, as the coal is of a very hard nature and would stand handling well.

In the other parts of the mine all work is pillar-extracting, both to the rise and to the dip. Monobel powder is being used, and all shots are fired by electric battery. The ventilation is produced by an exhaust-fan of the Guibal type, making 106 revolutions a minute, producing 30,000 cubic feet of air a minute, with a water-gauge of 1 inch. The shaft is divided by a strong midwall between the hoisting and upcast shaft, each being 5 x 6 feet in section.

When I made my inspection in December I measured 26,375 cubic feet of air a minute passing into this mine, divided into two splits.

No. 1 Split.—I found 12,095 cubic feet of air a minute passing for the use of sixty men and eight mules, or an average of 144 cubic feet of air a minute for each unit employed.

No. 2 Split.—I found 14,280 cubic feet of air a minute passing into this split for the use of twenty-four men and six mules, or an average of 274 cubic feet of air a minute for each unit employed.

No explosive gas found in this mine, and the timbering and roadways were in good condition. There is no electrical machinery about this mine as yet.

No. 7 MINE.

T. S. Spruston, Manager; F. Jaynes, Overman; J. Morris, H. Davidson, P. Myers, F. Peacock, N. Huby, F. Cope, A. W. Courtenay, and J. Elliott, Firebosses.

This mine is situated at the town of Bevan, about five miles from Cumberland and about seventeen miles from the shipping point at Union Bay.

There are at the present time 150 miners' houses in the town of Bevan, and a large store and an up-to-date hotel. The new Government school opened on October 1st, 1913.

This mine is entered by means of two slopes, running N. 35° E., and down a distance of 6,200 feet. The method of mining is the long-wall system, the coal ranging from 2½ to 3½ feet in thickness, and is of a very hard nature, being well adapted to this method of working.

No. 1 Main Slope.

From this slope levels are turned off east and west—Nos. 3, 5, 6, 7, 8, 9, and 10 on the west side, and Nos. 3, 5, 9, and 10 on the east side. The thickness of the coal varies from 15 to 40 inches, with a little soft mining dirt under the coal and a friable fireclay roof.

No. 3 East Diagonal.

This slope is driven off No. 3 East, at a distance of 500 feet from the main slope and 2,000 feet from the entrance to the mine, running north-east. Levels are turned off on the east side of the slope, owing to a fault running parallel to the slope on the west side; these levels are in good coal ranging in thickness from 2 to 3 feet.

The mine has been worked continuously during the year, development-work progressing favourably.

During the year the improvements at the mine consisted of an electric plant, replacing the entire steam plant formerly in use at this mine.

A new Sirocco ventilating-fan, of a capacity of 270,000 cubic feet of air a minute, with a 5-inch water-gauge, has been installed at this mine. This fan is driven by a 350-horse-power motor running at 245 R.P.M., and is equipped with an automatic liquid type controller. This fan-installation is carried out in a very substantial manner, and has been made fireproof throughout.

The power for the underground pumps and hoists is produced by a 350-horse-power two-stage Rand air-compressor, driven by a 500-horse-power synchronous motor running at 500 R.P.M. The motor and compressor are connected by double leather belt, 42 inches wide and 116 feet long.

A new electric haulage-engine for hauling up the Main slope has been installed. Size of drum 28 feet in circumference, with liquid and air-brake control from main-compressor; also from independent 2-horse-power motor-driven air-compressor.

Hoist is driven by a 750-horse-power motor running at 245 R.P.M., with a capacity of fifteen cars a trip, at a speed of fifteen miles an hour. The screening plant is driven and lighted electrically.

An electrical sub-station, with transformers, switch-gear, etc., of a capacity of 2,000 kw., has been installed to furnish the power, and this replaces the entire steam plant formerly in use at this mine.

When I made my inspection in December I measured 102,240 cubic feet of air a minute passing into this mine, divided into five splits.

No. 1 Split West.—There was 3,000 cubic feet of air a minute passing into this split for the use of six men and one mule, or an average of 333 cubic feet of air for each unit employed.

No. 2 Split West.—There was 13,500 cubic feet of air a minute passing into this split for the use of thirty-two men and two mules, or an average of 355 cubic feet of air a minute for each unit employed.

No explosive gas found in Nos. 1 and 2 splits, and the timbering and roadways in good order.

No. 3 Split West.—There was 9,720 cubic feet of air a minute passing into this split for the use of twenty-six men and two mules, or an average of 285 cubic feet of air a minute for each unit employed. Found a gas-cap in No. 10 West counter-level; all other places in this split free from gas, and the timbering and roadways in good condition.

No. 1 Split East.—There was 28,200 cubic feet of air a minute passing into this split for the use of forty-six men and four mules, or an average of 489 cubic feet of air a minute for each unit employed. No explosive gas was found in this split; timbering and roadways were in good order, with the exception of two places, where the timbers were too far back from the face.

No. 2 Split East.—There was 12,000 cubic feet of air a minute passing into this split for the use of thirty-seven men and two mules, or an average of 279 cubic feet of air a minute for each unit employed. No explosive gas was found in this split; timbering and roadways were in good condition.

The total quantity of air going into No. 7 mine in December on the main intake was 102,240 cubic feet a minute, and the total quantity passing into the several splits was 66,420 cubic feet a minute, making a leakage loss of 35,820 cubic feet a minute, going through doors, stoppings, etc.

Owing to a slight explosion of fire-damp in No. 9 East level in July of this year, whereby four men were slightly burned about the face and hands, safety-lamps of the Wolf type and permitted explosives have been used exclusively, all shots being fired by electric battery, in the lower sections of this mine; namely, Nos. 6, 7, 8, 9, 10 on the west side, and Nos. 9 and 10 on the east side. All my examinations were made with a Wolf safety-lamp.

No. 8 MINE.

Robert Broom, Manager; J. R. Sutherland, A. Pickup, and A. Kirkham, Firebosses.

This mine is situated about one mile and a half east of No. 7 mine and about four miles and a half from Cumberland.

The mines are sunk down to the Lower seam, and reached the coal at a depth of 964 feet from the surface, in July, 1913.

The main shaft is 11 x 22 feet, and the air-shaft, which is 200 feet distant from the main shaft, is 11 x 18 feet, inside the timbers.

The sinking-work was carried out by steam-power, but the permanent plant is being fitted up with electric power, which is derived from the new hydro-electric plant now working at Puntledge river, situated about three miles from the mine.

The only work being done in the meantime underground consists of a few development places on the north and south sides of the shaft. This seam is the same as is being worked in Nos. 4 and 7 mines.

There is another good seam of coal at a depth of 500 feet from the surface; no development-work has been done in it so far.

A complete steel tipple with Marcus screens, rotary tipplers, car-hauls, etc., is being erected at this mine; all the machinery will be electrically driven.

An electric winding plant is being installed at the main shaft. This winder has conical drums and is designed for hoisting with two cars to a cage when required. The motor has a capacity of 1,200 horse-power, and is direct-connected to the hoisting-drums.

This motor is controlled by means of a motor-generator set on the Ward-Leonard system. The hoist is fully equipped with depth indicators, tachograph, brake and clutch engines, safety devices for prevention of overwinding, etc. A half-speed switch is also provided at the pit-head under the control of the cager, which limits the speed of the winder when winding men.

This winding plant is installed in a reinforced concrete building, and the entire plant is built fireproof.

An electric winding plant is also being installed at the air-shaft. This winder is identical in every way with that at the main shaft, excepting as to capacity and the use of a single plain drum instead of double conical drums.

In the same building as the air-shaft winder is installed the sub-station equipment, consisting of transformers, switch-gears, etc., having a capacity of 2,500 kw. This sub-station will supply power for the winding-engines and all the surface and underground machinery.

Turbine pumps are on order for underground pumping. A double exhaust fan with a capacity of 40,000 cubic feet of air a minute at a 5-inch water-gauge is installed temporarily for mine ventilation, and is driven by a 50-horse-power motor.

A complete equipment of railway-sidings is installed, and seventy-five miners' houses have been erected.

When I made my inspection in December, in company with Chief Inspector Graham, I measured 12,000 cubic feet of air a minute passing into this mine for the use of sixteen men, or an average of 750 cubic feet of air a minute for each unit employed. I found a little explosive gas in a crosscut off No. 2 North level; all other places were free from gas; the timbering and roadways were in good condition. Owing to existing conditions, this mine is worked exclusively with safety-lamps of the Wolf type, and only permitted explosives used, fired by electric battery.

The following are the official returns from the Comox Colliery for the year 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	311,321		66	
" export to United States	24,895			
" " to other countries				
Total sales		336,216		66
Lost in washing	128,926			
Used under colliery boilers, etc	35,327			
Total for colliery use		164,253		
		500,469		
Stocks on hand first of year	2,781		2,370	
" last of year	10,407		2,304	
Difference {* added to / † taken from} stock during year		*7,626		†66
Output of colliery for year		508,095		

By-products—Fireclay, 1,052 tons.

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	43	3.57 - 9.00	7	4.00 - 6.00	50	.....
Whites—Miners	150	3.30 - 5.50	.....	.....	150	.....
Miners' helpers	65	3.00	.....	.....	65	.....
Labourers	64	2.47 - 3.30	51	2.47 - 3.02	115	.....
Mechanics and skilled labour	38	3.30 - 3.85	40	3.30 - 3.85	78	.....
Boys	24	1.37 - 2.47	12	1.10 - 1.65	36	.....
Japanese—Miners 71, helpers 46	117	1.75 - 3.50	* 3	1.40 - 1.65	120	.....
Chinese —Miners 118, helpers 93	211	1.75 - 3.50	.....	.....	211	.....
—*Labourers 66, Japanese 8*	74	1.76	†110	1.40 - 1.65	184	.....
Totals	786	.....	223	.....	1,009	.....

* Japanese labourers. † Chinese labourers.

Name of seams or pits—Comox Nos. 4, 5, 6, and 7.

Description of seams, tunnels, levels, shafts, etc., and number of same—No. 4 Comox slope, No. 5 Comox shaft, No. 6 Comox shaft, No. 7 Comox slope, and No. 8 Comox shaft; Upper and Lower seams.

NICOLA-PRINCETON INSPECTION DISTRICT

REPORT OF ROBERT STRACHAN, INSPECTOR

I have the honour to submit my annual report as Inspector of Coal-mines for the Nicola-Princeton Inspection District for the year 1913.

A short description is given of each colliery in the district, with the names of the certificated staff.

Attached is a list of the accidents that have occurred during the year, amounting to eighteen, three of which were fatal, four serious, and eleven slight.

Ten of these, including the three fatal, occurred in Middlesboro Colliery, four in the Princeton Coal and Land Company's mine, three in the Inland Coal and Coke Company's mine, and one in the mine of the Boundary Mining and Exploration Company at Midway.

The causes of the accidents were: Three from falls of rock, two of which were fatal; one *from fall of top coal (fatal)*; cars, five; burning by ignition of gas, four; machinery, one; and four miscellaneous; these latter include two slipping on slopes, one injured by slipping on guide-rail on slope, and another injured by an axe which his partner threw down.

All the fatal accidents have been caused by falls of either rock or coal, and I regret to say that at least two of these were avoidable, and were due either to the negligence of the persons injured or to lack of proper discipline on the part of the officials.

These fatal accidents are generally the result of an error of judgment as to timbering, and I am glad to state that following the Chief Inspector's letter of June 10th, as to "systematic timbering," this question has been taken up, and special rules covering this have been or are in the process of being adopted in all the collieries.

One bright feature regarding this is that the company having the largest list of accidents in this district was the first to adopt this rule, which was done last July, and whereas in the first seven months of the year there were recorded nine accidents, of which three were fatal; in the last five months only one accident has been reported, and this was of a slight nature.

It may be rather early to judge the results of the adoption of rules governing "systematic timbering," but, from the remarkable results already obtained in this district, this rule should lead to a substantial reduction in the accident rate.

A list is attached of the complaints laid before the Magistrates for violations of or failures to comply with the "Coal-mines Regulation Act" or special rules adopted as provided for by the Act.

Twenty-one complaints were laid; of these, thirteen were found guilty or pleaded guilty, one fled the country, and seven were dismissed.

In the list the name of the offender is given, date offence was committed, name of the colliery, offence charged and the punishment inflicted, and it is noticeable that in very few of the cases did the punishment err on the side of severity, considering that by such breaches of the Act the lives of workmen are generally endangered, as well as the liability to destroy property.

MINE-RESCUE WORK.

Regarding this branch of the work, I am glad to be able to report a very considerable improvement, not so much in the way of additional apparatus as in the better training of the mine officials.

The equipment of the companies is as follows: Nicola Valley Coal and Coke Company, Limited, two 2-hour Draeger apparatus, recharging-pump, and sufficient supply of oxygen and potash regenerators; Inland Coal and Coke Company, Limited, two 2-hour Draegers, two ½-hour Draegers, pulmotor, and sufficient supply of oxygen and potash cartridges; Diamond Vale Colliery Company, two ½-hour Draegers; Columbia Coal and Coke Company, Limited, three 2-hour Draegers, one ½-hour Draeger, pulmotor, and a good supply of oxygen and potash cartridges; Princeton Coal and Land Company, one 2-hour Draeger, one ½-hour Draeger, pulmotor, pump, and a good supply of oxygen and potash cartridges. This leaves three of the small collieries that, so far, have not acquired rescue apparatus; this question has been taken up with these collieries, and I expect at an early date that they will have complied with section 106.

Our progress in mine-rescue work has been brought about through the Department sending Mr. Stewart, Instructor in Mine-rescue Work, Nanaimo, here to give the necessary instruction, and I am glad to say that twenty-nine of the officials and workmen in the district took advantage of the opportunity to qualify for the certificate of competency issued by the Department.

Among those taking the course were sixteen of the Middlesboro Colliery, and included all those who had already taken the certificate issued by the Nicola Valley Coal and Coke Company, Limited, for competency in mine-rescue work, twelve from the Inland Coal and Coke Company, Limited, and one from the Pacific Coast Colliery Company.

We were very much indebted to the Nicola Valley Coal and Coke Company for the use of the rescue-station at the Middlesboro Colliery for the instruction of the class, also the use of the apparatus, and also for the uniform courtsey and assistance extended to us during the session.

In addition to the above, the majority of those who qualified in mine-rescue work have also taken courses in "first aid to the injured," classes having been held last winter by Dr. Williams, of Middlesboro; these classes are being continued this summer and efforts are being made to join the St. John's Ambulance Association.

Nicola Valley Coal & Coke Co., Ltd.

Head Office—Vancouver, B.C.

Capital, $1,107,700.

Officers.	*Address.*
John Hendry, President,	Vancouver, B.C.
Alexander McLaren, Vice-President,	Vancouver, B.C.
W. H. Armstrong, Managing Director and General Manager,	Vancouver, B.C.
J. J. Plommer, Secretary-Treasurer,	Vancouver, B.C.
Robert Fairfoul, Mine Manager,	Vancouver, B.C.

Value of plant, $250,000.

MIDDLESBORO COLLIERY.

Robert Fairfoul, Manager.

The Middlesboro Colliery of the Nicola Valley Coal and Coke Company, Limited, is situated about one mile from Merritt, and includes two entirely different series of coal-seams—namely, the Upper, in the Coldwater hill, and the Lower, in the Coal gully.

No. 2 Mine.

Leonard Warburton, Overman; Wm. Halliman, Wm. Strang, and James Fairfoul, Firebosses.

The No. 2 mine which is situated in the Coldwater hill and includes the Nos. 2 and 3 seams, is operated by means of a slope sunk on the No. 2 seam, dipping at an angle of 22 degrees to the east.

The section of the coal in Nos. 2 and 3 seams is here given showing that No. 2 seam is 5 feet 7 inches thich; No. 3, 3 feet 6 inches.

No. 2 Seam.	*No. 3 Seam.*
36″ coal.	37″ coal.
5″ sandy shale.	15″ bone.
11″ coal.	5″ coal.
2″ shale.	
8″ coal.	

The method of working is by pillar and stall, the stalls being about 15 feet wide, leaving pillars 40 feet square. The coal is all mined by hand, very little blasting being required.

In the interior of the mine the cars are handled by horses, and compressed-air hoists to the main landings, from where they are hauled by a tail-rope haulage, operated by a steam-hoist situated outside the mine.

The mine is ventilated by a Sheldon fan, 36 x 56 inches, driven direct by a steam-engine, and produces from 26,000 to 30,000 cubic feet of air a minute, with a $\frac{6}{10}$-inch water-gauge, while running at 250 revolutions a minute.

For ventilation purposes the mine is divided into three districts—No. 3 seam, No. 2 Upper and No. 2 Lower districts; the first two districts using open lights exclusively; the inspections, as required by rule 5, being done with safety-lamps of the Wolf pattern. In neither of these two districts have I found explosive gas at any time during the past year.

Clay Model of Mine of Nicola Coal and Coke Co.—Middlesboro.

Rescue Squad—Inland Coal and Coke Co.—Nicola.

In the other district—No. 2 Lower—safety-lamps of the Wolf type are used exclusively, and during the past year I only found explosive gas once. The dividing line between the districts using open and safety lamps is well defined, and marked with notice-boards and lighted safety-lamps with red glass, as required by Special Rule No. 75.

I have generally found a good current of air circulating around the places in this mine, and conditions as to timber and roadways fairly good. A plan of the mine and the special and general rules are posted at the mine entrance, and, generally, the Mines Act is well attended to.

An auxiliary steam plant is situated at No. 2 mine, and consists of one Goldie-McCulloch boiler of 150-horse-power capacity, and a 14- x 18-inch Rand compressor, with a capacity of 2,000 cubic feet of free air a minute.

No. 4 MINE.

Thomas Brace, Overman; James Hendry, Alec Ewart, Jno. Taylor, Wm. Gemmell, Thos. Rowbottom, Jno. Kirkwood, and Hollis Camamile, Firebosses.

The No. 4 mine is situate in the Coal Gully series, and includes Nos. 4 and 6 seams, the main entrance crosscutting Nos. 4, 5, and 6 seams. Sections of Nos. 4 and 6 seams:—

No. 4 Seam.	*No. 6 Seam.*
5″ bony coal.	51″ coal.
5″ coal.	8″ bony coal.
1″ bone.	9″ coal.
17″ bony coal.	
32″ coal.	
10″ bony coal.	
21″ coal.	
2″ bone.	
9″ coal.	
2″ bone.	
2″ coal.	
1″ bone.	
21″ coal.	
12″ bone.	
4″ coal.	
7″ bone.	
12″ coal.	
6″ bone.	
60″ coal.	

The No. 4 seam is worked on the pillar-and-stall method, stalls being driven 12 feet wide, leaving pillars 30 x 60 feet. The inclination of the coal is at 25 degrees to the south. The coal is all mined by hand, and is loaded into cars which are raised to top of slope by compressed-air hoists, and from there taken to the tipple by horse.

The ventilation is produced by a Sheldon fan, 8½ feet in diameter, driven by means of a continuous-rope drive from a steam-engine. This fan is producing 104,000 cubic feet of air a minute, with a water-gauge of 3.3 inches, speed of fan being 265 revolutions a minute, for the use of sixty-six men and four horses.

Safety-lamps are exclusively used in this mine, all of the Wolf type, and I have always found a good current of air circulating around the working-faces, and only once during the past year have I found explosive gas. The roads and places have all been kept well timbered, and generally the mine conditions have been very good.

In the No. 6 seam, a section of which is shown, the inclination and methods of work are practically the same as in No. 4; all the present working being to the rise, the coal is hauled by horse direct to the tipple. I have not found any trace of explosive gas in this seam, and the places and roads are all well timbered.

NOS. 7 AND 8 MINES.

Arthur Phalen, Overman; Jno. McDonald, L. Clarke, C. Mitchell, and Thomas Bullen, Firebosses.

The No. 7 mine, which has been opened in the Coal gully, but on the opposite side from the No. 4 mine, has a slope driven on the coal for about 500 feet. The seam of coal is about 15 feet thick, with only one small parting, and dips at about 25 degrees southerly. Sections of Nos. 7 and 8 coal-seams:—

No. 7 Seam.	*No. 8 Seam.*
Sandstone roof.	Shale roof.
12″ bony coal.	18″ coal.
1″ sandstone.	3″ clay.
108″ coal.	11″ coal.
1″ clay.	3″ shale.
69″ coal.	26″ coal.
2″ soft coal.	1″ shale.
	10″ coal.

This mine, which was opened up last summer, has already several levels driven off it, and the pillar-and-stall method of working has been adopted. The stalls are 14 feet wide, leaving pillars 50 x 50 feet. Ventilation is produced by means of a small Guibal fan driven by a compressed-air engine. This fan, running at 250 revolutions a minute, produces 16,000 cubic feet of air a minute for eighteen men.

No trace of explosive gas has, as yet, been found, and I have always found a good current of air circulating around the faces.

While the roof generally is very good, any parts showing signs of danger have been timbered I expect that shortly an order, covering systematic timbering for the mine, will be in force.

In the No. 8 mine, which is only in the prospecting stage as yet, and is only in a distance of 200 feet, no sign of explosive gas has been found and the roadways are well timbered.

The lights used in both Nos. 7 and 8 mines are open lights, the inspection being made with safety-lamps of the Wolf type.

All the workings in the above two mines are to the dip, and the coal is hoisted by compressed-air hoists to the outside, from where it is lowered to the tipple, a distance of about 300 feet, by a gravity-incline, which delivers the coal almost on to the tipple.

The only explosive in use in the Middlesboro mines is Monobel, one of the explosives approved for use in coal-mines by the British Explosives Order, and is used with electric detonator and battery, all shots being fired by competent persons appointed for the purpose.

All the safety-lamps in use are of the Wolf pattern, including those supplied to the firebosses for the purpose of detecting smaller percentages of gas than can be detected with the ordinary safety-lamp, which are fitted with the Cadman-Cunninghame gas-detector. The lamps are cleaned and tested in the lamp-room near the tipple and are then examined by the fireboss before being allowed into the mine.

All the coal comes to a common tipple from No. 2 mine by steam-locomotive, from Nos. 7 and 8 by gravity-incline in cars with a capacity of 1.5 tons; these cars being built at the mine of 2-inch plank with iron fittings, and having a door at one end.

The cars are dumped by a Phillips crossover dump; a switchback and car-haul arrangement bring the empty cars back, so that they can be arranged into trips, for whatever place required.

The coal passes to a shaking screen, which allows all coal under 2½ inches to pass into a hopper, the lump coal travelling over a picking-table 42 feet long, where the waste is picked out, the cleaned coal then passing by a conveyor to the lump-coal bin.

All coal under 2½ inches is fed to a Stewart washer, erected by the Roberts & Schaefer Company of Chicago, capable of treating 100 tons an hour. In the washer three grades of small coal are arranged, each being taken by separate conveyors to the coal-bunkers. A portable box-car loader of the Christy type is used to facilitate the loading of box cars.

Close to the tipple is situated the main power plant, consisting of four return-tubular boilers, each 150 horse-power; one Canadian Rand cross-compound air-compressor, with a capacity of 2,000 cubic feet of free air a minute; a 27½ kw. generator for lighting purposes, and feed-pumps. A small though very complete mine-rescue station is also maintained at this colliery, in which is kept two 2-hour Draeger apparatus, 1911, pattern, recharging-pump, and a plentiful supply of oxygen; here also is kept the Mines Department rescue apparatus, consisting of two 2-hour Draeger apparatus, two ½-hour Draeger apparatus, pulmotor, oxygen, and regenerators.

The following are the official returns of the Nicola Valley Coal and Coke Company, Limited, for the year ending 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	102,362			
" export to United States				
" " other countries				
Total sales		102,362		
Used in making coke				
Used under colliery boilers, etc.	11,119			
Total for colliery use		11,119		
		113,481		
Stocks on hand first of year	431			
" last of year	555			
Difference added to stock during year		124		
Output of colliery for year		113,605		

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	16	3.50 - 4.33	7	5.72	23	
Whites—Miners	105	3.30 - 5.50			105	4.40
Miners' helpers	25	3.00 - 3.30			25	3.14
Labourers	55	2.75 - 3.30	35	2.75 - 3.30	90	3.00
Mechanics and skilled labourers			15	3.30 - 4.25	15	3.50
Boys			10	1.50 - 2.25	10	1.85
Japanese						
Chinese						
Indians						
Total	201		67		268	

Name of seams or pits—Nos. 2 and 3 seams, one mine; Nos. 4 and 6 seams, one mine; Nos 7 and 8 mines.

Description of seams, tunnels, levels, shafts, etc., and number of same—Nos. 2 and 3 seams: These seams are operated by a main tunnel and dip. Thickness of No. 2 seam, 5 feet 6 inches; of No. 3 seam, 2.5 feet. Nos. 4 and 6 seams: These are operated by a main tunnel cross-cut from No. 5 seam to No. 4 and from No. 4 to No. 6. Thickness of No. 4, 14 feet; No. 6, 5 feet. No. 7 mine: The haulage of this mine to the tipple is by gravity-plane. The coal is 16 feet thick, with sandstone roof and floor, and pitches about 30 degrees. A slope has been driven in this seam to the dip and has reached a point 800 feet from the surface. No. 8 mine is as yet but a prospect.

Description and length of tramway, plant, etc.—With the exception of the gravity-plane from No. 7 mine to the tipple, which is 1,000 feet long, grade 29 degrees, the plant has not been added to during the past year.

Inland Coal & Coke Company, Ltd.

(FORMERLY THE COAL HILL SYNDICATE.)

Head Office—Merritt, B.C.

Capital, $1,500,000.

Officers.	*Address.*
Geo. I. Wilson, President,	Vancouver, B.C.
W. L. Nichol, Vice-President,	1200 Comox Street, Vancouver, B.C.
K. C. Smith, Secretary-Treasurer,	Pacific Block, Vancouver, B.C.
Joseph Graham, Vice-Pres. and Gen. Man.,	Merritt, B.C.
Andrew Bryden, Mine Manager,	Merritt, B.C.

Value of plant, $89,266.

COAL HILL COLLIERY.

Andrew Bryden, Manager; Geo. Hudson, Overman; R. S. Brown, David Crawford, Jno. Brown, Jno. Hughes, Wm. Hoggan, A. E. Smith, Jno. Wilcocks, and Abner G. Horrocks, Firemen.

The property of this company is situated west and about 500 feet above the Middlesboro Colliery of the Nicola Valley Coal and Coke Company, and during the past year another seam has been opened up.

No. 3 mine, which includes No. 3 and No. 5 seam (the new seam opened during the past summer), is now down a distance of about 900 feet; nine levels have been set away on the right and eight on the left. The Main slope is driven on the coal, dip 30 degrees to the south, and the haulage is by a tail-rope operated by a steam-engine on the surface.

The coal in the No. 3 seam is 10 feet thick, in No. 5 seam 5½ feet thick; the method of work is pillar and stall, stalls being driven up the pitch about 15 feet wide, leaving pillars 50 x 50 feet. The roof is mostly sandstone and very little timber has been used; the tendency is to use more, so as to prevent accidents from unseen slips.

The ventilation is produced by means of a Sheldon fan, 6 feet diameter, single-entry type, and produces from 25,000 to 30,000 cubic feet of air a minute for the use of forty men; fan-speed, 228 revolutions a minute.

For ventilating purposes the mine is divided into three splits, two of which are mostly natural, the other caused by the aforementioned fan.

During my inspections I have found the places in fair condition, and until the last month of the year I had found no trace of gas; during this month, December, I found gas three times, which should be sufficient warning to all the officials to keep a strict outlook regarding these conditions in the future.

The coal is run down the chutes, loaded into cars, and then taken to the slope and hoisted up in trips of three cars.

In the No. 5 seam, which was developed last summer, a slope was sunk on the seam, and at 250 feet down a level to the east met a crosscut tunnel from the No. 3 seam. The coal from the No. 5 seam is taken through this crosscut tunnel and hoisted up No. 3 slope. So far only the East level and another to the west, with about two rooms off each, is all the work done on this seam.

Another slope was sunk on the No. 3 seam, west of the Main slope, and all the coal from the No. 1 West level is hoisted up through it. All the coal is loaded into cars with a capacity of 1 ton, and from the mouth of the slope is lowered down by a tail-rope engine 1,500 feet on a 3-per-cent. grade to the top of the gravity-incline.

The gravity-incline is a three-rail track with a passing at the centre 2,000 feet long, running trips of six cars, and delivers the coal to the trestle which leads to the tipple. The cars are dumped at the tipple, where the coal is picked before going into the bunkers, which have a capacity of 400 tons, and from where it is drawn as required to load the cars. The tipple is connected to the Canadian Pacific Railway by a standard-gauge track one mile long.

The power plant at the mine consists of two Leonard type boilers, which furnish steam to operate the hoists, fan, and for heating the wash-house. An auxiliary plant at the tipple furnishes steam to operate a hauling-engine to operate the cars on the tipple, and also to pump water to the mine.

The following are the official returns of the Inland Coal and Coke Company, Limited, for the year ending 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	112,456			
" export to United States				
" " to other countries				
Total sales		112,456		
Used in making coke				
" under colliery boilers, etc.	1,547			
Total for colliery use		1,547		
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of colliery for year		114,003		

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	7	4.00	6	6.00	13	4.75
Whites—Miners	64	4.50	.....	.....	64	4.50
Miners' helpers	7	3.00	.....	.....	7	3.00
Labourers	37	3.00	42	3.00	79	3.00
Mechanics and skilled labour	5	3.50	9	4.00	14	3.85
Boys	.....	.....	.....	.....	.....	.....
Japanese	.....	.....	.....	.....	.....	.....
Chinese	.....	.....	.....	.....	.....	.....
Indians	.....	.....	.....	.....	.....	.....
Totals	120	3.87½	57	5.00	177	4.25

Name of seams or pits—Nos. 1, 2, 3, 4, and 5.

Description of seams, tunnels, levels, shafts, etc., and number of same—No. 1 seam has a slope driven on the pitch which is driven at 26 degrees for 350 feet, but no work has been done on this seam for three years. The seam has about 3 feet of a good quality of coal. No. 2 seam has a slope driven on the pitch which is at 32 degrees for 500 feet. The seam is 7½ feet thick of a good quality of coal, but no work has been done on it for three years. No. 3 seam is the seam where almost all the output has been obtained from and averages 12 feet thick, with splendid roof and floor of coarse sandstone. The production is entirely due to development-work, consisting of slopes, levels, and crosscuts aggregating four and a half miles in the seam. The pitch varies from 40 to 14 degrees. Water and gas give very little trouble. Work on No. 5 seam, which is 5½ feet thick, commenced late in 1913, but exceeds 1,000 feet already, showing a seam of bright hard coal. No work was done on No. 4 seam.

Description and length of tramway, plant, etc.—The boiler plant consists of two 40-horse-power Leonard type boilers. The fan is an Aelos type, capacity 50,000 feet, belt-driven, by a 60-horse-power engine. The winding-engine on the Main slope is a 60-horse-power Ottumwa hoist. On the No. 1 slope there is a 12-horse-power engine and an 18-horse-power one for the haul-back from head of tramway. The gravity-tramway is run by a Stine wheel, capable of handling 1,000 tons a day, using a 1-inch rope, and six loaded and six empty cars to a trip. The tramway is 1,800 feet long, of an average grade of 22 degrees. It is entirely exposed, and though running for three winters no difficulty has been experienced due to climatic conditions. Water is obtained for the mine and camp from the Coldwater river, a mile and a half distant, against a head of 700 feet to a 60,000-gallon tank, from where it is distributed by gravity whenever needed. The tipple is of wood construction, capable of handling 1,000 tons a day, with bunker capacity of 500 tons.

Pacific Coast Colliery Co., of B.C.

Head Office—Minneapolis, Minn.

Capital, $500,000.

Officers.	*Address.*
Jas. C. Andrews, President, 215 N.Y. Life Building,	Minneapolis, Minn.
G. B. Norris, Vice-President,	Minneapolis, Minn.
G. H. Derry, Secretary,	Minneapolis, Minn.
J. S. Sherril, Treasurer,	Minneapolis, Minn.
W. E. Duncan, Consulting Engineer,	Merritt, B.C.

Howell John, Overman.

The Pacific Coast Colliery Company's property is situated north of the Middlesboro mines of the Nicola Valley Coal and Coke Company. In the earlier part of the year operations were confined to diamond-drilling this property, and it was about August before any actual mining was commenced.

For the present the No. 2 shaft has been discontinued, and work confined to No. 1 slope, which has now been sunk 300 feet. The slope is 7 x 8 feet, and has two levels driven off to the right—the No. 1 for a distance of 150 feet; No. 2, 16 feet. A shaft for ventilating purposes, has been sunk and connected with the No. 1 East level.

During my inspection I have always found the conditions in this mine very good, both as to timber and roadways. The ventilation, which is natural, shows from 3,000 to 5,000 cubic feet of air a minute for the use of five men.

The power equipment is small, consisting of a 10 horse-power vertical boiler, a 7- x 10-inch hoist for operating the tail-rope, and 4½ x 3 x 4 pump for keeping the water out of the slope. Bunkers of a small capacity have been erected during the year to store coal.

Copies of the Mines Act, special rules, plan, etc., are posted at the mine entrance, and, generally, every endeavour is made to comply with the "Coal-mines Regulation Act."

The following are the official returns for the Pacific Coast Colliery for the year ending 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	500			
" export to United States				
" " other countries				
Total sales		500		
Used in making coke				
" under colliery boilers, etc.	100			
Total for colliery use		100		
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of colliery for year		600		

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	5.00	1	3.50	2	3.50
Whites—Miners	3	3.75	.....	.....	3	3.75
Miners' helpers	.....	.....	.....	.....	.....	.....
Labourers	1	3.00	.....	.....	1	3.00
Mechanics & skilled labour	.....	.....	2	3.50	2	3.50
Boys	.....	.....	.....	.....	.....	.....
Japanese	.....	.....	.....	.....	.....	.....
Chinese	.....	.....	.....	.....	.....	.....
Indians	.....	.....	.....	.....	.....	.....
Totals	5	.....	3	.....	8	.....

Name of seams or pits—No. 1 slope and No. 2 shaft.

Description of seams, tunnels, levels, shafts, etc., and number of same—No. 1 slope, 8 x 10, down 300 feet; direction, N. 51° E.; dip, N. 40° E.; one level turned off main slope to connect with air-shaft 6 x 6, which is down 76 feet; thickness of seam is about 5 feet. No. 2 shaft: During the past year there has been no work done in this mine.

Description and length of tramway, plant, etc.—Tramway, none. Boiler, 10 horse-power, with double cylinder, 7 x 10; double-drum hoisting-engine; one steam-pump, duplex, 4½ x 3 x 4.

Diamond Vale Collieries, Limited.

Head Office—Vancouver, B.C.

Capital, $1,000,000.

Officers.	*Address.*
T. J. Smith, President,	Rogers Building, Vancouver, B.C.
John McLeod, Vice-President,	Rogers Building, Vancouver, B.C.
J. A. McInnes, Secretary-Treasurer,	Rogers Building, Vancouver, B.C.
A. E. Smith, Mine Manager,	Vancouver, B.C.

Value of plant, $50,000.

DIAMOND VALE COLLIERY.

A. E. Smith, Manager; A. Horrocks, Overman.

This company's property lies immediately to the south and on the opposite side of the Coldwater river from the Middlesboro Colliery of the Nicola Valley Coal and Coke Company.

Only the No. 3 slope has been operated this year, and is now down a distance of 650 feet. The slope is driven on the coal-seam, S. 5° W., at an angle of 45 degrees pitch. Two levels have been driven to the east, No. 1 East level being in a distance of 400 feet and No. 2 East 850 feet; one level on the west side has been driven a distance of 550 feet. The coal seam is 4.5 feet thick, with two bands of sandstone 6 inches thick. The method of work is "double-stall," these stalls being driven up and connected at the top.

While inspecting this mine I generally found the conditions fairly good, and after the new fan was installed there was always a good current of air circulating around the faces. The fan was producing about 15,000 cubic feet a minute for the use of thirty-five men.

Safety-lamps of the Wolf pattern are used exclusively in this mine, and are cleaned and tested in the lamp-room adjoining the mine, and afterwards examined by the fireboss before being allowed to enter the mine.

The power plant consists of one 30-horse-power and two 10-horse-power boilers, the first being of the locomotive type, the other two vertical. An 8- x 12-inch hoist operates the tail-rope on the slope and two water-pumps; the fan-engine is 8 x 10 inches and drives the fan direct. The fan is 8 feet in diameter and was built by the Sheldon Engineering Company.

Active mining operations at this colliery were discontinued for some reason about May, and there is no indication of them being resumed at present.

The following are the official returns for the Diamond Vale Colliery for the year ending 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	6,132			
" export to United States				
" " other countries				
Total sales		6,132		
Used in making coke				
" under colliery boilers, etc.	194			
Total for colliery use		194		
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of collieries for year		6,326		

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	6.70	2	4.50	3	5.23
Whites—Miners	33	3.57			33	3.57
Miners' helpers	19	3.45			19	3.45
Labourers			7	3.00	7	3.00
Mechanics and skilled labour			5	3.60	5	3.60
Boys						
Japanese						
Chinese						
Indians						
Totals	53	3.58	14	3.43	67	3.55

Name of seams or pits—No. 3 slope.

Description of seams, tunnels, levels, shafts, etc., and number of same—Four-foot seam, with sandstone roof and floor. No. 1 East level in 1,000 feet; No. 2 East level in 800 feet; No. 1 West level in 400 feet; Main slope down 600 feet.

Description and length of tramway, plant, etc.—Length of tramway, 200 feet. Plant consists of one locomotive type boiler, one upright boiler, pump, and fan.

Princeton Coal and Land Company, Ltd.

Head Office—15 Great St. Helens, London, E.C.

Capital, $1,000,000.

Officers.	*Address.*
A. St. George Hamersley, Chairman,	London, Eng.
Sheffield Neave, Director,	London, Eng.
Alex. Crerar, Director,	London, Eng.
Arthur Hicklin, Advisory Director,	London, Eng.
Oswald J. Bambridge, Director,	London, Eng.
E. S. Neave, Secretary,	London, Eng.
Ernest Waterman, General Manager,	Princeton, B.C.

Value of plant, $77,000.

Francis Glover, Manager; Andrew McKendrick, Overman.

This company's property is situated on the right-hand bank of the Similkameen river, near its junction with the Tulameen river, in the Similkameen Mining Division.

The coal-seam is reached by a slope from the surface, which is continued for a distance of 1,100 feet on the seam. On the west side three levels have been driven, while on the east four have been started. The method of work is pillar and stall, pillars being 50 x 50 feet, stalls 9 feet. The coal lies at an angle of about 12 degrees, and the cars are operated mostly by small air-hoists, which hoist up the empty car and lower down the loaded car.

The coal-seam, which is classed as "lignitic coal," is 24 feet thick, of which only the top 9 feet is mined. Post coal-cutting machines of either the Hardy or Rand type, are used for mining and shearing, so that only the minimum of explosives is used to blast the coal, therefore giving the maximum of round or lump coal. For blasting purposes Monobel, a permitted explosive, is used exclusively; all shots being fired only after examination by duly appointed shotfirers.

During my inspections I have always found this mine very well ventilated and free from gas, the ventilation being in two separate splits, with 7,000 on the west side, no men working on this side, and 22,000 cubic feet a minute on the east side for twenty-five men and one horse.

This ventilation is produced by a 30- x 6-foot fan of the Guibal type, driven by a 25-horse-power steam-engine, speed of fan being 156 revolutions a minute; speed of engine, 78 revolutions a minute; water-gauge, $\frac{1}{4}$ inch.

I have always found the roads and places well timbered and in good condition; copies of the Act, special rules, and mine-plan being kept posted at the mine entrance. Open lights are used in this mine, the inspection, as required by section 91, Rule 4, being made with safety-lamps of the Wolf type.

The screening plant, which was erected by the Link Belt Engineering Company, Chicago, is capable of handling 600 tons a day. The mine-cars carry 1.5 tons, and are hauled up the slope by a 50-horse-power Jenks hoist in trips of six to the tipple, which is situated about 45 feet above the level of the ground. Here the cars are dumped by a rotary dump into a reciprocating feeder, and the coal separated by shaking screens into three different grades, namely, all over 4 inches termed "lump," from 2 to 4 inches "egg," from ½ to 2 inches termed "nut"; the various grades of coal are then taken by picking-belts to the bunkers, and during this process the waste is picked out. Each grade is kept separate in the bunkers, which have a capacity of 240 tons. In drawing the coal from these bunkers a conveyor is used which carries the coal to a box-car loader of the Victor type, so that any kind of coal can be loaded as required.

The power plant consists of two 275-horse-power, and one 50-horse-power boilers, the first being manufactured by Goldie-McCulloch, the latter being a Gray boiler. A Rand compressor, with a capacity of 744 cubic feet of free air a minute, supplies air for the underground hoists, pumps, and mining-machines, and a 6-kw. direct-currrent generator is used for lighting purposes around the mine. One 35-horse-power and one 25-horse-power steam-engines are used for driving the picking-tables; both these engines were manufactured by the Link Belt Company. The machine-shop is equipped with a McDougal lathe, a 350-lb. steam-hammer, drill-press, a 2-inch Acme bolt-cutter, a Merrill pipe-machine, a 20-inch shaper, hack-saw, and emery-grinder. A 12- x 7- x 12- inch steam-pump is used for fire-protection purposes, connected with a water-tank having a capacity of 30,000 gallons; pressure 200 lb. to the square inch.

The following are the official returns of the Princeton Coal and Land Company for the year ending 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	20,729			
" export to United States	3,168			
" " other countries				
Total sales		23,897		
Lost in washing	2,995			
Used under colliery boilers, etc.	2,509			
Total for colliery use		5,504		
		29,401		
Stocks on hand first of year	240			
" last of year	45			
Difference taken from stock during year		195		
Output of colliery for year		29,206		

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	4.50	5	4.50	8	4.50
Whites—Miners	16	5.00	.....	.....	16	5.00
Miners' helpers	8	3.00	.....	.....	8	3.00
Labourers	.....	.....	7	3.00	7	3.00
Mechanics and skilled labour	3	3.75	4	3.75	7	3.75
Boys	.....	.....	2	1.75	2	1.75
Japanese	.....	.....	.....	.....	.....	.....
Chinese	.....	.....	.....	.....	.....	.....
Indians	.....	.....	.....	.....	.....	.....
Totals	30	.....	18	.....	48	.....

Name of seams or pits—No. 1 slope.

Description of seams, tunnels, levels, shafts, etc., and number of same—The seam is 24 inches thick and dips at an inclination varying from 16 to 9 degrees. The top 9 feet is worked, and is a good-grade lignite and has a jet black appearance. The slope is down a distance of 1,050 feet, driven on the full pitch of the seam, with main and counter levels on strike of the seam, and 500 feet and 1,000 feet respectively both east and west. There is an air-shaft down to the seam and has a depth of 60 feet. Nos. 2 and 3 East levels are in 1,200 feet; No. 4 and No. 4 East counter 1,000 feet; No. 1 West level 600 feet; No. 2 West level and counter are in 100 feet. The coal is mined by post machines, of which six are used.

Description and length of tramway, plant, etc.—The plant consists of tipple having a length of 250 feet, with rotary dump, reciprocating feeder, shaking screen, picking-belts, and bunkers having a capacity of 240 tons; conveyor-belt and Victor box-car loader; two 75-horse-power and one 50-horse-power boilers; machine-shop containing lathe, shaper, pipe-threader, bolt-cutters, hack-saws; blacksmith and carpenter shops with steam-hammer and all necessary equipment.

United Empire Mining Co.

Capital, $500,000.

Officers.	*Address.*
W. C. McDougall, President,	Princeton, B.C.
M. H. Whitehouse, Vice-President,	Princeton, B.C.
E. G. Marston, Secretary-Treasurer,	Princeton, B.C.
E. P. Galliac, Mine Manager,	Princeton, B.C.

Value of plant, $1,000.

UNITED EMPIRE COLLIERY, PRINCETON, B.C.

W. G. Simpson, Manager; B. Barlow and Alex. Orr, Firemen.

The United Empire Mining Company's property is situated on Hunter creek, about a mile and a half from Princeton. The main tunnel is driven through the slide-rocks to a point 900 feet inside, where it strikes the coal, and then continues on the coal for a distance of almost 400 feet, making a total distance of 1,300 feet.

A counter-level has been driven and several stalls started, and during the past year a crosscut tunnel cutting the measures has been driven 90 feet to tap the higher seams in the coal series. In the lower vein the coal was about 4 feet thick, and in the higher or top vein there is 8 feet 9 inches of coal, with a clay-parting of 6 inches.

The method of work is pillar and stall, pillars being left 45 feet, stalls being driven 14 feet wide. The haulage is by horse, all the work at present being to the rise. The pitch of the seams is 45 degrees, east to west.

The following is a section of the coal-seams, which are classed as "lignitic coal":—

48″ coal
6″ clay } Top seam.
54″ coal
21 ft. sandstone and clay.
60″ coal and slate.
48″ clay.
16 ft. sandstone.
48″ coal, Lower seam.
7 ft. coal and clay.
11 ft. sandstone.

Conditions at this mine as to ventilation and general working conditions have greatly improved during the past year, and at my last inspection I found 9,600 cubic feet of air a minute provided for fifteen men; I have found no trace of explosive gas, and there has always been a fair current of air circulating around the faces. The roadways and timbering have been well attended to, and a new air-shaft has been put through to the surface. There is no steam plant, and the fan, which is of the Guibal type, is driven by a 10-horse-power gas-engine.

The mine is connected to the Great Northern Railway by a spur about one mile long. Practically the most of the output of this mine is consumed by the British Columbia Portland Cement Company, the remainder being shipped over the railway, mostly to United States points.

The following are the official returns of the United Empire Mining Company for the year ending 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	1,352			
" export to United States	400			
" " other countries				
Total sales		1,752		
Used in making coke				
" 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		1,752		

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	4	4.65	.....	.....	4	4.65
Whites—Miners	16	3.50	.....	.....	16	3.50
Miners' helpers	2	3.00	.....	.....	2	3.00
Labourers	3	3.00	5	3.00	8	3.00
Mechanics and skilled labour	.....	.....	1	3.50	1	3.50
Boys	.....	.....	.....	.....	.....	.....
Japanese	.....	.....	.....	.....	.....	.....
Chinese	.....	.....	.....	.....	.....	.....
Indians	.....	.....	.....	.....	.....	.....
Totals	25	.....	6	.....	31	3.44

Name of seams or pits—No. 1, United Empire. Two seams, Upper and Lower, operated by crosscut tunnel.

Description of seams, tunnels, levels, shafts, etc., and number of same—*See* 1912 Report.

Columbia Coal and Coke Company, Limited.

Capital, $4,000,000.

Officers.	*Address.*
Hon. C. H. Campbell, President,	Winnipeg, Man.
J. L. Johnston, Vice-President,	Coalmont, B.C.
W. L. Parrish, Secretary-Treasurer,	Winnipeg, Man.
G. L. Fraser, General Manager,	Coalmont, B.C.
J. W. Powell, Mine Manager,	Coalmont, B.C.

Control of the company was secured late in the year by a Vancouver syndicate headed by A. McEvoy, with J. C. McDonald as general manager.

MOUNT CARBON COLLIERY.

The mining operations of this company at the Mount Carbon Colliery were discontinued in the month of April, and it was November before work was recommenced. The work so far has been confined to exploration on the North fork of Granite creek, and principally in what are termed Nos. 2 and 4 tunnels. The No. 2 tunnel, which had previously been driven in for a distance of 820 feet on a seam of coal and shale-bands about 60 feet thick, was extended for another 50 feet, and crosscuts driven to both walls for the purpose of taking samples to demonstrate the quality of the coal. No. 4 tunnel, which had previously been driven in for a distance of 210 feet, was extended another 40 feet, and the same procedure followed as in No. 2.

In both these tunnels the ventilation, which is produced by a small furnace situated outside, is fairly good, and no traces of explosive gas has been found. Open lights are used, but the inspections are made with safety-lamps of the Wolf pattern. Both tunnels are well timbered, and generally, the mining conditions are fairly good.

Allan Ford, the holder of a second-class certificate under the "Coal-mines Regulation Act," is in charge of the mining operations, while J. C. McDonald is general manager.

The following are the official returns of the Columbia Coal and Coke Company for the year ending 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	40			
" export to United States				
" " to other countries				
Total sales		40		
Used in making coke				
" under colliery boilers, etc.	10			
Total for colliery use		10		
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of colliery for year		50		

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		5		6	
Whites—Miners	5	*3.50			5	
Miners' helpers	10	3.00			10	
Labourers			15	†3.00	15	
Mechanics and skilled labour			4	4.25	4	
Boys						
Japanese						
Chinese			2	2.25	2	
Indians						
Totals	16		26		42	

*Underground work from November 1st only. †Surface work from October 1st.

Name of seam or pit—Granite Creek tunnels Nos. 2 and 4.

Description of seams, tunnels, levels, shafts, etc., and number of same—The surface work has been confined to the construction of wagon-roads, etc. The underground work has consisted of the extension of old prospect-tunnels and opening of crosscuts in same. All work has been of a purely preliminary nature.

Boundary Mining and Exploration Company, Limited.

Capital, $1,000,000.

Officers.	*Address.*
A. E. Watts, President,	Wattsburg, B.C.
A. Carney, Vice-President,	Kaslo, B.C.
S. J. Miller, Vice-President,	Grand Forks, B.C.
E. R. J. Forster, Secretary-Treasurer,	Grand Forks, B.C.

MIDWAY COLLIERY.

James Touhey, Overman.

This company's property is situated in the Greenwood Mining Division on the banks of the Kettle river, two miles and a half west of Midway. At this property there are two levels and a shaft; of these, only the No. 2 tunnel has been in operation during any part of the year, and was closed down in August for alterations to the plant. Formerly the fan was driven by a gas-engine, which also operated the hoist, and I understand a steam plant is being installed.

The following are the official returns for the Boundary Mining and Exploration Company for the year ending 1913:—

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	4.00			1	4.00
Whites—Miners	1	4.00			1	4.00
Miners' helpers	4	4.00			4	4.00
Labourers	3	3.25			3	3.25
Mechanics and skilled labour						
Boys	1	3.00			1	3.00
Japanese						
Chinese						
Indians						
Totals	10				10	

Name of seams or pits—Boundary Mining and Exploration Company, Nos. 1 and 2 seams.

Description of seams, tunnels, levels, shafts, etc., and number of same—No. 1 tunnel driven in rock about 300 feet; a seam of coal and bituminous shale about 4 feet 6 inches thick, intersected at about 100 feet from the portal. No. 2 tunnel driven in about 572 feet; a seam of coal and bituminous shale, varying from 4 to 9 feet thick, intersected at about 30 feet from portal of tunnel. One slope driven in the seam about 90 feet and one about 9 feet. A rise-room driven up about 30 feet between the slopes. One perpendicular, rectangular shaft, sunk about 87 feet.

Description and length of tramway, plant, etc.—Small tramways with a gauge of about 18 inches. At No. 2 mine, in addition to the tunnel, there is about 120 feet of tramways outside of the mine. No. 1 mine has about 280 feet of tramway inside the mine. There is no plant at No. 1 mine, and the plant at No. 2 consists of one 60-horse-power return-tubular boiler, one steam-hoist about 20 horse-power, one gasolene engine about 10 horse-power, and two fans (blow); one of these fans is a single inlet of 6 inch diameter; the second one is a double inlet of 7-inch diameter; one 25-horse-power steam-engine.

EAST KOOTENAY DISTRICT.

Until within the year 1909 there was only one company actually producing coal in the East Kootenay District—that is, the Crow's Nest Pass Coal Company, although this company operated three separate collieries; but during that year two new companies began to produce—namely, the Hosmer Mines, Limited, at Hosmer, and the Corbin Coal and Coke Company, at Corbin. These new companies began to ship coal towards the latter part of 1908, and, as they have extensive and fully equipped collieries, have now become important factors in the production of the district.

The district is divided into two separate Inspection Districts. The Southern East Kootenay District, under Inspector Evan Evans, with headquarters at Fernie, includes the Coal Creek Collieries and the Carbonado Collieries of the Crow's Nest Pass Coal Company, although this latter colliery has not been worked this past year. The Northern East Kootenay District, under Inspector T. H. Williams, with headquarters also at Fernie, includes the Hosmer Colliery of the Hosmer Mines, Limited, the Michel Collieries of the Crow's Nest Pass Coal Company, and the Corbin Colliery of the Corbin Coal and Coke Company.

Both Inspectors now have their headquarters in the Government rescue-station at Fernie.

SOUTHERN EAST KOOTENAY INSPECTION DISTRICT.

REPORT OF EVAN EVANS, INSPECTOR.

I have the honour, as Inspector of Coal-mines for the Southern East Kootenay Inspection District, to submit my annual report for the year 1913.

I beg to state that during the year seventy persons were trained, and awarded the Government certificates of competency, in the use of mine-rescue apparatus. The training was effected with the Draeger apparatus, and there was used 7,000 cubic feet of oxygen and 759 No. 1 potash cartridges to train the men.

The Carbonado Colliery was not operated during the year.

Crow's Nest Pass Coal Company, Ltd.

Capital, $3,500,000.

Officers.	*Address.*
Elias Rogers, President,	Toronto, Ont.
E. C. Whitney, Vice-President,	Ottawa, Ont.
R. M. Young, Secretary,	Fernie, B.C.
Elias Rogers, Treasurer,	Toronto, Ont.
John Shanks, Colliery Manager,	Fernie, 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 COLLIERIES, situated on Coal creek, about five miles from the town of Fernie, on a branch railway to the mines, connecting at Fernie with the tracks of the Canadian Pacific Railway and also those of the Great Northern Railway.

CARBONADO COLLIERIES, situated on Morrissey creek and connected by a branch railway with the Canadian Pacific Railway and the Great Northern Railway at Morrissey. The colliery is about fourteen miles from Fernie by rail, in a south-easterly direction. This colliery has been shut down for more than two years.

MICHEL COLLIERIES, situated on both sides of Michel creek, on the line of the Canadian Pacific Railway, being twenty-three miles in a north-easterly direction from Fernie. This last colliery is in the Northern Inspection District.

The total gross output of the company's collieries for the past year was 1,041,409 tons. Of this 334,475 tons was used in the manufacture of coke, yielding 226,374 tons, and in addition 712 tons of coke was added to stock, making the amount of the coke sold 227,086 tons, of which 176,460 tons was sold for consumption in Canada, and 50,626 tons was exported to the United states. The coal exported to the United States amounted to 475,120 tons, while 173,387 tons was sold for consumption in Canada.

The amount and disposition of this combined output of the company's collieries is more fully shown in the following table :—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	173,387		176,460	
" export to United States	475,120		50,626	
" " other countries				
Total sales		648,507		227,086
Used in making coke	334,475			
" under colliery boilers, etc.	58,539			
Total for colliery use		393,014		
		1,041,521		
Stock on hand first of year	206		774	
" last of year	94		62	
Difference taken from stock during year		112		712
Output of collieries for year		1,041,409		226,374

NUMBER OF HANDS EMPLOYED, INCLUDING THOSE AT COKE-OVENS, 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	52		15		67	
Whites—Miners	751				751	
Miners' helpers						
Labourers	153		243		396	
Mechanics and skilled labour	450		193		643	
Boys	26		26		52	
Japanese						
Chinese						
Indians						
Totals	1,432		477		1,909	

COAL CREEK COLLIERY.

JOHN SHANKS, MANAGER.

The colliery is five miles east of Fernie; transportation is afforded by a branch railway making connection with both the Canadian Pacific Railway and the Great Northern Railway at Fernie.

The mines operating during the year are: No. 1 North, No. 5, No. 9, and B North mine on the north side of the valley; No. 1 South, No. 2, No. 3, and No. 1 East mine on the south side of the valley. The general strike of the seams is north and south, the seams dipping to the east with an average inclination of 10 to 18 degrees, also in few exceptions the seams undulate. The coal from the several mines is conveyed to a central tipple, which is of steel structure, 840 feet in length, extending across the valley. The tipple is equipped with two revolving dumps, two picking-tables and screens which are operated by electricity, also two box-car loaders operated by hydraulic pistons. The colliery operated continuously during the year, and the output from the mines was 825,185 long tons.

I regret to state that the number of fatal accidents was large in and about the mines. There were nine fatal accidents reported, five of these being caused by falls of roof and collapsing of timber, and one from fall of coal at the face; another was attributed to breaking of the cable or rope on an incline, and the other two occurred on the surface, being of a miscellaneous nature.

NO. 1 EAST MINE.

D. Martin, Overman; John Caufield, Tom Wilson, Tom Banns, John Mawson, John Bell, and Jas. McLaughlin, Firebosses; Thos. Wakelam, and George Harvey, Shotlighters.

This mine is opened by means of a rock tunnel 215 feet in length to where it strikes the coal. The mouth of the tunnel is 90 feet above and 800 feet east of the tipple. Parallel to the main tunnel a counter-tunnel has been driven; both tunnels are 3,500 feet in length from the entrance and driven towards the south. At 300 feet from the entrance of the tunnel a diagonal entry 2,800 feet in length has been driven south-east. At a point 400 feet from the mouth of the main tunnel the main dip, 1,400 feet, has been driven to the full dip of 10 degrees; rooms are driven in pairs, 150 feet apart, each room being connected with crosscuts 60 feet apart. Entries and tunnels are driven 10 x 8 feet; rooms and crosscuts are driven 14 x 8 feet in size; all roadways are timbered with notched timbers.

Owing to the fact that the main tunnels passed through undulating ground and in order to cope with mine extension and increased output, the management is driving a tunnel 1,700 feet in length, size 7 x 12 feet; this tunnel will include 580 feet of bottom brushing, 330 feet of top brushing, and 790 feet of solid rock-work. When this tunnel is completed the endless-rope system of haulage will be installed. The system of haulage at present throughout the mine is the direct system of haulage, except that there is installed for a short distance in the tunnel and extending a short distance to the outside the endless-rope system. The coal from the mouth of the tunnel to the tipple is lowered over a gravity-plane 800 feet in length.

Shot-firing is carried on in the rock tunnel, the explosive used being Samsonite and fired by means of an electric battery. Wolf safety-lamps are used exclusively throughout the mine.

During the year a new reversible Wilson fan, 16 feet diameter, by 8 feet wide, was installed, belted, and connected to a 150-horse-power centre-crank engine. On December 23rd the total quantity of air at the fan-drift was 100,000 cubic feet a minute, fan running 104 revolutions a minute, water-gauge 2 inches. The ventilation throughout the mine was good, except that small quantities of gas were discovered in the faces of crosscut off No. 8 room, No. 1 room off No. 10 East, and crosscut off No. 11 room diagonal. For the west side of the mine there was 35,000 cubic feet of air a minute for fifty-six men and six horses. For the east side of the mine there was 35,200 cubic feet of air a minute for fifty-five men and six horses.

No. 2 MINE.

Wm. Lancaster, Overman; Frank Landers, Jas. Bushel, and H. Landfear, Firebosses.

Entrance to this mine is by means of an adit tunnel situated on the south side of the valley and in line with the tipple. At present only development-work is being made to the rise of the rock tunnel. A pair of entries 10 x 8 feet are being driven S. 20° W.; the faces of these entries are 750 feet in advance of the rock tunnel. From the faces the coal is hauled to the rock tunnel with horses and hauled to the tipple with compressed-air motor. Shot-firing is not required, and Wolf safety-lamps are exclusively used.

On December 17th, when the last inspection was made, a small quantity of gas was discovered in crosscut off the main entry; the ventilation was good throughout, and both the timbering and roadways are in good condition. There was 24,000 cubic feet of air a minute for the use of sixteen men and two horses.

This district is ventilated with the No. 2 Highline fan, making 50,000 cubic feet of air a minute, running 100 revolutions a minute, water-gauge 1.4 inches; size of fan, 16 feet diameter by 8 feet wide, connected directly to a 15- x 18- inch steam-cylinder.

No. 3 MINE.

H. E. Miard, Overman; John Biggs, Jos. Worthington, and W. R. Puckey, Firebosses.

This mine is working the same seam as No. 2 mine, only that the workings are to the dip. The seam is about 5 feet thick and of good quality. Commencing from underneath the tipple, a slope 2,250 feet in length has been driven on the full pitch. At a point 1,450 feet from the mouth of the slope the South level is turned off; this South level has made connection with the South levels in the No. 2 dips, the faces of which are 4,600 feet from the No. 3 Main slope; it is the intention to work and transport the coal through the No. 3 Main slope.

The seam is worked on the long-wall system; slopes are driven on the full pitch and levels are turned off the slopes, with stalls 40-foot centres. Cogs are set 4 feet apart on each side of the roadways and the gob is filled with floor-brushings. On the slopes the mode of haulage is the direct system; on the levels and stalls the coal is hauled with horses. During the last inspection, December 23rd, the mine was clear of gas and ventilation good. Both the roadways and timbering are in good condition. There was 24,000 cubic feet of air a minute for

the use of sixty men and six horses. The ventilation is produced with the old No. 2 fan; the return air travels through No. 2 dips. Total quantity of air at the fan-drift is 46,000 cubic feet of air a minute, fan running 86 revolutions a minute, water-gauge 1.4 inches; size of fan (Wilson), 16 feet diameter by 8 feet wide, belted in ratio 5 to 8 pulleys, and driven by a 16- x 18-inch engine.

No. 1 SOUTH MINE.

Adam Watson, Overman; Thos. Ratcliffe, Wm. Stockwell, and Wm. Commons, Firemen.

This mine is located 2,500 feet south-west and 200 feet higher elevation than the tipple. The mine is opened by an adit tunnel 2,000 feet in length, driven on the strike of the seam. At a point 900 feet in the main entry the main incline, 1,700 feet in length, has been driven to the full rise; the seam averages 15 to 30 feet thick. Right and left off the incline rooms are turned off in pairs, having pillars of 150-foot centres, and driven on the strike of the seam; width of pillars between rooms is 60 feet and are connected with the crosscuts 60 feet apart.

Rooms and crosscuts are driven 14 feet wide, and all roadways are supported with notched timber. There is a little shot-firing in the mine, and Wolf safety-lamps are exclusively used. The coal over the incline is lowered by means of a tail-rope system of haulage, and is conveyed to the mine-mouth partly by direct haulage and partly by horses. From the bottom of the incline to the tipple the coal is hauled with an electric motor. The mine is ventilated with a Brazil fan, 10 feet in diameter by 4 feet wide, belted and connected to a 30-horse-power motor.

On December 27th, when the last inspection was made, small quantities of gas were discovered in No. 14 room and crosscut off third left room. Both the roadways and timbering are in good condition. The ventilation was good throughout; there was measured at the fan-drift 30,000 cubic feet of air a minute for the use of sixty men and seven horses; the fan was running 100 revolutions a minute, water-gauge 1.7 inches.

B NORTH MINE.

Wm. McFegan, Overman; Alex. McFegan, D. Shanks, and J. Moore, Firebosses.

This is a new mine, having been placed on the shipping-list during the year; it is located 1,800 feet north-east of the tipple. Entrance is by means of two tunnels 10 x 8 feet in size, which struck the coal at a distance of 150 feet; the seam is 10 feet thick. Two entries 1,220 feet in length have been driven N. 16° 30′ W., making an average grade of 8 per cent. against the load. At 500 feet from the entrance two parallel inclines have been driven to the rise, with pillars between them 150 feet wide. From the right incline rooms with 60-foot centres are driven on the strike of the seam. To protect the main entries there is a pillar 100 feet thick left between the rooms and entries. The rooms are 14 feet wide and are supported with notched timber. The haulage over the main entry, and continued to the top of the outside incline, is by means of the endless-rope system operated with a 20-horse-power electric motor, and the coal is lowered to the tipple over a gravity-plane 1,620 feet in length. There is a little shot-firing in this mine, and Wolf safety-lamps are used throughout. The mine is ventilated with a Brazil fan, 10 feet in diameter by 4 feet wide. During the last inspection, in December, both the roadways and timbering were in good condition, the mine clear of gas, and the ventilation good. There was 22,000 cubic feet of air a minute for the use of twenty-two men and three horses.

No. 9 MINE.

Same officials as in B North Mine.

Since September the only work that has been done in this mine is to drive through a fault; about 470 feet of rock-drift was driven, together with a parallel. The rock-drift was driven to the right of the main level and 300 feet from the face. If operation will prove

successful, it is the intention of the management to open new workings on a large scale. This mine is already equipped with a fan 16 feet in diameter and driven with a 16- x 18-inch engine.

When the last inspection was made, in December, the timbering and roadways were in good condition, the mine clear of gas, and ventilation good. There was measured 17,000 cubic feet of air a minute.

No. 5 MINE.

Jas. Stewart, Overman; Jas. White, Car McNay, Alex. Kinsman, Harry Dunlap, and Peter Millar, Firebosses.

This mine is divided into two sections—namely, dip and rise workings. A new diagonal slope 1,800 feet in length has been driven to open new workings in an entirely new region; this new diagonal commences from a point on the surface underneath the main tunnel 3,800 feet from the tipple. The seam is 8 to 16 feet thick. Off the diagonal entries are turned right and left and are connected with crosscuts 60 feet apart. The entries are 10 feet wide and crosscuts are 14 feet wide.

The rise workings are operated through No. 4 South entry, which is located 350 feet higher than the entrance of the Diagonal slope, which is nearly on the same level as the tipple. At 1,040 feet from the entrance of No. 4 South entry, No. 19 incline has been driven to the rise, 1,350 feet in length; off the incline levels are turned off right and left 250 feet apart; rooms are turned off the levels at 60-foot centres and connected with crosscuts 60 feet apart. All roadways are supported with notched timbers.

The coal through the Diagonal slope to the surface is hauled by the direct system of haulage operated by means of a new double 12½- x 14-inch steam-hoist. Transportation in the rise workings is made by the tail-rope system of haulage over the incline, and the coal is conveyed to the surface by a compressed-air motor, where it is lowered over a gravity-plane 1,100 feet in length, one mile from the tipple, from whence it is hauled to the tipple by means of a steam-locomotive over a side-hill tramway of 3-foot gauge.

Both districts are ventilated with the same fan, 16 feet diameter by 4 feet 8 inches wide, making 130,000 cubic feet of air a minute, fan running 145 revolutions a minute, water-gauge 2.3 inches. Shot-firing is confined to the south side of the Diagonal slope, and Wolf safety-lamps are used throughout the mine.

On December 16th, when the last inspection was made, the timbering and roadways were found to he generally in good condition. Small quantities of gas were discovered in Nos. 9, 10, and 11 rooms in No. 5 right incline and in crosscut off the main North diagonal district. The ventilation was found generally good throughout the mine. For No. 19 incline district there was measured 21,000 cubic feet of air a minute for fifty-two men and five horses. For the Diagonal district there was measured 17,500 cubic feet of air a minute for twenty-five men and 2 horses.

No. 1 NORTH MINE.

Wm. Wilson, Overman; Robt. Adamson, Wm. Wesnadge, D. James, Chas. O'Brien, Walter Joyce, and John Chester, Firebosses.

This mine is located on the north side of the valley; the entrance is by means of adit level about 300 feet higher in elevation than the tipple; for part of the distance a second entry has been driven parallel with the main level for ventilation. The seam is 30 to 40 feet thick; operations are in the lower portion of the seam. Inclines are driven to the full rise of the seam, rooms, which are connected with crosscuts 60 feet apart, are turned off the inclines, with 60-foot centres driven on the strike of the seam. The inclines are 10 feet wide; the rooms and crosscuts are 14 feet wide, and all roadways are supported with notched timbers. Owing to the thickness of the seam the timbers are much crushed along the roadways, but the

timbering in the faces is good. On December 15th small quantities of gas were discovered in faces of Nos. 2, 4, and 5 rooms off the slope where the ventilation is usually good. There is no shot-firing in the mine, and Wolf safety-lamps are used throughout. The mine is ventilated with a 5-foot blowing-fan, making 28,000 cubic feet of air a minute. There was measured 19,600 cubic feet of air a minute for the use of sixty-seven men and six horses. The coal over the inclines is lowered by means of the tail-rope system of haulage, and from the mouth of the main entry the coal is lowered over a gravity-plane 3,000 feet from the tipple.

I beg to state that both the general and special rules are posted at each mine. In compliance with section 106 of the "Coal-mines Regulation Act," there is installed at the colliery the following equipment for mine-rescue work: Two 2-hour Draeger apparatus, two 2-hour apparatus of the Proto type, six ½-hour apparatus of the Draeger type, two pulmotors, one respirator, also 650 cubic feet of oxygen and other necessary equipment. I beg to state that all of the underground officials have undergone a full course of training for mine-rescue work in the Government mine-rescue station at Fernie, and each one has been awarded a certificate of competency as such.

The following are the official returns for the Coal Creek Colliery for the year 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	128,116		138,771	
" export to United States	425,355		19,134	
" " other countries				
Total sales		553,471		157,905
Used in making coke	233,315			
Used under colliery boilers, etc	38,408			
Total for colliery use		271,723		
		825,194		
Stocks on hand first of year	103		*Nil.*	
" last of year	94		*Nil.*	
Difference taken from stock during year		9		*Nil.*
Output of colliery for year		825,185		157,905

NUMBER OF HANDS EMPLOYED, INCLUDING THOSE AT FERNIE COKE-OVENS, 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	39		8		47	
Whites—Miners	573				573	
Miners' helpers						
Labourers	138		168		306	
Mechanics and skilled labour	359		149		508	
Boys	22		22		44	
Japanese						
Chinese						
Indians						
Totals	1,131		347		1,478	

Name of seams or pits—No. 1 North, No. 1 South, and No. 1 East, same seam; No. B, No. 2, No. 3, No. 9, and No. 5, same seam.

Description of seams, tunnels, levels, shafts, etc., and number of same—

No. B Fan.—Consists of a 10-foot forcing Brazil fan, belt-connected to a 40-horse-power multipole Jaffray motor. This fan which is of a temporary character, is operating under a ½-inch water-gauge and producing 32,000 cubic feet of air a minute.

No. 1 South Fan.—Consists of a 10-foot Brazil fan, belt-connected to a 30 horse-power shunt-wound continuous-current General Electric motor. This fan is also of a temporary character and capable of producing, under normal conditions, from 30,000 to 40,000 cubic feet of air a minute.

No. 1 East Fan.—This represents a 16-foot reversible Wilson fan, belt-connected to a 150-horse-power centre-crank engine. Both fan and engine house are of permanent character, being of reinforced-concrete construction throughout. The installation at present is operating under a 2¼-inch water-gauge, and producing 102,000 cubic feet of air a minute.

No. B Incline.—B incline has been double-tracked throughout its entire length, 1,620 feet, and a set of pulleys for the operation of gravity-plane have been installed and put in commission. For a distance of 250 feet from pit-mouth to top of incline a continuous snow-shed has been erected, and a similar shed for a distance of 600 feet at foot of incline has been installed. By this arrangement an interrupted service due to heavy snowfall is thus avoided.

No. 9 Rock Tunnels.—In order to pierce big fault on north side of Coal creek at tipple elevation, No. 9 main levels for a distance of 450 feet were cleaned up and repaired. A rock tunnel (8 x 10 feet) and parallel was then commenced and driven for a distance of 470 feet, where they are at present standing awaiting results of prospect borehole under way.

No. 1 East Drainage Tunnel.—To provide drainage for No. 1 East mine a mud tunnel has been started at a point 8 feet above Coal Creek high-water mark. This tunnel, which is 8 x 10 feet, will be, when completed, 440 feet long. It is driven on a uniform grade of 2.4 per cent. and will tap No. 1 East drainage levels. At the time of writing, December 26th, 1913, 60 feet has been driven.

No. 1 East Main Tunnel.—Driven for the installation of endless haulage to cope with mine extension and increased output. The size of the tunnel is 7 x 12 feet in the clear, and will have a total length, when completed, of 1,700 feet. This embraces 580 lineal feet of bottom brushing averaging 4.9 feet, 330 lineal feet of top brushing averaging 7.5 feet, and 790 feet of tunnel proper. The various lengths and grades of tunnel are as follows:—

Chainage.	Length.	Grade.
5+00 to 9+00	400	6.0%
9+00 to 15+50	650	1.5%
15+00 to 22+00	650	2.0%

No. 1 East Fan-drift.—Represents a 10- x 12-foot slide tunnel driven from No. 2 room to connect with No. 1 East fan. The tunnel, which was driven on a uniform grade of 0.5 per cent., has a total length of 80 feet.

Coal Creek Wash-house.—Consists of a concrete structure (31 feet 6 inches by 53 feet) built in the form of an addition to present wash-house, and offering accommodation for 246 additional lockers.

Snow-sheds.—No. 1 East incline, 210 feet; No. 1 North bottom landing, 500 feet; No. 5 tram-line, 300 feet, built to replace that portion destroyed by snowslide of January 14th, 1913; No. B mine, top landing, 250 feet; No. B mine, bottom landing, 600 feet.

No. B Seam Main Tunnel and Parallel.—In order to open up No. B seam, prospected during the strike of 1911, it became necessary to drive two slide tunnels, totalling in all some 300 feet. These tunnels, which constitute the present main entry and return, are located 172 feet above the tipple-floor elevation, and distant 2,250 feet from it. They are driven 60-foot centres and on a running grade of 1 per cent.

No. 5 Mine Development.—During the year 1913 the main Diagonal slope for a distance of 1,800 feet was cleaned up and repaired. The slope was also extended through to the surface, and a new double-cylinder 12½- x 14-inch hoist installed. The necessary track alteration to handle the output from this source was also arranged for, and an additional 130-horse-power Abell boiler added to the existing power equipment.

NORTHERN EAST KOOTENAY INSPECTION DISTRICT.

REPORT OF T. H. WILLIAMS, INSPECTOR.

I have the honour to submit the annual report as Inspector of Coal-mines for the Northern East Kootenay Inspection District for the year 1913.

The mines at present being operated are as follows: Hosmer Colliery, by the Natural Resources Department of the Canadian Pacific Railway Company; Michel Colliery, by the Crow's Nest Pass Coal Company, Limited; and Corbin Colliery, by the Corbin Coal and Coke Company, Limited.

There were four fatal and fifteen non-fatal accidents reported during the year, being a decrease of two and twelve respectively as compared with the previous year. Three of the fatalities were caused by falls of coal, the other by haulage.

Crow's Nest Pass Coal Company.*

MICHEL COLLIERY.

B. Caufield, Manager.

This colliery, operated by the Crow's Nest Pass Coal Company, Limited, is situated on both sides of Michel creek, and comprises Nos. 3, 4, 5, and 3 East on the south side, and Nos. 7, 8, and 8 North on the north side.

No. 3 MINE.

W. Robinson, Overman; R. Spruston, A. Frew, and J. Henney, Firebosses; W. Almond, and F. Hutchinson, Shotlighters.

At this place a main tunnel cuts successfully Nos. 5, 4, and 3 seams. No. 3 mine, which is 970 feet from the mouth, is the only one of these that produced any coal during the year. The method of working is pillar and stall, entries being driven 12 feet wide and rooms 16 feet wide, and substantial pillars being left between.

A new district known as the West level has been opened to develop a large area of coal that lies above water-level.

Upon my last inspection of this mine I found small quantities of explosive gas in three places. With these exceptions it was in good condition and well timbered throughout.

The ventilation is effected by two splits. In one of these splits there was 35,000 cubic feet of air a minute for thirty-two men and four horses, and in the other there was 24,000 cubic feet for twenty-four men and three horses. The total quantity in the intake is 79,000 cubic feet, thus allowing 20,000 cubic feet for the ventilation of the old workings. This ventilation is produced by a 6- x 12- foot Sullivan fan, capable of giving 150,000 cubic feet of air a minute, with a 2-inch water-gauge, when running at a speed of 210 revolutions a minute.

The rock tunnel, mentioned in my last report, which was being driven to connect Nos. 5 and 3 seams so as to form a new return airway for the latter, was completed early in February, and thus enabled the fan referred to above to be brought into use at this mine. The tunnel is 620 feet in length and has a sectional area of 77 square feet.

In addition to the driving of this tunnel, considerable work has been done toward enlarging the main return airway on the west side. False cap-rock, averaging 4 feet in thickness, has been removed for a distance of about 2,000 feet, thus establishing a permanent airway free from standing timber.

The coal in a few places in the West level district is undermined with coal-cutting machines, and blasted with Monobel powder fired by electric detonators.

No. 3. EAST OR NEW No. 3 MINE.

T. Cunliffe, Overman; E. Hayes, J. Mason, and T. Phillips, Firebosses; R. Oakes, Shotlighter.

This mine is situated about 3,000 feet south-east of the tipple and is worked on the pillar-and-stall system. The entries are driven 12 feet wide and the rooms 16 feet wide, with 60-foot pillars between.

At the time of my last inspection I found a little explosive gas in three places. All the others were clear, well timbered, and in good condition.

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*See also page 386.

The ventilation is effected by three splits, as follows: Main east, 25,000 cubic feet a minute for twenty-six men and six horses; east of slope, 15,100 cubic feet a minute for twenty men and four horses; west of slope, 3,500 cubic feet a minute for eight men and two horses.

The total quantity of air going into the mine is 50,000 cubic feet a minute, and is produced by an Allis-Chalmers-Bullock fan, running at a speed of 240 revolutions a minute, against a 1-inch water-gauge.

With the exception of a few places on the west side of the slope, the coal is all mined without the use of explosives. In these places Monobel powder, fired with electric detonators, is used.

A new rock tunnel (7 x 10 feet) 210 feet long is being driven to connect the Main slope of No. 4 mine with the No. 2 West left of No. 3 East mine, and is expected to be completed early in January. This will enable the Wilson fan, which formerly ventilated No. 4 mine, and which at the present time is idle, to be used in the ventilation of No. 3 East mine. This fan is 8 x 16 feet, and is estimated to give 175,000 cubic feet of air a minute when running at a speed of 225 revolutions a minute, against a 2-inch water-gauge.

NEW NO. 8 MINE.

W. Whitehouse, Overman; M. Littler and T. Baybutt, Firebosses.

Not desiring to reopen No. 8 mine, which was sealed during the strike of 1911 owing to a fire, this seam has been redeveloped during the year above the workings of Old No. 8 mine at an altitude of 535 feet from the tipple-floor. Two tunnels, each 9 feet wide by 8 feet high, have been driven into the coal, from which a four-way system of levels is projected. A barrier pillar 175 feet in thickness separates this mine from Old No. 8.

Upon my last inspection I found it clear of gas, well timbered, and in good condition. A 4-foot fan has been temporarily installed and is giving 9,000 cubic feet of air a minute for the use of 12 men and one horse.

Another mine, known as No. 8 North, is being opened on this side at about the same elevation as New No. 8, where it is expected to develop a field of coal heretofore unexplored. From present indications this mine promises to become an important factor in the production at this colliery.

From the pit-mouth of New No. 8 mine a double-track tram-line, having a grade of 0.5 per cent. in favour of the loads, contours the hill for a distance of 930 feet. The coal is hauled along this road to a Phillips crossover tipple, where it is dumped into a bin.

To convey this coal to the tipple below, a 20-foot double-track standard gravity-incline, 1,130 feet long, has been constructed. This incline is equipped with a $1\frac{1}{8}$-inch Acme rope and a pair of counterbalanced skips, having a capacity of 7 tons each, which are operated from a pair of 8-foot drums controlled from the top loading-station. These skips are designed and arranged to automatically discharge into a bin provided at the bottom, and are capable of handling under active working conditions 300 tons of coal an hour.

In order to control the landing of a full skip on the bottom grade, it being 63 per cent., while the top averages 43 per cent., a double-compound brake operated in connection with two vertical 7-foot wheels was installed, the one brake being constantly in use, while the other is used for emergency purposes only. The coal lowered by these skips is loaded out of the bin into the mine-cars and taken to the tipple by endless-rope haulage.

The Draeger rescue equipment, which consists of four 2-hour and six $\frac{1}{2}$-hour sets, one pulmotor, oxygen-tank, recharging-pump, etc., is kept in good condition. Wolf safety-lamps are used throughout at this colliery.

The following are the official returns from the Michel Colliery for the year 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	45,271		37,689	
" export to United States	49,765		31,492	
" " to other countries				
Total sales		95,036		69,181
Used in making coke	101,160			
" under colliery boilers, etc.	20,131			
Total for colliery use		121,291		
		216,327		
Stocks on hand first of year	103		774	
" last of year	*Nil.*		62	
Difference taken from stock during year		103		712
Output of colliery for year		216,224		68,469

NUMBER OF HANDS EMPLOYED, INCLUDING THOSE AT COKE-OVENS, 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	13		7		20	
Whites—Miners	178				178	
Miners' helpers						
Labourers	15		75		90	
Mechanics and skilled labour	91		44		135	
Boys	4		4		8	
Japanese						
Chinese						
Indians						
Totals	301		130		431	

Name of seams or pits—New No. 3 (top section of No. 3 seam); Old No. 3 (lower section of No. 3 seam); New No. 8 (Old No. 8 seam continued); No. 8 North (general information on this seam at present uncertain).

Description of seams, tunnels, levels, shafts, etc., and number of same—

Old No. 3 Mine Rock Tunnel.—In order to utilize No. 5 fan, which had been installed previous to the strike of 1911, it became necessary to drive a rock tunnel from No. 5 main return to Old No. 3 East level. This tunnel, which is 620 feet long, was commenced on August 1st, 1912, and finished February 8th, 1913. It was driven on a 0.5-per-cent. grade and has a cross-sectional area of 77 square feet.

Main Return, No. 3 Mine.—To facilitate the circulation of an increased quantity of air to cope with mine extension and gas-generation, it became necessary to enlarge and repair existing airways. After careful inspection it was found expedient to remove false

cap-rock, averaging 4 feet in thickness, from roof of main West parallel level for main return airway, and increased sectional area to 60 square feet (6 x 10 feet). Of a total length of 2,500 feet, the cap-rock for a distance of 2,000 feet has been removed, thus establishing a permanent airway free from standing timber. The remaining 600 feet has also been enlarged to 60 square feet area, and placed in good condition of repair.

Air-drift to utilize No. 4 Fan.—This consists of a rock-drift (7 x 10 feet). 210 feet long, driven on an inclination of 15 degrees between Main slope of No. 4 mine and No. 2 West left of New No. 3 mine. In connection with rock-drift, the Diagonal slope of No. 4 mine was cleaned up and repaired for a distance of 460 feet. By the above arrangement the permanent Wilson fan formerly ventilating No. 4 mine has been put in commission on No. 3 East mine, thereby augmenting present air-supply and affording ample ventilation for future requirements.

New No. 8 Development.—No. 8 seam has been redeveloped during the year above Old No. 8 workings at an elevation of 535 feet above the elevation of tipple-floor. No. 8 seam at this altitude was in the first place traced to 175 feet barrier pillar altitude above Old No. 8 workings by the driving of a prospect-drift along the outcrop fringe of No. 8 seam. After obtaining this information permanent development was outlined, and two tunnels started—No. 1 on the strike-line of projected low level, which was driven 9 feet wide between timbers by 8 feet high, through the mountain detritus, which covers the coal at this point for a tunnel distance of 200 feet. No. 2 tunnel constituting the main haulage-road, has been driven at right angles with the strike from the face of the mountain through No. 9 seam to No. 8 seam on a grade of $\frac{6}{10}$ of 1 per cent. No. 2 tunnel is 370 feet long, and finished 8 feet high by 9 feet wide in the clear. From these tunnels a four-way system of levels is projected, the two lower now well on the way, and Nos. 3 and 4 steadily being developed by the advancement of backway incline raises that are being driven. From the pit-mouth a double-track tram-line, having a 0.5-per-cent. grade in favour of the loads, contours the hill for a distance of 930 feet, where it connects with a gravity-incline. This tram-line also extends westward from pit-mouth for a distance of 1,280 feet, where after crossing a gulch on an elevated superstructure it enters No. 8 North main tunnel, an entry driven for the purpose of developing a field heretofore unexplored. In order to reach the tipple with the large output made possible by the above development, a 20-foot double-track standard-gauge gravity-incline, 1,130 feet long, was constructed, connecting the top tram-line with a bottom endless haulage. The incline is equipped with a $1\frac{1}{8}$-inch Acme rope, and a pair of counterbalanced skips, having a capacity of 7 tons each, operate from a pair of 8-foot drums controlled directly from the top loading-station. The skips are designed and arranged to automatically load from, and discharge to, bins provided, and are capable of handling under active working conditions 300 tons of coal an hour. In order to control the landing of a full skip on the bottom grade, it being 63 per cent. while the top averages 43 per cent., a double-compound brake operated in connection with two vertical 7-foot wheels was installed, the one brake being constantly in commission, while the other is used for emergency purposes only. By the above arrangement an excess load of 7,800 lb. is maintained under immediate control from two different sources, thus minimizing the liability of serious accidents and the inconvenience caused through an interrupted service. To convey the coal from the bottom incline bin to the tipple an endless haulage 1,700 feet long has been installed and put in commission, and as provision for the loading of two cars at one time from the lower incline bin had been arranged for, the capacity of the endless haulage is consequently in excess of that of the tipple dump.

Hosmer Mines, Ltd.

C.P.R. Department Natural Resources.

Head Office—Montreal.

Capital, $1,500,000.

Officers.	*Address.*
Sir Thos. G. Shaughnessy, President,	Montreal, P.Q.
D. McNicoll, Vice-President,	Montreal, P.Q.
W. R. Baker, Secretary,	Montreal, P.Q.
H. E. Suckling, Treasurer,	Montreal, P.Q.
G. L. Naismith, Manager,	Calgary, Alta.
Lewis Stockett, General Superintendent,	Calgary, Alta.
Wm. Shaw, Superintendent,	Hosmer, B.C.

Value of plant, $1,000,000.

HOSMER COLLIERY.

William Shaw, Manager.

This colliery has mines producing coal from two different levels, known as A and B.

A LEVEL.

Thomas Shaw, Overman; W. Rankin, J. Maltman, J. Bain, R. Fowler, E. Jones, and J. Wardrop, Firebosses.

The coal on this level is reached by an adit tunnel driven through the measures for a distance of 4,931 feet, crosscutting ten seams, but only two of these, Nos. 2 and 9, have been worked during the year.

No. 2 Seam.—This seam has an average thickness of about 12 feet and a dip of about 60 degrees. It is worked on the pillar-and-stall system, a gangway and counter-level being driven north and south from the main tunnel, forming two districts, which are known as No. 2 North and No. 2 South. The South side gangway advanced nearly 1,000 feet during the year, making a total length of 4,860 feet from the main tunnel, and has penetrated a part of the mountain where the overlaying cover is very heavy.

Owing to the enormous pressure produced by this cover, and the consequent difficulty of keeping the places open and carrying on operations advantageously, it was decided at the end of October to abandon the whole of the South side workings. The material has all been taken out and permanent concrete stoppings built in the main and counter gangways.

The North side is not affected by this heavy cover and operations have been carried on very successfully in this district. Upon my last inspection I found it clear of explosive gas, well timbered, and in good condition. I measured 18,000 cubic feet of air a minute for the use of fifty-seven men.

The coal in the whole of this district is mined with coal-cutting machines driven by compressed air. Monobel powder, fired with electric detonators, is used for blasting.

No. 9 Seam.—The coal in this seam has an average thickness of about 8 feet and an inclination of about 5 degrees. It is worked by the pillar-and-stall method. The whole of the coal produced during the past year has been from the South side, the workings of which are nearly all to the dip.

Upon my last inspection I found a little explosive gas in one place. All the others were clear and in fairly good condition. I measured 30,000 cubic feet of air a minute for fifty-four men.

The ventilation on A level is produced by a Walker reversible fan, which is giving 88,000 cubic feet of air a minute, with a water-gauge of 3.4 inches.

B LEVEL.

J. McKelvie, Overman; S. Richards, A. Allan, J. Donnachie, and J. Loxton, Firebosses; W. Clarkston, Shotlighter.

This level, which is at an elevation of 500 feet above A level, has two producing mines. No. 2 North and No. 2 South. The seam which is worked in these mines is the same as No. 2 on A level. A barrier pillar 100 feet in thickness, which up to the present remains intact, separates the workings of each of these levels. The method of working is pillar and stall, the coal being mined with coal-cutting machines driven by compressed air and blasted with Monobel powder, which is fired by electric detonators.

I have never found any gas in either of these mines, and upon my last inspection I found them well timbered and in good condition.

No. 2 North mine is ventilated by a 6-foot fan of the Guibal type, driven by a 20-horse-power electric motor, and is producing 14,000 cubic feet of air a minute for eight men. No. 2 South mine is ventilated by an 8-foot Keith fan which is capable of producing 120,000 cubic feet of air a minute. At the present time it is giving 45,000 cubic feet a minute for the use of sixty-five men. This fan was installed during the year and replaced the smaller one which was formerly in use.

In addition to the installation of this fan, the following improvements and addition to plant have been made: Steam-locomotive for rock bank; the double-tracking of B incline; an additional drum for haulage-engine, B incline; and the extension of the high-pressure air-line to both mines on B level, thus enabling the hauling to be done by air-locomotives instead of horses.

The Draeger rescue equipment, which consists of two 2-hour sets, pulmotor, recharging-pump, etc., is kept in good condition. Wolf safety-lamps are used throughout at this colliery.

Taking advantage of the facilities afforded by the Government at its Fernie rescue-station for training persons in the use of the Draeger apparatus, fifteen officials went through the regular course of instruction, each being presented with a certificate of proficiency.

The following are the official returns of the Hosmer Colliery for the year ending 31st December, 1913:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	96,216		60,005	
" export to United States				
" " other countries				
Total sales		96,216		60,005
Used in making coke	98,802			
Used under colliery boilers, etc.	22,910		416	
Total for colliery use		121,712		416
		217,928		60,421
Stocks on hand first of year	695		1,045	
" last of year	295		295	
Difference taken from stock during year		400		750
Output of colliery for year		217,528		59,671

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	14	5.00 - 3.93	12	9.00 - 2.42	26	
Whites—Miners	138	7.00 - 3.30			138	
Miners' helpers	138	2.75			138	
Labourers	150	3.30 - 2.75	124	3.40 - 2.47	274	
Mechanics and skilled labour	20	3.75 - 3.00	24	4.25 - 2.90	44	
Boys			13	2.00 - 1.37	13	
Japanese						
Chinese						
Indians						
Totals	460		173		633	

Name of seams or pits—No. 2, No. 9.

Description of seams, tunnels, levels, shafts, etc., and number of same—No. 2 A North, No. 2 A South, No. 2 B South, No. 2 B North.

Additions for year 1913—Steam-locomotive; double track, B incline; additional drum, haulage-engine, B incline; 8-foot Sirocco fan, No. 2 B South mine.

Corbin Coal & Coke Company, Limited.

Head Office—Spokane, Wash.

Capital, $10,000,000.

Officers.	*Address.*
D. C. Corbin, President,	Spokane, Wash.
Austin Corbin 2nd, Vice-President,	New York, N.Y.
A. T. Herrick, Secretary-Treasurer,	Spokane, Wash.
E. J. Roberts, Superintendent,	Spokane, Wash.
Chas. Graham, Mine Manager,	Corbin, B.C.

Value of plant, $315,000.

CORBIN COLLIERY.

Charles Graham, Manager.

This colliery, which comprises Nos. 1, 3, and 4 mines, is situated on the East fork of the South branch of Michel creek, about fourteen miles from McGillivray Junction, on the Crowsnest branch of the Canadian Pacific Railway, and is connected to it by the Eastern British Columbia Railway.

The whole of the coal produced during the first half of the year was from No. 1 mine, but owing to a fire which was discovered in an abandoned level known as No. 2 South off No. 6 raise in the Prime seam, it became necessary to seal it up. This fire was first observed on March 1st, and efforts were made to extinguish it by building a line of stoppings close to the fire area, and thus isolate it from the other portions of the mine. These efforts, which were continued for nearly three months, proved unavailing, and after a consultation which was held on May 21st between the company's officials and Inspector Evans and myself, it was decided to seal off the entire mine by building a number of concrete and dirt stoppings at the various openings, the last being completed on June 3rd.

No. 4 MINE.

H. Massey, Overman; J. Quinn, Fireboss.

Upon the closing of No. 1 mine, the prospect known as No. 4 was opened up and has developed into a mine producing 300 tons a day. This prospect had previously been driven into a seam of coal which was considered to be a branch of No. 1 mine, and is similar to the Prime seam.

At each of my inspections I have found it clear of gas, well timbered, and in good condition. The 4- x 12-foot fan which formerly ventilated No. 1 mine has been removed to and installed here, and is producing 12,000 cubic feet of air a minute for the use of thirty men.

No. 3 Mine.

David Brown, Overman; T. Owen, Fireboss.

A considerable amount of work was done in stripping off the surface at this mine, which is also known as the "Big Showing," and has left exposed a large body of coal. Operations here were conducted on the open-cut or quarry system during the summer, but owing to the heavy snowfall at this point, surface work had to be discontinued early in the winter and underground methods of working resorted to. From these workings an output of 150 tons a day is being obtained.

Upon each of my inspections I have found this mine clear of gas and well timbered. Wolf safety-lamps are used in No. 4 mine and open lights in No. 3. Monobel powder, fired with electric detonators, is used for blasting the coal.

The Draeger rescue equipment, which consists of two 2-hour and one ½-hour sets, pulmotor, recharging-pump, etc., is kept in good condition.

No addition has been made to the plant, but a Marcus screen has been purchased and is ready to be installed in the spring.

There were no accidents reported from this colliery during the year. This is the second year in its history that has passed without having an accident to report.

The following are the official returns from the Corbin Colliery for the year 1913:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lb.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	17,807			
" export to United States	52,500			
" " other countries				
Total sales		70,307		
Used in making coke				
Used under colliery boilers, etc.	2,481			
Total for colliery use		2,481		
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of colliery for year		72,788		

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		12	
Whites—Miners	64				64	
Miners' helpers						
Labourers			39		39	
Mechanics and skilled labour	4		5		9	
Boys						
Japanese						
Chinese						
Indians						
Totals	73		51		124	

Description of seams, tunnels, levels, shafts, etc., and number of same—No. 1 mine was shut down on March 1st, 1913, on account of fire breaking out in the workings. No. 4 mine was opened up on what is a branch of the No. 1 seam. This mine is now producing about 300 tons daily. No. 3 mine (Big Showing): Considerable work was done at this showing during the past summer. The railroad was completed and a considerable portion of the seam uncovered. Owing to heavy snowfall, outside work was suspended for the winter. The seam was opened up underground, and was producing about 150 tons a day. There have been no additions to plant during the year, but a Marcus screen has been purchased and is now on the ground ready for erection in the spring.

SUMMARY—TABLE SHOWING ACCIDENTS OCCURRING IN B.C. COLLIERIES IN TEN YEARS—1904 TO 1913.

For the year	1904.				1905.				1906.				1907.				1908.				1909.				1910.				1911.				1912.				1913.				Total for 10 years.			
Output of coal—tons.	1,685,698				1,825,832				1,899,076				2,219,608				2,109,387				2,400,600				3,139,235				2,193,062				3,025,709				2,570,760				23,068,967			
No. persons employ'd	4,453				4,407				4,805				6,059				6,095				6,418				7,758				6,873				7,130				6,671				60,669			
Nature of Injury.																																											
Cause of Accident.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.
Explosion (cause unknown).	14	.	..	14	..	..	..	..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14	..	..	14
Gas explosions	7	..	8	15	..	..	9	9	..	..	1	1	1	1	18	20	1	..	8	9	32	..	7	39	..	..	6	6	..	..	10	10	7	2	3	12	..	..	13	13	48	3	83	134
Falls of coal.....	5	12	1	18	2	8	3	13	5	6	3	14	8	15	7	30	3	6	10	19	7	7	4	18	5	16	5	26	3	5	6	14	4	7	9	20	6	4	2	12	48	86	50	184
" rock	4	7	1	12	4	6	1	11	7	8	7	22	2	7	8	17	5	10	7	22	6	13	9	28	8	15	12	35	...	5	24	29	5	9	10	24	11	9	3	23	52	89	82	223
Mine cars and horses	3	15	5	23	3	9	8	20	2	13	13	28	8	22	15	45	1	19	15	35	6	17	24	47	11	49	23	83	5	7	18	30	5	10	10	25	4	28	9	41	48	189	140	377
" timber	..	2	..	2	1	2	..	3	..	1	1	2	..	4	1	5	1	3	..	4	..	2	3	5	1	4	2	7	...	..	5	5	1	2	2	5	3	6	1	10	7	26	15	48
Hoisting, ropes, &c .	...	2	..	2	...	..	1	1	..	2	1	3	..	..	3	3	1	4	..	5	..	..	3	3	..	2	4	6	...	1	1	2	3	7	6	16	1	2	..	3	5	20	19	44
Powder, &c., explo'n	1	..	1	2	1	1	3	5	..	1	1	2	1	2	4	7	..	2	4	6	1	1	3	5	1	1	3	5	..	1	2	3	2	1	..	3	..	2	..	2	7	12	21	40
Underground — Miscellaneous.	..	..	..	..	..	2	1	3	..	2	3	5	1	1	4	6	4	2	5	11	2	2	2	6	1	4	4	9	4	..	5	9	...	4	4	8	..	..	6	6	12	17	34	63
On surface — miscellaneous.	3	3	..	6	1	2	..	3	1	3	2	6	10	9	2	21	2	4	3	9	3	5	4	12	1	4	7	12	4	4	11	19	1	2	3	6	2	6	1	9	28	42	33	103
	37	41	16	94	12	30	26	68	15	36	32	83	31	61	62	154	18	50	52	120	57	47	59	163	28	95	66	189	16	23	82	121	28	44	47	119	27	57	35	119	269	484	477	1230

ACCIDENTS IN BRITISH COLUMBIA COLLIERIES DURING 1913.

Causes of Accident and Nature of Injury.	W.F.Co. Nanaimo. Fatal.	W.F.Co. Nanaimo. Serious.	W.F.Co. Nanaimo. Slight.	C.C. Extension. Fatal.	C.C. Extension. Serious.	C.C. Extension. Slight.	C.C. Comox. Fatal.	C.C. Comox. Serious.	C.C. Comox. Slight.	P.C.C. Co. S. Wellington Fatal.	P.C.C. Co. S. Wellington Serious.	P.C.C. Co. S. Wellington Slight.	V.N.C. Co. E. Wellington. Fatal.	V.N.C. Co. E. Wellington. Serious.	V.N.C. Co. E. Wellington. Slight.	I. C. & C. Co. Coal Hill. Fatal.	I. C. & C. Co. Coal Hill. Serious.	I. C. & C. Co. Coal Hill. Slight.
Gas—Explosion of																		
Fatal																		
Serious																		
Slight						1			8									
Falls of Coal																		
Fatal																		
Serious					2			1										
Slight									1									
Falls of Rock																		
Fatal	1			1			4											
Serious		1						4										
Slight			2															
Mine Cars and Horses																		
Fatal				3														
Serious		1			2			11									1	
Slight									1									1
Shots or Powder																		
Fatal																		
Serious														2				
Slight																		
Ropes, Hoisting or Haulage																		
Fatal																		
Serious								2										
Slight																		
Post or Timber																		
Fatal							2											
Serious								4										
Slight																		
Miscellaneous—Underground																		
Fatal																		
Serious																		
Slight									1									1
Miscellaneous—Surface																		
Fatal																		
Serious								1										
Slight																		
Total	1	2	2	4	4	1	6	23	11					2			1	2
Number of men employed	1,231			199			1,069			572			343			177		

Causes of Accident and Nature of Injury.	N.V.C. Co. Middlesboro. Fatal.	N.V.C. Co. Middlesboro. Serious.	N.V.C. Co. Middlesboro. Slight.	P.C. & L. Co. Princeton. Fatal.	P.C. & L. Co. Princeton. Serious.	P.C. & L. Co. Princeton. Slight.	C.N.P. Co. Crows-Nest. Fatal.	C.N.P. Co. Crows-Nest. Serious.	C.N.P. Co. Crows-Nest. Slight.	C.P.R. Hosmer Fatal.	C.P.R. Hosmer Serious.	C.P.R. Hosmer Slight.	C.C. & C. Co. Corbin. Fatal.	C.C. & C. Co. Corbin. Serious.	C.C. & C. Co. Corbin. Slight.	Other Collieries. Fatal.	Other Collieries. Serious.	Other Collieries. Slight.	Total for 1913. Fatal.	Total for 1913. Serious.	Total for 1913. Slight.	Total.
Gas—Explosion of																						13
Fatal																						
Serious																						
Slight						3												1			13	
Falls of Coal																						13
Fatal	1						3			3									7			
Serious								1												4		
Slight												1									2	
Falls of Rock																						23
Fatal	2						3												11			
Serious		1						3												9		
Slight												1									3	
Mine Cars and Horses																						41
Fatal							1												4			
Serious		2						8			3									28		
Slight			1			1			1			4									9	
Shots or Powder																						2
Fatal																						
Serious																				2		
Slight																						
Ropes, Hoisting or Haulage																						3
Fatal							1												1			
Serious																				2		
Slight																						
Post or Timber																						9
Fatal																			2			
Serious								2												6		
Slight			1																		1	
Miscellaneous—Underground																						6
Fatal																						
Serious																						
Slight			1						1			2									6	
Miscellaneous—Surface																						9
Fatal							2												2			
Serious		1						4												6		
Slight									1												1	
Total	3	4	3			4	10	18	3	3	3	8						1	27	57	35	119
Number of men employed	268			48			1,909			633			124			158			6,671			

ANALYSES OF ACCIDENTS DURING YEAR 1913.

	No. of Accidents per 1,000 Men Employed.				Tons of Coal mined per Accident.			
	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.
East Kootenay District	4.88	7.87	4.13	16.88	102,440	63,415	121,066	29,594
Coast District	3.49	8.99	5.99	18.47	88,502	34,418	51,626	16,744
Total Province	4.05	8.54	5.25	17.84	95,213	45,101	73,450	21,603

PER CAPITA PRODUCTION OF COLLIERIES.

	Gross tons of coal mined in 1913.	Total number of men employed by producing collieries.	Tons of coal mined per man employed at collieries.	Number of men employed underground in producing collieries.	Tons of coal mined per man employed underground.
East Kootenay District	1,331,725	2,666	500	1,965	678
Coast District	1,239,035	3,777	328	2,865	433
Total for Province	2,570,760	6,443	399	4,830	532

DETAILED STATEMENT OF ACCIDENTS IN B.C. COLLIERIES DURING 1913.

COAST COLLIERIES.

REPORTED BY THOMAS MORGAN AND JOHN NEWTON, INSPECTORS.

No.	Colliery.	Date.	Name.	Occupation.	Details.
1	Nanaimo..... (W.F. Co.)	Jan. 4	Jno. Haddow	Miner	A piece of rock fell and bruised his head and broke a bone in his right foot.
2	East Wellington. (V. & N.)	" 7	W. Riddle.....	"	Premature explosion of powder while loading hole burned his face, arms, and hands.
3	Comox ..... (C.C.)	" 9	George Charlie	Rope-rider....	Crushed across the hips by getting between loaded car and post.
4	Extension ..... (C.C.)	" 16	Alex. Brown	Miner.....	Lighted a small quantity of gas near the roof and slightly burned his face.
5	Nanaimo ..... (W.F.Co.)	" 23	Arthur Newbury ..	"	He was loading coal when he was struck by a fall of rock receiving cuts about the head.
6	Nanaimo . .... (W.F.Co.)	" 24	Arthur Penning ...	Machineman..	While standing on a siding a runaway trip crashed into a loaded trip beside him. A mule also standing there turned around and knocked him into the cars. Leg broken below knee and flesh torn for 6 inches.
7	Extension ..... (C.C.)	" 28	James Strang	Overman.....	Train of empty cars jumped the track, catching him against the slope and squeezed him about the hips.
8	Comox..... (C.C.)	" 28	Tang Kee.....	Driver.....	Caught between car and roadside, and leg crushed and broken.
9	No. 6... ..... (C.C.)	" 29	G. Tasoka	"	Slipped on rail and fell in front of trip, receiving a fractured left hip.
10	No. 1 Shaft ..... (W.F.)	Feb. 5	Jno. K. Davidson..	Miner	While shovelling loose rock a piece of rock fell on him, breaking his back; died a few hours later.
11	Comox ..... (C.C.)	" 18	Coo Chung.....	"	While taking down top coal was struck by a falling piece, causing cuts and bruises about his head and face.
12	Comox ..... (C.C.)	" 25	Lee Gum Yung....	"	In driving a crosscut between Nos. 2 and 3 stalls, after breaking through into No. 3 stall cap-rock broke away and caught him in the back, fracturing his spine. Died of injuries April 4th, 1913.
13	Comox ..... (C.C.)	Mar. 13	Thomas Coombs...	Driver.....	While driving cars was caught by a stringer and pulled between the cars; partial dislocation of the clavicle.
14	Extension ..... (C.C.)	" 22	James Glen	Fireboss	Was repairing roadway when a piece of coal falling away brought down two sets of timber on him; dislocated shoulders and bruised about body.

ACCIDENTS IN COAST COLLIERIES.—*Continued.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
15	Comox ..... (C.C.)	Mar. 25	Yuen Chuck	Loader.....	While putting up a stringer a fall of roof-rock killed him.
16	Extension ..... (C.C.)	" 28	Dominic Gionnetti.	Labourer.....	While attending cars his light went out, became confused and got in the way of the cars. Fatally injured, died while being attended by doctor.
17	Comox ..... (C.C.)	" 31	Y. Odo	Miner	While working at the face a piece of rock fell from the roof and fractured his thigh.
18	Comox ..... (C.C.)	Apr. 19	J. Buzzelo	Shaftman.....	While timbering air-shaft staging gave way and five men fell down 44 feet; his pelvis and ribs fractured.
19	Comox ..... (C.C.)	" 19	Reid Miller	Shift-boss.....	Same accident as previous one; fractured left forearm, finger, and metatarsal bone, scalp-wound.
20	Comox ..... (C.C.)	" 19	Steve Munich	Labourer.....	Same accident as above; dislocation of right elbow with fracture of arm, severe injury to back.
21	Comox ..... (C.C.)	" 19	Elias Dorvin	"	Same accident as above; neck broken, died immediately.
22	Comox ..... (C.C.)	" 19	G. Continenzo.....	"	Same accident as above; fatal.
23	Comox ..... (C.C.)	" 24	John Thompson ...	Fireboss	Having fired one shot, was in the act of firing another when top coal fell on him; fracture of left leg, bruised and strained back.
24	Comox ..... (C.C.)	" 26	Thomas Smith	Miner	In pulling down cap-rock after shot was fired, deceased failed to get clear, and piece falling on him broke his neck.
25	Extension..... (C.C.)	May 1	Wong Moon	Labourer.....	Runaway car jumped the track; knocking out two posts, one of which struck deceased on the head and killed him.
26	Extension..... (C.C.)	" 20	John McKendrick .	Miner	Leg broken above the ankle by piece of coal falling.
27	Comox ..... (C.C.)	June 2	Ma Kee	Surface [labourer.	While uncoupling cars he slipped on the rail; two cars passed over him and he sustained double compound fracture of both legs.
28	Extension.. .... (C.C.)	" 5	Malcolm Johnson..	Loader.....	A piece of rock fell from end of post and broke his leg; died two days later from blood-clot on the brain.
29	Comox ..... (C.C.)	" 28	Chenn Joe	Miner	While passing the trip at a landing was caught between the cars and a post; fracture of pelvis, with injury to bladder.
30	Comox ..... (C.C.)	July 4	Noah Hudgins	Labourer.....	While oiling a bull-wheel, the rope started, caught his arm and pulled it into the wheel; Fractured ribs and right arm, and wounds and bruises.

ACCIDENTS IN COAST COLLIERIES.—*Continued.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
31	Comox ..... (C.C.)	July 11	Chow Ping.....	Loader.....	Large fall of rock buried him and killed him.
32	Comox ..... (C.C.)	" 17	Mah Sing.....	Pusher.....	*Hands, face, and neck burnt* when another man lit a small feeder of gas issuing from a cave.
33	Comox ..... (C.C.)	" 17	Ling You.....	Driver.....	Same accident as above; burn of second and third degree of face, neck, arms, back of thigh, and legs.
34	Comox No. 7.... (C.C.)	" 17	Mike Krall	Miner	Same accident as above; burns on wrist and hand.
35	Comox No. 7.... (C.C.)	" 17	Lang Lee	Driver.....	Same accident as above; burns on face, neck, hands, and wrists.
36	Comox No. 7.... (C.C.)	" 17	Herbert Simms....	Fireboss	The same accident; the slight concussion knocked him over, and he fell down 4 feet and sustained bruised and lacerated wounds of the scalp.
37	Comox No. 8.... (C.C.)	" 18	Jos. Radich.....	Machineman ..	While coupling up shots, a feeder of gas was ignited, causing burns on face, neck, and hands.
38	Comox No. 8.... (C.C.)	" 18	Mike Pouvich.....	" ..	Same accident as above; second and third degree burns of face, neck, hands and wrists.
39	Comox No. 8.... (C.C.)	" 18	Robert Rodgers ...	" ..	Same accident as above; burn of face, neck, hands, and wrist.
40	Comox ..... (C.C.)	" 28	Chow Dan	Trapper.....	Was in the act of opening the door when he fell, and the loaded trip jammed him against the rib; fracture to four ribs on left side and three on right side, with injury to the lung.
41	Comox ..... (C.C.)	" 31	Kangino Neno	Loader.....	Lost his balance in cage and was caught by the shaft timber; fractured ribs, lacerated wound left ear and cheek, cut lip, minor bruises.
42	Comox ..... (C.C.)	Aug. 2	Jung Kum.....	"	While shovelling coal a piece of caprock fell and broke his leg.
43	No. 6 Mine .,... (C.C.)	" 12	John Greathead ...	Miner.....	Slipped on rail in front of loaded trip, sustaining crushed and sprained ankle.
44	Comox No. 4.... (C.C.)	" 16	Yung Li.....	Loader.....	While loading, a piece of rock rolled off the gob, catching his foot between the rock and a piece of coal; compound *fracture of left leg.*
45	East Wellington. (V.-N.)	Sep. 10	John Watson	Miner	Returned to his place before lighted shot had gone off; shot went off and knocked him unconscious; internally injured.
46	Extension ..... (C.C.)	Oct. 4	Wing Ying	Pusher.....	When boarding empty trip was caught between car and centre post; hips squeezed.

ACCIDENTS IN COAST COLLIERIES.—*Concluded.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
47	Comox .... (C.C.)	Oct. 27	Nick Christie	Driver.....	Collision of cars caused the car he was riding on to kick up and squeeze him; fracture of three ribs, bruised back and side.
48	Comox No. 4.... (C.C.)	" 30	William Ross	Pumpman.....	Was caught in pump mechanism and received wounds on foot, thigh, and scalp; severed one tendon.
49	Comox No. 7.... (C.C.)	" 31	Arthur Bailey.....	Driver.....	While riding on cars was crushed between two of them; fracture of right side of pelvic arch.
50	Extension ..... (C.C.)	Nov. 5	Un Sim Lam.....	"	Was standing between two loaded cars when another car jumped track and bumped the car next to him, and he was squeezed about the hips; died on November 6th.
51	Nanaimo ..... (W. F. Co.)	" 11	Joseph Dixon	Miner	Picking top coal down when roof-rock came away on top of him; back of neck, left arm, and left leg bruised.
52	Comox No. 4.... (C.C.)	Dec. 2	Chun Gee.....	Loader.....	Slipped in front of loaded car and received a comminuted fracture of collar-bone.
53	Comox ..... (C.C.)	" 16	Hugh Rowlands...	Timberman....	While passing a mule, the animal turned and squeezed him against a full car; fractured two ribs and internal injuries.
54	No. 7 Mine ..... (C.C.)	" 23	Yo Hing.....	Loader.....	Struck by a stringer dropped by helpers while timbering; fracture of tible of skull and fracture of nose.
55	Comox No. 8.... (C.C.)	" 24	Nick Brodovich ...	Miner	Jammed between empty and loaded car; bruise and sprain of left hip and abdomen.
56	Comox No. 7.... (C.C.)	" 29	Ching Sing.....	"	Piece of roof-rock struck him on the leg, fracturing it in two places.

NICOLA COLLIERIES.

REPORTED BY ROBERT STRACHAN, INSPECTOR.

57	Middlesboro .... (N.V.C. & C. Co.)	Jan. 4	John H. Morrison .	Miner	He went in after shooting and a stringer fell out, letting down some rock on his head; he died as the result of internal hæmorrhage of the brain.
58	Middlesboro .... (N.V.C. & C. Co.)	" 17	John Kawul	Miner's helper.	In pushing in an empty car he knocked out a post, which let down a stringer on his left hand and broke two fingers.
59	Middlesboro .... (N.V.C. & C. Co.)	" 18	Walter S. Morrison	Hoist-boy.....	While outside stepping over a rope his coat caught and he was dragged into the drum; left leg broken, right leg bruised.

ACCIDENTS IN NICOLA COLLIERIES.—*Concluded.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
60	Middlesboro .... (N.V.C. & C. Co.)	Feb. 7	Matthew Gilson ...	Driver.....	His lamp went out and he stayed riding on the car and got caught between the car and the roof; left arm broken and dislocated at wrist, side bruised.
61	Midway ..... (B.M. & E. Co.)	" 10	Thomas Henderson.	Miner	He ignited gas in a raise with his candle; burned about the hands and face.
62	No. 3 Mine..... (I.C. & C. Co)	Mar. 6	John Dunn.....	Rope-rider....	A guide-rail caught by the haulage-rope slid down the slope and struck him on the leg, breaking the small bone in it.
63	Middlesboro .... (N.V.C. & C. Co.)	" 8	Bartholomew [Casilla	Miner	After firing a shot the place was reported safe, but later a large piece of rock 16 feet from the face came down, breaking down three stringers, Casilla was killed outright and another man injured.
64	Middlesboro .... (N.V.C. & C. Co.)	" 8	Alex. Chas. Mitchell	Shotlighter....	Same accident as above; left leg broken, scalp-wounds.
65	No. 1 Mine..... (P.C. & L. Co.)	" 9	Norman McLeod ..	Machineman ..	A cave caused an emission of gas which was ignited by a naked light; slightly burned.
66	No. 1 Mine..... (P.C. & L. Co.)	" 9	John Basely.....	" ..	Same accident as above; very slightly burned.
67	No. 1 Mine..... (P.C. & L. Co.)	" 9	John Wrsuliak....	Machine-helper	A cave forced out some gas which was ignited by a naked light; slight burns.
68	No. 3 Mine..... (I.C. & C. Co.)	" 31	Jas. Nelson	Switcher	In sliding down a slope he came in contact with a fish-plate, causing a flesh injury to his hips.
69	Middlesboro .... (N.V.C. & C. Co.)	Apr. 8	Jas. McAuley	Miner	A piece of coal came off a slip and broke his back, killing him.
70	No. 3 Mine ..... (I.C. & C. Co.)	" 29	John Smith	Rope-rider....	He got caught between cars going up and down the slope, due to carelessness on the part of the topman, and his leg was broken.
71	Middlesboro .... (N.V.C. & C. Co.)	June 4	Chas. T. Isitt.....	Miner.....	He was walking down the slope when his foot slipped and he fell, breaking one rib.
72	Middlesboro .... (N.V.C. & C. Co.)	July 4	Robt. Preston.....	"	He was lifting a prop when his partner threw down an axe on his hand, cutting off the point of his second finger and cut the third finger.
73	Middlesboro .... (N.V.C. & C. Co.)	Sept. 4	Geo. Vukine	Driver.....	His elbow was raised too high while driving and was caught in a chute and jammed against the car; right arm broken above the wrist.
74	No. 1 Mine ..... (P.C. & L. Co)	Oct. 3	J. Forsythe	Switcher	Injured by runaway car on slope.

NORTH-EAST KOOTENAY COLLIERIES.

REPORTED BY T. H. WILLIAMS, INSPECTOR.

No.	Colliery.	Date.	Name.	Occupation.	Details.
75	Hosmer A..... (C.P.R.)	Jan. 5	L. Vince.....	Miner	Forehead cut with axe by his helper while chopping timber.
76	Hosmer A ..... (C.P.R.)	" 10	Harry Meroniuk...	Switcher.....	While running beside a loaded trip his foot slipped under and two toes were cut off.
77	Hosmer A ..... (C.P.R.)	" 17	John Tyruk.	Switchman....	While running beside a trip of cars his foot slipped under a wheel and the bone of the foot broken.
78	Hosmer A..... (C.P.R.)	" 31	John Dendnea.....	Switcher.....	Was pinched between a car and a post and badly bruised, with internal injuries.
79	Hosmer A..... (C.P.R.)	Feb. 22	Geo. Holowachuk..	Car-pusher....	His leg was pinched between the bumpers of two cars and badly bruised.
80	Michel ..... (C.N.P.)	Mar. 3	Ben Bloomfield....	Labourer.....	He was driving out a loaded car, and not coming back for some time the miners went to look for him. They found the car off the track and pulled him out from underneath; dead.
81	Hosmer..... (C.P.R.)	" 26	Norman Shaw.....	Pit-boy.....	He was caught between two motors and his right forearm was broken.
82	Hosmer..... (C.P.R.)	Apr. 1	Alek. Kowryluk...	Labourer.....	The accident happened through a collar breaking, thereby causing fall of coal which buried the deceased and suffocated him.
83	Hosmer..... (C.P.R.)	" 27	Jas. Redka	"	His arm was pinched between a car and post, breaking it.
84	Michel No. 3.... (C.N.P.)	" 9	Geo. Witherington.	Driver.....	While switching empty cars he fell on the track and the horse pulled an empty car over him; fracture of left tibia into ankle, contused left kidney and abdomen, hæmaturia.
85	Michel No. 3.... (C.N.P.)	" 9	P. Heack	"	While leading his horse over a switch, the horse fell sideways on top of the driver; large scalp-wound and fractured collar-bone.
86	Hosmer..... (C.P.R.)	June 11	Sif Kuryluk.....	Loader..	While pushing a car a motor pushing empties bumped into him; wrist-bone fractured and bruised.
87	Hosmer B..... (C.P.R.)	July 5	Mike Pakulis.....	Miner	Accident caused by a fall of coal in working-place; killed.
88	Hosmer..... (C.P.R.)	" 5	H. Powluk.....	Labourer.....	Same accident as above; killed.
89	Hosmer..... (C.P.R.)	Aug. 11	Andro Tuvek.....	Miner	Whilst operating his coal-cutting machine some coal from the face fell on him; sprained back and crushed leg.

ACCIDENTS IN NORTH-EAST KOOTENAY COLLIERIES.—*Concluded.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
90	Hosmer..... (C.P.R.)	Aug. 26	Wm. Greaner	Miner	He stepped on a pile of planks and slipped, falling backward against bulk-head in manway and dislocated his shoulder.
91	Michel ..... (C.N.P. Co.)	Sept. 15	J. De Wilde	"	De Wilde was digging a post-hole preparatory to putting up a set of timber when some rock fell away from the roof and struck his back, fracturing his spinal column.
92	Michel ..... (C.N.P. Co.)	" 4	J. Tantrum	"	While working at the face a small piece of coal struck him in the eye, fracturing his eyeball.
93	Hosmer..... (C.P.R.)	" 12	T. Carpee.....	Labourer.....	Some temporary timbers fell out, allowing rock to fall on the injured man; lacerated arm and elbow and cut ankle.

SOUTH-EAST KOOTENAY COLLIERIES.

REPORTED BY EVAN EVANS, INSPECTOR.

94	Coal Creek No. 9 (C.N.P. Co.)	Jan. 9	John Charnock....	Miner	Rock from a pot-hole fell on the floor and rolled on his leg; compound fracture right tibia.
95	Coal Creek No. 1 (C.N.P.)	" 20	Wm. Atkinson....	"	A cave of top coal came away without warning and buried Atkinson for thirty-five minutes, and when recovered was dead.
96	Coal Creek ..... (C.N.P.)	Mar. 6	James Langdon....	"	In preparing to put up a set of timbers a leg came out and struck him on the leg, fracturing his tibia.
97	Coal Creek..... (C.N.P. Co.)	" 16	Frank Greco	Tipple labourer	While cleaning up the box-car loader pit on surface he, in some way, moved the loader, which dropped on him and crushed him against the cement floor; died May 15th.
98	Coal Creek..... (C.N.P. Co.)	" 22	Mike Vrach.....	Miner	The injured man was run over by a car from which he had just removed a block; fracture of clavicle, scapula, and cut and bruised chest.
99	Coal Creek..... (C.N.P. Co.)	" 26	Joe Sciara	"	He was driving a horse-car and got tangled between the harness-gun and the car; both bones in leg broken.
100	Coal Creek No. 1 (C.N.P. Co.)	Apr. 14	Paul Barzier	Timberman....	In drawing centre posts to allow track to be laid, the side coal knocked out a bridge-stick leg and caused the place to cave; deceased was buried and suffocated.
101	Coal Ck. No. 1 S. (C.N.P. Co.)	" 23	James McDicken ..	Miner	Deceased and his partner were buried under fall of roof due to timbers giving way; base of the skull fractured.

ACCIDENTS IN SOUTH-EAST KOOTENAY COLLIERIES.—*Continued.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
102	Coal Creek..... (C.N.P. Co.)	Apr. 23	Herbert Ashe	Miner	Same accident as above; neck broken.
103	Coal Creek ..... (C.N.P. Co.)	May 3	John Hill.....	"	A fall of coal struck his left leg, fracturing the tibia.
104	Fernie..... (C.N.P. Co.)	" 5	Adelin Bellagambia	"	A small "bump" knocked down some top coal and gumbo; a large piece jammed the man's leg against a car, causing a fracture of his left femur.
105	Coal Creek No. 5 (C.N.P. Co.)	June 6	Wm. Waters.....	Driver.....	While riding on a trip of cars he was caught between a boom and the top of a car; broken clavicle.
106	Coal Creek ..... (C.N.P.)	" 13	John S. Weir	Rope-rider....	He was caught against a loaded car by an empty that jumped the track; left leg amputated below the knee.
107	Coal Creek..... (C.N.P.)	July 9	Dominic Antorine..	Miner	He was working on a bench when a large piece of coal slipped off the face and struck him, knocking him off the bench; died of internal hæmorrhage four hours later.
108	Coal Creek..... (C.N.P. Co.)	" 14	William Hall.....	Coupler.....	While driving a horse on surface he was caught by the tail-chain and his leg broken.
109	Coal Creek..... (C.N.P. Co.)	" 18	Danato Rannelletti	Car-handler...	While shovelling on surface into a box car on loader the door swung shut and caught him on the right shoulder; fractured clavicle.
110	Coal Creek..... (C.N.P. Co.)	" 24	Joseph Wistor	Driver.....	While driving, the horse's head knocked out a boom, bringing down two cars of small rock; in the ensuing mix-up the driver got tangled with the harness and his thigh was broken.
111	Coal Creek..... (C.N.P. Co.)	Sept. 15	John Dragon.....	Miner	While riding, the car left the track, knocked out a timber which fell on his chest, causing a broken rib and internal hæmorrhage.
112	Coal Ck. surface. (C.N.P. Co.)	" 22	Guiseppa Cemera..	Outside [labourer.	Was injured while riding on a surface train of timber; fractured left patella, injuries to right jaw and back.
113	Coal Creek..... (C.N.P. Co.)	Nov. 3	Jas. Stirling	Power-house [engineer.	While he was in the boiler-room making an inspection he was struck by a runaway car from the ash-dump; compound fracture right tibia, cut arm, face, etc.
114	Coal Creek..... (C.N.P. Co.)	" 3	Danoili Babboni...	Labourer.....	Same accident as above; skull fractured and died two hours later.
115	Coal Ck. surface. (C.N.P. Co.)	" 8	John Cunliffe	Boss-driver....	In bringing out a trip of coal on the surface he ran past a signal against him, thereby causing a collision in which he was crushed between cars; severely crushed and lacerated legs, bruises, etc.

ACCIDENTS IN SOUTH-EAST KOOTENAY COLLIERIES.—*Concluded.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
116	Coal Ck. No. 1 E. (C.N.P. Co.)	Nov. 21	Joseph Harrison...	Miner	While at the face a sudden cave of coal broke the timbers and caught him while he was running away; death by suffocation.
117	Coal Ck. No. 1 S. (C.N.P. Co.)	" 29	Edward McCarthy.	"	McCarthy and his partner were putting up a boom when it fell off the posts, striking him and fracturing his pelvis.
118	Coal Creek..... (C.N.P. Co.)	Dec. 11	Dan Chanasse	Driver.....	A car jumped the track and caught the injured man between it and the side, fracturing his crest ileum.
119	Coal Creek..... (C.N.P. Co.)	" 12	Tomaso Mazza	Tracklayer....	A rope broke, allowing three empty cars to run back down the incline on top of deceased; fractured skull and died immediately.

PROSECUTIONS UNDER "COAL-MINES REGULATION ACT."

As is incumbent upon the Inspector, he has been obliged to lay information before the local Magistrates in a large number of cases for infractions, by the workmen in the mines, of the general and special rules, which are provided solely for their own protection. These regulations are for the general safety of all the underground employees, and the carelessness of one man endangers all his fellow workmen, whose lives are practically in the hands of such foolishly careless or criminal person.

The following prosecutions have been brought during the year for the offences noted; the judgments given by the Magistrate being shown:—

Date.	Name.	Occupation.	Mine.	Offence charged.	Judgment.
Jan. 18	Chas. Graham.	Manager....	Middlesboro	Employing boy under sixteen years to operate supply-hoist, contrary to sec. 5	Fined $1 and costs.
" 27	Peter Meyers..	Fireboss ...	"	Riding on mine-cars, contrary to Special Rule No. 73	Fined $5 and costs.
Feb. 1	Thomas Fraser	Miner	"	Having explosives in an improper case or canister, contrary to sec. 91, Rule 2	Fined $5 and costs.
" 11	F. Dickie	"	Michel	Violating Special Rule 114	Convicted; let off on suspended sentence.
" 11	A. Parson.....	"	"	" "	Convicted; let off on suspended sentence.
" 14	M. Synatvioch.	Labourer....	Middlesboro	Having matches in his possession in mine, contrary to sec. 91, Rule 9	Fined $2.50 and costs.
" 18	P. H. Beach...	Mine foreman	Boundary M. [& E. Co.	Acting as shotfirer without certificate, contrary to sec. 32	Dismissed.
" 18	F. H. Knight..	Agent	"	Operating mine without having certificated officials in charge, contrary to sec. 33	Dismissed.
" 18	A. E. Watts ..	Co. President	"	Failing to notify the Chief Inspector of the commencement of operations, contrary to sec, 66	Dismissed.
" 18	A. E. Watts ..	"	"	Failing to report accident to an employee as required by sec. 63	Fined $75 and costs or 30 days in prison.
" 18	A. E. Watts .	"	"	Employing officials without certificates, contrary to sec. 32	Fined $1.
" 18	A. E. Watts ..	"	"	Failing to provide ambulance box, as required by sec. 91, Rule 40	Fined $1.

PROSECUTIONS.—*Continued.*

Date.	Name.	Occupation.	Mine.	Offences charged.	Judgment.
Feb. 18	A. E. Watts ..	Co. President	Boundary M. [& E. Co.	Failing to have plan of mine posted at the entrance thereof, as required by sec. 86	Fined $1.
" 18	A. E. Watts ..	"	"	Failure to keep plans of underground workings, as required by sec. 84	Fined $1.
" 18	F. H. Knight..	Manager....	"	Failing to report "Accident to an employee," as required by sec. 63	Fined $25 or ten days in prison.
April. 3	J. C. Hughes..	Shotfirer....	Inland C. & [C. Co.	Having detonators in an improper box, contrary to sec. 91, Rule 12	Fined $1 and costs.
" 3	J. C. Hughes..	"	"	Loading and firing a second shot before making examination of place after firing first, contrary to section 91, Rule 12	Dismissed.
" 4	A. Dimidowych	Labourer....	Hosmer.....	Violating Gen'l Rule 9 (matches in possession)	Sentenced to three mos. imprisonment, on appeal reduced to a fine of $10 and costs.
" 11	John F. Sgura.	Miner	"	Charged with passing beyond a danger-signal	Fled the country.
July 24	John Kovach..	"	Michel	Going to sleep in the mine....	Fined $10 and costs.
" 24	Geo. Heckel..	"	"	" "	Fined $10 and costs.
Mar. 10	Joseph Jautier.	"	Coal Creek..	Damaging safety-lamp	Fined $10.
" 10	Isador Pron...	"	" ..	" "	Fined $10.
June 29	J. Siroryak....	"	" ..	" "	Fined costs of Court.
" 29	W. Wesleynuk	"	" ..	" "	Fined $5.
.....	S. Rossi.....	"	" ..	Violating Special Rule 114 (neglecting to sprag coal)	Fined $10.
Aug. 9	John Shepuk..	"	" ..	Damaging safety-lamp	Fined $10.
Nov. 14	Joe Porvet	Labourer....	Middlesboro	Having matches in his possession in mine, contrary to sec. 91, Rule 9	Fled the country.
Dec. 1	John Chain....	Miner	Inland C. & [C. Co.	Being inside or beyond a fence or danger-signal, contrary to Special Rule No. 71	Dismissed.
" 1	Thomas Fraser.	"	"	Ditto.....	Dismissed.
" 1	Wm. Hoggan..	Fireboss	"	Allowing workmen inside fence or danger-signal before firedamp or impure air was removed, contrary to Special Rule 36	Fined $1.
" 1	A. G. Horrocks	"	"	Ditto.....	Fined $1.

PROSECUTIONS.—*Concluded.*

Date.	Name.	Occupation.	Mine.	Offences charged.	Judgment.
Dec. 18	R. Stackhouse.	Carpenter...	Inland C. & [C. Co.	Allowing detonators out of his control, contrary to sec. 91, Rule 12	Dismissed.
" 24	Jacob Pablo...	Miner	Coal Creek..	Damaging safety-lamp.....	Fined $25.
.....	J. H. McMillan	Manager....	No. 5 C. C..	Violating sec. 35	Fined $10.
.....	D. McKinnell.	Overman ...	Extension ..	Charged with sending man into a return airway with an open light, resulting in an explosion	Second-class Certificate No. B 37 and Third-class Certificate No. C 99 held by McKinnell were cancelled.

METALLIFEROUS MINES SHIPPING IN 1913.

CASSIAR.

PORTLAND CANAL MINING DIVISION.

Mine or Group.	Locality.	Owner or Agent.	Address.	Character of Ore.
Evening Star	Glacier creek	Rush and Baggs	Stewart	Gold, silver, lead, copper.
Katherine	"	Rush Portland Mining Co.	Vancouver	" "
Lakeview	"	James McKay	Stewart	Gold, silver, lead.
Montana	Marmot river	G. W. Bruggy	"	Silver, lead.

QUEEN CHARLOTTE MINING DIVISION.

Oceanic	Collison Bay	Jno. Lawson	Jedway	Silver, copper.
Early Bird	Moresby island	J. McLellan	Queen Charlotte	Gold.

ATLIN MINING DIVISION.

Engineer	Windy Arm	J. Alexander	Carcross	Gold.

OMINECA MINING DIVISION.

American Boy	9-mile mountain	Harris Mines, Ltd.	Hazelton	Gold, silver, lead.
Erie	6-mile mountain	Omineca Mines, Ltd.	Vancouver	Silver, lead.
Silver Standard	Glen mountain	Silver Standard Mining Co.	New Hazelton	Gold, silver, lead.
White Heather	Hudson Bay mountain	F. J. Martin	Hazelton	" "

EAST KOOTENAY.

GOLDEN MINING DIVISION.

Monarch	Field	Mt. Stephen Mines, Ltd.	Vancouver	Silver, lead, zinc.

FORT STEELE MINING DIVISION.

Society Girl	Moyie	The Society Girl Mining Co.	Moyie	Silver, lead.
St. Eugene	"	Consolidated M. & S. Co.	Marysville.	"
Sullivan	Kimberley	" "	"	"

WEST KOOTENAY.

NELSON MINING DIVISION.

Arlington	Erie	Hastings (B.C.) Explt'n Syd., Ltd.	Nelson	Gold, silver.
California	Toad mountain	W. Moore	"	"
Emerald	Salmo	Iron Mountain, Ltd.	Salmo	Silver, lead.
H.B.	Deer creek	H. B. Mining Co	"	"
Molly Gibson	Kokanee creek	Consolidated M. & S. Co.	Nelson	"
Motherlode	Sheep creek	Motherlode Sheep Creek Min. Co.	Sheep Creek	Gold, silver.
Perrier	Cottonwood creek	C. Crosley	Nelson	"
Poorman	Granite Siding	Kootenay Gold Mines, Ltd.	Granite	"
Queen	Sheep creek	Queen Mines, Incorporated	Sheep Creek	"
Queen Victoria	Beasley	B.C. Copper Co.	Greenwood	Gold, silver, lead.
Second Relief	Erie	A. Litchfield	Seattle	Gold, silver.
Silver King	Toad mountain	Consolidated M. & S. Co.	Nelson	Gold, silver, copper.
Vancouver	Sheep creek	Unfried & Fisher	Sheep Creek	Gold, silver.
Yankee Girl	Ymir	Hobson Silver Lead Co.	Ymir	"
Zincton	Deer creek	P. F. Horton	Salmo	Silver, lead.

WEST KOOTENAY.—*Concluded.*

AINSWORTH MINING DIVISION.

Mine or Group.	Locality.	Owner or Agent.	Address.	Character of Ore.
Bluebell	Riondel	New Canadian Metal Co.	Riondel	Silver, lead.
Cork	Ainsworth	Selkirk Mining Co., Ltd	Kaslo	"
Florence	"	F. R. Wolfe	Spokane	"
Gallegher	"	A. D. Wheeler	Ainsworth	Gold, silver, lead.
Highland	"	Consolidated M. & S. Co.	"	Silver, lead.
Maestro	"	" "	"	"
No. 1	"	" "	"	"
Panama	Bear lake	H. Giegerich	Kaslo	Silver.
Revenue	Kaslo creek	Lachlan MacLean	"	Silver, lead.
Silver Hoard	Ainsworth	Silver Hoard Mines, Ltd.	Ainsworth	"
U.S		W. B. Smith	"	
Utica	Kaslo creek	Utica Mines, Ltd.	Kaslo	Silver, lead.
Whitewater	Whitewater	J. L. Retallack & Co.	"	Gold, silver, lead.

SLOCAN MINING DIVISION.

Apex	New Denver	A. J. Becker	New Denver	Gold, silver.
Cinderella	Three Forks	G. B. Dean	Three Forks	Silver, lead.
Colonial	Sandon	A. D. Coplen	Spokane	"
Evening	"	G. T Gormley	Sandon	"
Hartney	New Denver	A. H. Blumenauer	New Denver	Silver, lead, zinc.
Hewitt	Silverton	Silverton Mines, Ltd.	Silverton	Silver.
Idaho	New Denver	Idaho Alamo Con. Mines, Ltd.	New Denver	Silver, lead.
Ivanhoe	Sandon	Minnesota Silver Co.	Sandon	"
Lucky Jim	Zincton	Lucky Jim Zinc Mines, Ltd.	Victoria	Silver, lead, zinc.
Margaret	Sandon	G. W. Wray	Sandon	" "
Mountain Con	"	W. M. Bennett	"	Gold, silver, lead.
Neepawa	New Denver	E. M. Shannon	New Denver	Silver.
Noble Five	Sandon	T. L. McAllister	Sandon	Silver, lead.
Rambler	McGuigan	Rambler-Cariboo Mines, Ltd.	Three Forks	Silver, lead, zinc.
Reco	Sandon	Reco Mining & Milling Co., Ltd	Sandon	Silver, lead.
Richmond	"	Con. Mining & Smelt'g Co. of Can.	New Denver	"
Ruth	"	The Ruth Mines, Ltd.	Kaslo	"
Slocan Star	Sandon	Slocan Star Mines, Ltd.	Sandon	Silver, lead.
Standard	Silverton	Standard Silver Lead Mining Co.	New Denver	Silver, lead, zinc.
Surprise	Sandon	J. P. MacFadden	Sandon	Silver, lead.
Van-Roi	Silverton	Van Roi Mining Co., Ltd.	Rossland	Silver, lead, zinc.
Wonderful	Sandon	Wonderful Group Mining Co.	Sandon	Silver, lead.

SLOCAN CITY MINING DIVISION.

Eastmont	Ten-mile	Ellis Silver Mining Co.	Slocan	Gold, silver, lead.
Kilo	Lemon creek	A. Sostad	Nelson	Gold, silver.
Meteor	Springer creek	G. H. Aylard	New Denver	"
Ottawa	New Denver	Consolidated M. & S. Co.	"	Silver.

TROUT LAKE MINING DIVISION.

Ajax	Ferguson	Ferguson Mines, Ltd.	Ferguson	Gold, silver, lead.
Silver Cup	"	"	"	" "
Fidelity	Gerrard	J. C. Rady	Gerrard	Gold, silver.
High Grade	Trout lake	J. W. Livingstone	Ferguson	Silver, lead.

TRAIL CREEK MINING DIVISION.

Centre Star	Rossland	Consolidated M. & S. Co.	Rossland	Gold, silver, copper.
Giant California	"	Granby M., S. & P. Co.	Grand Forks	" "
Inland Empire	Paulson	Inland Mining Co., Ltd.	Paulson	Gold, silver.
Le Roi	Rossland	Consolidated M. & S. Co.	Rossland	Gold, silver, copper.
Le Roi No. 2	"	Le Roi No. 2, Ltd.	"	" "
Nickel Plate	"	John Ruffner	"	Gold, silver.
Phœnix	"	Phœnix Gold Mining Co.	"	Gold, silver, copper.

BOUNDARY.

GRAND FORKS MINING DIVISION.

Granby	Phœnix	Granby M., S. & P. Co.	Grand Forks	Gold, silver, copper.
Rawhide	"	New Dominion Copper Co.	Greenwood	" "
Union	Franklin camp	Lewis Johnson	Grand Forks	Gold, silver.

BOUNDARY.—*Concluded.*

GREENWOOD MINING DIVISION.

Mine or Group.	Locality.	Owner or Agent.	Address.	Character of Ore.
Bounty	Beaverdell	Phœnix M., S. & Dev. Co., Ltd.	Phœnix	Silver.
Jewel	Greenwood	Jewel Denero Mines, Ltd.	Greenwood	Gold, silver.
Motherlode	"	B.C. Copper Co., Ltd.	"	Gold, silver, copper.
Number 7	Boundary Falls	Consolidated M. & S. Co.	Trail	Gold, silver, lead.
Sally	Wallace mountain	Alex. Robinson	Greenwood	" "
Sunnyside	James creek	E. Williams	Rock Creek	" "

OSOYOOS MINING DIVISION.

Dividend	Kruger mountain	Dividend-Lake View C. G. M. Co.	Spokane	Gold, silver, copper.
Nickel Plate	Hedley	Hedley Gold Mining Co.	Hedley	Gold.

NICOLA MINING DIVISION.

Copper Bell	Coutlee	R. Henderson	Merritt	Silver, copper.
Blue Ridge	Princeton	Uhler & Cox	Princeton	Gold, silver, copper.

KAMLOOPS MINING DIVISION.

Iron Mask	Kamloops	E. G. Wallinder	Kamloops	Gold, silver, copper.

LILLOOET MINING DIVISION.

Coronation	Cadwallader creek	Coronation Gold Mines, Ltd.	Victoria	Gold.

COAST.

VANCOUVER MINING DIVISION.

Britannia	Britannia beach	Britannia Mining & Smelting Co.	Britannia Beach	Silver, copper.

NANAIMO MINING DIVISION.

Cornell	Texada Island	I. Little	Vananda	Gold, silver, copper.
Little Billie	"	A. Goldberg	Vancouver	" "
Marble Bay	"	Tacoma Steel Co.	Tacoma	" "

CLAYOQUOT MINING DIVISION.

Kallapa	Meares island	Kallapa Mining Co., Ltd.	Vancouver	Gold, silver, copper.

LIST OF CROWN-GRANTED MINERAL CLAIMS.

CROWN GRANTS ISSUED IN 1913.

CASSIAR.

Claim.	Division.	Grantee.	Lot No.	Acres.	Date.
Artic	Atlin	Mary McDonald	107	51.65	July 19
Britannia	"	Albert Edward Crosby McDonell	156	42.09	April 19
Canyon Creek	"	Mary McDonald	108	51.65	July 5
Manitoba	"	Margaret Creighton Gatewood	159	41.65	July 4
Toronto	"	Neomie Fraser	290	45.83	Sept. 20
Boston	Portland Canal	Bear River Mining Co.	1482	17.46	Aug. 15
Boundary No. 1	" "	John McIntominey	2314	51.0	July 15
Boundary No. 2	" "	Daniel Luke McIntominey	2315	47.15	July 15
Boundary No. 4	" "	"	2313	51.65	July 15
Elgin	" "	Bear River Mining Co.	1481	51.65	July 4
Kensington Fraction	" "	"	1484	16.27	Aug. 15
Last Chance	" "	Red Cliff Mining Co., Ltd.	88	46.97	June 20
Missing Link Fraction	" "	Daniel Luke McIntominey	2316	32.36	July 15
Never Sweat	" "	Wm. Armitage Thompson	2321	47.99	Feb. 3
Paris	" "	Bear River Mining Co.	1483	32.23	Aug. 15
Star	" "	Wm. Noble, Wm. Henry Collison, Alfred Woodcroft, Watson Dores Noble, John Maxwell Collison, William Edwin Collison	562	34.44	Feb. 20
Bee	Skeena	Howard Abbott Turner	1915 R. 4	45.65	Mar. 4
Bell	"	Wm. Shannon, Geo. Martin, J. Bolivar Mathers	644 R. 4	51.65	Feb. 11
Bird	"	" " "	645 R. 4	45.63	Feb. 11
Cassie	"	Howard Abbott Turner	228 R. 4	23.23	Feb. 26
Deer	"	Wm. Shannon, Geo. Martin, James Bolivar Mathers	641 R. 4	51.65	Feb. 10
Eburne	"	" " "	179 R. 4	41.61	Feb. 10
Erma	"	" "	637 R. 4	51.65	Feb. 10
Etta	"	Howard Abbott Turner	1918 R. 4	32.3	Mar. 4
Evening Star	"	Barclay Bonthrone	2033 R. 4	25.15	July 2
Flora	"	Wm. Shannon, George Martin, James Bolivar Mathers	639 R. 4	51.65	Feb. 10
Gold Drop	"	Barclay Bonthrone	2031 R. 4	42.14	Mar. 17
Granite	"	Howard Abbott Turner	1916 R. 4	41.5	Mar. 4
Isabel	"	William Shannon, George Martin, James Bolivar Mathers	642 R. 4	51.65	Feb. 11
Jane	"	" "	1246A R. 4	51.65	Feb. 11
Lake View	"	Howard Abbott Turner	229 R. 4	29.17	Mar. 4
Lion Fractional	"	Wm. Shannon, George Martin, James Bolivar Mathers	185 R. 4	50.11	Feb. 10
Mable	"	" "	636 R. 4	46.77	Feb. 10
Mariah	"	" "	638 R. 4	48.77	Feb. 10
Mary	"	" "	635 R. 4	51.65	Feb. 10
Mathers Frac.	"	" "	184 R. 4	51.65	Feb. 10
Nelson	"	" "	1245A R. 4	51.65	Feb. 11
Olive	"	Howard Abbott Turner	227 R. 4	24.90	Mar. 4
Opps	"	Wm. Shannon, George Martin, James Bolivar Mathers	181 R. 4	50.98	Feb. 10
Owl Fract.	"	" "	1244A R. 4	46.97	Feb. 11
Prince Rupert	"	Barclay Bonthrone	2032 R. 4	32.56	Mar. 17
Rat	"	Wm. Shannon, George Martin, James Bolivar Mathers	176 R. 4	51.65	Feb. 10
Rat Frac	"	" "	178 R. 4	18.63	Feb. 10
Red Fraction	"	Pacific Metals Co., Ltd.	1993	48.55	June 30
Red Jacket	"	" "	1991	51.65	June 30
Red Wing	"	" "	1992	51.65	June 30
Rose	"	Wm. Shannon, George Martin, James Bolivar Mathers	642 R. 4	51.65	Feb. 11
Sea Fraction	"	Howard Abbott Turner	1914 R. 4	31.35	Mar. 4
Sheep	"	Wm. Shannon, George Martin, James Bolivar Mathers	634 R. 4	50.49	Feb. 10
Vancouver	"	Barclay Bonthrone	2034 R. 4	17.3	Mar. 17
Wolf	"	Wm. Shannon, George Martin, James Bolivar Mathers	640 R. 4	50.78	Feb. 10
Almo	Omineca	John W. Stewart, Angus Stewart, Donald McLeod, Anthony L. McHugh	2259	34.37	Oct. 2
Balsam	"	Rocher de Boule Copper Co.	2401	51.23	Nov. 11
Balsam Fractional	"	"	2406	12.98	Nov. 11
Black Prince	"	John W. Stewart, Angus Stewart, Donald McLeod, Anthony L. McHugh	2411	31.69	Oct. 2
Canadian King	"	Ditto	2409	27.57	Oct. 2
Canadian Queen	"	"	2410	39.65	Oct. 2
Canadian Queen Fract'n'l	"	"	2415	4.61	Oct. 2
Clear Water	"	"	2414	44.77	Oct. 2
Glen Mountain	"	"	2264	20.67	Oct. 2
Iowa	"	Rocher de Boule Copper Co.	2404	51.65	Nov. 6
Jack Pine	"	"	2402	44.73	Nov. 6

CASSIAR.—*Concluded.*

Claim.	Division.	Grantee.	Lot No.	Acres.	Date.
Juniper	Omineca	Rocher de Boule Copper Co.	2400	51.65	Nov. 6
King Fractional	"	John W. Stewart, Angus Stewart, Donald McLeod, Anthony L. McHugh	2417	10.23	Oct. 2
Leadville	"	Ditto	2260	51.65	Oct. 3
Log Cabin	"	Rocher de Boule Copper Co.	2405	27.61	Nov. 11
Pie Fractional	"	"	2407	0.74	Nov. 11
Silver Standard	"	John W. Stewart, Angus Stewart, Donald McLeod, Anthony L. McHugh	2262	38.34	Oct. 2
Skagway	"	Ditto	2263	41.40	Oct. 2
Specultor	"	"	2412	35.77	Oct. 2
Standard	"	"	2261	49.91	Oct. 2
Swiftwater	"	"	2413	45.80	Oct. 2
Third Fractional	"	Rocher de Boule Copper Co.	2408	12.01	Nov. 11
Timber Line	"	"	2403	50.55	Nov. 6
Ajax	*Queen Charlotte*	*John Stafford McMillan*	81	39.23	June 14
Apricot	" "	Ikeda Mines, Ltd.	1874	51.62	Jan. 8
Bamboo	" "	"	100	46.03	Jan. 7
Banana Fraction	" "	"	1885	2.24	Jan. 9
Buttercup	" "	"	1877	44.82	Jan. 8
Camillia	" "	"	1881	34.12	Jan. 8
Cherry	" "	"	1873	38.54	Jan. 8
Chrysanthemum	" "	"	1869	45.80	Jan. 8
Golden Gate	" "	"	1892	48.01	Jan. 9
Grape	" "	"	1893	37.82	Jan. 9
Larkspur	" "	"	98	24.9	Jan. 7
Loftus	" "	"	1867	40.36	Jan. 8
Longfellow	" "	Henry Lowry Beresford	2353	51.65	Nov. 4
Maple	" "	Ikeda Mines, Ltd.	97	50.55	Jan. 7
Morning Glory	" "	"	1857	30.71	Jan. 7
Orange Fraction	" "	"	1862	17.51	Jan. 7
Peony	" "	"	1868	45.34	Jan. 8
Persimmon	" "	"	1859	46.02	Jan. 7
Petunia	" "	"	1876	14.68	Jan. 8
Pine Fractional	" "	"	95	29.5	Jan. 7
Rose	" "	"	1871	33.64	Jan. 8
Sandwich Fraction	" "	John Stafford McMillin	92	28.68	June 14
Sea Shore	" "	Ikeda Mines, Ltd.	96	30.11	Jan. 7
Snowball	" "	"	1860	40.06	Jan. 8
Sunflower Frac	" "	"	1880	23.31	Jan. 8
Tulip	" "	"	1887	45.17	Jan. 9
Violet	" "	"	1872	29.21	Jan. 8
Water Lilly	" "	"	93	51.65	Jan. 7
Westorilla	" "	"	94	44.25	Jan. 7

EAST KOOTENAY.

Dardanelle	Fort Steele	Albert Banks	10329 G. 1	49.33	Sept. 11
Morning Fraction	"	Robert O. Jennings, James A Harvey and John H. Fink	3909 G. 1	8.25	July 23
Mother Lode	"	Albert Banks	10380 G. 1	38.38	Sept. 11
Omenica	"	Elgin E. Jones	5270 G. 1	51.65	Feb. 21

WEST KOOTENAY.

Glasgow	Nelson	Harry H. Shallenberger	6599 G. 1	38.09	Jan. 15
Glasgow No. 1 Fractional	"	"	6611 G. 1	12.05	Jan. 15
Golden Fleece	"	"	6607 G. 1	23.73	July 3
Golden Rod	"	"	6605 G. 1	23.2	July 3
Hastings	"	"	6598 G. 1	51.65	Jan. 15
International	"	"	6606 G. 1	11.84	Jan. 15
International No. 1	"	"	6610 G. 1	36.99	Jan. 15
Lake View	"	"	6602 G. 1	40.12	July 3
Medoc	"	"	6603 G. 1	49.91	Jan. 15
Pioneer	"	"	6601 G. 1	51.65	July 3
Pioneer No. 1 Fractional	"	"	6608 G. 1	8.16	July 9
Renfrew	"	"	6604 G. 1	51.65	Jan. 15
Renfrew No. 1	"	"	6609 G. 1	40.24	July 10
Salmo	"	"	6600 G. 1	51.65	July 24
Salmo No. 1 Fractional	"	"	6612 G. 1	15.71	Jan. 15
Silverstone	"	Lucia Swedberg	10640 G. 1	38.86	Dec. 31
Skookum	"	*Joseph Campbell*	9360 G. 1	35.77	Oct. 27
Black Warrior	Ainsworth	Bella Coursier, J. Ethel Morris and James McMahon, and George Smith McCarter, administrator of the estate of Thomas Edwin Horne, deceased, intestate	10646	51.65	April 21
Copper Star	"	Ellen Turner, Ralph Marcellus Kenyon, William Hawthorne, Henry Lewis Manley	10480 G. 1	51.65	May 27
De Lamar	"	Ditto	10479 G. 1	49.1	May 27
Delhi	"	"	10478 G. 1	51.03	May 27
Eva May	"	Bella Coursier, Janet Ethel Morris and James McMahon, and George Smith McCarter, administrator of the estate of Thomas Edwin Horne, deceased, intestate	10647 G. 1	51.31	April 21
Harrison	"	Chas. R. Hamilton	4380 G. 1	28.90	Jan. 24

WEST KOOTENAY.—*Concluded.*

Claim.	Division.	Grantee.	Lot No.	Acres.	Date.
Mollie	Ainsworth	Ellen Turner, Ralph Marcellus Kenyon, William Hawthorn and Henry Lewis Manley	10481	35.6	May 27
Orogon	"	Henry Giegerich	11279 G. 1	45.12	Mar. 13
Silver Bell	"	Charles Robert Hamilton	4378 G. 1	51.65	Jan. 24
White Star	"	Bella Coursier, Janet Edith Morris and James McMahon, and George Smith McCarter, administrator of the estate of Thomas Edwin Horne, deceased, intestate	11330 G. 1	45.5	April 21
Abey Doues Frac	Slocan	John Richard Cassin	11126 G. 1	6.61	May 6
Boxer II	"	"	11128	12.26	May 6
Four Mile	"	Frederick Ferdinand Liebscher	10635 G. 1	47.24	Mar. 6
Gordon	"	Standard Silver Lead Mining Co	11123 G. 1	50.42	Oct. 14
Laughing Waters	"	John Richard Cassin	11127 G. 1	22.72	May 22
Liberator No. 2	"	"	11124 G. 1	35	May 6
Northern Pacific	"	"	3174 G. 1	51.36	April 19
Old Tom Moore	"	"	11125 G. 1	37.34	April 19
Page	"	Standard Silver Lead Mining Co	11122 G. 1	44.09	Oct. 14
Red Cross	"	John Richard Cassin	3176 G. 1	38.65	May 6
Soho	"	"	3175 G. 1	33.65	April 19
Standard Fractional	"	Standard Silver Lead Mining Co	11754 G. 1	0.29	Oct. 14
Jorkins	Trout Lake	True Fissure Mining and Milling Co., Ltd	10650 G. 1	29.73	Mar. 7
Park Fraction	"	" "	10648 G. 1	1.66	Feb. 15
Spenlow	"	" "	10649 G. 1	51.46	Mar. 7
Alcome Fract	Trail Creek	Daniel Thomas	11468 G. 1	17.18	May 5
Alice L	"	Valance C. Simmons and Homer F. Libby	4321 G. 1	40.51	Jan. 20
Berlin	"	Albert Niebergall	11157	47.23	Oct. 22
Glendale	"	"	11137 G. 1	24.51	Oct. 22
Hidden Hand	"	"	11139 G. 1	35.57	Oct. 22
Independent	"	"	11136 G. 1	50.94	Oct. 22
Inland Fraction	"	"	11156 G. 1	1.32	Oct. 22
Saginaw	"	"	3879 G. 1	51.65	Oct. 22
Washington	"	"	11138 G. 1	51.65	Oct. 22

BOUNDARY.

B. C	Grand Forks	Wm. Herman Hoffman, executor of the will of Catherine Hoffman, deceased, and Jacob M. Paulson	1318 S.	48.0	Nov. 4
Copper King	"	Ditto	1319 S.	41.85	Nov. 4
Criterion	"	Emma Bently	2025 S.	31.01	Mar. 14
Joe Joe	"	J. J. Bassett	759 S.	43.15	Oct. 10
Lone Star Fraction	"	Hubert J. Bayly and Ida Lindholm	1446 S.	24.11	Nov. 28
Nellie	"	Wm. J. Prendergast and Christopher H. Reeves	1017 S.	51.5	July 15
Silver King	"	Jacob M. Paulson and Wm. Herman Hoffman, administrator of the estate of Catherine Hoffman, deceased	1317 S.	49.69	Jan. 29
Silver Queen	"	Ditto	1316 S.	51.65	Jan. 29
Sunrise	"	Jose h Alfred Miller	2789 G. 1	37.25	Jan. 29
The Lay Over	"	Peter Arthur Zephirin Pare, Patrick Joseph Byrne	434 S.	51.65	Nov. 21
Belmont Fractional	Greenwood	Eric E. Jackson	1422 S.	0.46	Aug. 13
Enterprise	"	Teresa M. Graham	1449 S.	51.65	Dec. 31
Florence No. 2 Fractional	"	Joseph J. Bassett	717 S.	2.04	Sept. 16
Iron Horse	"	John A. Tuzo and Wm. M. Law, administrator of the estate of Thomas Curry, deceased, intestate	2951 S.	44.25	June 27
Red Metal Frac	"	Frank Bell	1568 S.	37.03	Oct. 29
Teresa Fractional	"	Teresa M. Graham	869 S.	38.99	Dec. 30
Ammie	Osoyoos	Robert A. Brown	1247 G. 1	47.24	Aug. 25
Avoca	"	Duncan Woods	1480 S.	50.8	May 6
Goodwin Fraction	"	"	1484 S.	46.09	May 6
Hope	"	John McLean, Edward J. Rotherham	112 S.	51.65	Mar. 8
International	"	Adelbert Hart	1076 G. 1	48.07	Aug. 25
Jack Pine	"	Duncan Woods	637 S.	50.7	May 5
Jubilee Fraction	"	Valentine C. Hayes	941 G. 1	9.27	Aug. 25
Last Chance	"	Duncan Woods	1479 S.	46.55	May 19
Last Chance Fraction	"	"	1481 S.	35.92	July 4
Primrose	"	"	1482 S.	47.15	May 19
Richland Fract	"	Barbara McCurdy	702 S.	18.7	Jan. 20
Summit Fractional	"	Duncan Woods	1483 S.	41.20	May 19
All Up	Lillooet	James Alexander Fitzsimmons and Wm. R. Brown	3080 G. 1	50.26	June 30
Blue Jacket	"	" "	3077 G. 1	51.42	June 30
Corasand	"	Andrew Ferguson, Adolphus Williams	3049	41.27	Oct. 21
Emmadale	"	" "	3050	44.0	Oct. 21
Great Fox	"	" "	3046 G. 1	51.65	Oct. 21
Last Chance	"	Catherine Jane Fitzsimmons, James Alex. Fitzsimmons, W. R. Brown	3078 G. 1	51.42	June 30
Leona Fractional	"	James Alexander Fitzsimmons and Wm. R. Brown	3087 G. 1	28.14	Dec. 5
Sun Rise	"	" "	3079 G. 1	49.19	June 30
Union Jack Fractional	"	Andrew Ferguson, Adolphus Williams	3051	9.25	Oct. 21
Yellow Jacket	"	Catherine Jane Fitzsimmons, James Alex. Fitzsimmons, William R. Brown	3076 G. 1	51.65	June 30
Pretoria Fraction	Ashcroft	George J. Novak	200A	2.40	May 22
Almaden	Kamloops	The Hardie Cinnabar Mines, Ltd	950 G. 1	47.15	June 11
Boldre Fractional	"	" "	955	12.2	Nov. 27
Columbia Frac	"	" "	958 G. 1	13.80	June 11
Eureka	"	" "	954 G. 1	50.40	June 11
Idria	"	" "	949 G. 1	51.65	June 11
Mountain Chief	"	" "	952 G. 1	51.65	May 12
Summit	"	" "	959 G. 1	51.65	June 11

BOUNDARY.—*Concluded.*

Claim.	Division.	Grantee.	Lot No.	Acres.	Date.
Argentine Fraction	Similkameen	Geo. W. Aldous	1793 S.	49.0	July 3
Copper Farm	"	Chas. A. Saunders	122A	48.74	Sept. 16
Copper King	"	Charles Bonnevier and Gustaf Pornvels	403 G. 1	51.65	June 20
Cyclone Frac.	"	Duncan Woods	1485 S.	48.59	May 28
Enterprise	"	Charles Willarson, Peter Johnson, John Crowley, R. O. Cramer	644 S.	48.85	July 3
Hawk	"	Francis W. Groves	942 S.	48.69	Nov. 17
Helen H. Gardiner	"	Olive Pringle, Jesse S. Miller, Alexander Miller	120A	51.18	Sept. 16
Jennie Silkman	"	David O. Day, Llewellyn G. Barron, Thomas M. Day and Douglas M. French	810	22.66	May 15
Johnston	"	Charles Willarson, Peter Johnson, John Crowley	645 S.	51.65	Sept. 16
Smugler	"	" "	646 S.	24.50	May 6
Transvaal Frac.	"	Albert Elgin Howse	3534	21.0	June 5

VANCOUVER ISLAND AND COAST.

Azimuth	N. Westminster	Charles O. Wickenden	2593 G. 1	47.45	May 8
Bear	"	"	2594 G. 1	41.94	May 8
Evergreen	"	Harriet M. MacLaren	3427	41.26	Oct. 23
Extension	"	Bowen Island Copper Co., Ltd.	3369 G. 1	44.03	Feb 6
Gem	"	" "	3372 G. 1	34.86	Feb 6
Iron Wedge Fraction	"	Wm. Lewis, Mary Ann Williams, Fred. James Proctor, Thomas Wm. Strange	2168 G. 1	0.91	Aug. 4
Islander	"	Bowen Island Copper Co., Ltd	3370 G. 1	48.6	Feb. 6
Martin	"	Clara Maud Wickenden	2595 G. 1	39.77	May 19
Oyama	"	John R. Brown, Clara Maud Wickenden	2591 G. 1	39.82	May 19
Stalicum	"	Charles O. Wickenden	2592	29.46	May 8
Tonapah	"	Wm. Lewis, Mary Ann Williams, Fred. James Proctor, Thomas William Strange	2165 G. 1	47.47	Aug. 4
Westcliffe	"	Bowen Island Copper Co , Ltd.	3371	12.55	Feb. 6
Big 1 No. 6	Clayoquot	Wilbur Johnston	1231	51.65	May 2
Big 1 No. 7	"	John D. McLeod, Hugh H. Sutherland	1232	51.65	May 2
Great Central No. 5	"	John D. McLeod	1234	51.65	May 2
Great Central No. 6	"	John D. McLeod, H. H. Sutherland	1233	51.65	May 2
Copper Bell	Vancouver	Britannia Mining and Smelting Co., Ltd.	2333 G. 1	45.32	Jan. 17
Copper Bell Fractional	"	" "	2334 G. 1	35.5	Jan. 17
Hillside	"	" "	2332 G. 1	43.82	Jan. 29
Little Jap No. 2	"	" "	2095 G. 1	50.68	Jan. 17
Little Jap No. 3	"	" "	2329 G. 1	49.66	Jan. 17
Nettie Fractional	"	" "	2330 G. 1	22.57	Jan. 17
Power	"	" "	2331 G. 1	51.65	Jan. 17
Quinte	Victoria	H. B. Thomson	Sect. 146	48.25	July 19

DEPARTMENT OF MINES.

VICTORIA, B.C.

HON. SIR RICHARD MCBRIDE,	*Minister of Mines.*
R. F. TOLMIE,	*Deputy Minister of Mines.*
WM. FLEET ROBERTSON,	*Provincial Mineralogist and Assayer.*
D. E. WHITTAKER,	*Provincial Analyst and Assistant Assayer.*
JOHN D. GALLOWAY,	*Assistant Provincial Mineralogist.*
THOMAS GRAHAM,	*Chief Inspector of Mines, Victoria.*
HENRY DEVLIN,	*District ,, Nanaimo.*
JOHN NEWTON,	,, ,, ,,
EVAN EVANS,	,, ,, *Fernie.*
THOMAS H. WILLIAMS	,, ,, ,,
ROBERT STRACHAN,	,, ,, *Merritt.*
JAMES MCGREGOR,	,, ,, *Nelson.*

GOLD COMMISSIONERS AND MINING RECORDERS.

Mining Divisions.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-Recorder.
Atlin Mining Division	Atlin	J. A. Fraser	W. G. Paxton	
Sub-office	Discovery			R. Webster.
"	Telegraph Creek			H. W. Dodd.
"	Summit Station			Geoffrey Butler.
"	Wynnton			W. H. Simpson.
"	Haines (U.S.)		(Com. for taking Affidavits)	Risdon M. Odell.
"	Nahlin			J. F. Pilling.
Stikine Mining Division	Telegraph Creek	H. W. Dodd (Actg.)	H. W. Dodd (Actg.)	
Sub-office	Boundary	" "	" "	William Strong.
Liard Mining Division	Telegraph Creek	" "	" "	
Sub-office	Porter			Chas. H. Smith.
"	McDame Creek			Amos Everson.
Skeena Mining Division	Prince Rupert	J. H. McMullin	J. H. McMullin	
Sub-office	Kitimat			Geo. L. Anderson.
"	Port Simpson			J. R. C. Deane.
"	Essington			A. Forsythe.
"	Stewart (Portland Canal)			John Conway.
"	Unuk River			Burt E. Daily.
"	Anyox			F. A. McKinnon.
Portland Canal M.D.	Stewart	J. H. McMullin (at Prince Rupert)	John Conway	
Bella Coola Mining Div.	Prince Rupert	J. H. McMullin	J. H. McMullin	
Sub-office	Bella Coola			Frank Broughton.
Queen Charlotte Min'g D.	Queen Charlotte	E. M. Sandilands	E. M. Sandilands	Petrie S. Jack.
Sub-office	Jedway			W. Prescott.
"	Masset			C. Harrison.
"	Lockeport			H. L. Beresford.
Omineca Mining Division	Hazelton	Stephen H. Hoskins	Jas. E. Kirby	
Sub-office	Fort Grahame			*John Ross.*
"	Fort St. James			Alex. C. Murray.
"	Manson Creek			W. B. Steele.
"	Copper City			P. R. Skinner.
"	Telkwa			R. Gale.
"	Lorne Creek			F. E. Holt.
"	Terrace			T. W. S. Parsons.
"	Fort St. John			F. W. Beatton.
"	Babine Portage			R. J. Cameron.
"	Fort Fraser			J. E. Hooson.
"	Junction Finlay & Parsnip Rivers			Wm. Fox.
"	Pacific			T. H. McCubbin.

GOLD COMMISSIONERS AND MINING RECORDERS.—*Continued.*

Mining Divisions.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-Recorder.
Peace River Mining Div..	Fort St. John	....	F. W. Beatton	
Cariboo Mining Division..	Barkerville	C. W. Grain	.....	
Sub-office	Quesnel.....	....	.....	A. P. Halley.
"	Fort George.....	.....	....	T. W. Herne.
"	17-Mile Post G.T.P	.....	....	Henry Taylor.
Quesnel Mining Division..	150-Mile House...	C. W. Grain	Arthur Sampson...	
Sub-office	Quesnel.....	(at Barkerville)	....	George Milburn.
Clinton Mining Division..	Clinton	E. C. Lunn.....	.....	
Lillooet "	Lillooet.....	Caspar Phair... ..	Caspar Phair.....	
Kamloops Mining Division	Kamloops.....	E. T. W. Pearse	E. Fisher	
Ashcroft "	Ashcroft.....	" (at Kamloops)	H. P. Christie.....	
Nicola "	Nicola.....	" "	W. N. Rolfe	
Yale "	Yale	" "	L. A. Dodd	
Sub-Office.....	Hope.....	" "	.....	Ewen McLeod.
Similkameen "	Princeton	Hugh Hunter	Hugh Hunter	
Sub-office	Hedley	.....	.....	F. M. Gillespie.
Vernon Mining Division..	Vernon	L. Norris	H. F. Wilmot	
Greenwood Mining Div...	Greenwood.....	W. R. Dewdney...	....	
Sub-office	Vernon	.....	.....	H. F. Wilmot.
"	Rock Creek.....	....	.....	H. Nicholson
"	Beaverdell	.....	.....	E. F. Ketchum.
Grand Forks Min. Div....	Grand Forks	S. R. Almond	S. R. Almond	
Osoyoos Mining Division..	Fairview.....	J. R. Brown	R. D. Tweedie.....	
Sub-office	Olalla.....	.....	.....	R. W. Northey.
"	Hedley	.....	.....	F. M. Gillespie.
Golden Mining Division..	Golden	H. C. Rayson	F. H. Bacon	
Windermere " ..	Wilmer.....	.....	Ronald Hewat	
Fort Steele Mining Div...	Cranbrook	N. S. A. Wallinger.	H. S. Clark	
Sub-office	Steele.....	.. ..	.....	Joseph Walsh.
"	Fernie.....	.....	....	Geo. F. Stalker.
"	Moyie	.....	.....	John P. Farrell.
"	Marysville	....	.....	G. W. Mowatt.
Ainsworth Mining Div ...	Kaslo	R. J. Stenson	A. McQueen	Wm. J. Green.
Sub-office	Howser.....	.....	.....	W. Simpson.
"	Trout Lake	.....	.....	A. N. Vars.
Slocan Mining Division...	New Denver	R. J. Stenson (at	Angus McInnes ...	
Sub-office	Sandon	" Kaslo)	.....	W. J. Parham.
Slocan City Mining Div...	Slocan.....	... .	Howard Parker....	
Trout Lake Mining Div..	Trout Lake	R. J. Stenson	A. N. Vars.....	
Nelson Mining Division ..	Nelson	John Cartmel.....	S. S. Jarvis.....	
Sub-office	Creston.....	....	.....	Guy Loewenberg.
"	Ymir.....	.....	.....	Geo. S. Coleman
"	Sheep Creek	.....	.....	James Thompson.
"	Salmo	....	.....	G. A. Kennington.
Arrow Lake Min. Division	Nakusp.....	John Cartmel.....	Walter Scott	
Sub-office	Vernon.....	(at Nelson)	.....	H. F. Wilmot.
Revelstoke Mining Div...	Revelstoke.....	Robt. Gordon	R. S. Squarebriggs.	Newton R. Brown
Lardeau Mining Division.	Beaton	" (at Revelstoke)	William A. Strutt.	Mrs. A. H. Strutt.
Trail Creek Mining Div...	Rossland	H. R. Townsend...	H. R. Townsend...	

GOLD COMMISSIONERS AND MINING RECORDERS.—*Concluded.*

Mining Division.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-Recorder.
Nanaimo Mining Division	Nanaimo	George Thomson	George Thomson	
Sub-office	Ladysmith			John Stewart.
"	Alert Bay			H. F. Helmsing.
"	Vananda			David Jones.
"	Rock Bay			W. H. Lines.
Alberni Mining Division	Alberni	J. Kirkup		
Clayoquot "	Clayoquot	" (at Alberni)	W. T. Dawley	
Quatsino "	Quatsino	" "	O. A. Sherberg	
Victoria Mining Division	Victoria	Herbert Stanton	Herbert Stanton	
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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LIST OF ILLUSTRATIONS.

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Victoria, Government Printing Office, 1914.

Author.

Robertson, William Fleet. *(Provincial Mineralogist.)*

Annual Report of the Minister of Mines of British Columbia for the year ending 31st December, 1913, being an account of mining operations for gold, coal, etc., in the Province. (British Columbia, Bureau of Mines.) 459 pp., plates, maps, 1913.
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